

# Tajikistan

## Key Priorities for Climate Change Adaptation

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## Abstract

How should Tajikistan adapt to ongoing and future climate change, in particular given the many pressing development challenges it currently faces? The paper argues that for developing countries like Tajikistan, faster economic and social development is the best possible defense against climate change. It presents some key findings from a recent nationally representative household survey to illustrate the strong public support for more climate change related spending on better

management of water resources, disaster management, agriculture, and public health—four key sectors that the government’s latest poverty reduction strategy identifies as being especially important from a climate change perspective. Finally, the paper argues that, as important as project-based adaptation measures may be, it is imperative that they be supported by an overall policy framework that provides a truly enabling environment to facilitate faster climate change adaptation.

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# Tajikistan: Key Priorities for Climate Change Adaptation

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## 1. INTRODUCTION AND OUTLINE

1. The publication in 2006 of the Stern Review on the economics of climate change has marked a watershed in attracting widespread public attention on the effects of climate change (CC) and global warming on the world economy. As the study highlights, an overwhelming body of scientific evidence indicates that climate change resulting from increased accumulation of greenhouse gases is a serious and urgent issue. Over the next 2-3 decades, global mean temperatures may rise between 2-5 degrees Celsius, exacerbating existing patterns of water shortages and excesses and increasing the risk of drought and floods. Climate change impacts will be felt differentially across regions and localities: while some parts of the world may even benefit from modest rises in temperature, most countries are expected to suffer heavily, and some of the world's poorest countries are likely to be disproportionately affected by the adverse impact on global economic growth.

2. Tajikistan is a small landlocked country in the heart of Central Asia, bordered by Afghanistan, China, the Kyrgyz Republic, and Uzbekistan. Roughly one-tenth of its 7 million total population lives in Dushanbe, the capital city. The country is blessed with abundant water resources, contributing to its specialization in cotton production. Tajikistan also has huge hydropower generation potential—abundant and inexpensive electricity has led to its other main specialization, aluminum production, contributing about one-half of exports. However, unlike other richer Central Asian countries (e.g. Kazakhstan, Turkmenistan), Tajikistan has negligible oil, gas, and other such natural resources. Only 7 percent of its total land area of 143,000 square kilometers is arable. High mountain ranges across its territory make communication between different parts of the country difficult, especially in winter. Tajikistan is highly susceptible to natural disasters, and is regularly affected by floods, landslides, earthquakes, and droughts. Up to 40 percent of the country's national workforce is employed abroad (mostly in Russia) and sends home remittances equal to more than one-third of its gross domestic product.

3. The above factors combine to make Tajikistan one of the poorest and most vulnerable economies in the world.<sup>1</sup> Given its unique combination of geography, topography, climate, and low income, it is also especially prone to the adverse impacts of global climate change. How well informed are households in Tajikistan about the different causes and consequences of climate change? How concerned are they about its various potential impacts, and how do these concerns compare with other development challenges the country currently faces? What are some of the main transmission channels through which households could be impacted? Which potential impacts, if realized, would be of greatest public concern? Is there evidence of some of these changes already taking place? Using data from a nationally representative household survey carried out in Tajikistan recently, this paper examines some salient aspects of public perceptions of climate change in the country to help address these and other such important questions of policy interest.

4. The Pilot Program on Climate Resilience has recently been launched in Tajikistan with donor support, which will provide the Government of Tajikistan with USD50 million in grant financing to strengthen institutional capacities for climate resilience and to fund investment projects. There is also interest among other donors and national counterparts in integrating a climate change perspective in their operations. Do the survey findings have any bearings on how Tajikistan should adapt to ongoing and future climate change, in particular given the many pressing development challenges it

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<sup>1</sup> Tajikistan's GDP per capita is \$751 (current US\$, 2008 estimate) / \$PPP 1,906 (current international \$, 2008 estimate). In 2004, more than one-half (51 percent) the country's population was estimated to subsist below the \$PPP 2 per capita per day international poverty line. *Source:* World Bank's World Development Indicators, September 2009 edition.

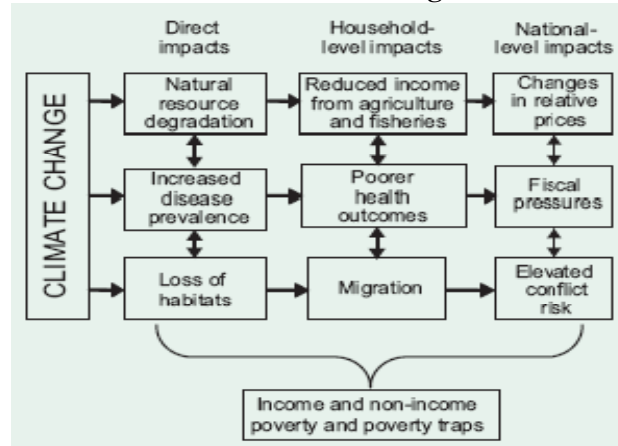
currently faces? Are there trade-offs, or can long-term climate adaptation be reconciled with near-term development priorities? The paper offers three main propositions in this regard, and provides various supporting arguments and evidence to buttress them. First, it argues that for developing countries like Tajikistan, faster economic and social development is the best possible defense against climate change (i.e. rather than being a competing consideration). Second, it presents some key findings from a recent nationally representative household survey to illustrate the strong public support for more climate change related spending on agriculture, water management and infrastructure, disaster management, and public health—four key areas that the government’s latest poverty reduction strategy identifies as being especially important from a climate change perspective. Third, the paper argues that important as project-based adaptation measures may be, it is imperative that they be supported by an overall policy framework that provides a truly enabling environment to facilitate faster climate change adaptation.

5. This paper is organized as follows: Section 2 sets the stage for the rest of the paper by briefly reviewing the available evidence for Tajikistan on recent climate change trends and future projections. Section 3 then introduces the special climate change module added to a nationally representative household survey carried out in Tajikistan in February 2010, and presents the key findings related to public attitudes towards climate change gleaned from this survey. Wherever possible, the section contrasts these findings with observed patterns in Kazakhstan as well as EU27 countries where similar household surveys have also been recently carried out. Section 4 presents an overview of adaptation actions in priority areas identified by the survey respondents. Finally, Section 5 concludes by reviewing the main implications of these findings for Tajikistan, both for ongoing adaptation initiatives as well as the country’s future climate change adaptation strategy.

## 2. TAJIKISTAN: RECENT CLIMATE CHANGE TRENDS

6. Figure 1 provides a useful stylized illustration of the various channels through which CC affects the livelihoods of poor people, ranging from direct impacts on the environment to indirect impacts on households, communities, and the economy. For Tajikistan, virtually all are relevant.

**Figure 1: Various Transmission Channels through which CC Impacts the Poor**



**Source:** L. Cord, C. Hennet, and G. van der Vink, (2008): *Climate Change and Poverty: Towards an Integrated Policy Framework for Adaptation*. PREM Economics of Climate Change Discussion Papers, World Bank, Washington DC.

7. According to the 2nd National Communication of Tajikistan prepared under UNFCCC (2008), average temperatures rose by about 0.5-0.8C across most parts of the country during the 65 year period studied, with the biggest increases observed in Dushanbe (1.0C) and Dangara (1.2C) districts. Average temperatures in Tajikistan are projected to rise by 1.8-2.9C by 2050. If these forecasts are realized, the 2010-2012 Poverty Reduction Strategy identifies water resources, agriculture, transport infrastructure, and public health as the four main sectors in Tajikistan impacted by climate change. In addition, one of the priority objectives of the country's national development strategy is to tackle the problems of natural disasters both through prevention and effective natural resource management.<sup>2</sup>

### Water Scarcity

8. Since 1930, total area of glaciers declined by one-third, and is expected to fall a further 15-20 percent over the next 30-40 years, with many small glaciers disappearing altogether. Due to intensive melting of mountain glaciers, water inflow into major rivers will initially increase, but then will drastically decrease in the longer-term. Many local communities in Tajikistan will likely suffer critical water shortages, since total water stocks are expected to fall by 80-100 cubic km. over the next 30-40 years. Changes in average precipitation across the country have been quite uneven due to considerable topological diversity.<sup>3</sup>

### Natural Disasters and Impact on Infrastructure

9. In addition to rising temperatures and change in precipitation, Tajikistan is also vulnerable to frequent natural disasters and extreme weather events. According to the UN Office for Coordination

<sup>2</sup> *Poverty Reduction Strategy of the Republic of Tajikistan for 2010-2012* Government of Tajikistan, Dushanbe 2009.

