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Capacity assessment and awareness raising on CLIMATE CHANGE in Tajikistan

**Using Participatory Scenario
Development (PSD) approach**

The present PSD report was commissioned as one of the outputs of Phase I of the Pilot Programme for Climate Resiliency (PPCR) in Tajikistan. The primary task of the present report is to present the findings on capacity building and awareness raising on climate change in Tajikistan using the Participatory Scenario Development (PSD) approach, which aimed to identify priorities, development trends and gaps of key stakeholders in adaptive capacity, propose recommendations and, therefore, compliment the priority components identified in the Strategic Programme for Climate Resilience (SPCR). The results of the report are mainly based on the views and proposals by the participants of PSD trainings, which covered the main regions of Tajikistan.

The views expressed in this document are those of the author and participants of PSD trainings and do not necessarily reflect views and opinion of the partner organizations and government.

Author: Livia Bizikova

Photo on the cover page: Children's competition on drawing climate change. 15th WMO Congress exhibition, 2007



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Executive Summary

The development of strategies to adapt to climate change has evolved into a multidisciplinary approach that links natural and social science, policy-makers, experts and non-experts, and traditional and scientific knowledge. There are many challenges in designing adaptations among so many stakeholders while trying to make sure the adaptations not only respond to the projected impacts of climate change but also promote long-term resilience in conjunction with other development measures. To address these challenges, researchers and practitioners suggested participatory scenario development (PSD) approaches, which were successfully tested in a number of countries in the context of climate change adaptation. PSD is applied in the multistakeholder context to help anticipate and understand the consequences of climate change in the context of plausible socioeconomic futures, and then to identify well-suited adaptations that will reduce risk and increase resilience over different time horizons.

Tajikistan is one of the most vulnerable countries in Central Asia, with many development challenges dating back to the centrally planned Soviet system, as well as additional challenges experienced during the transition process. The population suffers from both relatively high sensitivity to potential climate change impacts and low adaptive capacity compared with other countries in the region (World Bank, 2009). To address some of these challenges in the context of climate change, Tajikistan is one of the countries in which the Strategic Program for Climate Resilience (SPCR) will be implemented. The program will include six investment and capacity-building activities, totalling \$50 million plus additional co-financing, with a focus on building capacity for climate resilience (improving service delivery related to weather, climate and hydrological issues); a climate science and modelling program to enhance the climate resilience of the energy sector; agriculture and sustainable land management; and building climate resilience in the Pyanj River basin.

In this final report we summarize the outcomes of the key tasks conducted during a program titled Capacity Assessment and Awareness Raising on Climate Change in Tajikistan. Specifically, we outline the application of a PSD process with the following objectives:

- Build capacity on issues related to climate change impacts on key stakeholders, and their consequent adaptation needs.
- Validate the priority areas in the SPCR to ensure that the identified priorities are in line with the key capacities of the communities.
- Complement the activities identified in the SPCR with further activities that are considered, from the stakeholders' perspective and in the context of other development priorities, to be key to increasing their capacity to respond to climate change.

In total, five workshops took place from September through November 2011, in five cities: Dushanbe (the capital of Tajikistan); Khorog, in the Gorno-Badakhshan Autonomous Province (GBAO); Kurgan-Tyube, in the Khatlon region; Khujand, in the province of Sughd; and Vakhdat district, in the Districts of Republican Subordination region (RRS). In total, 124 people participated in the workshops, excluding the facilitators, team members and other organizers. The participants worked in a total of 16 groups of six to ten people. On average, at each workshop approximately 25 per cent of participants were women and 75 per cent were men. Approximately

35 per cent of participants came from different levels of local, regional and national government; 22 per cent were teachers, academics or other research staff affiliated with a university or institute; 11 per cent came from non-governmental organizations or other civil society organizations; 12 per cent were farmers, producers or representatives of business organizations; and 19 per cent were managers or experts, often focused on water, land management or agriculture.

Overall, Tajikistan faces a number of challenges, including limited basic services such as clean water supply, access to reliable energy, quality health care and education, and social safety nets. Specific gaps exist in key sectors that are crucial for livelihoods, such as agriculture and processing. Workshop participants pointed out that challenges in these sectors include the availability and quality of suitable seeds, sustainable land management practices, access to infrastructure, access to storage facilities, and limited knowledge of processing and marketing to improve revenues from production. Many of these challenges could be further worsened if climate change and climate variability lead to further droughts and land degradation; a higher incidence of disease in plants, animals and humans; and disasters such as floods, mudflows and mountain lake overflows.

The participants perceived that their communities had low adaptive capacity and limited experience or resources that could be turned into action if impacts occurred. Participants had opportunities to list specific capacities that they could use to respond to climate variability and climate change, but most of them mentioned that they lacked resources for sustainable long-term adaptations. For example, the participants were the most concerned about droughts, as these directly impact agriculture - the most significant source of assets for most participants - and limited alternatives are available. Especially vulnerable and poor people tend to lose most of their assets during disasters, reoccurring impacts undermine their coping capacity, and they have almost no ability to rebuild their livelihood in either the original area or a resettled area.

While all these current and potential future impacts require adaptation measures, in the case of Tajikistan, it is important to link adaptations with investments in development so that the two work in synergy to improve resilience.

To improve capacity and reduce vulnerability to climate change, the participants suggested a number of actions, including actions focused on infrastructure development, ecosystem-based actions, and actions aiming to develop strategies, strengthen institutions and deliver specific capacity-development activities. Many of these identified adaptations and development goals are closely linked to the planned SPCR investments and actions. Thus, the SPCR could contribute to reducing the vulnerability of people and systems to climate change. The recommendations below could enhance the efficiency of the SPCR actions, and some of these measures could also be supported from small grants.

Based on the information gathered during the workshops, we can put forward the following key recommendations:

Measures focused on institutions, strategy development and coordination are crucial in considering and integrating adaptation priorities with development, across sectors and levels of governance:

- Develop a national climate change adaptation strategy outlining key priorities and principles for adaptation and capacity development. The actual implementation of the strategy could be done in a more decentralized manner.
- Use identified principles and guidelines for adaptations and capacity development to screen development projects and investments to ensure that they are not increasing vulnerability and that they are contributing to resilience, even if they are not directly focused on climate change.
- Promote collaboration among national, regional and international agencies so that work on climate change adaptation is coordinated and agencies are aware of each other's initiatives, preferably building on each other's results.
- Ensure that regional-level institutions such as *jamoats* (administrative divisions similar to municipalities) play a key role in implementation of actual actions, including those outlined in the SPCR. This is especially the case for activities such as training, information dissemination, capacity development, and providing forecasts and early warnings. According to the participants, this could be best achieved by allocating some of the resources to invest in *jamoats*' initiatives, perhaps by creating information centres in the *jamoats*. These centres would need to be in regular contact with the regional and national agencies to ensure coordinated action and information sharing.
- Ensure synergies between sectorial adaptations and different types of measures. For example, adaptation focused on species planted for agriculture would be more effective if adaptations focused on water management and economic development were designed and implemented in a coordinated manner. Similarly, measures to develop infrastructure could be supported by ecosystem-based measures and capacity-development activities.

Infrastructure-based adaptation measures provide important contributions in increasing resilience and promoting development while reducing climate change impacts:

- Consider that many current challenges, including delivering clean water; providing access to irrigation water, reliable energy, safe housing and healthcare; and monitoring water quality and quantity, land-use change and disease would require significant investment in infrastructure beyond only investments related to climate change adaptation.
- Consider that investments planned under the SPCRW were aligned with development priorities that the participants put forward as important; however, they may be required at a considerably larger scale throughout most of the country.
- Address crucial needs related to current types of livelihoods. Participants saw improving access to seeds, storage places, irrigation infrastructure, renewable decentralized energy systems and processing facilities as crucial for improving agricultural livelihoods in the context of climate change impacts.
- Improve access to water for drinking and irrigation by modernizing current hydroelectric power plants (HPPs), cleaning up current reservoirs and building small-scale HPPs. These suggestions were put forward to address both current challenges related to access to water and future climate change impacts such as droughts.

-
- Improve infrastructure to address future acute climate impacts. This includes building or renovating protection systems for floods and mudflows, as well as instituting and maintaining monitoring and emergency procedures to ensure timely evacuation when disasters occur.

Ecosystem-based measures are among the adaptations needed and, together with measures focused on infrastructure, they are crucial to resilient development:

- Promote forest plantations that could help to hold moisture and strengthen river banks. Such cultivation should be considered in areas vulnerable to drought and planted with drought-resistant species, perhaps using different species in areas affected by floods and mudflows (fast-growing species were suggested for these areas).
- Consider agroforestry to provide food for local people and products for them to sell, to ensure that they benefit from the land after forest plantations are established.
- To prevent further deterioration, address overgrazing of pastures by promoting rotation and management of pastures and limiting the number of and type of livestock.
- Put mechanisms in place to monitor the forest plantations, interactions between people and forests, and implementation of relevant management practices.

Capacity-development measures. To ensure the efficiency of adaptation measures, capacity-development measures would need to be closely integrated with other types of measures in most sectors and can be also supported from small grants:

- Develop capacity-building sessions for professionals and policy-makers working in monitoring, hydro-meteorology, agriculture, water and other sectors to increase their knowledge about climate change impacts and adaptations and how these could be integrated with their sectoral planning and actions.
- Work with specific stakeholder groups, especially farmers. Provide information and practical training on sustainable land management to reduce erosion, using agroforecasts, preparing for potential pests and developing skills in processing.
- Build capacity among teachers and other educators to provide them with the information and materials they need to include climate change in their teaching.
- Develop materials for capacity development that could be used by stakeholders' groups and the public.
- Use information and communication technology, including mobile phones, for example to disseminate information about forecasts, disasters and evacuations. These could also be used to involve people's feedback in validating data and forecasts, assessing harvests to prepare for potential food insecurity, and monitoring diseases.

Measures to protect vulnerable people, who cannot be assumed to benefit equally with the rest of the population from adaptation actions:

- Conduct further assessments to specifically address the needs of vulnerable people in areas of high vulnerability in Tajikistan and to identify adaptations targeted to them.

-
- Develop emergency and resettlements plans for populations in highly vulnerable areas, and keep these up-to-date so they can be implemented if disasters occur.
 - Ensure that women and vulnerable people are involved in public consultations and in capacity-development activities.
 - Provide support for relevant skill development and emergency safety nets or services.

Other future adaptation and capacity measures would need to be designed and continuously implemented to ensure that the capacities built would be sustained, and sensitivity to climate further reduced:

- Increase assessments of climate change impacts on water resources, key agricultural crops (commercial and food), and natural ecosystems.
- Develop vulnerability maps for different hazards and capacities and identify hot spots where areas with high levels of hazards or low capacities are estimated. Provide this information to the public and to stakeholder groups and ensure that projects for relevant adaptations are being implemented in these areas.
- Assess vulnerabilities and needed adaptation measures in health care and identify current public health challenges as well as future trends and adaptation needs.
- Consider further activities to ensure small-scale energy system development and water access.
- Based on planned activities, including the SPCR and others, and on strategic development documents, develop a key set of priority adaptations that could be progressively implemented over next 10 to 20 years to ensure that the effectiveness of current adaptations is sustained and improvements are made.

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List of Acronyms and Definitions

GBAO	Gorno-Badakhshan Autonomous Province
HPP	Hydroelectric Power Plant
PSD	Participatory Scenario Development
RRS	Districts of Republican Subordination (a region of Tajikistan)
SPCR	Strategic Program for Climate Resilience (SPCR)
<i>jamoat</i>	an administrative division similar to a municipality
<i>kishlak</i>	a rural settlement of semi-nomadic people
<i>oblast</i>	an administrative division, often translated as “area,” “zone,” “province” or “region”
<i>rayon</i>	an administrative division; refers to both a type of a subnational entity and a division of a city; commonly translated as “district”

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Introduction

Developing adaptation to climate change has evolved into a multidisciplinary approach that links natural and social science, policy-makers, experts and non-experts, and traditional and scientific knowledge. Challenges lie not only in the scientific projections of climate change and physical elements of adaptation design, but also in understanding the human dimensions of the consequences of climate change and identifying preferred means of adaptation for diverse groups of stakeholders. In order to successfully adapt to climate change, capacities in each of the stakeholder groups need to be available and must turn into adaptive actions when climate impacts occur. Since its appearance in the literature, the concept of *adaptive capacity* has been closely linked to levels of economic development, based on factors such as the range of technological options available, the availability of resources and the stock of human capital (Yohe, 2001).

Furthermore, research has shown that poverty negatively impacts diverse characteristics of adaptive capacity, and poor people overall often have fewer resources available to respond to climate change in a sustainable manner (see, for example Eriksen and O'Brien, 2007). Not only do poor people often lack access to health and educational services and other safety nets, they have limited involvement in decision-making and consultations. This reduces the likelihood that adaptation strategies and actions will account for the needs of poor people. Therefore, when developing projects and strategies and designing actions, it is crucial to apply methodological approaches that could account for a broader set of resources, capacities and stakeholder groups and to investigate how adaptations could be tailored to the needs of different groups, including poor people.

Tajikistan is one of the most vulnerable countries in Central Asia, with many development challenges dating back to the centrally planned Soviet system, and additional challenges experienced during the transition process. To address some of these challenges in the context of climate change, Tajikistan is one of the countries in which the Strategic Program for Climate Resilience (SPCR) will be implemented. It will bring six investment and capacity-building activities (totalling \$50 million plus additional co-financing), with a focus on building capacity for climate resilience; improving delivery of services addressing weather, climate and hydrological issues; implementing a climate science and modelling program; enhancing the climate resilience of the energy sector; improving agriculture and sustainable land management; and building climate resilience in the Pyanj River basin.

In this final report we summarize outcomes of the key tasks conducted during a series of workshops titled Capacity Assessment and Awareness Raising on Climate Change in Tajikistan. Specifically, we outline a Participatory Scenario Development (PSD) process used to assist in capacity development and to validate and complement SPCR investments and activities from different stakeholder perspectives. In this document, we first provide an overview of the PSD process and its applications at the national and regional level. Then we summarize the key results gathered through the capacity-building sessions and present major conclusions and recommendations.

Materials presented in this document were discussed and reviewed by the core team involved in the Pilot Project on Climate Resilience.

Design of Participatory Scenario Development

Strategies to increase adaptive capacity and resilience to climate change may target the global, continental or country scale to attempt to determine what resources are necessary, including demand for technology, money and information. However, it is also beneficial to investigate what synergies and trade-offs these responses may have with development goals and desired development pathways so they fit with key priorities of countries not focused only on climate change. An example would be promoting agricultural crops that are resilient to climate change but also relevant for local diets, and for which the community has access to markets, relevant technologies, and information for planting and processing.

PSD is an approach applied in a multi-stakeholder context to help anticipate and understand the consequences of climate change in the context of plausible socio-economic futures, and then to identify well-suited adaptations encompassing hard and soft measures to reduce risks and increase resilience in accordance with goals over different time horizons (Bizikova, 2009; Bizikova, Boardley & Mead, 2010, p. 64; for details see Table 1). It is a process that involves the participation of stakeholders to explore the future in a creative and policy-relevant way. Looking across sectors, stakeholder groups and scales is particularly important because when identifying options for adapting to climate change, we tend to focus on responding directly to climate signals and climate variability without sufficiently integrating these responses into overall development needs, priorities and plans. In the context of planning and policy development, PSD is used to identify the potential effects of alternative responses to emerging challenges, determine how

Table 1. Participatory scenario development (PSD) – brief overview

In general, the scenario method refers to a general category of techniques associated with creative visioning (Wollenber et al., 2000). Unlike projections, scenarios do not indicate what the future will look like. Scenarios instead stimulate creative ways of thinking that help stakeholders break out of established patterns of assessing situations and planning actions, so that they can better adapt to the future (Jaeger et al., 2000; UNEP 2002). In order to fully explore opportunities from scenarios, much attention is being devoted not only to the developed scenarios, but also to the scenario development process. This includes an increasing emphasis on stakeholder involvement in the developing of scenarios – referred to as participatory scenario development (PSD).

Participatory scenario development has been applied in earlier studies focused on forestry, regional development and energy and the following key contributions were identified (as compiled by Evans et al., 2008, selected):

- The use of scenarios allows local stakeholders to develop strategies that encourage self-reliance and strengthen intra-community collaboration.
- The concrete products of the scenarios – drawn or written visions, prioritized lists of needs, strategies and proposals – served as records of decision-making processes validated by the community.
- This method strengthened group discussions and broadened participation in decision making and in the development of practical strategies because the methods provided techniques and practical experience via meetings in which all participated.

Source: Bizikova et al. 2011

different groups of stakeholders view the range of possible policy and management options available to them, and identify appropriate public policies and investment support necessary to facilitate effective future actions.

2.1. Objectives and Methodology of PSD

Based on the aims listed above, we define **the objectives of the PSD workshops** as follows:

- Build capacity on issues related to climate change impacts and adaptation by key stakeholders.
- Validate the priority areas listed in the Pilot Project on Climate Resilience and the SPCR to ensure that the identified priorities are in line with the key capacities of the communities.
- Complement the identified activities in the Pilot Project on Climate Resilience and the SPCR with further activities that the stakeholders consider key to increasing their capacities when responding to climate change in the context of other development priorities.

Overall, PSD workshops are not a stand-alone activity, and they are better applied in tandem with other methods and tools. This means that PSD workshop results are more robust and relevant if the workshops are linked with inputs from other assessments and information available for the country or region, and if multiple events are conducted to ensure that wider groups of stakeholders get a chance to participate and diverse views are considered. Considering this, we applied the PSD process in this project as follows:

- Conduct a literature review of key documents in the country directly focused on climate change impacts and adaptation, as well as important documents focusing on poverty reduction, development priorities and sustainability.
- Conduct a project inception workshop in June 2011, outlining the planned PSD process and gathering feedback.
- Conduct a series of informal interviews with representatives of non-governmental organizations and international agencies working in Tajikistan to review major activities relevant for climate change and adaptation.
- Design the PSD process based on the gathered information, using guidance from the project team and based on project priorities and feedback from the local non-governmental organizations.
- Deliver a training session on PSD to local facilitators to help them acquire the capacities needed to deliver PSD workshops at the regional and *oblast*¹ level.
- Hold a national-level, one-and-a-half-day PSD workshop in Dushanbe (the national capital) in September 2011 to provide a set of brief results on national priorities and serve as a learning-by-doing opportunity for the local facilitators.

¹An *oblast* is a type of administrative division in Tajikistan.

- Conduct a series of four oblast-level PSD workshops in Sughd, Khatlon, the RRS and GBAO following the same process, agenda and reporting format to ensure comparability of results. The workshops were conducted between October and November 2011.
- Develop a draft final report summarizing the outcomes of the literature review, informal interviews and PSD workshops, with key recommendations on adaptation and SPCR priorities, gaps and key actions to improve the future activities.
- Present and review the report based on the comments from the project team and stakeholders during the final workshop held in January 2012.
- Complete the final report and submit it to the United Nations Development Programme.

The information and feedback gathered through these steps, especially the initial assessments, informal interviews and feedback from the local facilitators, informed the PSD workshop design. Specifically, this meant that during the PSD workshops, we focused on the key sectors identified during the inception workshop, such as energy, agriculture, water and health. Other issues and trends could be included if the participants feel they were relevant. Such additional issues could include migration, education, youth and gender.