<sup>3</sup> During the period reviewed, the amount of precipitation fell by 44 percent in Murgab, about 5-10 percent in the Eastern Pamir, but increased by 5-10 percent in Central Tajikistan, and 20 percent in the southern sub-mountain areas.

of Humanitarian Affairs, 85 percent of Tajikistan's area is threatened by mudflows; some 50,000 landslides have been reported by Tajik Glavgeology during the 1990s.<sup>4</sup> Furthermore, droughts have become increasingly common: in the past 60 years, the country has suffered eight major droughts, with the expected frequency of such disasters forecasted to increase. According to some estimates, the adverse impact of natural disasters per annum is equivalent to almost 5 percent of GDP.<sup>5</sup>

### **Impact on Agriculture**

10. With about three-fourths of Tajikistan's population living in the countryside and heavily dependent on farming, agriculture is one of the most important livelihood sectors for the poor. About 32 percent of the total land-area in the country is used for agriculture, and much of it is exposed to the impacts of CC particularly via land degradation and erosion of fertile topsoil.<sup>6</sup> While natural pastures and hayfields play an important role in protecting soil from erosion and increasing its fertility, their productivity is dependent in turn on CC and its spatial distribution during the vegetation period. For instance, rising temperatures of 2-4C in February and March can lead to 20 percent decrease in winter-spring pasture productivity, a decline that is greatly exacerbated during dry spells. By contrast, in high mountain pastures, rising temperatures of 1.5-3C can increase pasture productivity by 25-50 percent.<sup>7</sup>

### **Health Impacts**

11. The 2nd National Communication (2008) includes an assessment of the impact of CC factors on public health, noting that high temperatures and drought experienced in 2001-02 contributed to increased mortality rates, with hot and arid parts of the country disproportionately affected (e.g. Khatlon region). Second, rising temperatures have contributed to the resurgence of diseases like malaria (nearly eradicated from Tajikistan in the 1960s), the number of malaria cases observed peaking in 1997 at around 30,000 cases.<sup>8</sup> Third, CC increases the likelihood of natural disasters, which in turn impact public health, both via direct disaster fatalities and via increased risk of causative agents of infectious diseases like typhoid fever, salmonellae, dysentery, amoebiasis, lambiasis, etc. getting into the food and water supply. Finally, data from the 1999, 2003, and 2007 Tajikistan Living Standards Survey (TLSS) show that access to improved water source has decreased in all regions of Tajikistan, as well as across all income groups among rural households. The major health effects of poor water quality are diarrheal morbidity and mortality, and a host of other waterborne illnesses.<sup>9</sup>

12. A recent World Bank study has warned that, contrary to popular perception, countries in the Europe and Central Asia region (ECA) are significantly threatened by climate change, with serious risks – e.g. winter floods, summer droughts, melting of glaciers, etc. – already in evidence.<sup>10</sup> The study argues that over the next two decades vulnerability and adaptive capacity of ECA countries to climate change will be dominated by socio-economic factors and legacy issues. The report presents a

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<sup>4</sup> United Nations Office for the Coordination of Humanitarian Affairs (2006) UNDAC Mission Disaster Response Preparedness in Tajikistan, March 12-27, 2006 [http://www.unep.or.jp/ietc/DM/Final\\_Report\\_UNDAC\\_Tajikistan.pdf](http://www.unep.or.jp/ietc/DM/Final_Report_UNDAC_Tajikistan.pdf)

<sup>5</sup> As cited in *Poverty Reduction Strategy of the Republic of Tajikistan for 2010-2012*.

<sup>6</sup> Tajikistan, First National Communication to the UNFCCC (2003), page 65.

<sup>7</sup> Tajikistan, First National Communication to the UNFCCC (2003)

<sup>8</sup> However, according to data from the British NGO Merlin, the number of reported cases of malaria in Tajikistan has fallen considerably, to less than 3,000 reported cases per year over the period 2005-2007.

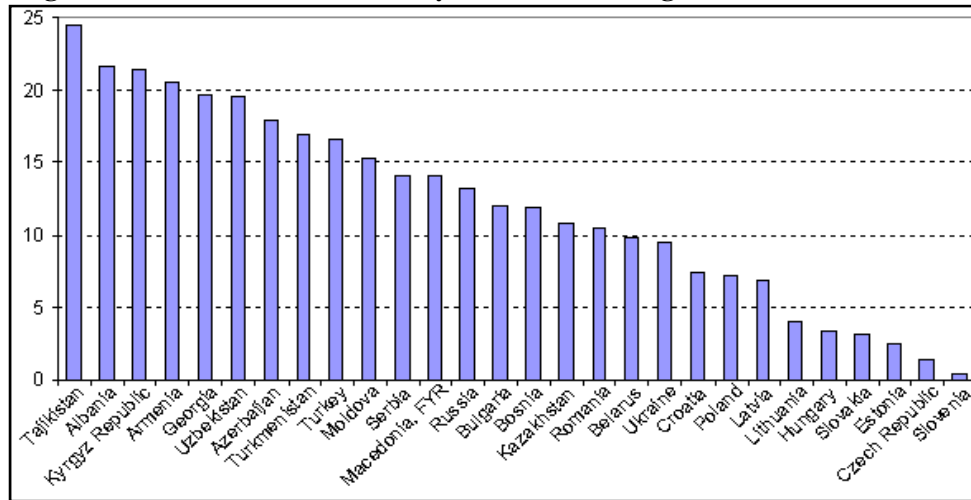
<sup>9</sup> World Bank Country Environmental Assessment, page 36.

<sup>10</sup> World Bank (2009) *Adapting to Climate Change in Europe and Central Asia* Office of the Chief Economist of the Europe and Central Asia region, World Bank Washington DC.



simple vulnerability index for ECA countries that combines three key indicators that capture each country's exposure, sensitivity, and adaptive capacity to climate change.<sup>11</sup> Based on the various criteria used to compute each index, Tajikistan emerges as the 6th most exposed ECA country to predicted climate changes, the most sensitive country (because of its reliance on hydropower and high share of agriculture in GDP, among other reasons); and together with Turkmenistan the country with the weakest adaptive capacity.

**Figure 2: An Index of Vulnerability to Climate Change across ECA Countries**



Source: World Bank (2009): *Adapting to Climate Change in Europe and Central Asia*

13. Combining the three indices into a single measure of vulnerability results in ranking Tajikistan as the most vulnerable country in the ECA region (Figure 2). In large part this is because the country has social and productive structures that make it very sensitive to the impact of a changing climate, as well as amongst the lowest adaptive capacity among countries in the region.

<sup>11</sup> For details, please see Fay and Patel (2008) "A simple index of vulnerability to climate change" Background paper prepared for the World Bank report *Adapting to Climate Change in Europe and Central Asia*

### 3. PUBLIC PERCEPTIONS OF CLIMATE CHANGE IN TAJIKISTAN

#### Survey Module on Attitudes toward Climate Change

14. The climate change questionnaire was one of the modules of a larger Pilot Life in Transition Survey (P-LITS 2), which was organized in Tajikistan and Kazakhstan in February 2010. LITS is a joint project of the World Bank and EBRD, which was first carried out between August and October 2006 to assess the impact of transition on people in 29 ECA countries<sup>12</sup> and understand how the attitudes towards market and political reforms are related to individual and households characteristics. The second LiTS round is planned in the fall of 2010, when the updated LiTS questionnaire will be administered in all ECA countries where the LiTS 1 was canvassed in 2006. In preparation for the launch of LiTS 2, a pilot test (P-LITS 2) was carried out in the two Central Asian countries, where the draft LiTS questionnaire was administered to nationally representative samples of 500 respondents per country (i.e. 1,000 respondents in total). Table 1 presents the distribution of the samples across different regions.

**Table 1: Distribution of the P-LITS 2 sample in Tajikistan and Kazakhstan**

TAJIKISTAN		KAZAKHSTAN	
Region	# households interviewed	Region	# households interviewed
		Almaty	
Dushanbe	50	South Kazakhstan	
GBAO	20	Central Kazakhstan	
Soghd	150	Western Kazakhstan	
Khatlon	170	Eastern Kazakhstan	
RSS	110	Northern Kazakhstan	
<b>Total</b>	<b>500</b>	<b>Total</b>	<b>500</b>

15. . The climate change module included many questions from a special Eurobarometer survey on attitudes towards climate change that was canvassed in all EU27 countries in 2008,<sup>13</sup> along with a few additional questions of special interest and relevance to Tajikistan. As a result, the data collected for Tajikistan can be compared not just with Kazakhstan, but also with EU27 countries in selected subject areas. The climate change module is presented in Appendix 1.

#### Climate Change: Awareness of the Main Causes and Consequences

16. Respondents in P-LITS 2 were asked if they thought they were well informed about the different consequences of climate change, with answers recorded on a 4-point scale: (i) very well-informed, (ii) fairly well-informed, (iii) not very well-informed, and (iv) not at all informed. Public awareness of the different consequences of climate change in Tajikistan is quite high, and in fact comparable to prevailing levels in Kazakhstan and EU27 countries (Figure 3a): a majority of respondents 57 percent) in Tajikistan (felt they were either very well-informed (9 percent), or fairly well-informed (48 percent) about the different consequences of climate change. Within the country, the level of public awareness varied considerably across different regions (Figure 3b): overall awareness levels were highest in Dushanbe (81 percent very/fairly well informed), followed by Soghd (60 percent) and

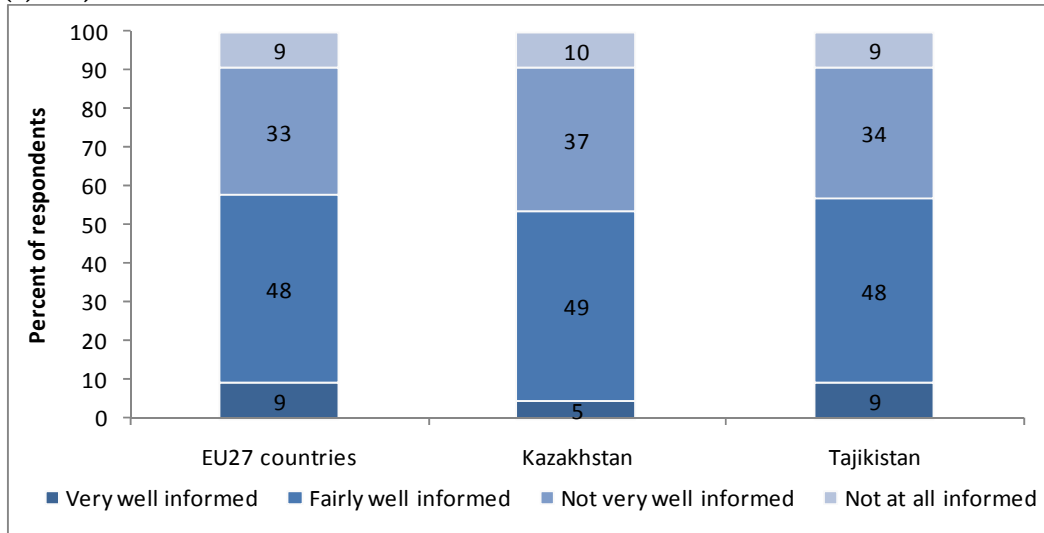
<sup>12</sup> Albania, Armenia, Azerbaijan, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Former Yugoslav Republic of Macedonia, Moldova, Mongolia, Montenegro, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Tajikistan, Turkey, Ukraine, and Uzbekistan.

<sup>13</sup> *Europeans' attitude towards climate change* Special Eurobarometer 300, Wave 69.2 September 2008. The survey was requested by the European Commission and the European Parliament, and coordinated by the Directorate General for Communication of the European Commission.

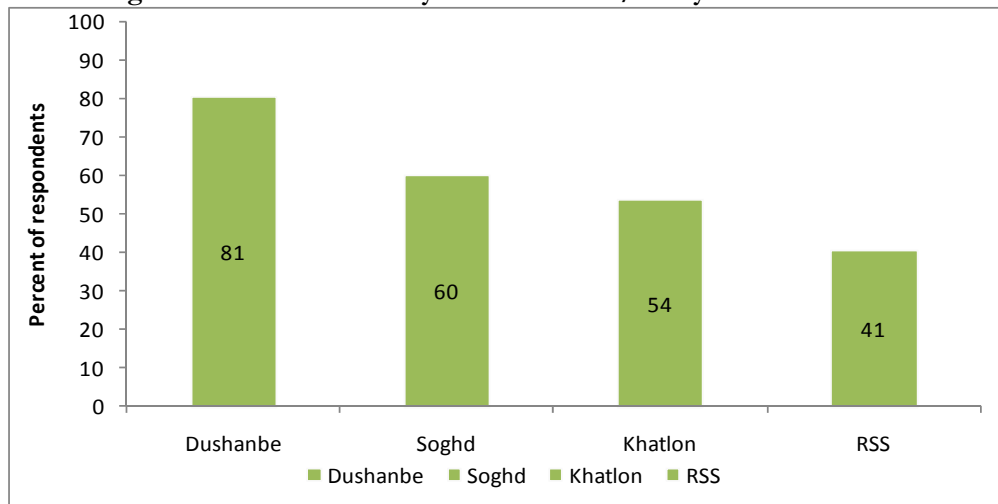
Khatlon (54 percent), and lowest (41 percent) in Regions of Republican Subordination (RSS). Awareness levels among women in Tajikistan also tended to be somewhat lower than among men.

**Figure 3: Awareness of the Different Consequences of Climate Change**

**(a) Tajikistan vs. other countries:**



**(b) Across Region: Those that are very well informed / fairly well informed**



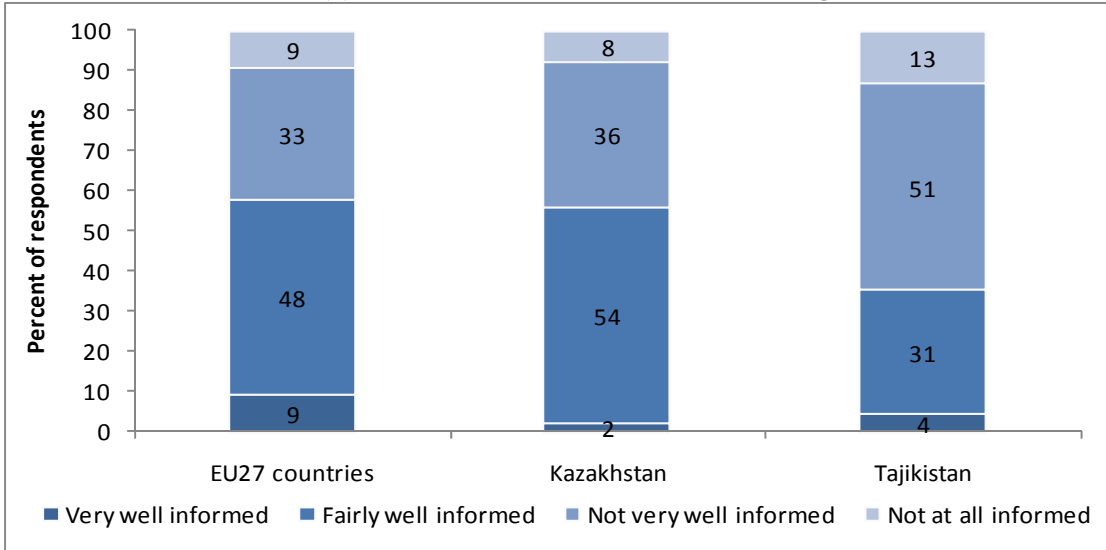
**Source:** Authors' calculations based on P-LITS 2 data. Only 2 sample points (20 interviews) were conducted in GBAO: these have been grouped together with Dushanbe because of the similarity in pattern of response.

17. Respondents in the survey were also asked if they felt they were well-informed about (a) the different causes of climate change, and (b) ways in which we can slow down climate change. Awareness of the different causes of climate change is somewhat lower in Tajikistan compared to Kazakhstan as well as EU27 countries: about 35 percent of respondents in Tajikistan felt they were very well-informed/fairly well-informed about the main causes of climate change, as compared to around 56-57 percent in Kazakhstan and EU27 countries (Figure 4). Similarly, public awareness of ways in which climate change could be slowed down was also considerably lower in both Tajikistan and Kazakhstan (24-27 percent of respondents very well/fairly well-informed about ways in which climate change can be slowed down) as compared to EU27 countries (53 percent).