To ensure diverse views of stakeholders in the process, PSD was applied at the national level mostly for decision-makers working at that level, and the four oblast-level workshops to get the

Table 2. Key oblasts and SPCR priorities explored during the PSD workshops in each of the oblasts

SPCR priority	Oblast			
	GBAO	Khatlon	Sughd	RRS
Build institutional capacity and awareness of climate change among stakeholder groups: civil society, media, vulnerable groups (women, youth, young men and children)	X	X	X	X
Improve the national hydro-meteorological monitoring system to provide timely warnings of dangerous events and support water management	X	X	X	X
Implement a climate science and modelling program *	X	X	X	X
Replicate and scale up existing effective land management practices		X		
Rehabilitate the Kairakkum HPP as a pilot			X	X**
Implement climate-proofing measures in vulnerable ecosystems and critical infrastructure, to be piloted in the Khatlon target area and Pyanj tributaries		X		

* This priority was not discussed with the stakeholders directly, but we make recommendations for this priority based on the data gaps and assessment needs the stakeholders identified.

** This additional oblast was also chosen for this priority because improving energy security is one of the most important priorities, even though the actual activity is not located in the area.

views of specific stakeholders at the local and regional level, such as farmers, teachers, and representatives of the local governments and local nongovernmental organizations. Including these groups provided opportunities to get insights about specific regional priorities and challenges that may have been different from those at the national level. Because one of the objectives of the PSD was to validate the priority areas listed in the SPCR to ensure that they were in line with the key capacities of the communities, the SPCR activities were divided among the oblasts based on their relevance. During the PSD workshop each oblast focused on the three most relevant SPCR priorities (Table 2). We allocated the priorities after consultations with the project team and local facilitators. One of the SPCR priorities, the climate science and modelling program, was not directly discussed with stakeholders because it is more targeted to researchers. But based on the recommendations, including data and assessments needs that the stakeholders identified, we are able to indirectly make suggestions in this priority area, as well.

Finally, PSD is usually applied in a workshop setting, and it could be flexibly designed based on participants' availabilities, overall preferences for participation and experiences of the facilitators. On average, multi-day events with skilled facilitators are sufficient to complete a process of scenario development and identification of capacity needs and gaps, climate change impacts and future priorities. The general rule is that, if the workshops are shorter or the facilitators less experienced, the scenario process tends to get less rigorous and is often presented as a brief future-visioning exercise. Based on the feedback from the local facilitators and the overall experience with participatory workshops in the country, the oblast-level workshops were simplified to shorter, one-day PSD events. This was based on the experiences of the local facilitators, who also indicated that the workshop participants in rural areas would not have time to participate in an event longer than a day.

2.2. Overview of the PSD Workshop Structure

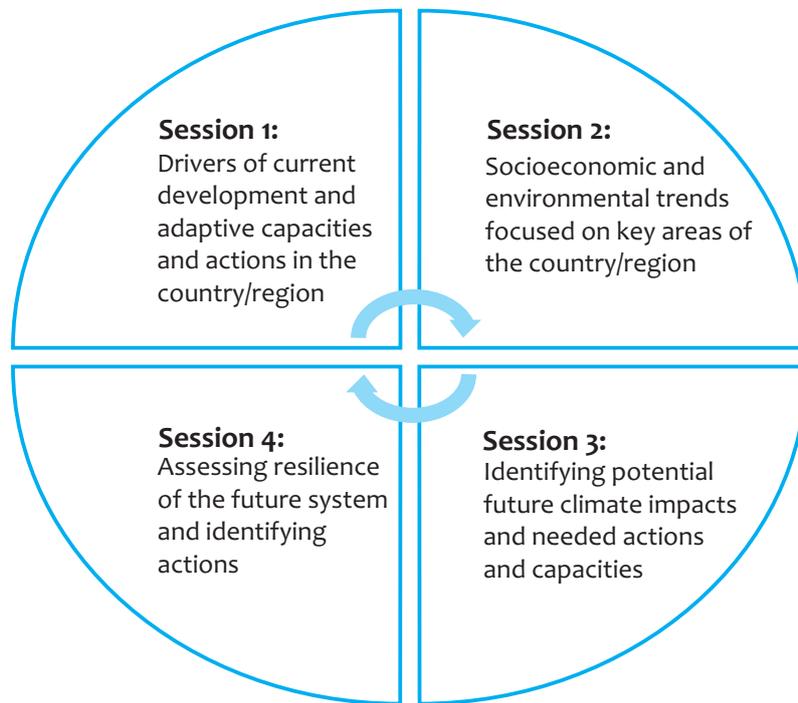
The PSD workshops were designed to work from an understanding of current trends and capacities. From this, we could assess future development goals and their vulnerability to potential future hazards, and then identify options to increase capacity and resilience of the pathways leading to these goals (based on Bizikova, 2009; Bizikova, Boardley & Mead, 2010, p. 64). Once goals and capacities were identified, they were used to guide a review of the relevant SPCR activities and identify additional measures that could increase their benefits to poor and vulnerable people.

We divided the agenda into four sessions (Figure 1), which were accomplished during a half-day workshop at the national level and a one-day workshop at the oblast level. Appendix 1 lists the detailed PSD workshop agendas.

The workshop started with an **opening session** that introduced the SPCR and Pilot Project on Climate Resilience studies and the objectives of the workshops. The session emphasized the importance of the workshop and of the participants' contributions to its success. During this session, participants introduced themselves and were divided into groups by region.

Session 1 focused on discussing the current situation and identifying important drivers and challenges. Here, we also tried to understand the importance of climate variability and impacts at the national and regional levels in the context of other trends and issues the stakeholders have to deal with. The main outcome of this session was a set of current drivers, as well as examples of past climate-related events combined with a list of capacities that people can access when they need to respond to such events.

Figure 1. Key elements of the PSD workshops



Session 2 aimed to further develop the list of identified drivers by looking at the range of possible and desired future trends. This session included identifying future goals (Figure 2), combining them into potential future scenarios (to 2040), and then developing the scenarios in detail by using the participants' knowledge of the country or region and the sectors. In the oblast-level workshops, participants worked in parallel groups focused on the same region, which increased the robustness of the results.

Figure 2. Example of future goals identified for selected key sectors

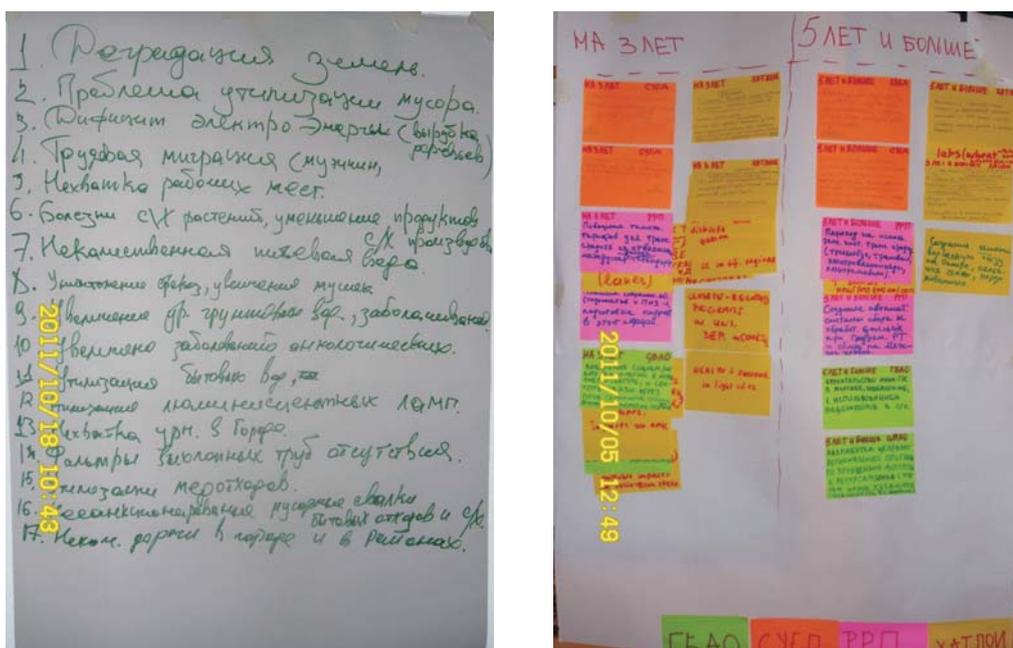


Photo: Rayhon Jonbekova and Livia Bizikova

Session 3 focused on introducing climate change projections and considering their impacts in the context of the future goals. This required identifying potential consequences of climate change in the context of the goals and then identifying a set of key responses. In this session, the participants received a brief introductory presentation on climate change impacts, based on published projections, and their impacts in Tajikistan as a whole as well as in the oblasts. The presentation was done by a local expert, as such a presenter is able to give examples of projections, similar events from the recent past, institutional context and other details that participants may ask about.

Figure 3. Participants working in groups during the workshop sessions in the GBAO



Photos: Rayhon Jonbekova

Session 4 looked at the trade-offs that came with each measure, as well as the actors' capacities to respond to climatic events, learn from their mistakes and try to improve the system. Once the groups had identified specific goals, capacities and actions, they were asked to review them and make any additions needed to increase the resilience of the regional system. Finally, they were asked to create a timeline of key actions that would be needed to build a resilient system.

The closing session consisted of informing the participants of how the results would be used, when and where they could access the reports, and other potential future events.

After completing the workshops, all materials written by the participants were collected, transcribed and processed. Section 3 of this report lists the major themes of these materials. When **processing the results**, we both looked at key challenges, goals and needed measures identified in each of the workshop locations and also highlighted the issues that were given priority across all the workshops. We summarize the results in Section 3 and present more detailed results in the appendix, Section 7.

2.3. Workshop Participants and Their Feedback

In total, five workshops took place from September through November 2011 in five cities: Dushanbe, the capital of Tajikistan; Khorog, in the Gorno-Badakhshan Autonomous Province (GBAO); Kurgan-Tyube, in the Khatlon region; Khujand, in the province of Sughd; and Vakhdat district, in the Districts of Republican Subordination region (RRS). In total, 124 people participated in the workshops, excluding the facilitators, team members and other organizers. The participants worked in a total of 16 groups of six to ten people. On average, at each workshop approximately 25 per cent of participants were women and 75 per cent were men.

Figure 4. Workshop locations throughout Tajikistan



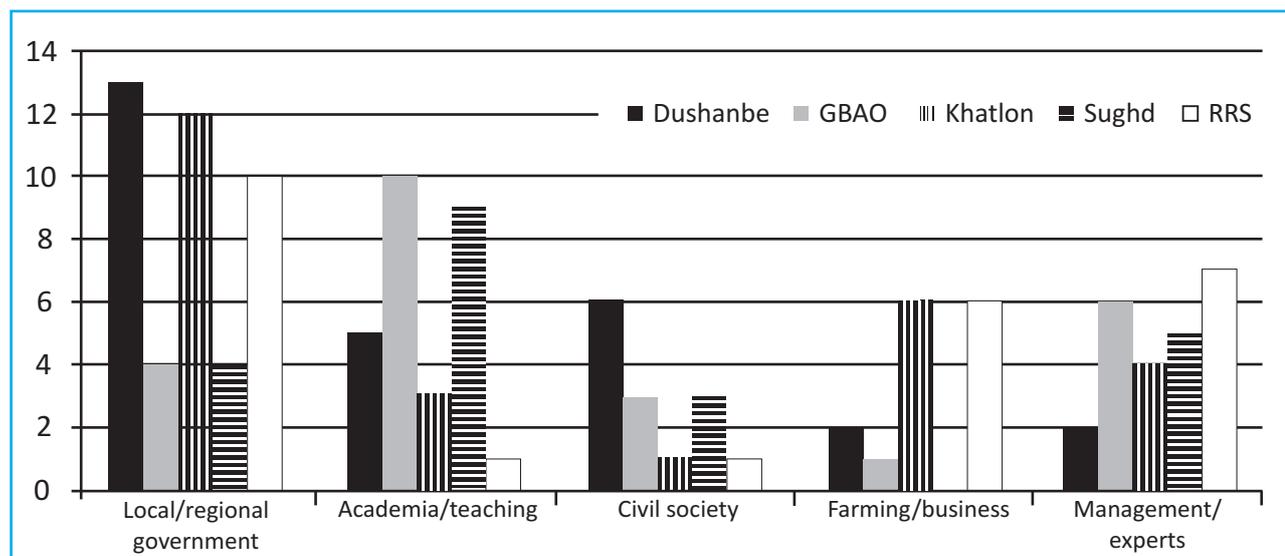
Source: Adapted by UNDP, 2012

In terms of the participants' affiliations, we distinguished five groups, with the following levels of participation across the five workshops:

- Representatives of different levels of local, regional and national government made up, on average, 35 per cent of participants.
- Teachers, academics and other research staff affiliated with universities or institutes represented 22 per cent of participants.
- Representatives of non-governmental and other civil society organizations made up 11 per cent of participants.
- Farmers, producers and members of business organizations represented 12 per cent of participants.
- Managers and experts, often focused on water, land management or agriculture, accounted for 19 per cent of participants.

The actual representation of these groups varied among the workshops (for details see Figure 5).

Figure 5. Affiliations of workshop participants



During the closing workshop session, evaluation forms were handed out to the participants to collect feedback about their overall satisfaction, key contributions and suggestions for improvements and changes, as well as for future applications for the PSD workshop. Based on the evaluations, more than 70 per cent of the participants considered the workshop to be very successful, and the rest considered it to be fairly successful. Participants agreed that the activities were challenging yet engaging and that the information presented in the presentation on climate change was interesting and highly relevant. Participants also appreciated the links among scenario development, climate change and adaptation. They found the integrated discussion more engaging than just discussing climate change. Most of the participants considered the workshop successful because of the participatory character of the exercises, the opportunities for discussions with their group members and the overall methodological approach.

Specific feedback from the participants included:

- They found a lot of useful discussion and opportunities to present their views.
- They appreciated the opportunities to discuss the topic with other experts from different fields.
- They enjoyed the unique approach to adaptation to climate change.
- They felt there was very high and active participation by the attendees.
- They felt a wide range of issues were discussed that considered the oblasts when focusing on climate change and adaptation.
- They felt the workshops were very useful and productive, especially the group work.
- They felt the workshops helped increase the level of awareness.

Looking ahead, participants suggested improvements to the PSD structure and content for future workshops, including providing more time for participants to complete the exercise and providing clearer guidelines, especially for the scenario-development exercise. Specific suggestions included:

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- To ensure higher participation by women, consider separate trainings for women in some areas.
 - Diversify trainings; let participants select one theme and consider it from different perspectives and priorities.
 - Involve more policy-makers to reach more sustainable recommendations.
 - Involve more teachers to further link the SPCR outcomes with the educational process.
 - Distribute leaflets and handouts.
 - Choose just one topic and/or sector to focus on.
 - Conduct more trainings.
 - Involve more local specialists who have information about the oblasts.
 - Show more examples of climate change adaptation in other countries.
 - Conduct trainings in other oblasts.
 - Use the Tajik language at the local and oblast level.

We implemented the suggestions for the regional and oblast levels in the oblast-level workshops, but perhaps more specific trainings are needed at the local and regional levels.

Finally, participants also suggested incorporating these types of activities into planning at the local and community levels so that climate change issues are well-integrated with other priorities and so that local and regional needs are reflected better in discussions about future responses to climate change.

PSD in Tajikistan: Key Results

Tajikistan, a landlocked country in Central Asia, is considered a low-income country with a gross national income of US\$280 per person (United Nations Development Programme, 2009, p. 65). The main sectors of the economy are non-ferrous metallurgy (lead, zinc and aluminum), light industry, and agriculture, with cotton as the most important commodity for export (World Bank, 2010).

The population suffers from considerable poverty, especially in rural areas, with over two-thirds of the population living on less than US\$2.15 a day (UNDP, 2009). People in rural areas are impacted by changes in agricultural production resulting from variability in both climate and markets. They also have limited access to health care and are at risk from disasters, during which people in rural areas lack resources to rebuild and/or relocate (World Bank, 2011). These negative trends often lead to migration by men, who then send remittances home, and this has become a significant livelihood-diversification strategy. According to a World Bank study (2011), approximately 40 per cent of household income in rural areas comes from remittances.

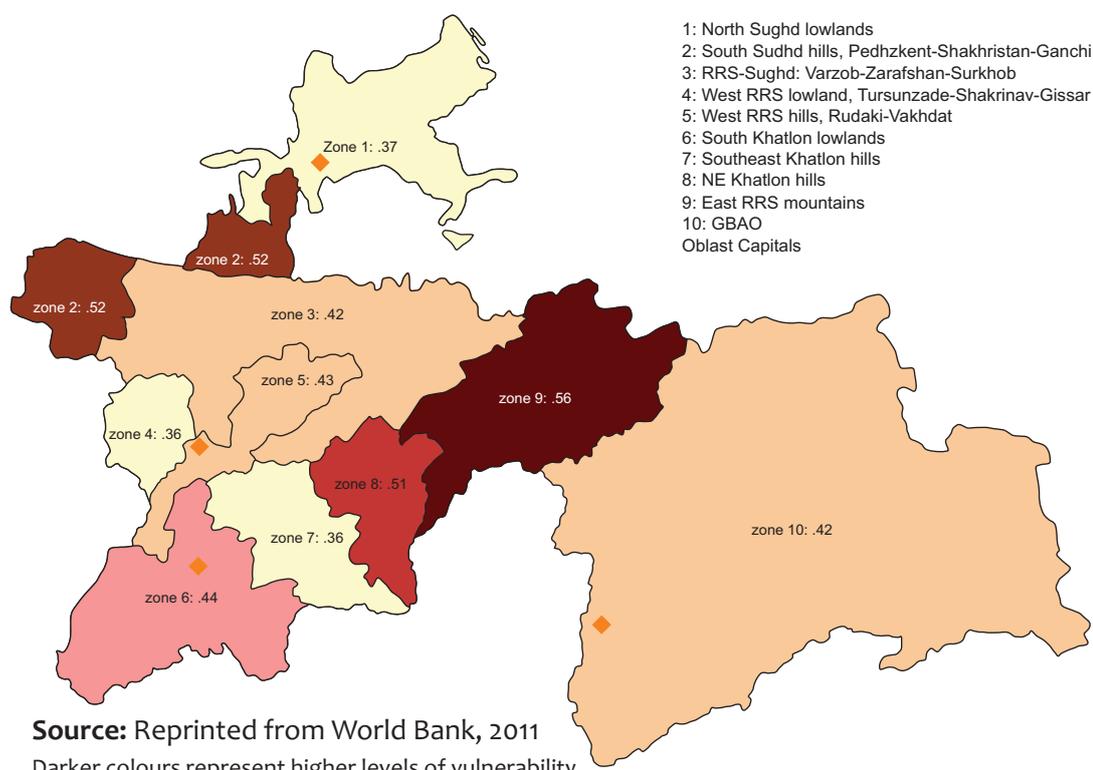
In general, Tajikistan's current climate is continental, subtropical and semiarid, with some desert areas. However, the climate changes drastically with elevation. Tajikistan is considered the main glacial centre of Central Asia, with glaciers occupying about 6 per cent of the total country area. These glaciers perform an important function by retaining water, controlling flows and regulating the climate; along with permafrost, they are the main source of water recharge to the river basins of the Aral Sea. The country lost more than 20 billion cubic metres of glacial ice volume (i.e., about 2.5 per cent, affecting mostly small glaciers) during the twentieth century alone. A further increase in temperature will accelerate glacial retreat. Rainfall tends to be sporadic, and recent years (1999 to 2002) have shown that most precipitation occurs in the winter and spring, causing droughts during the main agricultural seasons (State Agency for Hydrometeorology of the Committee for Environmental Protection., 2008, p. 92).