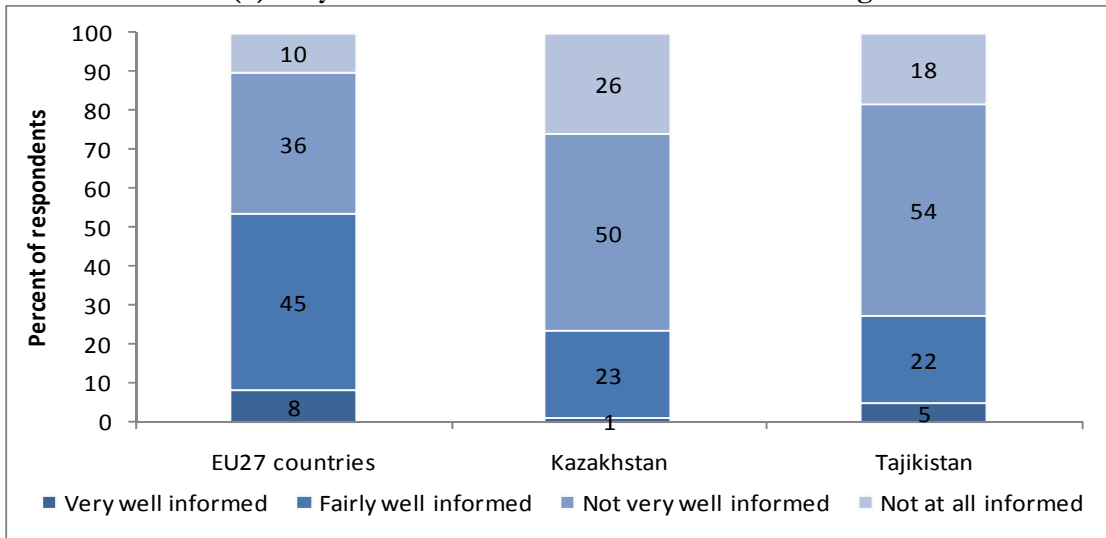
**Figure 4: Awareness of Climate Change Causes and Mitigation Measures**

Personally, do you think you are well informed or not about...

**(a) The different causes of climate change**



**(b) Ways in which we can slow down climate change**



Source: Authors calculations based on P-LITS 2 data. Special EU Barometer 300/wave 69.2

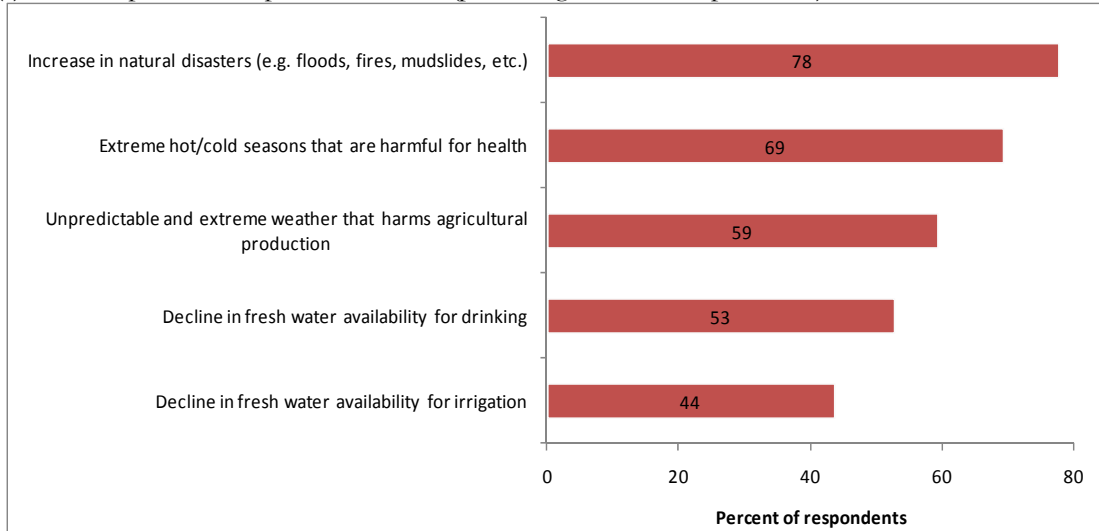
**Climate Change Impacts of Greatest Public Concern**

18. Respondents were presented several possible adverse impacts of climate change, and were asked to choose (a) which of these were of concern to them, as well as (b) which of these was of greatest concern. “Increase in natural disasters” was cited as a concern by the highest share of respondents (78 percent), and as the most important concern by the second-highest share of respondents (25 percent), while “dangers posed by extreme hot/cold seasons that are harmful for health” were cited as a concern by the second-highest share of respondents (69 percent), and as the single-most

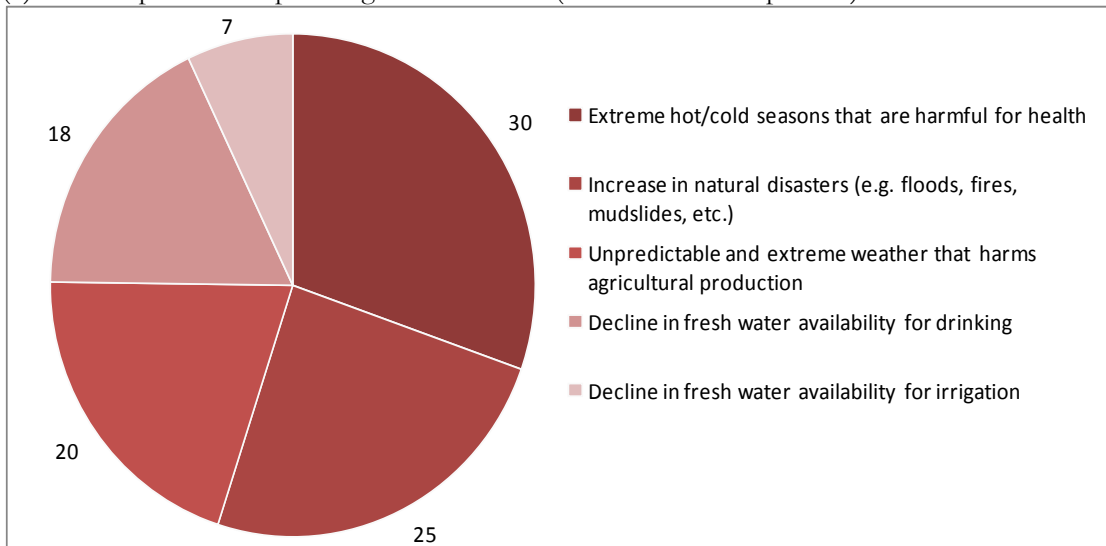
important concern by the highest share of the respondents (30 percent, Figure 5). “Unpredictable and extreme weather that harms agricultural production” was third on both lists.<sup>14</sup>

**Figure 5: Tajikistan: Potential climate change impacts of greatest concern (% respondents)**

(a) Cited as potential impact of concern (percentage of total respondents)



(b) Cited as potential impact of greatest concern (totals sum to 100 percent)



Source: Authors calculations based on P-LITS 2 data.

<sup>14</sup> Respondents reporting themselves as being fairly/very well informed about the main consequences of CC were more likely to select natural disasters and increased damage to agriculture (and less likely to select less water for drinking and irrigation) compared to those reporting themselves as not at all/not very well informed about the main consequences of CC

## Public Perceptions of the Seriousness of the Climate Change Problem

19. How serious a problem do citizens of Tajikistan perceive climate change to be? The answer to this question depends upon how the issue is posed to them. Respondents in the P-LITS 2 were asked a series of questions regarding the extent to which they think climate change is a very serious problem confronting the world. First, they were presented a list of various issues, and were asked which of these they considered to be “very serious problems” facing the world.