Overall, Tajikistan is one of the most vulnerable countries in Central Asia. Its population suffers both from relatively high sensitivity to potential climate change-related impacts and from low adaptive capacity compared with other countries in the region (World Bank, 2009). Vulnerability varies across the country according to adaptive capacity, while exposure and elevation exert smaller influences (World Bank, 2011). Recent estimates by the World Bank (2011) suggest that the most vulnerable areas are the eastern RRS mountains, southern Sughd hills, and Khatlon hills and lowlands (Figure 6). Although the zones are vulnerable for somewhat different reasons, they share a high degree of sensitivity to climate change, food insecurity, disaster sensitivity and reliance on agriculture. They also have weak adaptive capacity, in part stemming from low levels of income and education (World Bank, 2011).

All four of Tajikistan's oblasts include areas of high sensitivity and low capacity. But we conducted oblast-level PSD processes to identify similarities and differences among the oblasts and thus allow adjustments in adaptation measures and strategies. Tajikistan's four oblasts are described below.²

² This section was written by the local facilitators Rayhon Jonbekova and Bakhtiyor Rahimov, based on Statistical Agency (2011) and other national reference materials and assessment reports.

Figure 6. Vulnerability map for Tajikistan's 10 agroecological zones



Gorno-Badakhshan Autonomous Province (GBAO) occupies 45 per cent of the total territory of Tajikistan. Only 3 per cent of this area, primarily river plains, is suitable for settlement. The population is 260,000, or 3.2 per cent of Tajikistan's total population. The GBAO is located in the Pamir Mountains and boasts the highest mountain peak in the Commonwealth of Independent States (Ismoil Somoni Peak, formerly Communism Peak, at 7,495 metres high) as well as the largest glacier (the Fedchenko Glacier, which is 71 kilometres long). The Western Pamir supports some crop agriculture (grains, potatoes, vegetable and fruits), whereas in the Eastern Pamir, only sheep, goats and yaks survive because of the cold, high-elevation weather. Natural resources include: Precious stones; Construction materials (stones, wood, est.); medical hot springs.

Khatlon Province is located in the South-West of Tajikistan stretching south of the Hissor Range and west of Pamir. It is a region of wide river valleys (Lower Kofarnikhon, Vakhsh, Kyzylsu). The population of Khatlon is 2,579 300 according to 2008 census. Khatlon Province has the largest agriculture area in Tajikistan accounting for 45 percent of GAO (gross agricultural output), with 60 percent of cotton, 50 percent of cereals, and 40 percent grazing for cattle and small ruminants. Khatlon is the main producer of cereals, cotton, grapes, and flax. It is also the leader in livestock production (milk and meat) and horticulture. The western part Khatlon- Kurgantube enjoys the warmest climate in the country. Cotton and other subtropical crops are grown on large irrigated areas in Lower Kofarnikhon and Vakhsh valleys in western Khatlon. Agricultural products include: (cotton, potatoes, vineyard, barley, moize grain, paddy rice, oil seed and orchards), food (dairy, meat, flour and fruit processing). Industry: light industry – cotton, the brick manufacture, oil-extraction plant. Natural resources include crude oil, gas and stone salt. The oblast has five hydropower stations: Central, Perepadnaya, Nurek, Sngtuda-1 and Sangtuda-2, all on the Vaksh River.

Sughd is in the northwest of Tajikistan, with a population of 2.1 million people, of which 74 per cent live in rural areas. Sughd ranks first in the production of rice, tobacco, and fruits. Tajikistan's entire tobacco harvest comes from the Zeravshan Valley. Main crops in order of importance are Northern (N) cotton, cereals, livestock, horticulture; Zeravshan (S) tobacco, potato, cereals, livestock, horticulture. The climate is dry continental and varies with elevation. Irrigated agriculture, fed from the Larger Ferghana and North Ferghana canals and from reservoirs, is the major source of income. Crops include cotton and cereals, horticultural products, melons and gourds, wine, silk and livestock (cattle in valleys and sheep in the mountains).

The Districts of Republican Subordination (DRS) are an administrative group of 13 rayons (districts) in Central Tajikistan. Most agricultural production of DRS, both crops and livestock products, originate from the eastern part centered on the Hissor Valley around Dushanbe. The Hissor zone produces significant quantities of flax, grapes, and vegetables. It also grows rice and cotton, although in quantities much smaller than Khatlon and Sughd. Potatoes grown by rural households for own consumption and sales appear to be only significant crop in Rasht. Main crops are DRS (Centre) and Hissor- Cotton, livestock, horticulture, cereals; Rasht Livestock, cereals, horticulture, cotton. Their total population as of January 1, 2006, was 1.5 million people. Areas of the DRS such as the Tursunzoda district are major producers of rice and cotton. In 2006, Tursunzoda produced 1,400 tons of rice (13 per cent of Tajikistan's rice harvest) and 7,300 tons of cotton (3 per cent of Tajikistan's cotton harvest). Moreover, the Tajik Aluminium Company known as TALCO headquartered in Tursunzade as well and is known as the largest aluminium manufacturing plant in Central Asia. The factory produces high-quality of aluminium in primary. According to some sources, it produced 416 000 tonnes of aluminium in 2006.

3.2. Socioeconomic Trends and Challenges

Understanding the current situation and challenges as perceived in the different areas of the country helps in designing and adjusting adaptation measures. Such an understanding gives a better perspective on how significant climate change is in the context of other development challenges communities face. We focused first on identifying the most important issues and challenges to development in the oblasts, and then on formulating the main goals for addressing these challenges in the future. The participants listed a number of challenges around the key themes, which included water, energy, agriculture, health, migration and education. We summarize key challenges in Table 3 and present a detailed list of challenges in Appendix 7.3.1.

In terms of water, the most significant challenges listed among all four oblasts included the lack of drinking and irrigation water and water quality. Specifically, both of these challenges were linked to poor status or lack of infrastructure. In particular, lack of drinking water was often listed in the context of poor drinking water supply, which in turn was related to degrading infrastructure, including pipelines. Low water quality was linked to a lack of drinking water treatment and functioning drainage systems. Participants also mentioned the high cost of water and the lack of opportunities for obtaining boiled water challenges in water delivery and quality.

Challenges around water use in agriculture include absence of watering machinery, limited capacity of canals and reservoirs (which are often filled with silt), and lack of repairs. To improve the situation in the water sector, participants also suggested that information is lacking in key areas such as correct groundwater estimates, changes in groundwater levels, and water quality in

Table 3. Overview of current development and capacity in Tajikistan's four oblasts as presented by the workshop participants

Sector	Oblast			
	GBAO	Khatlon	Sughd	RRS
Water	Lack of drinking and irrigation water in remote areas Water pollution Irrational water use	Lack of drinking water, Poor drinking water supply Difficulty obtaining boiled water Lack of irrigated land Absence of watering machinery Lack of drinking water treatment and functioning drainage systems	Low water quality Poor drinking water treatment Lack of drinking and irrigation water Absence of centralized water supply and pipelines	Lack of drinking and irrigation water Water pollution Low quality of drinking water Poor water supply (taps, gates) Rise of groundwater table
Energy	Lack of electricity in autumn and winter Limited electricity supply No access to energy resources No renewable sources of energy and/or lack of firewood or coal Obsolete equipment in HPPs Slow construction or lack of funds for mini-hydro	Lack of electricity in winter Irregular electricity supply Obsolete electric power transformers Lack of electric parts Absence of alternative sources of energy (solar) and/or lack of gas or coal Low quality and poor utilization of bulbs	Lack of electricity, especially in autumn and winter Blackouts Irrational energy use Low cultural importance on energy conservation Need for building and use of alternative energy sources Need for use of renewable energy sources	Lack of electricity Non-operational pumping stations Poor technical condition of power transmission lines and substations Lack of water for HPPs
Agriculture	Droughts Soil erosion Land degradation Lack of irrigation water Poor irrigation system quality Degradation of pastures Random use of pastures Regulated use of pastures	Loss of agricultural lands Incorrect land distribution Increasing (incorrect) land taxes Absence of practical aid to land users Lack of financing to procure agricultural machinery or fertilizers	Land degradation: rising groundwater table, soil salinization Lack of agricultural machinery Outdated agricultural machinery Poor irrigation systems Excessive use of irrigation water	Land degradation Drought Ineffective use of land resources Low quality of seeds Lack of a national or certified seed fund Lack of fertilizers, pesticides and machinery
Other: Education Health Migration	Low numbers of specialists Outmigration by youth and capable specialists Lack of jobs due to scarce infrastructure Infectious diseases Lack of medication	Lack of jobs Low salaries Outmigration of specialists and youth (brain drain) Lack and poor condition of landfill sites Lack of training classrooms	Lack of jobs Low salaries Poor medical services Migration of rural people to cities Brain drain Youth migration	Migration of young specialists Lack of workplaces for specialists Lack of medical equipment Distribution of infectious diseases

oblasts and jamoats. The participants were aware that people contribute to some of these challenges by irrational use of water, especially in irrigation. Thus, education, capacity-building, and technologies including water metering and drip irrigation are needed to improve people's habits when it comes to water use.

The second key sector that was discussed was **energy**. For most of the oblasts, the biggest challenge was the limited access to electricity, especially in autumn and winter, and limited and unreliable services, including blackouts. The issues around limited energy availability for the public and industry are due to infrastructure challenges, including obsolete electric power transformers, old and unmaintained HPPs, and lack of parts to improve the infrastructure. Participants also emphasized the absence of alternative sources of energy such as solar, small HPPs or biogas, as well as lack of gas or coal, all of which could create energy at the local level to help overcome the infrastructure challenges. Similarly to water utilization, participants listed irrational and non-efficient use of resources and lack of energy-use education as contributors to the utilization challenges in the energy sector.

Agriculture is a key source of livelihoods in rural areas. The key challenge in all oblasts was land degradation, which was linked to number of challenges. These include increasing occurrence or reoccurrence of droughts, soil salinization, ineffective use of land and unsuitable cultivation practices (for example, the absence of crop rotation). These overarching challenges are linked to number of other cultivation and land management challenges, including:

- Lack of water for irrigation due to poor-quality irrigation systems, including idling pumping stations; low quality of drainage systems and inefficient use of irrigation water.
- Low quality of seeds due to the lack of a quality-control system and the absence of a national or certified seed fund, which could include support for local agricultural specimens, early-season cultures and drought-tolerant seeds.
- Degradation of pastures and lack of forage due to random or unregulated use of pastures.
- Absence of practical aid or support to land users. This could include information and capacity-building on suitable management practices as well as financing options to procure agricultural machinery or fertilizers.
- Increased plant pests and diseases, lack of pesticides and lack of vaccines for cattle.

These trends in the agricultural sector are worsened by capacity and institutional challenges, including limited availability of reliable and relevant forecasts for agricultural producers, poor land cadastral records, lack of knowledge among in-house cadasters about soil and other land resources, and high land taxes.

With regard to land degradation, the participants were mostly concerned about its impact on food security in rural and vulnerable areas, especially in the GBAO and Khatlon. In Khatlon, the major challenge was the continuation of unsustainable land management practices, leading to land degradation, combined with unregulated irrigation of fields. This in turn causes increases in food insecurity and, coupled with lower water quality, has negative impacts. In the RRS, land degradation was also linked to outmigration, as people are losing their income due to land

degradation combined with a lack of irrigation water. In all cases, participants listed challenges such as lack of capacity and knowledge of sustainable land management practices and soil erosion control.

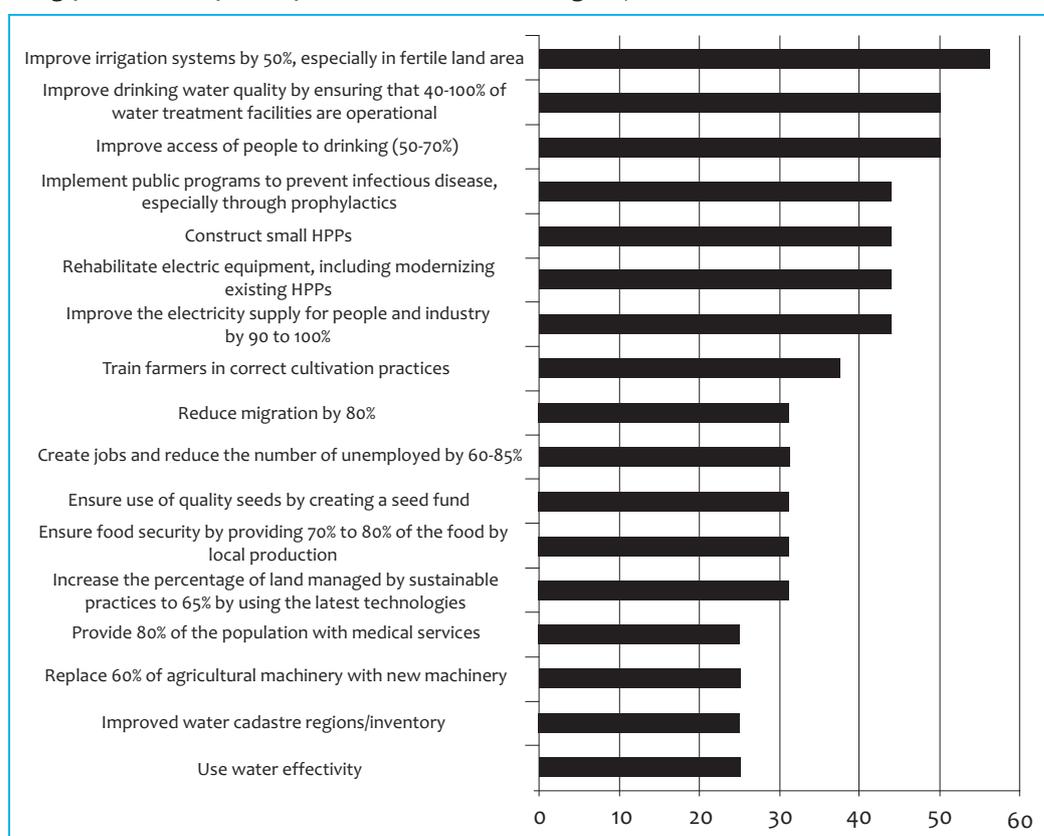
In terms of **other sectoral challenges**, the participants were mostly concerned about migration of young people and professionals from the oblasts, leading to a lack of specialists and experts. Other concerns included falling levels of education and a lack of teachers and classroom supplies. Specific types of education on environmental issues, health and sustainable development were also pointed out as challenges that require attention. Participants mentioned health care challenges, including lack of proper equipment in hospitals and an overall absence of medical oversight of public health. Such oversight would require addressing any possibly increasing levels of infectious diseases, monitoring and preventing HIV/AIDS and ensuring delivery of prophylactics to those who migrate to larger cities. Finally, participants mentioned the poor condition and lack of landfill sites, which leads to uncontrolled waste disposal and environmental pollution.

Finally, **consequences of current climate variability and change** were recognized as an important challenge across all the sectors in all the oblasts. Most significantly, climate-related consequences were mentioned in the agricultural sectors, in which increasing droughts coupled with unsustainable management practices lead to land degradation and thus decreased production. Other significant impacts were experienced in the form of disasters, such as floods and mudflows. In other sectors, the participants mentioned that they expect impacts of climate change in terms of increased plant and animal diseases and shortages of energy and clean water. Such shortages, coupled with the currently limited access to seeds, pesticides, disease control and renewable energy, could lead to significant consequences in the future. The participants also felt an overall lack of capacity to address these challenges. They suggested that trainings and seminars could deliver the needed information at the local and regional levels.

3.3. Key Future Priorities for Key Sectors

Understanding the current situation and challenges helps in the process of developing future scenarios, because participants start exploring issues that will need to be dealt with if they want a different development pathway for their communities. Based on the current trends identified, the participants were asked to create goals for a preferred future development pathway, centred on the key sectors already discussed. Participants were encouraged to create specific goals that could indicate the extent of the change needed up to 2040. We present an overview of the prioritized goals in Figure 7, Tables 4 through 7 and in the Appendix 7.3.2.

Figure 7. Overview of the goals most frequently listed by the 16 groups in the five workshops (showing per cent of participants who listed each goal)



In the **water** sector, the focus was on addressing the major current challenges, including drinking and irrigation water availability, and on improving water quality. These priorities were also ranked highly when comparing all the goals across all sectors. Specifically, the highest priority across most of the region was on increasing the number of people who have access to clean drinking water by 50 to 100 per cent, especially in areas suffering from lack of water in Sughd, the GBAO and the RRS, and in urban areas in Khatlon. Participants suggested steps to achieve this that included building small- and large-scale reservoirs, suggested in the RRS, and water metering to ensure efficient use in urban areas of Khatlon.

The other important current challenge was improving drinking water quality. According to the goals identified, this would require improvements in drinking water quality in at least 40 per cent of areas. This could be achieved by regulating the operation of water treatment, ensuring water

treatment facilities operate at their full capacity, constructing hydro-technical facilities to deliver water to areas at higher elevations, cleaning up 50 per cent of drainage and sewer networks, and, finally, enforcing water quality standards.

Table 4. Overview of key future goals for the water sector listed by the workshop participants

Sector	Oblast			
	GBAO	Khatlon	Sughd	RRS
Water	Double the number of people who have to access to free drinking and irrigation water Improve drinking water quality by ensuring that 100% of water treatment facilities are operational Improve irrigation systems by 50%, especially in fertile land areas (using technologies that reduce water loss)	Use water effectively Provide drinking water filtration and treatment Supply water to blocks of flats	Supply water to suffering regions from the current 45% to 100% Improve water quality by 40% by regulating the operation of water treatment Increase progressive irrigation systems by 50%, especially in fertile lands, and reduce water loss during irrigation	Provide access to water for 50% to 70% of the population Ensure that 100% of famers in areas of irrigated agriculture have access to irrigation water Implement water reservoirs for irrigation and drip irrigation to address droughts Improve river banks in the Rozik and Gulistaon jamoats

To address water availability for agriculture in the context of climate change and variability, participants suggested gradual improvement of irrigation water availability by up to 50% over current levels, especially in fertile lands and areas affected by droughts, combined with improved technology such as drip irrigation (specifically in Sughd). Addressing other impacts especially related to climate change included improving river banks to reduce sensitivity to floods.

Finally, improvements in institutions, monitoring and user capacity are needed to achieve the future goals identified. This requires improving monitoring capacity for drinking-water quality, groundwater levels and quality, and water pollution at local water sources and at industrial sites. Further institutional changes were suggested to improve land-use planning and correct the water-use tax. For capacity building, participants suggested working with water users to ensure that water metering is effectively implemented, working with farmers to apply water conservation in irrigation, and exploring water-monitoring schemes with the involvement of the local citizens.

For **energy**, the participants considered the priority to be significantly improving the electricity supply for people and industry by up to 90 to 100 per cent compared with the current situation. The participants suggested this be achieved by improving infrastructure, including modernizing already-built HPPs, power lines and other infrastructure important to the reliability of energy production, but also by improving small-scale, decentralized energy production such as small HPPs. This would lead to reduced use of firewood and coal, which the participants thought should be reduced by 50 per cent by 2040.

Capacity and institutional changes were also identified. These included developing a strategy for the expansion of renewable energy sources to support mini-hydro stations, solar energy and

biogas, including a review of the current tax and legal structure to encourage investment by the private sector. Further potential improvements identified included building capacity among experts, businesses and communities in energy issues and renewables, and to potentially engage in off-grid renewable energy development.

Table 5. Overview of key future goals for the energy sector listed by the workshop participants

Sector	Oblast			
	GBAO	Khatlon	Sughd	RRS
Energy	<p>Improve the electricity supply for people and industry by 90% to 100%</p> <p>Reduce use of fuel resources such as firewood and coal by 50%</p> <p>Rehabilitate electric equipment, including modernizing existing HPPs</p>	<p>Fully resolve the energy problem through effective use of electricity and correct power distribution</p> <p>Construct small HPPs</p> <p>Reduce the price of electricity throughout the country</p>	<p>Supply reliable energy for all businesses in the area</p> <p>Reconstruct (modernize) operating power stations</p> <p>Reduce use of fuel resources such as coal and firewood by 50%</p>	<p>Ensure that 90% to 100% of public electricity needs are met</p> <p>Construct new HPPs and mini-hydro stations</p> <p>Rehabilitate old HPPs</p>

For **agriculture**, the highest priority among all four oblasts was to improve food security so that approximately 70 to 80 per cent of areas are food sufficient, and to promote access to quality seeds. These priorities were also ranked highly when comparing all the goals across all sectors. To achieve this goal, the participants considered it key to create seed banks, implement proper land management practices, and promote monitoring of harvests and production to make sure that enough food is available.

In terms of ensuring access to quality seeds, the specific goals suggested included:

- Focus on improving the efficiency of cultivated specimens, doubling the current yields.
- Create banks for quality seeds, and distribution networks to provide certified seeds to farmers.
- Promote drought-tolerant and climate-resilient species and work with farmers to ensure their uptake.

Participants suggested acquiring sustainable farming practices by training people to rationally use land and water resources, including following correct land cultivation practices and using appropriate livestock species. Specifically, the suggested actions and goals included:

- Implement crop rotation.
- Ensure water supply to irrigated lands (up to 75 per cent), with water reservoirs for agricultural needs.
- Increase agricultural production on the abandoned lands.

Table 6. Key future priorities for agriculture to 2040

Source	Oblast			
	GBAO	Khatlon	Sughd	RRS
Agriculture	<p>Increase the percentage of land managed by sustainable practices to 65% by using the latest technologies</p> <p>Train people to rationally use land and water resources</p> <p>Train farmers in correct cultivation practices</p> <p>Establish an information centre on correct land cultivation</p> <p>Ensure food security by providing 70% to 80% of the local food supply with locally produced agricultural products</p> <p>Ensure use of quality seeds by creating a seed fund</p> <p>Ensure that 70% of seeds used are drought tolerant or climate resilient</p>	<p>Provide better seeds to farmers: doubling yields will supply 80% of domestic market with local food</p> <p>Select climate-resistant types of seeds</p> <p>Promote effective use of land, including crop rotation</p> <p>Promote new, improved types of cattle for milk, meat or skin</p>	<p>Use quality seeds, with the goal of 70% being climate-resistant varieties</p> <p>Create a seed fund</p> <p>Promote food security by ensuring 70% to 80% of food supply is local</p> <p>Promote rational use of land resources on at least 65% of the land</p> <p>Teach about rational use of irrigation water</p>	<p>Ensure that 70% to 100% of the seed supply is high-quality, climate-resilient varieties</p> <p>Create state seed distribution networks and provide certified seeds to farmers</p> <p>Promote food security by ensuring 60% to 80% of food supply is local</p> <p>Replace 60% of agricultural machinery with new machinery</p> <p>Improve technical servicing and reliability of agricultural machinery</p>

- Plant more orchards (various types).
- Promote the use of mineral fertilizers and pesticides while accounting for specific regional differences.
- Promote infrastructure improvements and new investments: repair pumping stations; clean up drainage canals, wastelands and landfills; and construct irrigation canals.

Finally, participants suggested capacity development to increase the skills of farmers and other local residents in farming practices and small business development. This should include creating information centres on proper farming practices as well as information for small businesses such as textiles, fruit processing, crafts, Angora wool goat production and silkworm cultivation.

In terms of addressing challenges in **other sectors**, the strongest focus was given to reducing migration by at least 60 per cent and up to 90 per cent. The participants emphasized the need to reduce the outmigration of young people and experts, which further weakens regional abilities to

deal with future challenges. This goal was followed by the priority of reducing unemployment by creating jobs in agriculture, construction and small businesses. Other goals included improving medical services by increasing the number of experts and by getting better equipment and pharmaceuticals in the hospitals, and development and implementation of public programs, especially prophylactic distribution, to prevent infectious disease.

The participants put forward goals focusing on vulnerable and poor people, aiming to reduce poverty levels; improve support systems for the disabled, homeless and mentally ill; and provide safety nets for the unemployed and people affected by disasters. Finally, future capacity-building needs were identified, including activities focused on improving legal awareness and effectively participating in decision-making.

Table 7. Key future priorities for the rest of the sectors up to 2040

Sector	Oblast			
	GBAO	Khatlon	Sughd	RRS
Other: public health, migration	Create jobs and reduce the number of unemployed by 60% Reduce migration by 80% Provide 80% of the population with medical services	Implement public programs to prevent infectious disease, especially through prophylactics Decrease migration by 90% Increase jobs in agriculture, construction, etc.	Reduce migration by 60% to 80% Reduce unemployment by 60% Ensure medical coverage for 80% of the population	Reduce the poverty level Reduce unemployment by 85% Increase hospitals by 85%

3.4. Climate Change Impacts, Capacities and Adaptations

After describing the future goals, representing a preferred development pathway, we focused on assessing how resilient these goals and pathways are in the context of projected climate change. So far, we had only looked at some climate variability and climate change consequences that people in the regions are already experiencing, including drought, flooding and mudflows. After being provided with basic information on projected climate change for each of the oblasts, participants discussed key climate change-related consequences, indicating adaptation needs and preferred actions.

Overall, the most significant **consequences of climate change** across the country were consistent among the workshop participants (Table 8). The participants expected to experience more droughts, disasters (especially related to larger-scale floods and mudflows and avalanches), and land degradation due to significant erosion because of flooding and unsustainable land management practices. In each of the oblasts, the term *disaster* has a different meaning depending on the local conditions.

Table 8. Overview of the most significant future climate change impacts as listed by the participants

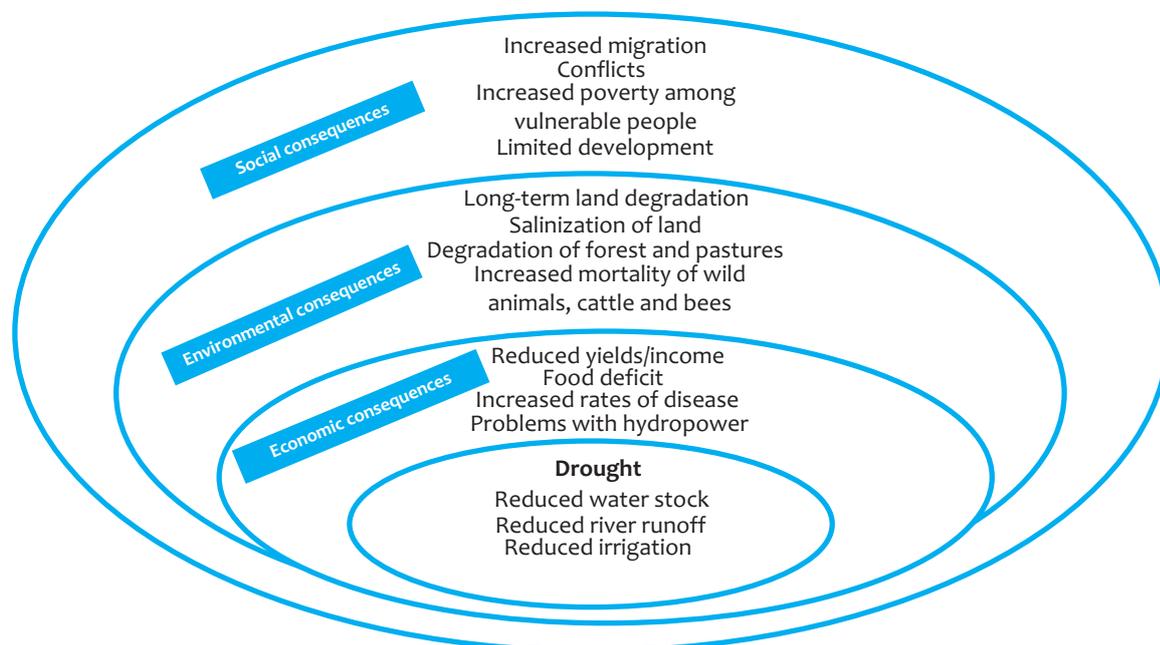
GBAO	Khatlon	Sughd	RRS	Dushanbe
Drought	Drought	Drought	Drought	Drought
Disasters (mudflows, floods, avalanches, landslides)	Localized flooding/flash floods	Disasters (floods, avalanches, landslides)	Floods	Floods
Land degradation (erosion, droughts)	Land degradation (erosion, droughts)	Land degradation (erosion, droughts)	Disasters (large-scale floods, avalanches, landslides)	Mudflows

In the context of drought, the participants recognized a number of consequences on people, animals, and the local economy and environment (Figure 8). The participants were concerned about direct impacts of droughts on local livelihoods, as those livelihoods are ultimately tied to agriculture, and access to energy, which depends on hydropower. They were also concerned about the long-term development potential of the region, because of the limited availability of water for energy production, drinking water and industrial processes.

On the longer time horizons, most of the consequences were related to further degradation of land, forests and pastures, and to salinization, all of which would lead to social impacts such as migration, increased vulnerability of poor people and potential diseases. Many of these trends are issues that are considered significant even now, and were prioritized as future development goals that would need to be addressed. These included improving access to energy through local energy production, reducing land degradation, promoting climate-resilient seeds and better-suited cattle species, reducing migration, and monitoring and controlling diseases.

In terms of other consequences of climate change and climate variability, the participants were concerned about flash floods causing mudslides that could turn into localized disasters. Other disasters that concerned participants included avalanches, landslides and reoccurring droughts

Figure 8. Cascading consequences of droughts on the number of livelihood aspects as described by the participants (compiled across the four oblasts)



leading to severe land degradation, thus limiting livelihoods as currently practiced. The specific consequences related to floods and mudflows included:

- Destroyed soil fertility due to significant erosion.
- Destroyed or ruined dams and water resources.
- Washed-away houses, roads and bridges.
- Destroyed vegetation on river banks.
- Loss of human lives and livestock.
- Increased prices for agricultural products and food due to limited availability.
- Increased risk of infectious diseases among people and cattle.
- Loss of assets by vulnerable and poor people.
- Contamination of drinking water with typhoid.
- Emergencies stemming from lack of food, vaccines or temporary shelter.

The participants identified the following potential consequences of climate-related events that could take disastrous proportions, such as large-scale floods and landslides:

- Destruction of river banks and hydro-technical facilities and power lines leading to a lack of energy and electricity.
- Destruction of water reservoirs, potentially causing water-borne diseases.

- Flooding of irrigated lands and consequent loss of production.
- Damage to livestock.
- Destruction of houses and infrastructure combined with limited evacuation and return of the people.
- An aggravated sanitary situation increasing the occurrence and spreading of infection.

In terms of **adaptive capacities and adaptations**, the participants perceived their communities as having low capacities and limited experience or resources that could be turned into actions if impacts occur. They had opportunities to list specific capacities that they could use to respond to climate variability and climate change, but most of them mentioned that they lacked resources for sustainable long-term adaptations. For example, the participants were the most concerned about droughts, as these directly impact agriculture livelihoods, the most significant source of assets for most of them, and limited alternatives are available. Regarding flash floods, mudflows and other disasters, participants were concerned about the lack of plans, information and resources that could ensure proper evacuation, temporary relief and return to their areas. Especially vulnerable and poor people tend to lose most of their assets during disasters, and they have almost no capacity to rebuild their livelihood in the area, or in a resettled area, if this occurs. (Tables 9 through 11 and Appendix 7.3.3 list all the adaptations.)

From all the identified impacts, **adaptation to drought** seemed to be of the greatest concern to participants, as they provided a large number diverse measures covering infrastructure development, ecosystem-based measures and adaptations aiming at governance, strategy and capacity development. They identified a number of measures relevant for all the areas, and these should be considered at the national level (Table 9). In terms of measures focused on infrastructure, distribution of land for different purposes, such as agriculture, pasture, forest and settlements, needs to be revisited to ensure that high-quality land is protected from salinization, erosion and overgrazing. Because of drought, irrigation water shortages especially concerned the participants, who suggested building additional water reservoirs, including both larger-scale infrastructure and small-scale community or household-level rainwater storage systems. These measures would need to combine with measures to increase water-use efficiency in irrigation by, for example, using drip irrigation and planting drought-resistant species or varieties.

Ecosystem-based adaptations were part of the mix of measures that participants considered important for combating droughts. These measures mostly included forest plantations, which could help hold moisture, and these cultivations should be considered in areas vulnerable to drought, using species that are drought resistant. To ensure that the local population derives resources from the land after plantations are established, areas might find more benefit from agroforestry, which can provide food and market products for local people.

Finally, the participants also recognized the role of institutional measures, strategy and capacity development to ensure that people are prepared and systems are in place to be used in case of emergency. Such measures should include assessments of causes of droughts and their changes over time, both past and projected future. Based on that, institutions should identify practical capacity-development sessions at the local level to educate people about effective responses, especially in agriculture. Such practical trainings would need to be linked to measures to help farmers implement the practices and responses, including centres that could provide access to tested, drought-resistant seeds, financial support for farmers to buy suitable irrigation

equipment, and forecasting services to inform farmers about weather events or diseases before such events occur. In terms of addressing the consequences of drought on the population, an overall development strategy is needed, and drought-related adaptation should be integrated into current planning strategies. Furthermore, institutions should develop plans to address health-related emergencies.

Table 9. Overview of adaptations to drought suggested by the participants. Options prioritized in four to five PSD workshops are highlighted in dark blue, and those prioritized in at least three workshops are in light blue.

Adaptation	GBAO	Khatlon	Sughd	RRS	Dushanbe
Infrastructure					
Address distribution of land resources	X	X	X	X	X
Create additional water reservoirs	X			X	X
Create small-scale or settlement-based water storage		X	X	X	
Conduct vaccinations	X	X	X		
Improve access to and use of climate-resistant seeds			X	X	X
Provide public pipes and access to clean drinking water		X			X
Create a stock of food and forage				X	
Promote food storage				X	X
Ecosystem-based					
Plant forests to hold moisture	X	X	X	X	X
Promote cultivation of drought-resistant cultures	X	X	X	X	X
Plant forests in sensitive areas			X	X	X
Encourage agroforestry to produce food or fodder		X	X		X
Use mountain torrents, glaciers or snowfields in dry years		X		X	
Improve control of overgrazing by cattle				X	
Introduce drought-resistant cultures such as dulon, pistachio, wild rose or almond				X	
Institutions, strategy and capacity					
Analyze the reasons for droughts and their cycles	X	X	X	X	
Increase capacity through education (practical trainings)	X	X	X	X	X
Draft development strategies	X		X	X	
Develop a viable emergency strategy for infectious diseases	X	X	X		
Provide support to farmers (financing)	X		X	X	
Establish centres to grow climate-resistant cultures	X	X		X	
Inform farmers about weather changes such as hail		X		X	X
Conduct local monitoring	X		X		
Regulate the use of glaciers and snowfields (for use only in exceptional or emergency cases)	X			X	
Establish information centres to provide agricultural support and assist with market access				X	
Create a seed fund for dry years					
Assist bee farmers to procure new breeds adapted to an altered climate				X	
Provide practical assistance to the poor population			X	X	
Organize pest-control groups				X	

Besides the listed adaptations that were recognized as highly relevant in most of the areas of Tajikistan, specific regional adaptations were identified as well, including:

- Developing public infrastructure to ensure access to drinking water in Khatlon.
- Promoting food storage and creating emergency food storage in the GBAO.
- Restricting of the use of glaciers for water to emergency situations, including droughts in the GBAO, Khatlon and the RRS.
- Promoting monitoring of local droughts and their impacts, with the involvement of local people in Sughd.
- Developing and implementing programs to assist poor people in coping with impacts of droughts in the RRS.

Other types of consequences of climate change that concerned participants included **floods and mudflows** (Table 10). Participants placed the highest importance on infrastructure-based measures to clean drainage systems, river banks and mudflow gutters, combined with ecosystem-based measures. These latter measures include planting trees to strengthen slopes and river banks, creating forest belts in vulnerable areas and promoting terraces in agricultural production. At the institutional level, the participants suggested establishing mechanisms for regular riverbank rehabilitation work to ensure that the elevated water levels from floods are not blocked with debris and do not wash out already-eroded banks.

Table 10. Overview of adaptations to floods and mudflows suggested by the participants. Options prioritized in three or four PSD workshops are highlighted in dark blue, and those prioritized in at least two workshops are in light blue.

Adaptation	GBAO	Khatlon	RRS	Dushanbe
Infrastructure				
Clean up drainage systems		X	X	X
Clean up river banks		X	X	
Clean up mudflow gutters	X		X	X
Establish proper construction rules on river banks		X		X
Ensure that an emergency water supply is available		X		
Define main areas exposed to floods and mudflows			X	
Build additional mudflow conduits			X	
Build dams upstream, above settlements			X	
Ecosystem-based				
Plant forests to strengthen slopes and river banks	X	X	X	X
Create forest belts and protect forests		X	X	
Promote use of terraces on agricultural lands		X		X
Governance and capacity				
Promote prophylactic measures for local populations	X	X	X	
Provide free medicine to vulnerable people	X	X	X	
Establish mechanisms to rehabilitate river banks regularly		X	X	X
Provide forecasts of upcoming danger or catastrophes			X	X
Create quick-response groups to prevent danger			X	X

Provide people with mosquito nets	X	X		
Conduct an information campaign in schools and kindergartens that includes sanitary norms	X	X		
Establish a laboratory for water treatment and chlorination		X	X	
Conduct regular seminars to inform about infectious diseases and tuberculosis		X	X	
Identify areas vulnerable to floods and mudflows		X	X	
Monitor parasites (such as flies and mosquitoes) and disinfect areas affected by parasites		X		
Limit or prohibit construction in vulnerable areas			X	
Revise construction standards in vulnerable areas			X	
Follow sanitary and hygienic norms in settlements and houses			X	

Further institutional and capacity-related measures included identifying areas vulnerable to floods and mudflows, providing residents with information about potential floods, and creating quick-response teams to help evacuate people and control relief work. Finally, the participants were also concerned about consequences of floods and mudflows on people's health, and a number of adaptations were suggested to address these concerns. These including running seminars and trainings on hygiene, creating emergency water supplies, and providing people with mosquito nets and information about current and potential infectious diseases.