**Table 2: Respondent Opinions about Major Problems Currently Facing the World**

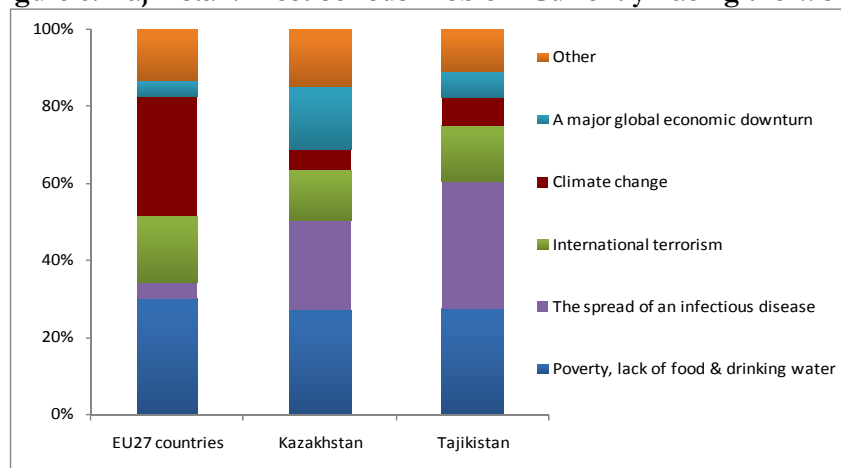
Issue:	Percentage of respondents in the country that consider the issue to be a very serious problem		
	EU27 countries	Kazakhstan	Tajikistan
Poverty, lack of food and drinking water	70	66	76
The spread of an infectious disease	24	70	84
International terrorism	55	50	47
<b>Climate change</b>	<b>64</b>	<b>36</b>	<b>41</b>
A major global economic downturn	25	47	38
Proliferation of nuclear weapons	24	33	29
Armed conflicts	39	53	28
The increasing world population	20	12	17

Source: Authors calculations based on P-LITS 2 data Special EU Barometer 300/wave 69.2

20. Three main findings are noteworthy (Table 2): (i) “poverty, lack of food and drinking water” and “international terrorism” emerged among the top 3 serious problems (ranked by votes received) in all three countries; (ii) however, a majority of respondents in Kazakhstan and Tajikistan noted “spread of infectious diseases” to be a serious problem (70 and 84 percent respectively); (iii) climate change was selected by a sizeable share of respondents in Kazakhstan (36 percent) and Tajikistan (41 percent), though not as high as in EU27 countries (64 percent).

21. However, when asked to select the single-most serious problem confronting the world, only 5-7 percent of respondents in Tajikistan and Kazakhstan chose climate change (ref. 31 percent in EU27 countries); instead, respondents in these two countries ranked “spread of infectious diseases” and “poverty, lack of food and drinking water” as the two most important problems (Figure 6).

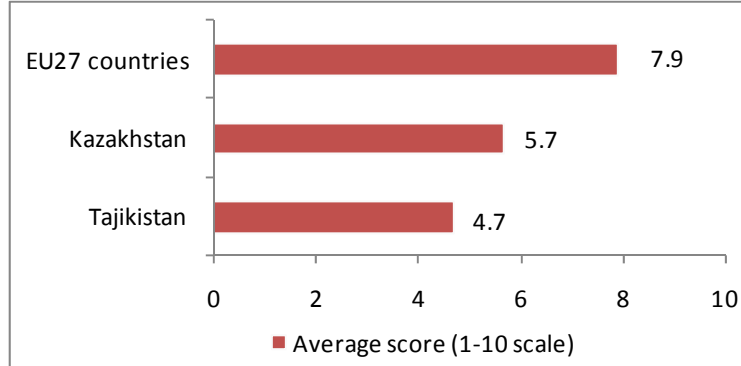
**Figure 6: Tajikistan: Most Serious Problem Currently Facing the World**



Source: Authors calculations based on P-LITS 2 data; Special EU Barometer 300/wave 69.2

22. Using a 10-point scale where 1 represents “not a serious problem at all” and 10 represents “an extremely serious problem”, respondents were asked how serious a problem they considered climate change to be: as Figure 7 shows, average scores by respondents in Kazakhstan (5.7) and Tajikistan (4.7) were considerably lower than in EU17 countries (7.9).<sup>15</sup>

**Figure 7: Seriousness of climate change problem (1-10 point scale)**



Source: Authors’ calculations based on P-LITS data; Special EU Barometer 300/wave 69.2

23. Within Tajikistan, average ratings of the seriousness of the climate change problem vary quite a bit across different groups. Amongst those reporting themselves as being “very well informed” about the consequences of climate change, average scores were considerably higher than amongst those that were “not at all informed” (5.7 vs. 3.3 respectively). Similarly, average scores among respondents in Dushanbe (6.0), those reporting sale/barter of farm products as their main source of income (5.3), and the poorest one-third (5.0) were also higher than the rest of the population.

**Table 3: Ordered Probit Results**

Respondent Characteristics	Coefficient	Std. Err.	z	P>z
<b>1. Income group:</b>				
Poorest one-third of population	0.3512	0.1299	2.70	0.01
Middle one-third of population	0.1175	0.1237	0.95	0.34
Richest one-third of population				<i>Reference Category</i>
<b>2. Region of Residence</b>				
Dushanbe	0.8281	0.1832	4.52	0.00
GBAO	-0.3183	0.2526	-1.26	0.21
Soghd	-0.2578	0.1262	-2.04	0.04
Khatlon				<i>Reference Category</i>
RSS	-0.3038	0.1337	-2.27	0.02
<b>3. Sale/barter of farm products is household’s main source of livelihood</b>				
	0.5226	0.1548	3.38	0.00
<b>4. Awareness of main consequences of CC</b>				
Not at all informed				<i>Reference Category</i>
Not very well informed	0.5018	0.1832	2.74	0.01
Fairly well informed	1.1215	0.1829	6.13	0.00
Very well informed	1.5978	0.2341	6.83	0.00

Source: Authors’ estimates based on P-LITS data. n=465, Log likelihood = -846.52, Pseudo R2 = 0.0747

<sup>15</sup> Among EU27 countries, the lowest reported scores were in the Netherlands (6.8) and the highest in Cyprus (9.4).

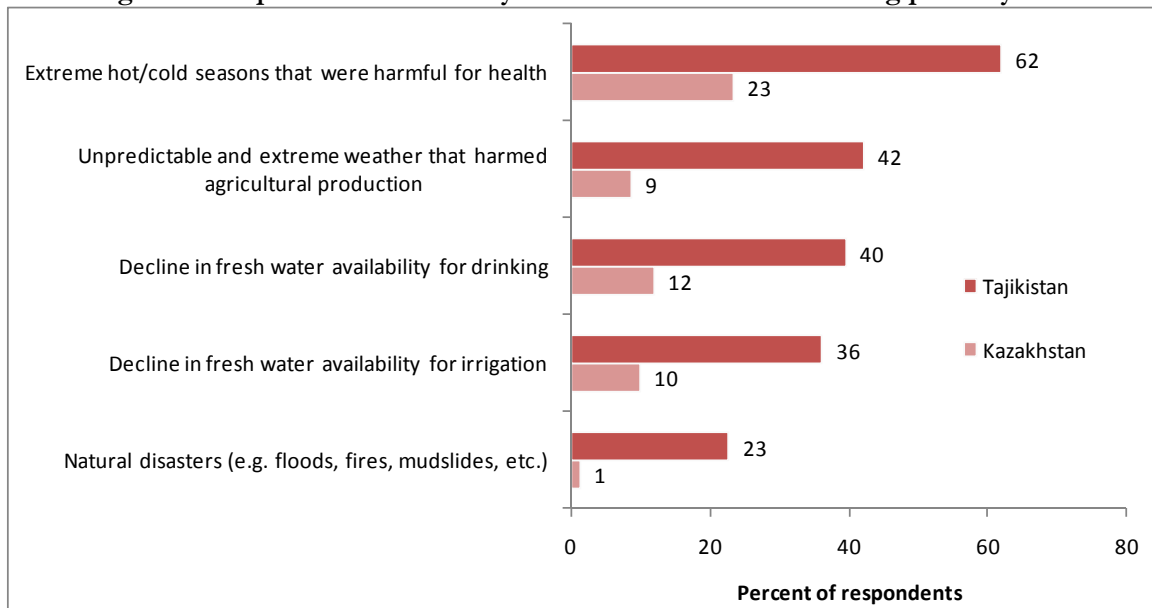
24. An ordered probit model was used to analyze respondents' rating of how serious they consider the issue of climate change to be. The results of the order probit regressions confirm differences across various population sub-groups discussed above are indeed statistically significant.