The third significant consequence of climate change consisted of **disasters** such as floods, avalanches and landslides that reach catastrophic proportions (Table 11). Naturally, a similar set of measures were identified as were chosen in the context of floods and mudflows, with a strong focus on constructing, supporting and cleaning river banks and mudflow-protection structures by using both engineered structures and natural protections such as forest belts. In this case, the participants suggested considering resettlement to safer areas, which would need to be assessed and supported by resettlement plans. Finally, it was also important to develop early-warning systems and to equip offices with technology and qualified personnel who could disseminate important information. Investment assistance would be needed to assist in both developing disaster-prevention systems and ensuring that resources from investment assistance are spent in a way that promotes disaster resistance and does not increase vulnerability.

Table 11. Overview of adaptations to disasters, as suggested by the participants. Options prioritized in three or four PSD workshops are highlighted in dark blue, and those prioritized in at least two are in light blue.

Adaptation	GBAO	Sughd	RRS	Dushanbe
Infrastructure				
Consider resettlement to safer areas	X	X	X	
Construct mudflow protection on river banks	X	X		X
Equip meteorological stations with correct equipment	X	X	X	
Construct resistant buildings	X	X		
Clean up mudflow gutters			X	
Provide people with clean drinking water and develop public infrastructure				
Ensure an adequate stock of food			X	
Ecosystem-based				
Plant forests to strengthen slopes	X	X	X	
Create forest belts and protect forests		X	X	X

Institutions, strategy and capacity				
Consider a resettlement plan	X	X	X	
Provide technologies and qualified personnel for forecasting and monitoring	X	X	X	X
Inform people about potential disasters		X	X	X
Provide financial assistance to affected/ vulnerable people	X	X		
Scientifically justify projects to build resistant structures	X	X		
Provide investment assistance	X		X	
Organize public evacuation trainings			X	
Establish a quick-response group for rescue personnel				X
Prepare for evacuation (plan, resources and people)			X	X
Establish a disaster-relief fund				X

3.5. Review and Recommendations for SPCR Priorities and Activities

The SPCR identifies six priority investment areas and activities to help build capacity and resilience to climate change in Tajikistan. The activities are as follows:

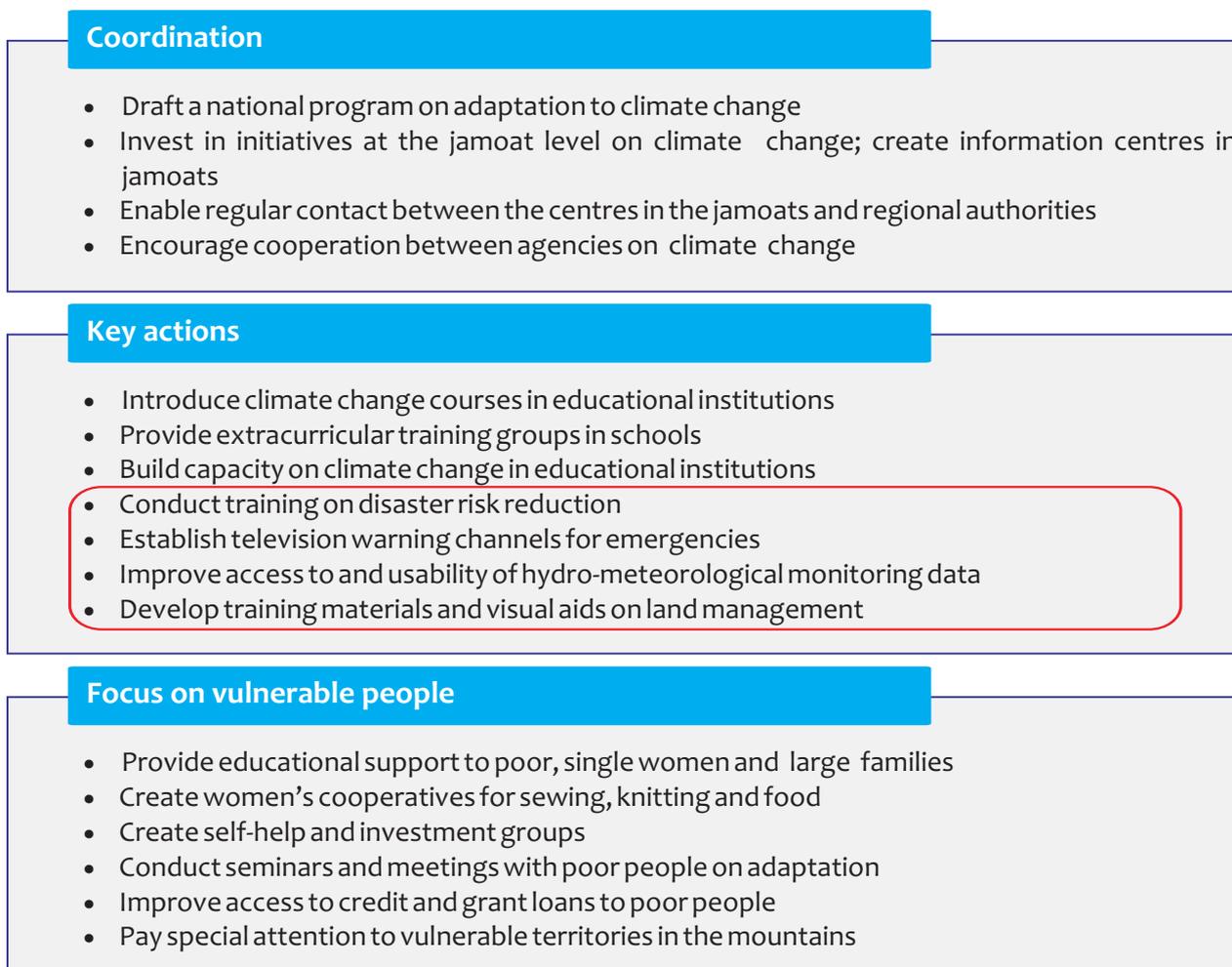
- Build institutional capacity and awareness of climate change among stakeholder groups (civil society, media, and vulnerable groups such as women, youth, young men and children).
- Improve the national hydro-meteorological monitoring system to provide timely warnings on dangerous events and support water management.
- Conduct climate science and glaciology research; develop climate change models.³
- Replicate and scale up effective existing land management practices.
- Rehabilitate the Kairakkum HPP as a pilot project.
- Take climate-proofing measures for vulnerable ecosystems and critical infrastructure, to be piloted in the Khatlon target area and Pyanj tributaries.

During the PSD workshops, participants were introduced to these activities. They then were asked to review those that were relevant to their areas and to make recommendations and suggestions to ensure higher efficiency of planned activities. An overview of their recommendations and suggestions is listed in Figures 8 through 12 and in Appendix 7.3.3.

In all oblast-level PSD workshops the participants were asked to make recommendations or suggestions regarding the SPCR priorities during an activity called “**building institutional capacity and awareness of climate change among stakeholder groups**” (Figure 9). Overall, the participants emphasized a need for development of a national climate change adaptation strategy or program. The specific SPCR activities could be integrated into this strategy, while their actual implementation could be done in a more decentralized manner.

³ This priority was not discussed with the stakeholders directly, but we make recommendations for it based on the data gaps and assessment needs identified by the stakeholders.

Figure 9. Overview of the key types of activities suggested by the participants on the priority “building institutional capacity and awareness of climate change among stakeholder groups”*



*Cross-cutting activities are shown in the red square

Participants also felt that regional-level institutions such as jamoats should play a key role in implementing SPCR activities such as training, information dissemination, capacity development and providing forecasts, early warnings, etc. According to the participants, this could be best achieved by allocating some of the SPCR resources to invest in initiatives within jamoats, perhaps by creating information centres. These centres would need to be in regular contact with regional and national agencies to ensure coordinated implementation of activities and sharing of best practices and lessons learned. Finally, these centres and associated communication channels need to be accessible to international agencies in order to coordinate the implementation of their activities at the local and regional levels. This will allow better exploration of synergies among the actions of different agencies.

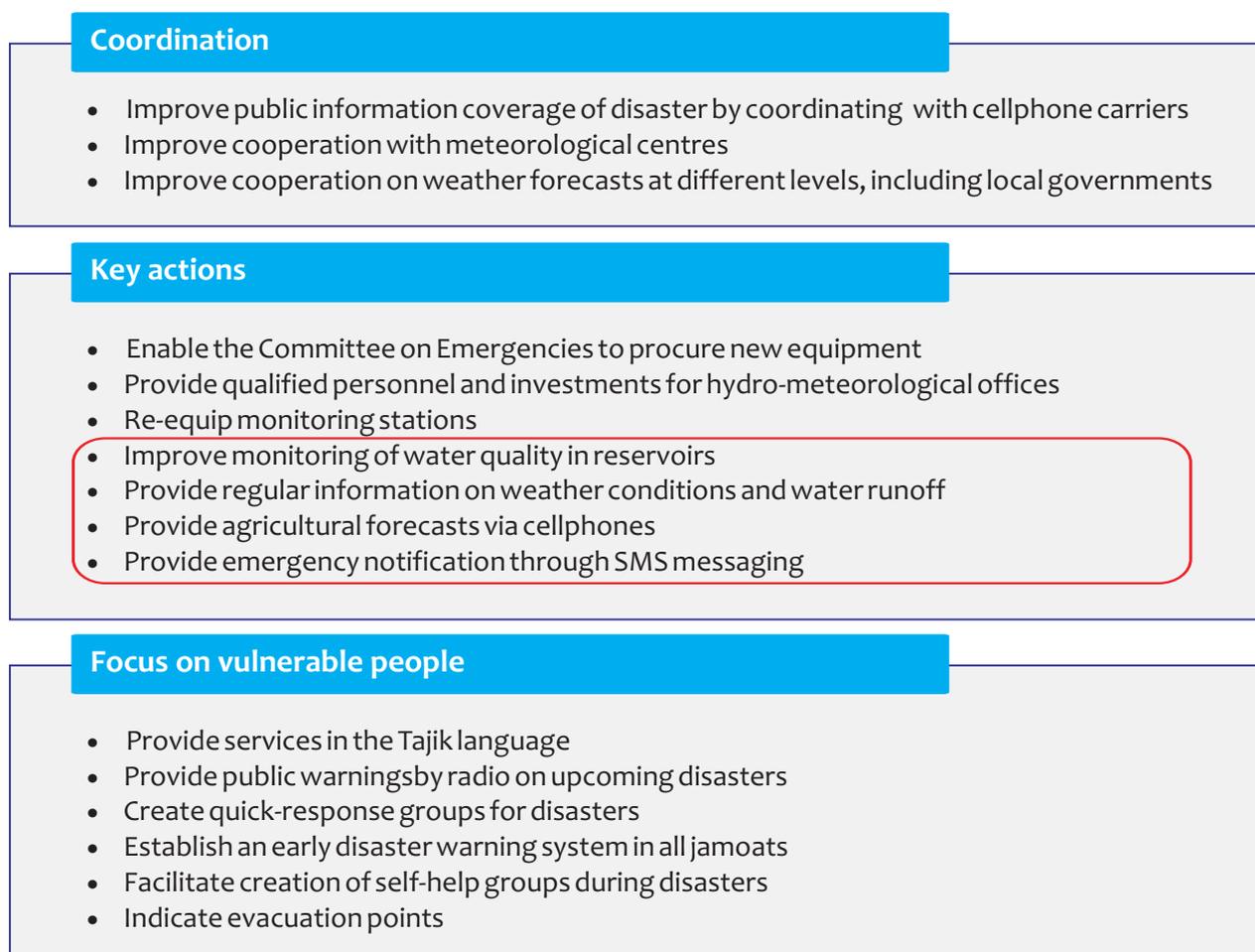
In terms of specific activities, the participants suggested working with educational institutions to improve their capacities in integrating climate change and adaptation into their curricula. They also suggested developing specific training courses for different target groups such as farmers, vulnerable or poor people, and other members of the public. Beyond the focus on climate change impacts, there is a need for training in disaster-related risk reduction, access to usable hydro-meteorological monitoring data, and training materials and visual aids for land management.

These last two needs are activities that cut across other SPCR priorities focused on land management and hydro-meteorological monitoring systems.

Finally, participants suggested capacity-building activities to address the needs of vulnerable people, including seminars and meetings with poor people on adaptation, and paying special attention to vulnerable territories in the mountains. However, these activities also aim to improve the well-being of these groups beyond assistance with adapting to climate change. Activities with such a dual goal could include, for example, establishing cooperatives of women for sewing, knitting and food production; promoting self-help and investment groups; providing educational support to poor, single women and large families; and finally, improving access to credit and granting loans to the poor. Many of these activities could be included in wider development assistance provided by national and foreign agencies.

The next SPCR activity is focused on **“improving the national hydro-meteorological monitoring system to provide timely warnings on dangerous events and support water management.”** Participants' suggestions focused on improving the current equipment and staff skills of hydro-meteorological offices and ensuring delivery of these offices' information to the users (Figure 10).

Figure 10. Overview of the key types of activities suggested by the participants for the priority “improving the national hydro-meteorological monitoring system to provide timely warnings on dangerous events and support water management”*



* Cross-cutting activities are in the red square

This would entail the hydro-meteorological offices cooperating with agencies working in agriculture, water resource management and disaster preparedness, as well as with cellphone providers. Participants suggested a need to improve water quality monitoring for drinking water and in reservoirs, which was also one of the future development goals. They also suggested using cellphones or radios to deliver information about weather and climate variability to farmers and about potential emergencies to the public. To ensure that the information is also relevant for vulnerable members of the population, it must be in the Tajik language. Local and jamoat-level early disaster warning systems and disaster self-help groups need to be created to ensure effective disaster mitigation.

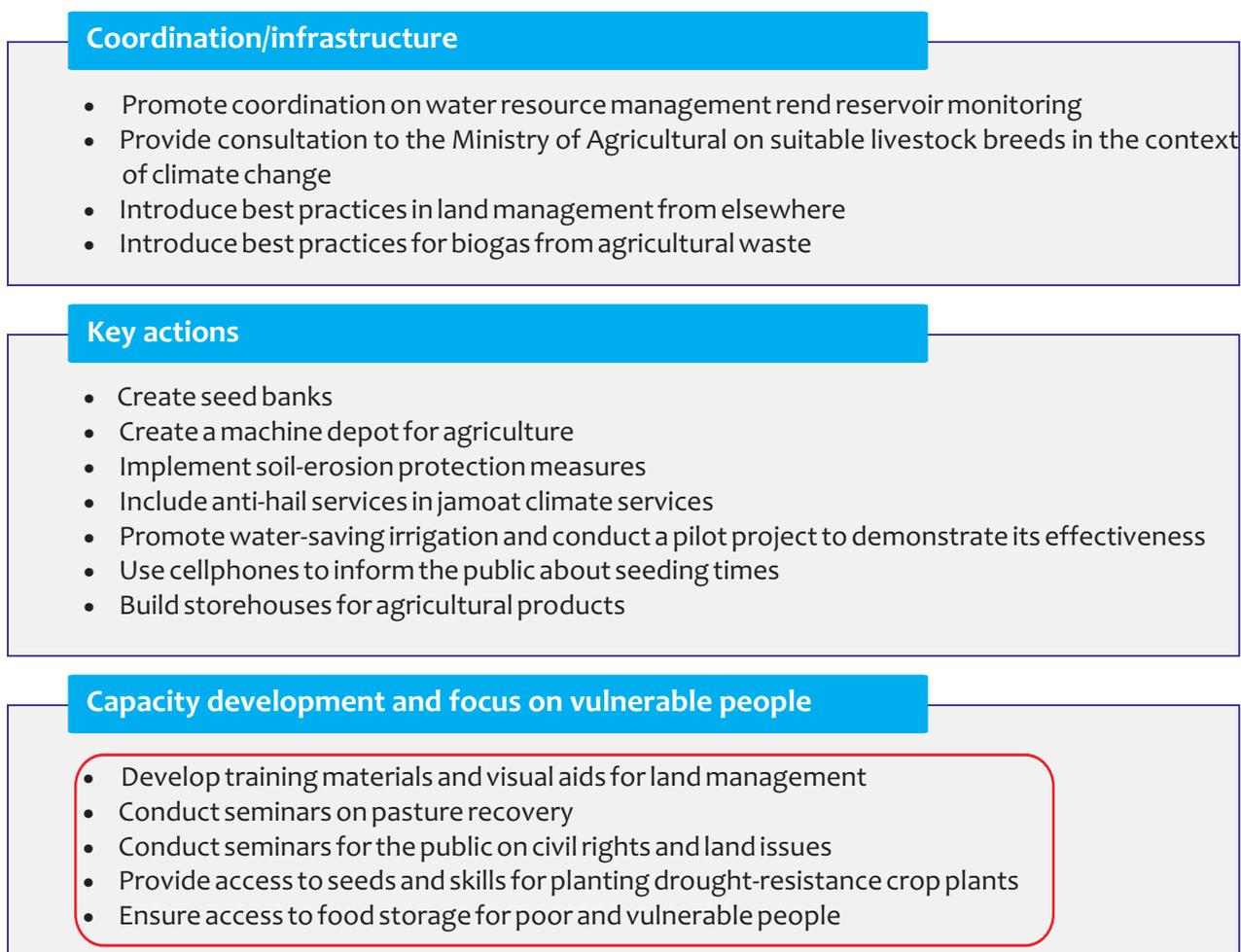
The next SPCR activity is “**conduct climate science and glaciology research; develop climate change models.**” During the PSD workshops the participants did not discuss this priority, but they made recommendations regarding research needs for other SPCR priorities. We used these needs to present recommendations for this SPCR activity. Overall, the identified research needs focus on analyzing hydrological data for the present and under climate change scenarios, looking at agricultural changes in the context of climate change and looking at climate change impacts on human health. The following specific research needs were identified during the PSD workshops:

- Study the reasons for the low and high water fluctuations in the Syrdarya River.
- Collect systematic data and perform an assessment on weather patterns and water runoff.
- Study cycles of water levels and the regularity of runoff in rivers of key importance.
- Assess the potential for hydroelectric dams to cover water needs during droughts.
- Identify areas vulnerable to floods and mudflows.
- Explore opportunities for limiting the use of glaciers to emergency situations such as severe droughts.
- Identify the most suitable crops, livestock, land management practices and irrigation for climate change projections.
- Identify potential future pests and animal diseases.
- Identify potential future diseases in humans (such as malaria, diarrhea and TB).

Other assessment needs indirectly related to climate change were mentioned, including assessing poverty and food insecurity levels and looking at changes in the distribution of diseases among rural populations. We do not include a table for this priority area.

The SPCR priority focused on “**replicating and scaling up effective existing land management practices**” aims to ensure climate resilience. In the participants' view, addressing this priority should include measures to reduce erosion, which is perceived as one of the key negative consequences of climate change and a major adaptation need (Figure 11). In terms of actual erosion-prevention measures, participants suggested forestation, agroforestry, and creating forested belts in vulnerable areas and terraces on agricultural lands.