	Frequency	Percent
<b>Income level</b>		
Poorest one-third	167	33.40
Middle	167	33.40
Richest one-third	166	33.20
<b>Region:</b>		
Dushanbe	50	10.00
GBAO	20	4.00
Soghd	150	30.00
Khatlon	170	34.00
RSS	110	22.00
<b>Sale/barter of farm products is the main source of livelihood of the household</b>		
No	436	87.20
Yes	64	12.80
<b>Awareness of main consequences of climate change</b>		
Not at all informed	44	9.22
Not very well informed	162	33.96
Fairly well informed	227	47.59
Very well informed	44	9.22

#### Climate-related Hazards during the Past 10 Years

25. Sixty-two percent of respondents in Tajikistan reported having encountered extreme hot/cold seasons that were harmful for health during the past 10 years; 42 percent experienced unpredictable and extreme weather that harmed agricultural production, while 40 percent reported having suffered a decline in fresh water availability for drinking (Figure 8).

**Figure 8: Respondents affected by climate-related hazards during past 10 years**



Source: Authors calculations based on P-LITS 2 data.



26. As Figure 8 shows, the reported incidence of floods, mudslides, fires, and other such natural disasters is much higher in Tajikistan than Kazakhstan (22.8 vs. 1.4 percent). However, recent meteorological records indicate that changes in average temperatures have been of fairly similar magnitude in the two countries.<sup>16</sup> Furthermore, a much larger share of the population of Kazakhstan lives in areas with harsh winters, so the pattern of reported incidence of adverse impacts of climate related hazards across the two countries is in fact the opposite to what one has expected *a priori*. A much higher share of respondents in Tajikistan report having suffered extreme hot/cold seasons that were harmful for health than in Kazakhstan (62 vs. 23 percent) or unpredictable and extreme weather that harmed agricultural production (42 vs. 9 percent). The differences in exposure to adverse climate effects alone cannot explain large disparities in respondents' answers suggesting that there are pronounced differences in sensitivity and adaptive capacity of the two countries. As is widely highlighted in the literature on likely climate-change impacts, countries with higher incomes, stronger institutions, developed infrastructure and public services are more resilient to the negative physical impacts of climate. In 2007, the per capita gross national income (GNI) of Tajikistan (\$460) was less than one-tenth the GNI of Kazakhstan (\$5,060).

### **Priorities for Additional Spending for Climate-Change Adaptation**

27. Respondents were asked the question: Suppose the government had a sizeable sum of money to soften climate change impact on people in your community, or communities like yours: on which of the following do you think the government should spend more money? More than half the P-LITS 2 sample in Tajikistan identified "improving extension services and providing seeds more resilient to climate extremes" (64 percent of respondents), "providing clean drinking water" (63 percent of respondents), and "investing in increasing availability of electricity" (57 percent) as important priorities for government spending (Figure 9a).

28. As one would expect, peoples' past experiences with adverse climate change-related impacts play an important role in influencing their views regarding what future course of action should be taken to combat climate change: the P-LITS data clearly show that respondents that reported having experienced unpredictable and extreme weather that harmed agricultural production, or a decline in fresh water available for drinking or irrigation are much more likely to favor increased government spending on improving extension services and providing seeds more resilient to climate change, as well as investing in clean drinking water and irrigation infrastructure respectively, compared to respondents that did not experience such climate change-related hazards.

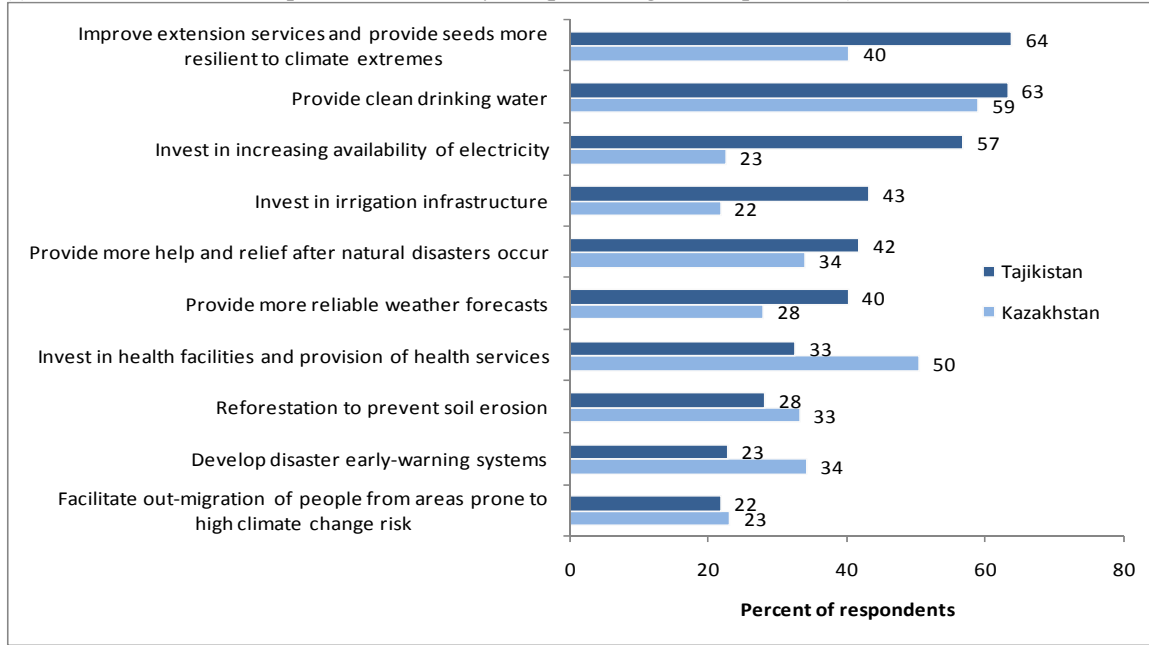
29. When asked to choose the single-most important priority for additional government spending related to climate change, (i) investing in increasing availability of electricity (22 percent), (ii) improving extension services and providing seeds more resilient to climate extremes (18 percent), and (iii) providing clean drinking water (14 percent) received the highest share of votes from respondents (Figure 9b); (iv) providing more help and relief after natural disasters occur (10 percent), (v) reforestation to prevent soil erosion (8 percent), (vi) providing more reliable weather forecasts (7 percent), and (vii) investing in health facilities and provision of health services (7 percent) received the next highest share of votes.

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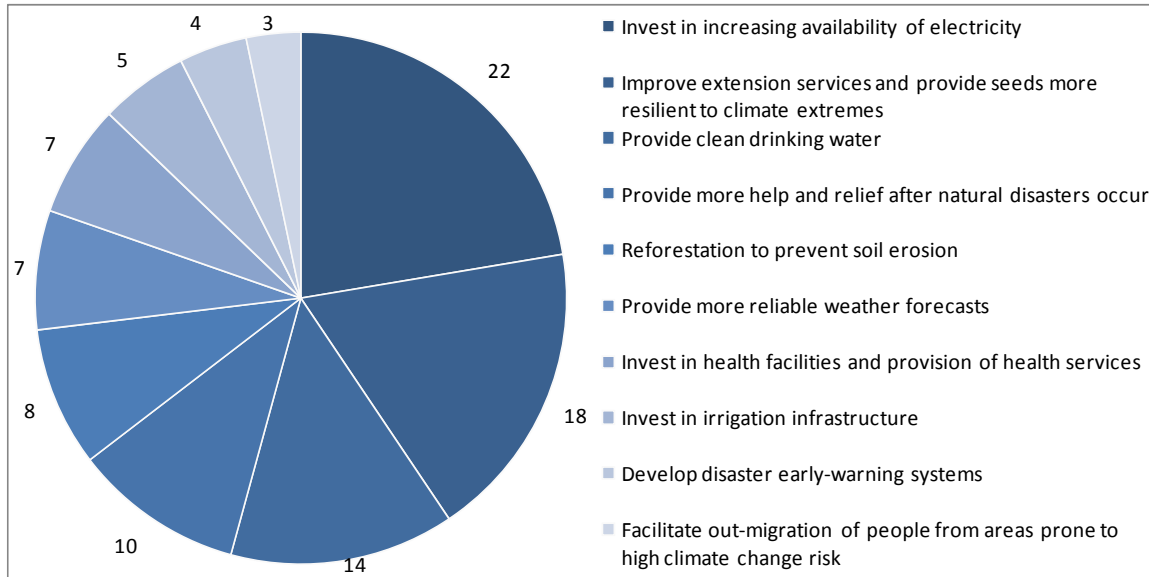
<sup>16</sup> For instance, as documented in the two countries' respective National Communications prepared recently under the United Nation's Framework Convention for Climate Change (UNFCCC).

**Figure 9: Priorities for Government Spending on Climate Change Adaptation**

(a) Government should spend more money to: (percentage of respondents)



(b) Tajikistan: Most important priority for additional spending (totals sum to 100 percent)



Source: Authors calculations based on P-LITS 2 data.

#### 4. ADAPTATION PRIORITIES

30. The impacts of climate change are already being felt in Tajikistan and will likely intensify in the future. This necessitates adaptation efforts, i.e. responses to reduce vulnerability to current climate conditions and adjust to potential climate changes. The purpose of this section is to identify priority areas and actions for adaptation. Based on the larger review of current policies and projects as well as the analysis of the survey results presented in the previous chapter, agriculture, improvement of water management and infrastructure, disaster management and public health emerge as key adaptation priorities. These priorities are also in conformance with the policy directions outlined in the latest Poverty Reduction Strategy of Tajikistan 2010-2012.

31. Effective adaptation will require review and reform of the current policies and regulations to create incentives for sustainable resource use and to improve the quality of public services. It will also be important to create conditions for development of non-farm employment opportunities to reduce Tajikistan's dependence on climate sensitive sectors. The narrative below will provide a brief overview of the major directions of adaptation actions.

##### **Agriculture**

32. A vast majority of the population in Tajikistan lives in rural areas and depends on the natural environment for their livelihoods. The decades of soviet rule left a legacy of overspecialization in cotton production and exploitation of water for irrigation without consideration of costs and environmental impacts of such policies. Following independence, the needs of the rural economy were largely neglected with little or no investment in equipment, new seed varieties, extension services and maintenance of irrigation and drainage systems. As a result, land degradation has emerged as a major environmental challenge.

33. Lack of incentives and resources available to farmers are among key constraints to adoption of sustainable agricultural practices. For instance, the inducement by local governments to plant cotton on up to 70% of cropped area reduces the ability of farmers to practice restorative crop rotations and diversify their incomes, while lack of access to credit prevents them from purchase of fertilizer and other essential agro inputs<sup>17</sup>. Current cotton policies distort the efficient allocation of land, labor and farm inputs and have a negative impact not only on the cotton subsector but also on total agricultural output. Reform of cotton policies and diversification towards crops that use less water should be among top priorities for agricultural sector development. It is also important to ensure secure land ownership to provide incentives to farmers to make investments in soil conservation, efficient water management and other sustainable practices.

34. The survey respondents have identified improvement of extension services and provision of seeds resilient to climate extremes as a major priority area for government spending on climate change adaptation. This is a field where the donor community can play a significant role by transferring knowledge and technologies. In fact, a number of donor-funded projects have already established Farmer Field Schools or other consultative services to improve farmers' knowledge on modern agricultural practices. These initiatives have generally been very successful in promoting sustainable land management and helping improve yields. For instance, farmers that attended *Farmer Field Schools* supported by UNDP Communities Program have managed to collect two-three crops per season. It is important to provide support for scaling up such initiatives as well as to develop mechanisms for their sustainability.

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<sup>17</sup> World Bank. 2006. *Priorities for Sustainable Growth: A Strategy for Agriculture Sector Development in Tajikistan*

## **Improvement of Water Management and Infrastructure**

35. Adaptation to climate change will inevitably involve using water more efficiently. Current water tariffs for drinking and irrigation purposes are set at a very low level and do not cover the costs of water provision and system rehabilitation. Furthermore, collection rates are also very low: 25% of people connected to plumbing in rural areas do not pay for water (most claim the service is free); of those who pay, only 10% have a water meter (both in urban and rural areas).<sup>18</sup> Lack of funding has resulted in deterioration of drinking water supply system and inability of the government to provide access to safe drinking water to half of the country's rural population. Similarly, low tariffs, lack of individual meters and inadequate knowledge of farmers of the water requirements of different crops result in overconsumption of water for irrigation; dilapidation of the irrigation infrastructure (current efficiency is estimated at 55%) as well as in planting of crops that will be economically unviable under realistic water prices. Such policies increase Tajikistan's vulnerability to climate change as they leave the country unprepared for the increased scarcity of water.

36. The government should support diversification of crops towards the ones that use less water, promote water saving irrigation technologies and create incentives for efficient water use (e.g. through introduction of individual meters and improving collection rates for water provision). It will also be important to implement institutional reforms to ensure that the irrigation system, built to serve large, state-owned collective farms, is capable of meeting the needs of small-holders. Decentralized water management arrangements have been promoted by several donors through support to establishment and development of water user associations (WUAs). To date, these institutions have been quite effective at improving access to water and strengthening community-level governance. Supportive national regulatory environment will be instrumental to allow for further development of these organizations.

37. The majority of survey respondents have identified electricity as the single most important priority for government spending on climate change adaptation. Indeed, stable power supply prevents deforestation and is essential for development of non-farm economic activities. Similarly, investments in roads and bridges will be necessary to connect remote rural communities to local and regional markets, facilitate trade and enable farmers to access distant pastures thus preventing overgrazing.

## **Disaster Management**

38. Climate change is expected to increase the frequency and severity of natural disasters, particularly mudflows, floods and droughts, posing additional risks to livelihoods, and infrastructure. However, vulnerability to natural hazards depends not only on the severity of weather events but also on availability of protective infrastructure and institutional capacity to prevent and respond to disasters. Disaster prevention rather than a mere response to their occurrence should become a priority for government and donor support and funding. A number of donor-supported projects have been very successful in preventing disasters and minimizing the impact of their occurrence by working with communities to identify local disaster risks, supporting small scale infrastructure improvements (e.g. construction of flood protection walls), developing evacuation maps, constructing shelters, and training of volunteers for the search and rescue brigades. While significant investments are necessary to scale these initiatives to all vulnerable areas, the international experience shows that disaster risk

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<sup>18</sup> TLSS (Tajikistan Living Standards Survey). 2007. The World Bank, UNICEF and Tajikistan State Statistics Committee. Dushanbe

reduction measures are cost-effective in mitigating the negative impacts of weather extremes. For instance, China's investment of US \$3.15 billion on flood control between 1960 and 2000 is estimated to have averted losses of about US\$ 12 billion while the Rio de Janeiro flood reconstruction and prevention project in Brazil yielded an internal rate of return exceeding 50%<sup>19</sup>.

## **Public Health**

39. Climate change has a potential to exacerbate the challenges faced by the health sector today, namely control over water-borne diseases and malaria as well as coping with disaster-related pressures. Water-borne diseases are already a major cause of children's morbidity and account for 27% of all post-neonatal deaths<sup>20</sup>. While warming climate increases vulnerability to different infections, the primary cause of disease in Tajikistan is inadequate access to clean water as well as poor sanitation and hygiene. Deteriorating health infrastructure, particularly in rural areas further compounds these problems.

40. Current government health reforms aimed at development of family medicine should be continued with a particular attention to the needs of rural areas. Apart from raising qualifications of medical professionals working in rural areas, rehabilitating the facilities and providing medical equipment, it is also important to integrate community outreach and education activities (particularly on hygiene issues) into primary health care. According to WHO estimates, hygiene education and promotion of hand washing can lead to a reduction of diarrheal cases by up to 45% as well as reduce the spread of many other infectious diseases<sup>21</sup>. Similarly, improvement of access to safe drinking water has a strong influence on health outcomes. For instance, the incidence of dysentery, diarrhea and viral hepatitis in five villages of the Soghd region, where the Red Crescent Society helped construct spring water supply systems, has declined by 41% on average over 2007-2008<sup>22</sup>. Some immediate results could also be achieved by educating the communities about different ways to treat water, like chlorination at the point of use, boiling, or use of filters.

41. The health sector should be prepared to respond to a potential increase in climate shocks. This will involve prevention of heat-related illnesses (e.g. heat strokes), ensuring that primary health care facilities particularly in remote rural areas have stockpiles of essential medicines as well as access to transportation to take patients to urban centers in case of emergencies, and increasing vaccination against major infectious diseases. It is also important to sustain the success of malaria control measures, which have resulted in reduction of malaria cases from almost 30,000 in 1997 to 635 in 2007<sup>23</sup>. Vector control programs, training of medical staff in malaria prevention and treatment as well as community education campaigns should continue to prevent any future outbreaks.

42. The above mentioned adaptation priorities are in conformance with the directions of reforms outlined in the latest Poverty Reduction Strategy of Tajikistan 2010-2012. In fact, poverty reduction is an integral part of climate change adaptation. Higher income levels, improved health and education as well as better access to quality public services and infrastructure enhances the capacity of households, particularly the poor, for autonomous adaptation.