Figure 11. Overview of the key types of activities suggested by participants for the priority “replicate and scale up effective existing land management practices”*



*Cross-cutting activities are in the red square

Participants also identified other measures that could assist in improving agricultural production, such as providing access to seed banks that supply certified drought-resistant seeds, delivering agricultural weather forecasts to farmers, supporting suitable planting practices, and providing storage facilities to store harvests, other agricultural products and machinery. Again, measures focusing on creating seed banks and providing access and capacity to plant more climate-resilient seeds were one of the especially key future development goals. Finally, participants suggested actions focusing on capacity development and the use of hydro-meteorological data, which link to other SPCR priorities. These actions include providing training on suitable land management practices, developing training materials, providing visual aids for land management and pasture recovery, and giving seminars to improve overall knowledge and awareness about civil rights and land issues. These measures would need to be adjusted so that vulnerable people are not excluded from the benefits. Workshop participants specifically mentioned ensuring that poor and vulnerable people have access to food storage.

For the SPCR priority “**rehabilitate Kairakkum hydropower plant (HPP) as a pilot,**” the participants provided a set of specific actions directly addressing challenges concerning the HPP (Figure 12).

Figure 12. Overview of the key activities suggested by the participants on the priority “rehabilitate Kairakkum hydropower plant (HPP) as a pilot”

Coordination

- Improve cooperation among meteorological and hydrological centres
- Access potential for hydroelectricity to cover multi-sector water needs during droughts

Key actions

- Mine silt from the bed of the Kairakkum water reservoirs
- Build reservoirs in the upstream portions of the Shakhimardan, Shokh and Isfaransai rivers to reduce siltation downstream
- Build silt-protection facilities in the upstream portions of the Shakhimardan, Shokh and Isfaransai rivers
- Improve monitoring of water contamination in the reservoir
- Rehabilitate small-scale HPPs
- Prepare specialists to build small-scale HPPs
- Build elevated reservoirs downstream to reduce situation

Capacity development and focus on vulnerable people

- Supply vulnerable families with subsidized alternative energy
- Provide vulnerable families with energy at lower prices
- Provide financing for power stations in poor mountain areas
- Lower tariffs for poor people

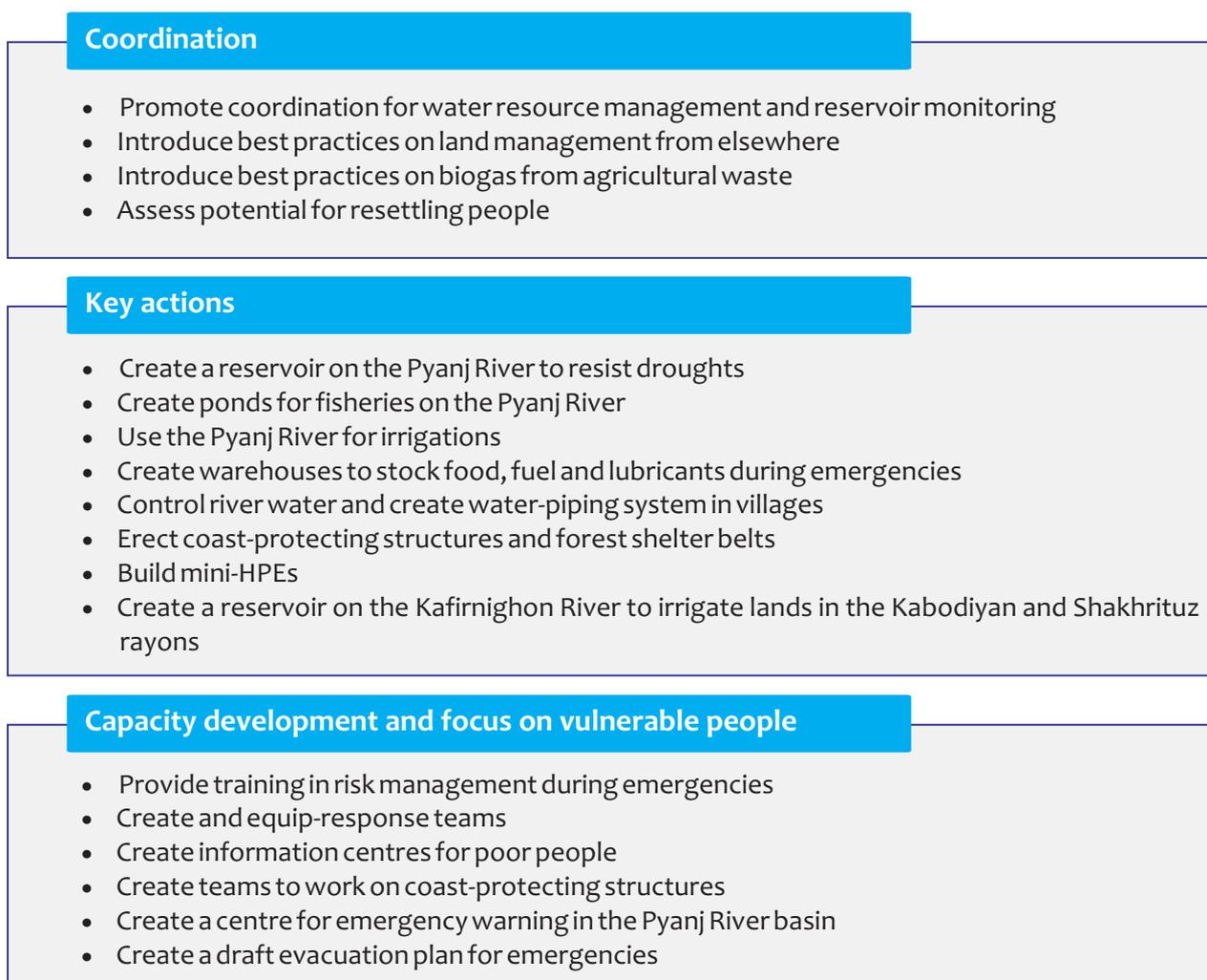
It is important to stress that improving current HPPs and building new ones (especially small ones) was one of the key future priorities identified for promoting energy production in rural areas. Especially because of increasing droughts, participants suggested the need to conduct an assessment of the potential of hydroelectric dams as water sources during dry seasons. In terms of specific measures, participants suggested focusing on mining silt from the bed of the Kairakkum reservoir, building reservoirs in the upstream portions of the Shakhimardan, Shokh and Isfaransai rivers, and elevated reservoirs downstream, to reduce siltation. To ensure access by vulnerable people to the benefits of this activity, participants suggested developing subsidized alternative energy for vulnerable families, financing power stations in the poor mountain areas and providing vulnerable families with energy at lower prices.

The final SPCR activity, “**climate-proofing measures in vulnerable ecosystems and critical infrastructure, to be piloted in the Khatlon target area and Pyanj tributaries,**” was viewed by participants as an opportunity to both improve services provided for agriculture and human well-being by these rivers and to deal with emergencies in the area (Figure 13).

The participants suggested creating a reservoir on the Pyanj River to resist droughts, a reservoir on the Kafirnihon River to irrigate lands in the Kabodiyon and Shakhrituz rayons, ponds for fisheries on the Pyanj River, water-piping systems for villages and forest shelter belts. The suggested measures also included promoting small-scale HPPs and food storage, which were also mentioned for other SPCR activities. Finally, participants felt that a crucial issue was to develop

strategies, teams and processes to deal with emergencies, including developing a warning system in the Pyanj River basin, training people on risk management processes, creating quick-response teams, drafting evacuation plans and exploring the potential for resettling people to safer areas.

Figure 13. Overview of the key types of activities suggested by participants on the priority “climate-proofing measures in vulnerable ecosystems and critical infrastructure, to be piloted in the Khatlon target area and Pyanj tributaries”



3.6. Key Actions to Improve Resilience over the Short Term

During this final session of the PSD workshops the participants were asked review all the actions, goals and suggestions discussed during the workshops and identify those that they considered crucial to improving the well-being of people and ecosystems and promoting future resilience. The participants were not particularly encouraged to focus on the SPCR activities, but rather to identify key short-term actions to promote resilience and well-being.

Naturally, the priorities that were listed during the workshop focused on development pressures and challenges that require actions over short time horizons (outcomes are listed in Table 12). Such measures included addressing the unreliable and limited energy supply, promoting renewable energy, improving access to drinking water, providing access to quality seeds, and

addressing social issues such as poverty and lack of jobs, equipment and access to credit in rural areas. To address these challenges, participants listed number of specific actions, including:

- Improve access to drinking water (Sughd, RRS).
- Restore equipment in power-supply repair pumps (Sughd, RRS).
- Provide access to high-quality seeds and animal breeds (all).
- Develop photovoltaic power (RRS) and biogas systems to utilize waste (Sughd).
- Create burial grounds for animals in jamoats (RRS).
- Rehabilitate the Yavan Chemical Plant (RRS).

To achieve these goals and other development goals, the participants suggested needs for strategy and capacity development, including:

- Monitor animal diseases and infections (RRS).
- Create and implement strategies for waste utilization, recycling and processing (GBAO, RRS).
- Create a renewable development strategy (GBAO, Khatlon, RRS).
- Allocate state financing to support food security (RRS).

Overall we can conclude that many of the activities included under SPCR priorities are in line with the actions put forward by participants. It seems that specific short-term goals and actions that participants viewed as crucial to addressing development challenges could be linked to the SPCR priorities. Such activities include:

- Develop projects to address soil degradation in rayons and jamoats (all).
- Clean up canals and drainages (GBAO and Khatlon).
- Modernize the Kairakkum HPP (Sughd).
- Remove silt from the bed of the Kairakkum Reservoir (Sughd).
- Build three mini-HPPs in three jamoats in the city of Vakhdat (RRS).
- Organize new forest nurseries and plant fast-growing species to strengthen slopes (GBAO, RRS).
- Pay special attention to vulnerability in mountain regions (Sughd).
- Study reasons for degradation and salinization of soils and rising groundwater tables (Sughd)
- Identify agricultural reforms in line with climate change (Khatlon, Dushanbe).

Table 12. Overview of the short-term goals and actions listed during the workshops, grouped by their relevance to overall development needs and to SPCR priorities. Parentheses indicate the oblast(s) in which the goals and actions were listed.

		3-year goals	5-year goals
Development needs	Institutional	<p>Monitor animal diseases and infections (RRS)</p> <p>Create and implement strategies for waste utilization, recycling and processing (GBAO, RRS)</p>	<p>Create a renewable development strategy (GBAO, Khatlon, RRS)</p> <p>Allocate state financing to support food security (RRS)</p>
	Specific actions	<p>Create food storage and warehouses (Khatlon, Sughd, RRS)</p> <p>Restore equipment for the power supply, repair pumps (Sugd, RRS)</p> <p>Improve access to drinking water (Sughd, RRS)</p> <p>Provide access to high-quality seeds and animal breeds (all)</p> <p>Develop and photovoltaic power (RRS) and biogas systems to utilize wastes (Sughd)</p> <p>Create burial grounds for animals in the jamoats (RRS)</p> <p>Rehabilitate the Yavan Chemical Plant (RRS)</p>	<p>Construct roads and restore and construct highways (GBAO, to Lake Sarez, and Khatlon)</p> <p>Provide drinking water through pipelines and ensure effective water use (GBAO, Khatlon)</p> <p>Develop renewable energy sources (GBAO—biogas in Murgab, RRS)</p> <p>Create a GMO-free national seed fund</p> <p>Help small businesses process fruits and vegetables in jamoats in the mountain regions (GBAO, Khatlon, Sughd, RRS)</p> <p>Create a program to breed Angora goats and promote beekeeping (GBAO, RRS in the Ramit Gorge)</p> <p>Create machine depots to support farmers (RRS)</p>
	Capacity	<p>Provide mobile and radio services in remote locations (GBAO)</p>	<p>Conduct skill development in processing</p> <p>Establish investment self-help groups</p>
	Institutional	<p>Create local action plans for adaptation with the local population in each jamoat (GBAO)</p> <p>Establish information centres at the jamoat level, as well as courses and seminars for specialists (land, energy, water, monitoring) (all)</p>	<p>Pay special attention to vulnerability in mountain regions (Sughd)</p> <p>Study reasons for degradation and salinization of soils and rising groundwater tables (Sughd)</p> <p>Study disaster-prevention methods (RRS)</p> <p>Identify agricultural reforms in line with climate change adaptation (Khatlon, Dushanbe)</p>

Relevant for the SPCR goals	Specific actions	<p>Develop projects on soil degradation in rayons and jamoats(all)</p> <p>Clean up collectors and drainages (GBAO and Khatlon)</p> <p>Modernize the Kairakkum HPP (Sughd)</p> <p>Remove silt from the bed of the Kairakkum Reservoir(Sughd)</p> <p>Build three mini-HPPs in three jamoats in the city of Vakhdat (RRS)</p>	<p>Construct a small HPP(GBAO)</p> <p>Plant forest for prevention of mudflows(GBAO)</p> <p>Construct HPPs(GBAO and RRS)</p> <p>Rehabilitate cultivated lands in the oblasts(Sughd)</p> <p>Improve river banks(RRS)</p> <p>Issue public disaster warnings(RRS)</p> <p>Organize forest nurseries and plant fast-growing species to strengthen slopes(GBAO, RRS)</p>
	Capacity	<p>Develop capacity for forest nursery management(RRS)</p> <p>Conduct skill development on reducing land degradation(GBAO and Khatlon)</p>	<p>Arrange with local radio stations to broadcast agricultural and weather forecasts(GBAO)</p> <p>Establish an information centre for farmers(Khatlon)</p>

Exploring these opportunities and advancing development needs and resilience through the SPCR priorities would require a close collaboration among the groups responsible for the implementation of the SPCR activities. Such collaboration could help link actual actions with capacity-building activities. Developing strong collaborations with jamoats and improving the skills of experts, specialists and members of the local population would help maintain the SPCR investments and activities that are implemented.

Discussion and Conclusions

Based on the findings of the PSD workshops, significant development challenges affect poor people's livelihoods and make them further vulnerable to climate change. These challenges include limited access to clean drinking water, energy and food security, and access to health care. Specifically:

- **Water.** Challenges here include lack of drinking water, poor drinking water supply or inability to obtain boiled water; lack of irrigation water or the absence of watering machinery; and lack of drinking water treatment and functioning drainage systems.
- **Energy.** Issues include lack of electricity in winter or irregular electricity supplies; obsolete electric power-generation infrastructure; absence of alternative sources of energy; and lack of non-renewable energy sources.
- **Agriculture.** Challenges include droughts, soil erosion and land degradation; lack of irrigation water or poor-quality irrigation systems; degradation or random use of pastures; and unregulated use of pastures.
- **Other social challenges.** These include out-migration of youth and specialists, lack of appropriate workplaces for specialists, lack of medical equipment, lack of jobs and a low quality of education.

Although the PSD workshops were conducted in the oblasts to ensure that specific regional needs were accounted for, after reviewing the results we can conclude that **the findings, goals and needed actions are consistent across most of the oblasts**. This provides an opportunity to include most of the prioritized actions as national priorities and enables diverse pilot projects as well as case studies and building on lessons learned throughout Tajikistan. However, the workshops were not conducted in the most vulnerable areas, such as areas in the RRS, Sughd and some parts of Khatlon (see Figure 6). Such areas may need specific actions that could reduce the high levels of vulnerability and may not be relevant for the rest of the country, at least not to the extent that they are needed in these areas.

Based on the review of the adaptation actions and capacity needs, the workshop participants viewed themselves and their communities as having **very low adaptive capacity**, confirming the recent capacity assessment published by the World Bank (2011), in which Tajikistan was one of the countries with the lowest capacities in the Central Asian and Central and Eastern European regions. This finding emphasizes the need to invest in capacity development, especially in rural areas, to enable adaptation to climate change. Such **capacity-building activities for adapting to climate change** would need to focus both on addressing acute climate change impacts through disaster preparedness and on improving the livelihoods of people in the context of longer-term changes due to climate change. Disaster preparedness would require creating evacuation plans, establishing emergency response teams and working with communities in vulnerable areas so they are prepared in case of emergencies. To improve local livelihoods, the suggested actions to improve adaptation capacity mostly focused on helping people acquire management practices suitable to dry conditions for agricultural lands and pastures, skills to plant drought-resistant crops, knowledge of care for suitable livestock breeds, access to quality seeds, knowledge of efficient watering methods and processing skills.

When aiming to improve adaptation capacities, these efforts would need to be linked to actual improvements in **adaptation actions**, including measures to protect riverbanks and strengthen

slopes, clean drainage systems and canals, introduce new agricultural practices, establish seed banks and storage for food and crops, improve energy infrastructure and promote small-scale renewables such as small HPPs, and improve medical services, especially to combat infectious diseases. When identifying adaptation options, the participants prioritized ecosystem-based actions such as planting forests to hold moisture, especially in sensitive areas, planting fast-growing species to strengthen slopes, and introducing agroforestry to produce food and fodder and improve land conditions. In order to advance these activities, the participants emphasized the need to develop a country-level adaptation strategy and explore specific strategies for increasing renewable energy, combating drought and land degradation and ensuring food security. In order to make these strategies effective, monitoring of key changes in the environment and society would need to be conducted, and further assessments would need to be completed, for example to assess drought cycles, the degradation and salinization of soils, and the rising groundwater table, and to study disaster-prevention methods.

Many of the SPCR priorities target key development issues and needed adaptations, and could provide considerable improvement in resilience and sustainability of livelihoods. For example, strong linkages exist among needed future actions in the agricultural sector focused on climate-resistant seeds, suitable land management practices, delivering agricultural forecasts, and skill development in production and processing that are aligned with a number of SPCR goals (Table 13). However, to make the SPCR activities effective, strong collaboration at the local and regional level would need to be considered, and the actual implementation of the activities would be needed to align them with local people's needs and capacities, and must be actions that are relevant for them.