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<sup>19</sup> UNISDR. 2008. *Climate Change and Disaster Risk Reduction*. Briefing Note 01. Geneva

<sup>20</sup> UNDP. 2005. *Investing in Sustainable Development: Millennium Development Goals Needs Assessment*, Dushanbe

<sup>21</sup> WHO. 2004. *Water, Sanitation and Hygiene Links to Health*. Facts and Figures

<sup>22</sup> International Federation of Red Cross and Red Crescent Societies. 2009. *Annual Report*. Central Asia (Focus on Tajikistan)

<sup>23</sup> WHO. 2008. *World Malaria Report 2008*.

## 5. CONCLUDING OBSERVATIONS

43. The survey findings show that public awareness of the different consequences of climate change is quite high in Tajikistan (similar to prevailing levels in EU27 countries and Kazakhstan) and that a large majority of respondents are already affected by climate-related hazards. The key priorities for adaptation that emerged from the survey, i.e. investments in agriculture, improvement of water management and infrastructure (mainly electricity supply and irrigation), disaster management and improvement of public health system are in close conformance with Tajikistan's development objectives and the latest PRSP 2010-2012.

44. Indeed, faster poverty reduction and economic development represent the best strategy for climate change adaptation as higher and diversified incomes and better access to quality public services and infrastructure increase the capacity of households and the economy as a whole for adaptation. It is important however to consider environmental sustainability and climate change implications in national and local development plans to ensure that achievement of short-term goals (in particular in areas like infrastructure investments, territorial development and the use of natural resources) does not increase the country's vulnerability in the long run.

45. There are a lot of useful adaptation initiatives in Tajikistan. Many donors have funded projects that while designed to improve environmental management, raise agricultural productivity, improve community-level governance, strengthen local infrastructure, prevent disasters or improve health care have directly contributed to enhancing capacities for adaptation, primarily at the local level.

46. A supportive national regulatory framework will be important to allow for further development of these and many other relevant initiatives and to enable faster climate change adaptation. This will include reducing dependence on water-intensive crops and removing constraints that tie farmers to cotton cultivation, ensuring secure land ownership to provide incentives for sustainable natural resource management and improving water governance. It will also be important to develop more off-farm livelihood opportunities (through better infrastructure, business-friendly investment climate, improvement of education and skills in the rural areas) to reduce dependence on climate-sensitive activities, like agriculture.

## APPENDIX 1: P-LITS 2 CLIMATE CHANGE MODULE

<b>Section</b>	<b>5 Climate Change</b>	RESPONDENT: THE PERSON SELECTED AT THE BOTTOM OF SECTION 1. NO SUBSTITUTIONS ARE POSSIBLE	RESPONDENT'S ID CODE:
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(5.01) In your opinion, which of the following do you consider to be a very serious problem currently facing the world as a whole?

READ OUT CROSS ALL THAT APPLIES ▼

a	Poverty, lack of food and drinking water			
b	The spread of an infectious disease			
c	International terrorism			
d	Climate change			
e	A major global economic downturn			
f	The proliferation of nuclear weapons			
g	Armed conflicts			
h	The increasing world population			

MARK WITH A CROSS THE MOST IMPORTANT ▲

(5.02) And how serious a problem do you think climate change is at the moment?

Please use a scale from 1 to 10  
"1" would mean that it is not a serious problem at all; and "10" would mean that it is extremely serious.

Not a serious problem at all SHOW CARD WITH SCALE - CIRCLE ONLY ONE NUMBER An extremely serious problem

1	2	3	4	5	6	7	8	9	10	DK
										11

(5.03) Personally, do you think that you are well informed or not about ...?

SHOW CARD WITH SCALE - CIRCLE ONE ANSWER PER LINE  
READ OUT - ROTATE

		Not at all informed	Not very well informed	Fairly well informed	Very well informed	DK
a	The different causes of climate change	1	2	3	4	5
b	The different consequences of climate change	1	2	3	4	5
c	Ways in which we can slow down climate change	1	2	3	4	5

(5.04) As a result of climate change, do you think people in your country will be ....

READ OUT - ONE ANSWER POSSIBLE

On balance, better-off	1
Not affected much	2
On balance, worse-off	3

(5.05) Have you perceived any noticeable changes in the climate during the past ten years?

YES	1	
NO	2	>> (5.08)

(5.06) Have you or other household members taken any steps to adapt to these changes?

YES	1	
NO	2	>> (5.08)

(5.07) What steps have you taken to adapt to these changes in the climate?

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

(5.08) There is consensus among the scientific community that climate change can have serious potentially negative impacts on the lives of people. Which of the following potential impacts of climate change would be of most concern to you?

READ OUT CROSS ALL THAT APPLIES ▼

a	Increase in natural disasters (e.g. floods, fires, mudslides, etc)			
b	Unpredictable and extreme weather that can harm agricultural production			
c	Decline in fresh water availability for drinking			
d	Decline in fresh water availability for irrigation			
e	Extreme cold and hot seasons that can be harmful for health			
f	Other (specify) _____			
g	No potential impacts are of any concern			
h	DK			

MARK WITH A CROSS THE MOST IMPORTANT ▲

(5.09) Has your household been personally affected by climate-related hazards in the last 10 years?

READ OUT		CROSS ALL THAT APPLIES ▼	
a	Natural disasters (e.g. floods, fires, mudslides, etc)		
b	Unpredictable and extreme weather that harmed agricultural production		
c	Decline in fresh water availability for drinking		
d	Decline in fresh water availability for irrigation		
e	Extreme cold and hot seasons that were harmful for health		
f	Other (specify) _____		
g	No climate-related hazards were of any concern		
h	DK		

MARK WITH A CROSS THE MOST IMPORTANT ▲

ASK (5.10) ONLY IF ANSWER TO (a) OR (b) ABOVE IS MARKED WITH A CROSS

(5.10) Did you have any prior warning of these natural disasters / unpredictable or extreme weather events?

YES	1
NO	2

(5.11) Suppose the government had a sizeable sum of money to soften climate change impact on people in your community or in communities like yours. On which of the following do you think the government should spend more money?

READ OUT		CROSS ALL THAT APPLIES ▼	
a	No climate change related spending necessary		
b	Providing clean drinking water		
c	Investing in irrigation infrastructure		
d	Improving extension services and providing seeds more resilient to climate extremes		
e	Providing more reliable weather forecasts		
f	Reforestation to prevent soil erosion		
g	Investing in increasing availability of electricity		
h	Providing more help and relief after natural disasters occur		
i	Developing disaster early-warning systems		
j	Invest in health facilities and provision of health services		
k	Facilitating out-migration of people from areas prone to high climate change risk		
l	Other (specify) _____		
m	DK		

MARK WITH A CROSS THE MOST IMPORTANT ▲

(5.12) For each of the following statements please tell me whether you totally agree, tend to agree, tend to disagree or totally disagree?

Interviewer: if necessary explain that CO<sub>2</sub> (carbon dioxide) is a gas generated notably in the combustion of fossil fuels for example by all types of transport that use hydrocarbons and by industrial plants and power generators using fossil fuels.

READ OUT - ROTATE ITEMS 1 TO 3

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree	DK
a	1	2	3	4	5
b	1	2	3	4	5
c	1	2	3	4	5

SOME PEOPLE FEEL THAT CLIMATE CHANGE IS A GLOBAL PROBLEM REQUIRING ACTION ON ALL OUR PARTS; WHILE OTHERS FEEL THIS IS A PROBLEM CAUSED MAINLY BY RICHER COUNTRIES, HENCE THEY SHOULD BE THE ONES TO TAKE STEPS TO COMBAT IT

(5.13) Do you believe the Government of [COUNTRY] should take measures to fight climate change?

SHOW CARD - ONE ANSWER

No, climate change is not an important problem in our country	1
No, fighting climate change will divert the resources from other/more important sectors	2
No, governments of rich countries should take measures to fight climate change	3
No, not unless other countries also take such measures	4
Yes, the government should take actions to fight climate change	5

(5.14) Do you get weather forecasts about upcoming extreme weather events?

YES	1
NO	2

(5.15) Did you take any action after hearing the last such forecast?

IF YES, SPECIFY WHAT ACTION(S) WAS / WERE TAKEN

IF NOT, SPECIFY WHY NO ACTION WAS TAKEN

\_\_\_\_\_

\_\_\_\_\_