Table 13. Overview of key development priorities and needed actions to improve well-being and resilience, including those that are relevant for the SPCR priorities with a focus on agriculture

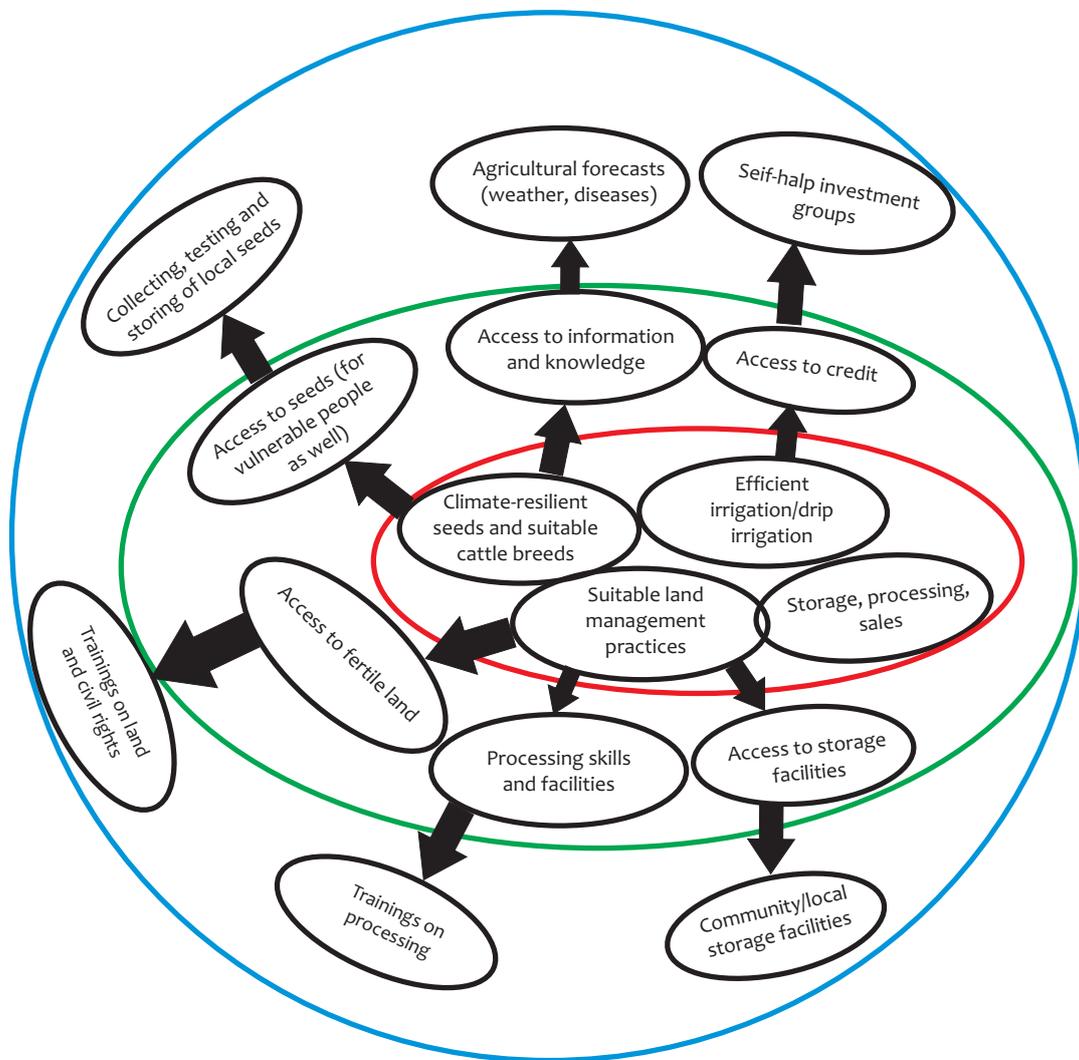
Future development goals as identified by the participants, with focus on agriculture		
Development goals	<ol style="list-style-type: none"> 1. Reach 65% of land under rational use. Train people to rationally use land and water resources (looking at the latest technologies), provide training in correct land cultivation practices and establish an information centre on correct land cultivation. 2. Improve food security by ensuring that 70% to 80% of the food supply is from local agriculture. 3. Use quality seeds. Create a seed fund with a goal of 70% of the local seed supply being of adapted seeds. 4. Replace 60% of agricultural machinery with new machinery. Improve technical servicing and reliability of agricultural machinery. 	
	3-year goals	5-year goals
Development needs	<ul style="list-style-type: none"> Create food storage and warehouses (Khatlon, Sughd, RRS) Provide access to high-quality seeds and animals (Sughd, RRS) Improve access to drinking water (Sughd, RRS) Develop biogas systems to utilize wastes (Sugh) 	<ul style="list-style-type: none"> Create a renewable development strategy (GBAO, Khatlon, RRS) Allocate state financing to support food security (RRS) Establish a non-GMO national seed fund Establish small businesses to process fruits and vegetables in the jamoats in mountain regions (GBAO, Khatlon, Sughd, RRS)

	Provide mobile and radio services in remote locations (GBAO)	Establish a program to breed Angora goats and promote beekeeping (GBAO, RRS in the Ramit Gorge) Create machine depots to support farmers (RRS) Promote skill development in processing Establish investment self-help groups
SPCR goals	Create local action plans for adaptation among the local population in each jamoat (GBAO) Establish information centres at the jamoat level and provide courses and seminars for specialists (on land, energy, water, monitoring)(all) Develop projects on soil degradation in rayons and jamoats Promote skill development on reducing land degradation (GBAO and Khatlon)	Pay special attention to vulnerability in mountain regions (Sughd) Study reasons for degradation and salinization of soils and rising groundwater tables (Sughd) Rehabilitate cultivated lands (Sughd) Improve river banks (RRS) Arrange with local radio stations to broadcast agricultural and weather forecasts (GBAO) Establish an information centre for farmers (Khatlon)

Furthermore, to increase the effectiveness of adaptation actions and capacity development, it is important that they be implemented congruently across different sectors and across different types of measures (Figure 14). Promoting development of infrastructure and hydro-meteorological services is highly beneficial when the qualified personnel are prepared to maintain and use the facilities and when the information gathered is distributed to the relevant stakeholders' groups. It is crucial that congruence be ensured across the sectors; for example, the benefit from an increased number of water reservoirs would be maximized if efficient irrigation practices are used, drought-resistant and quality seeds are planted, and the farmers use practices that are suitable for the land in the area. Similarly, it is also important to ensure the linkages at the program level so that agricultural planning accounts for climate change and creates linkages with water management, hydro-meteorological monitoring, and economic development and diversification.

Finally, while most of the adaptations provide benefits to vulnerable people, it cannot be automatically assumed that these people will benefit equality with the rest of the population from these measures. Specific adaptations need to be adjusted or additional measures designed to account for the needs of vulnerable people. According to the participants, these include, for example, access to seeds, lower tariffs for energy, access to equipment, loans and investment self-help groups, and specific attention during capacity development and consultations. This could include specific women-only consultation sessions, paying specific attention to mountainous regions and offering specific trainings on disaster management to vulnerable groups.

Figure 14. Examples of congruency among different activities and sectors in promoting adaptation based on participants' responses. The red inner circle shows some of the key actions that people need to take to maximize adaptation, in the green circle are key capacities that people need to enable these adaptations, and finally, in the blue circle, are examples of support mechanisms that could help increase these capacities.



Recommendations

Overall, Tajikistan faces a number of challenges, including limited basic services such as clean water supply, access to reliable energy, quality health care and education, and social safety nets. Specific gaps exist in key sectors that are crucial for livelihoods, such as agriculture and processing. Workshop participants pointed out that challenges in these sectors include the availability and quality of suitable seeds, sustainable land management practices, access to infrastructure, access to storage facilities, and limited knowledge of processing and marketing to improve revenues from production. Many of these challenges could be further worsened if climate change and climate variability lead to further droughts and land degradation; a higher incidence of disease in plants, animals and humans; and disasters such as floods, mudflows and mountain lake overflows.

The participants perceived their communities as having low adaptive capacity and limited experience or resources that could be turned into action if impacts occurred. They had opportunities to list specific capacities that they could use to respond to climate variability and climate change, but most of them mentioned that they lacked resources for sustainable long-term adaptations. For example, the participants were the most concerned about droughts, as these directly impact agriculture - the most significant source of assets for most participants - and limited alternatives are available. Especially vulnerable and poor people tend to lose most of their assets during disasters, reoccurring impacts undermine their coping capacity, and they have almost no ability to rebuild their livelihood in either the original area or a resettled area.

While all these current and potential future impacts require adaptation measures, in the case of Tajikistan, it is important to link adaptations with investments in development so that the two work in synergy to improve resilience.

To improve capacity and reduce vulnerability to climate change, the participants suggested a number of actions, including actions focused on infrastructure development, ecosystem-based actions, and actions aiming to develop strategies, strengthen institutions and deliver specific capacity-development activities. Many of these identified adaptations and development goals are closely linked to the planned SPCR investments and actions. Thus, the SPCR could contribute to reducing the vulnerability of people and systems to climate change. The recommendations below could enhance the efficiency of SPCR actions, and some of them could also be supported by small grants.

Based on the information gathered during the workshops, we can put forward the following key recommendations:

Measures focused on institutions, strategy development and coordination are crucial in considering and integrating adaptation priorities with development, across sectors and levels of governance:

- Develop a national climate change adaptation strategy outlining key priorities and principles for adaptation and capacity development. The actual implementation of the strategy could be done in a more decentralized manner.
- Use identified principles and guidelines for adaptations and capacity development to screen development projects and investments to ensure that they are not increasing

vulnerability and that they are contributing to resilience, even if they are not directly focused on climate change.

- Promote collaboration among national, regional and international agencies so that work on climate change adaptation is coordinated and agencies are aware of each other's initiatives, preferably building on each other's results.

- Ensure that regional-level institutions such as *jamoats* (administrative divisions similar to municipalities) play a key role in implementation of actual actions, including those outlined in the SPCR. This is especially the case for activities such as training, information dissemination, capacity development, and providing forecasts and early warnings. According to the participants, this could be best achieved by allocating some of the resources to invest in *jamoats*' initiatives, perhaps by creating information centres in the *jamoats*. These centres would need to be in regular contact with the regional and national agencies to ensure coordinated action and information sharing.

- Ensure synergies between sectorial adaptations and different types of measures. For example, adaptation focused on species planted for agriculture would be more effective if adaptations focused on water management and economic development were designed and implemented in a coordinated manner. Similarly, measures to develop infrastructure could be supported by ecosystem-based measures and capacity-development activities.

Infrastructure-based adaptation measures provide important contributions in increasing resilience and promoting development while reducing climate change impacts:

- Consider that many current challenges, including delivering clean water; providing access to irrigation water, reliable energy, safe housing and healthcare; and monitoring water quality and quantity, land-use change and disease would require significant investment in infrastructure beyond only investments related to climate change adaptation.

- Consider that investments planned under the SPCRW were aligned with development priorities that the participants put forward as important; however, they may be required at a considerably larger scale throughout most of the country.

- Address crucial needs related to current types of livelihoods. Participants saw improving access to seeds, storage places, irrigation infrastructure, renewable decentralized energy systems and processing facilities as crucial for improving agricultural livelihoods in the context of climate change impacts.

- Improve access to water for drinking and irrigation by modernizing current hydroelectric power plants (HPPs), cleaning up current reservoirs and building small-scale HPPs. These suggestions were put forward to address both current challenges related to access to water and future climate change impacts such as droughts.

- Improve infrastructure to address future acute climate impacts. This includes building or renovating protection systems for floods and mudflows, as well as instituting and maintaining monitoring and emergency procedures to ensure timely evacuation when disasters occur.

Ecosystem-based measures are among the adaptations needed and, together with measures focused on infrastructure, they are crucial to resilient development:

- Promote forest plantations that could help to hold moisture and strengthen river banks. Such cultivation should be considered in areas vulnerable to drought and planted with drought-resistant species, perhaps using different species in areas affected by floods and mudflows (fast-growing species were suggested for these areas).
- Consider agroforestry to provide food for local people and products for them to sell, to ensure that they benefit from the land after forest plantations are established.
- To prevent further deterioration, address overgrazing of pastures by promoting rotation and management of pastures and limiting the number of and type of livestock.
- Put mechanisms in place to monitor the forest plantations, interactions between people and forests, and implementation of relevant management practices.

Capacity-development measures. To ensure the efficiency of adaptation measures, capacity-development measures would need to be closely integrated with other types of measures in most sectors:

- Develop capacity-building sessions for professionals and policy-makers working in monitoring, hydro-meteorology, agriculture, water and other sectors to increase their knowledge about climate change impacts and adaptations and how these could be integrated with their sectoral planning and actions.
- Work with specific stakeholder groups, especially farmers. Provide information and practical training on sustainable land management to reduce erosion, using agroforests, preparing for potential pests and developing skills in processing.
- Build capacity among teachers and other educators to provide them with the information and materials they need to include climate change in their teaching.
- Develop materials for capacity development that could be used by stakeholders' groups and the public.
- Use information and communication technology, including mobile phones, for example to disseminate information about forecasts, disasters and evacuations. These could also be used to involve people's feedback in validating data and forecasts, assessing harvests to prepare for potential food insecurity, and monitoring diseases.

Measures to protect vulnerable people, who cannot be assumed to benefit equally with the rest of the population from adaptation actions:

- Conduct further assessments to specifically address the needs of vulnerable people in areas of high vulnerability in Tajikistan and to identify adaptations targeted to them.
- Develop emergency and resettlements plans for populations in highly vulnerable areas, and keep these up-to-date so they can be implemented if disasters occur.
- Ensure that women and vulnerable people are involved in public consultations and in capacity-development activities.

- Provide support for relevant skill development and emergency safety nets or services.

Other future adaptation and capacity measures would need to be designed and continuously implemented to ensure that the capacities built would be sustained, and sensitivity to climate further reduced:

- Increase assessments of climate change impacts on water resources, key agricultural crops (commercial and food), and natural ecosystems.
- Develop vulnerability maps for different hazards and capacities and identify hot spots where areas with high levels of hazards or low capacities are estimated. Provide this information to the public and to stakeholder groups and ensure that projects for relevant adaptations are being implemented in these areas.
- Assess vulnerabilities and needed adaptation measures in health care and identify current public health challenges as well as future trends and adaptation needs.
- Consider further activities to ensure small-scale energy system development and water access.
- Based on planned activities, including the SPCR and others, and on strategic development documents, develop a key set of priority adaptations that could be progressively implemented over next 10 to 20 years to ensure that the effectiveness of current adaptations is sustained and improvements are made.

References

1. Bizikova L., Boardley, S., and Mead, S. 2010. Economics of adaptation to climate change: Participatory scenario development (PSD) approaches for identifying pro-poor adaptation options. Discussion paper series no. 18. Washington, D.C.: World Bank. Retrieved from http://beta.worldbank.org/sites/default/files/documents/PSD-Pro-Poor-Adaptation_EACC-Social%20.pdf
2. Bizikova, L., Dickinson, T., and Pinter, L. (2009). Opportunities for participation and learning when translating impacts of climate change into adaptations. *Participatory Learning and Action* 60, 167–173.
3. Eriksen, S. H., and O'Brien, K. (2007). Vulnerability, poverty and the need for sustainable adaptation measures. *Climate Policy*, 7, 337–352.
4. Evans K, Jong de E, Cronkleton P (2008) Future scenarios as a tool for collaboration in forest communities. *Surveys and Perspectives Integrating Environment and Society* 1: 97-103
5. Jaeger CC, B Kasemir, S Stoll-Kleemann, D Schibli, U Dahinden (2000) Climate change and the voice of the public. *Integrated Assessment* 1:339–349
6. Lonely Planet. (2011). Map of Tajikistan. Retrieved from <http://www.lonelyplanet.com/maps/asia/tajikistan>
7. State Agency for Hydrometeorology of the Committee for Environmental Protection. (2008). The second national communication of the Republic of Tajikistan under the United Nations Framework Convention on Climate Change. Dushanbe, Tajikistan. Retrieved November 2, 2011, from http://www.undp.tj/index.php?option=com_content&task=blogcategory&id=7&Itemid=73
8. Statistical Agency Under President of the Republic of Tajikistan. (2011). Database. Retrieved from <http://www.stat.tj/english/database.htm>
9. UNEP (2002) *Global Environment Outlook-3: past, present and future perspectives*. Earthscan: London
10. United Nations Development Programme (UNDP). (2009). *Central Asia regional risk assessment: Responding to water, energy, and food insecurity*. New York: United Nations Development Programme, Regional Bureau for Europe and CIS.
11. Wollenberg E, Edmunds D, Buck L (2000) Using scenarios to make decisions about the future: participatory learning for the adaptive co-management of community forest. *Landscape Urban Plan* 47:65-77.
12. World Bank. (2009). *World development report 2009: Reshaping economic geography*. Washington, D.C.
13. World Bank. (2010). Country profile: Tajikistan. Retrieved November 2, 2011, from <http://www.worldnabk.org/tj>
14. World Bank. (2011). *Tajikistan: Economic and distributional impact of climate change*. Report No. 62211-TJ. Washington, D.C.: World Bank Poverty Reduction and Economic Management Unit, Europe and Central Asia Region.
15. Yohe, G. W. (2001). Mitigative capacity: The mirror image of adaptive capacity on the emissions side. *Climatic Change*, 49, 247–262.

7.1. TOT Workshop Agenda

Agenda

Logos
Date and Place
Workshop title

Day 1	
8:30 – 9:00	Registration
9:00 – 9:30	Welcome and Introductions Local representatives (UNDP, consultants) Lead Facilitator <i>Introducing the PPCR study including the key measures/investments Outlining the purpose of the workshop and expected outcomes</i>
9:30 – 10:45	Session 1 Drivers of current development and current capacities in the country/region <i>Plenary discussion and group work</i>
10:45 – 11:00	Break
11:00 – 12:30	Session 2 Socioeconomic and environmental trends focused on the key areas in the country <i>Plenary discussion and group work Group Briefings</i>
12:30 – 13:30	Lunch
13:30 – 14:00	Overview of Climate Change and Impacts Local climate change expert <i>Presentation and Plenary discussion</i>
14:00 – 16:00	Session 3 Identifying potential future climate impacts and needed actions and capacities <i>Group Activity</i> 15:30 Working coffee break <i>Group report-back on key climate hazards and major vulnerabilities of the future scenarios</i>
16:00 – 17:00	Group presentations on climate impacts and adaptation, capacities to respond to impacts
17:15	Wrap-up of day 1

Day 2		
9:00 – 9:30	Welcome Back & Opening Remarks	
9:30 – 11:00	Session 4	Assessing resilience of the future system Introduction of the key elements of resilience Review of the system for its resilience <div style="text-align: right;"><i>Plenary discussion</i> <i>Group Activity</i></div>
11:00 – 11:15		Break
11:00 – 13:00		Moving Forward: Identifying actions to increase resilience at the regional and country level Linking Developing action/policy pathways and related actions <div style="text-align: right;"><i>Group Activity</i> <i>Presentations by groups</i> <i>Plenary discussions</i></div>
13:00 – 13:30	Next steps and closing; Workshop Evaluation	
13:30 – 14:30	Lunch	

Note: The starting time and the breaks can change, but the length of the sessions should be kept untouched to provide enough time for their completion.

7.2. Oblast-level agenda

Agenda

Logos

Date and Place

Workshop title

8:30 – 9:00		Registration
9:00 – 9:20		Welcome and Introductions <i>Brief project overview Workshop objectives Participant introductions</i>
9:20 – 10:45	Session 1	Key future priorities for key sectors through the next 10 – 15 years <i>Plenary discussion and group work 10:15 – 10:45 Group briefings</i>
10:45 – 11:00		Break
11:00 – 13:00	Session 2	Overview of climate change and impacts relevant for the oblast <i>Brief overview of relevant climate change impacts (select few slides from Yuri's presentation); 15 min Group work 12:15 – 13:00 Group briefing 10 min per group</i>
13:00 – 14:00		Lunch
14:00 – 15:45	Session 3	Overview of key SPRC activities and their relevance for the region <i>Brief overview of the activities Group work</i>
15:45 – 16:00		Coffee break
16:00 – 16:45	Session 4	SPRC activities in the region <i>Group briefings – each group will provide a brief overview of one SPRC activity; each presentation should be 5–7 min.</i>
16:45 – 17:45		Key priority activities to promote sustainable adaptation and development <i>Group work Plenary discussion</i>
17:45 – 18:00		Next steps and closing

7.3. Workshop results

7.3.1. Overview of Current Development and Capacities for Each of the Oblasts

Sector	Key challenges
GBAO	
Water	<ul style="list-style-type: none"> Lack of drinking water in remote areas Lack of irrigation water Water pollution Irrational water use Long-lasting heavy precipitation, mudflows and reduced glacial area Lack of water-related infrastructure such as water reservoirs and pipe networks Absence of correct groundwater estimates
Energy	<ul style="list-style-type: none"> Lack of electricity in autumn and winter Limited electricity supply No access to energy resources No renewable energy sources and/or lack of firewood or coal Obsolete equipment on HPPs Slow construction or lack of funds for mini-hydro Irrational or ineffective energy use Old equipment and remoteness from main transmission lines Lack of funds for distribution lines
Agriculture	<ul style="list-style-type: none"> Droughts and soil erosion Land degradation Lack of irrigation water Poor irrigation system quality Pasture degradation Random or unregulated use of pastures Reduced seed quality Lack of a seed fund Lack of land Lack of mineral fertilizers Lack of forage Poorly developed cattle breeding Unused land resources Increased diseases and pests
Other: Education Public health Migration	<ul style="list-style-type: none"> Limited number of specialists Outmigration of youth and capable specialists Poor technical basis Lack of jobs and low salaries Lack of jobs due to scarce infrastructure Infectious diseases Pathologies of newborn babies Lack of medications Increased emergencies: melting glaciers, floods, avalanches, mudflows, storm winds, glacial lake overflows People unaware of ecological conditions and reasons for emergencies

Khatlon	
Water	<ul style="list-style-type: none"> Lack of drinking water Poor drinking water supply Inability to obtain boiled water Lack of irrigated land lots Absence of watering machinery Limited drinking water treatment Lack of drainage system Irrational use of water High price of water Rising groundwater level
Energy	<ul style="list-style-type: none"> Lack of electricity in winter Irregular electricity supply Obsolete electric power generators Lack of electric parts Absence of alternative energy (solar) Lack of gas and coal Low-quality bulbs and poor utilization High price of fuel resources
Agriculture	<ul style="list-style-type: none"> Loss of agricultural lands Incorrect land distribution High (incorrect) land tax Absence of practical aid to land users Lack of financing to procure machinery or fertilizers Lack of local agricultural specimens Lack of early-season cultures Lack of irrigation water Pumping stations idling Bad quality of drainage system
Other: Education Public health Migration	<ul style="list-style-type: none"> Lack of jobs Low salaries Outmigration of specialists and youth (brain drain) Bad conditions and lack of landfills Lack of training classrooms Absence of public health programs Increasing HIV/AIDS Lack of prophylactics for migrants Rise of groundwater level

Sughd	
Water	<ul style="list-style-type: none"> Drinking water contamination Low water quality Poor drinking water treatment Absence of correct data on water resources Lack of drinking and irrigation water Absence of centralized water supply Lack of pipe systems Need for reconstruction of water treatment facilities Calamities Irrational use of resources Incorrect irrigation
Energy	<ul style="list-style-type: none"> Lack of electricity, especially in autumn and winter Blackouts Irrational energy use Lack of energy conservation in the culture Need to build and use alternative energy sources Need for use of renewable energy sources Damage to substations Use of obsolete equipment for power transmission Lack of payment for electricity (theft of energy)
Agriculture	<ul style="list-style-type: none"> Land degradation Rise of groundwater table Soil salinization Lack of agricultural machinery Need to modernize agricultural machinery Poor irrigation systems Excessive use of irrigation water Low rate of land recultivation Absence of a seed fund Lack of mineral fertilizers Poor land cadastral and poor in-house cadastral of soil and land resources Irrational land distribution among users Untimely auditing of lands Corruption Genetically modified organisms Pesticides Absence of agricultural forecasts
Other: Public health Migration	<ul style="list-style-type: none"> Lack of jobs Low salaries Poor medical services Migration of rural people to cities Brain drain Youth migration Poor social protection Lack of waste-processing facilities Nuclear tailings ponds Low level of ecological education

RRS	
Water	<ul style="list-style-type: none"> Lack of drinking and irrigation water Water pollution Low quality of drinking water Poor water supply (taps, gates) Rise of groundwater table Irrational water use Need to clean up drainage and irrigation network Lack of machinery Soil contamination Mudflows
Energy	<ul style="list-style-type: none"> Lack of electricity Non-operational pumping stations Poor condition of transmission lines and substations Lack of water for HPPs Absence of non-traditional sources of energy Ensuring payment for utilities by private businesses Ineffective programs
Agriculture	<ul style="list-style-type: none"> Land degradation Drought Ineffective use of land resources Low quality of seeds Absence of a national seed fund or certified seed fund Lack of mineral resources, pesticides and machinery Absence of crop rotation Increased plant pests and diseases Lack of vaccines for cattle Lack of water resources Limited reconstruction of bridges and roads Absence of industrial processing Low agro-technology knowledge High land taxes Incorrect land distribution
Other: Migration Public health	<ul style="list-style-type: none"> Outmigration of young specialists Lack of appropriate workplaces for specialists Lack of medical equipment Distribution of infectious diseases and cancer Poor monitoring of food products

7.3.2. Overview of All the Future Goals Identified by the Participants

Water
<ul style="list-style-type: none"> Double the number of people who have to access to drinking water (to 50–70%) Improve drinking water quality by ensuring that 40–100% of water treatment facilities are operational Improve irrigation systems by 50%, especially in fertile land areas (using technologies that reduce water loss) Supply water to blocks of flats Use water effectively Implement water reservoirs for irrigation and drip irrigation to address droughts Address the lowering groundwater table Improve regional water cadaster and inventory Construct small and larger reservoirs Improve river banks in the Rozik and Gulistaon jamoats
Energy
<ul style="list-style-type: none"> Improve the electricity supply for people and industry by 90–100% Reduce use of fuel resources such as firewood and coal by 50% Rehabilitate electric equipment, including modernizing existing HPPs Construct small HPPs Improve the skills of specialists in the sector Improve the tax and legal basis for investing in the private sector Create conditions for hot water supply in the rayons and cities Promote effective use of electricity Reduce the price of electricity throughout the country
Agriculture
<ul style="list-style-type: none"> Increase the percentage of land managed by sustainable practices to 65% by using the latest technologies Train people to rationally use land and water resources Train farmers in correct cultivation practices Establish an information centre on correct land cultivation Ensure food security by providing 70–80% of the local food supply from locally produced agricultural products Ensure use of quality seeds by creating a seed fund Ensure that 70% of seeds used are drought tolerant or climate resilient Provide better seeds to farmers; doubling yields will supply 60–80% of the domestic market with local food Replace 60% of agricultural machinery with new machinery Improve technical servicing and reliability of agricultural machinery Promote selection of new, better types of cattle Increase agriculture production on uncultivated land Provide training on marketing and processing Provide fertilizers and pesticides Create state seed-distribution networks
Other: migration, health, education
<ul style="list-style-type: none"> Create jobs and reduce the number of unemployed by 60–85% Increase jobs in agriculture, construction, etc. Reduce migration by 80% Provide 80% of the population with medical services Implement public programs to prevent infectious disease, especially through prophylactics Reduce the poverty level Increase hospitals by 85% Improve the education system Improve legal awareness Provide better conditions for the disabled, homeless, handicapped and people with low income

7.3.3. Overview of Adaptations Identified by the Participants

Key impacts: Droughts	GBAO	Khatlon	Sughd	RRS
Necessary/ relevant adaptations	<p>Distribution of land resources</p> <p>Water reservoirs</p> <p>Vaccination</p> <p>Forest planting</p> <p>Drought-resistant plants</p> <p>Locality monitoring</p> <p>Increase of potential through education (seminars, trainings)</p> <p>Support to farmers (financing)</p> <p>Use of glaciers and snowfields only in exceptional cases</p> <p>Detailed study/analysis of the reasons for droughts and of their cycles</p> <p>Creation of additional water reservoirs</p> <p>Drafting of development strategies</p>	<p>Correct cultivation of crops, permanent grass, autumn land tillage</p> <p>Precipitation-filled water reservoirs</p> <p>Improved climate resistance of seeds</p> <p>Centres to grow climate-resistant cultures</p> <p>Afforestation</p> <p>Provision of clean drinking water</p> <p>Improved public culture around water piping</p> <p>Creation of water reservoirs in settlements</p> <p>Use of the world's best achievements in water supply</p> <p>Avoidance of infectious disease during droughts</p> <p>Information to people on weather change</p>	<p>Land resource distribution</p> <p>New water reservoirs</p> <p>Vaccination</p> <p>New forests</p> <p>Cultivation of drought-resistant cultures</p> <p>Monitoring</p> <p>Improved sustainability potential through training courses</p> <p>Support to farms (finance)</p> <p>Use of glaciers and snowfields in emergency cases</p> <p>Detailed study of droughts and their cycles</p> <p>New water reservoirs to preserve water</p> <p>Drafting of development strategies</p>	<p>Construction of water reservoirs</p> <p>Improved drainage lean-ups</p> <p>Water wells</p> <p>Planting of forests</p> <p>Organization of pest-control groups</p> <p>Studying the reasons for droughts and their cycles</p> <p>Use of mountain torrents, glaciers and snowfields in dry years</p> <p>Creation of seed funds in dry years</p> <p>Increased forested areas to hold up moisture</p> <p>Creation of necessary stock of food and forage</p> <p>Creation of water reservoirs to use rain water in later periods</p> <p>Practical assistance to the poor population</p> <p>Assistance to bee farmers to procure new breeds adapted to altered climate</p>

Key impacts: Land degradation	GBAO	Sughd	RRS
Necessary/ relevant adaptations	<ul style="list-style-type: none"> Construction of forest protection and drainages Introduction of water-efficiency in irrigation Seminars to local farms on land degradation Prophylactics Improvement in qualification of doctors through trainings Procurement of modern medical equipment Improved access to modern medical practices Programs to use medicinal herbs Land protection program 	<ul style="list-style-type: none"> Forest-protection belts Water-saving technologies Seminars to farmers to prevent land degradation Revival of herbal medicine Improvement to doctors' qualifications (seminars) Modern medical equipment Drafting of land protection program 	<ul style="list-style-type: none"> Tree planting Better information on weather conditions Effective use of lands. State support to recover losses from natural disasters Hail-protection services at the state level Information centres for agricultural products Activities on soil erosion protection (water, wind) Promotion of market access Improved control of cattle overgrazing Drought-resistant cultures (pistachio, wild rose, almond)
Key impacts: Disasters	GBAO	Sughd	RRS
Necessary/ relevant adaptations	<ul style="list-style-type: none"> Resettlement to safer areas Mudflow protection Correct equipment for meteorological stations Planting of trees and forests Construction of resistant buildings Resettlement plan Financial assistance to the affected Technologies and qualified specialists in forecasting and monitoring Standards for projects to build resistant structures Investment assistance 	<ul style="list-style-type: none"> Resettlement of people to safer places Mudflow protection facilities Correct equipment for meteorological stations Access for farmers to an anti-hail system Forest belts and forest protection Financial aid Modern equipment and accessories Newest technologies and qualified specialists Quake-proof structures 	<ul style="list-style-type: none"> Mudflow-protection dams Quick-response teams for rescues Preparation for evacuation Public evacuation trainings Provision of pharmaceuticals and medicines Clean-up of mudflow gutters Provision of equipment during natural disasters Timely public information on natural disasters Preparation of food stocks Tree planting Protection of main economic facilities Mobilization of people during calamities Use of agricultural machinery to prevent natural disasters

Key impacts: Floods/ mudflows	Khatlon	RRS
Necessary/ relevant adaptations	<ul style="list-style-type: none"> Cleanup of drainage systems Extermination of parasites (flies, mosquitoes), disinfection of areas that may contain parasites Drinking water chlorination and filtering Construction rules on river banks Sanitary and hygienic norms in settlements and houses Improvement of living standards Provision of mosquito nets Information campaign at schools and kindergartens Prophylactic measures for local population Free medicine for the needy Drinking of only boiled water Laboratory for water treatment Seminars on water use Regular seminars to inform on infectious diseases 	<ul style="list-style-type: none"> Improvement of river banks Forest protection and forest belts Cleanup of drainage systems Preparation of the population for calamities In-depth study of occurrence of floods and mudflows Additional mudflow conduits Definition of the main areas exposed to floods and mudflows Building of houses in safe areas Forecasts of upcoming dangers or catastrophes Fast-response teams to prevent danger Building of dams upstream, above settlements

7.3.4. Overview of Recommendations/Issues to Consider for the SPCR Activities

SPCR priorities	GBAO	Khatlon	Sughd	RRS
Building institutional capacity and awareness of climate change among stakeholder groups (civil society, media, vulnerable groups such as women, youth, young men and children)	<p>Information centres at the jamoat level on initiatives to prevent climate change impacts</p> <p>Training courses to study climate and resilience</p> <p>Draft national program on adaptation to climate change</p> <p>Introduction of relevant knowledge to educational institutions</p> <p>Training courses on certain trades</p> <p>Educational support to poor, single women and large families</p> <p>Women's cooperatives for sewing and knitting</p> <p>Self-help and investment groups</p> <p>Special attention to vulnerable people in mountain areas</p>	<p>Development of training materials, visual aids on land management</p> <p>Retraining centres for specialists abroad</p> <p>Location of resources and cooperation with international funds</p> <p>Creation of information centres</p> <p>Cooperation among agencies on climate change</p> <p>TV warning channels on emergencies</p> <p>Extracurricular training groups in schools</p> <p>Training on disaster risk reduction</p> <p>Women's cooperatives to provide food</p> <p>Seminars and meetings with poor people on adaptation</p> <p>Improved access to credit and loans for the poor</p>	<p>Investment in jamoat initiatives on climate change</p> <p>Information centres in jamoat</p> <p>Regular contact by such centres with jamoat and regional authorities</p> <p>Drafting of national program on adaptation to climate change</p> <p>Climate change courses in educational institutions</p> <p>Improved access/usability of hydro-meteorological monitoring</p> <p>Self-help and investment groups</p> <p>Special attention to vulnerable territories in the mountains</p> <p>Educational support to poor, single women, disabled people and large families</p> <p>Women's cooperatives for sewing and knitting</p>	<p>Regular emergency trainings</p> <p>Regular seminars on adaptation measures</p> <p>Timely use of recommendations for adaptation</p> <p>Improved public information on potential climate change risks</p> <p>Assessment of poverty in jamoats</p> <p>Women's cooperatives for confectionery, sewing and food-preserving shops</p> <p>Trainings for women on alternative energy</p> <p>Involvement of women in developing adaptation measures</p>
Improving the national hydro-meteorological monitoring system to provide timely warnings on dangerous events and to support water management	<p>New equipment procured by the Committee on Emergencies</p> <p>Provision of qualified personnel and investments</p> <p>Improved water-quality monitoring in reservoirs</p> <p>Improved monitoring of public water</p>		<p>New technologies and accessories</p> <p>Skill-upgrading courses for specialists</p> <p>Improved dam monitoring</p> <p>Improved public information coverage on disasters via cellphone carriers</p> <p>Improved financing of</p>	<p>Disaster forecasting for the agricultural sector</p> <p>Disaster monitoring and prophylactics</p> <p>Trainings for the population</p> <p>Systematic work on climate change in <i>kishlaks</i>⁴ and jamoats</p> <p>Financing of climate</p>

⁴ Rural settlements of semi-nomadic people.

	<p>supply</p> <p>Re-equipment of monitoring stations</p> <p>Agricultural forecasts by cellphone</p> <p>Emergency notification by SMS messaging in the Tajik language</p>		<p>hydro-meteorological services</p> <p>Weather forecasts on radio and other means</p> <p>Improved cooperation with the meteorological centre</p> <p>Regular information on weather conditions and water runoff</p> <p>Re-equipment of monitoring stations</p> <p>Mobile agricultural forecasts</p>	<p>change activity</p> <p>Cooperation on weather forecasts at different levels, including local governments</p> <p>Quick-response groups</p> <p>Early disaster warning systems in all jamoats</p> <p>Self-help groups during disasters</p> <p>Public warnings on upcoming disaster events</p> <p>Indication of evacuation points</p>
Replicate and scale up effective existing land management practices	<p>Storehouses for agricultural products</p> <p>Seminars for the public on civil rights and land issues</p> <p>Development of training materials, visual aids on land management</p> <p>Seminars on pasture recovery</p>	<p>Inclusion of anti-hail services in jamoat climate centres</p> <p>Seeding time conveyed to the public via cellphones</p> <p>Seed banks</p> <p>Machine depot for agriculture</p> <p>Soil erosion protection measures</p> <p>Development of training materials and visual aids on land management</p>	<p>Courses and seminars on climate and sustainable land management</p> <p>Storehouses for agricultural products</p> <p>Biogas best practices</p>	<p>Access to seeds and skills to plant drought-resistant crop plants</p>
Rehabilitate the Kairakkum HPP as a pilot	<p>Improved dam monitoring and investments</p> <p>Mining of silt from the bed of the Kairakkum reservoir</p> <p>Reservoirs in the upstream portion of the Shakhimardan, Shokh and Isfanransai rivers to reduce siltation downstream</p> <p>Improved cooperation with the meteorological centre</p> <p>Supply of alternative energy (at best prices) to poor people</p>		<p>Procurement of new equipment through the Emergencies Committee.</p> <p>Silt removal from the bed of the Kairakkum reservoir.</p> <p>Silt-protection facilities in the upstream portion of the Shakhimardan, Shokh and Isfanransai rivers</p> <p>Assessment of potential for hydroelectricity to cover multi-sector water needs during droughts</p> <p>Improved monitoring</p>	<p>Rehabilitation of mini-HPPs</p> <p>Preparation of specialists to build mini-HPPs</p> <p>Elevated reservoirs to reduce siltation downstream</p> <p>Practical measures to make hydro-technical facilities work in low-water years</p> <p>Financing to power stations in the poor mountain areas</p> <p>Lower tariffs for poor people</p>

			<p>of reservoir water contamination</p> <p>Supply of subsidized alternative energy to vulnerable families</p> <p>Provision to vulnerable families of energy at lower prices</p>	
<p>Climate-proofing measures in vulnerable ecosystems and critical infrastructure piloted in the Khatlon target area and Pyanj tributaries</p>		<p>Water reservoir on the Pyanj River to resist droughts</p> <p>Ponds for fisheries on the Pyanj River</p> <p>Use of the Pyanj River for irrigation</p> <p>Training in risk management for emergencies</p> <p>Quick-response teams equipped with machinery</p> <p>Information centres for poor people.</p> <p>Warehouses to stock food, fuel and lubricants for emergencies</p>	<p>Coast-protecting structures</p> <p>Mini-HPPs</p> <p>Water reservoir on the Kafirnighon River to irrigate lands in the Kabodiyan and Shakhrituz rayons.</p> <p>Teams to work on coast-protecting structures</p> <p>Centre on emergency warning in the Pyanj River basin</p> <p>Drafting of evacuation plan for emergencies</p> <p>Forest shelter belt.</p> <p>Building and reconstruction of dams</p> <p>Assessment of potential to resettle people</p>	

