



POLICY BRIEF

**Climate change impacts
on local land users
in the Zarafshan Valley**

R. Braitsch, D. Bakhriev, D. Tuvalov

EXECUTIVE SUMMARY

Changing climatic conditions are already having direct and measurable effects on livelihoods and biodiversity in the Zarafshan Valley. Based on empirical evidence, farmers in both Uzbekistan and Tajikistan report rising temperatures, more frequent droughts, declining water availability, and a visible degradation of the landscape compared to previous decades. These changes are associated by farmers with declining productivity and increasing uncertainty. Current farmers' responses are largely insufficient to address these challenges in the long term. Adaptation is largely reactive and dominated by short-term coping strategies, constrained by limited financial resources and knowledge, scarce institutional support, and low trust in institutional assistance. Informal farmer-to-farmer cooperation plays a crucial role in dealing with climatic challenges but cannot substitute for coordinated and supportive policy frameworks. Policymakers must enable climate-resilient agriculture through improved water-saving technologies, accessible financial support, and farmer-centered knowledge exchange, while strengthening formal transboundary cooperation. Without targeted policy action climate impacts will further erode livelihoods and intensify pressure on already fragile but biodiversity-rich ecosystems in this transboundary valley.





↑ Middle stream of Zarafshan river.

WHAT'S AT STAKE?

Global climate change is threatening local livelihoods worldwide. In the trans-boundary region of the Zarafshan Valley, where the majority of local livelihoods depends on water intensive agricultural production, changing climatic conditions have severe consequences for the well-being of human and nature. This policy brief draws on the findings of an empirical study based on perception interviews with local land users where it has been assessed how climate change is currently experienced at the local level, how farmers response to these challenges and which adaptation strategies exist. This policy brief aims to translate the research findings into policy-relevant insights. The findings show that while the impact of changing climatic conditions is already clearly felt, current coping and adaptation capacities remain limited and uneven, pointing to an urgent need to strengthen policy frameworks that support locally feasible climate change adaptation measures and coordinated action in this shared socio-ecological system. This constitutes an urgent policy issue. If current trends continue without effective intervention, climate change risks to deepen socio-economic vulnerability, increasing dependence on migration and external income sources, and further degrading land and water resources.



CONTEXT & IMPORTANCE OF THE PROBLEM

Agricultural production in middle of the Zarafshan Valley has historically been highly dependent on irrigation water from the Zarafshan River. However, its water availability has been shaped by extensive human interventions along the river system. Decades of river regulation, expansion of irrigation infrastructure, and steadily increasing water abstraction for agriculture have created a structural imbalance between water consumption and natural water availability. This imbalance has weakened the resilience of both agricultural production systems and river-dependent ecosystems. Large parts of the former floodplain have been converted into agricultural land, while embankments and river regulation have disrupted natural inundation dynamics. As a result, key ecosystem services have been progressively lost. The degradation of riparian ecosystems has reduced water retention capacity, groundwater recharge, natural water purification, microclimate regulation, and natural buffering against floods and droughts. Wildlife habitat has been drastically reduced and fragmented, with functional habitats largely confined to the transboundary protected zone. This erosion of ecological functions is making both agriculture and ecosystems increasingly sensitive to external pressures. These long-standing structural pressures are

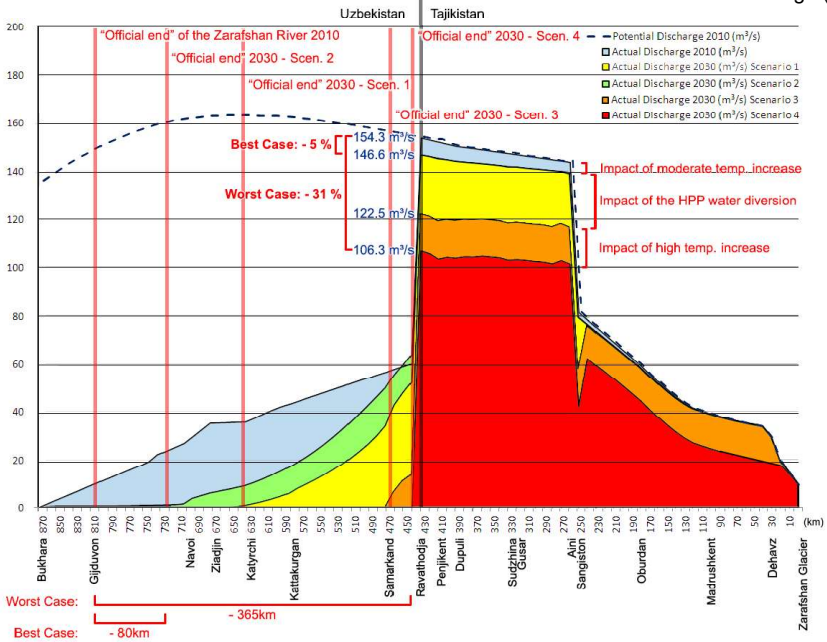
↓ *Large share of the land along the river converted to the arable land. Photo: R. Braitsch*



now being amplified by climate change. Rising temperatures, declining snow cover, accelerated glacier retreat, and higher evapotranspiration rates increase water demand while reducing long-term water supply. Because the Zarafshan River is largely fed by meltwater from the mountains of Tajikistan, climate-induced changes in upstream areas have direct and far-reaching consequences for water availability throughout the entire valley, including downstream regions in Uzbekistan. Projected long-term declines in runoff further intensify the growing discrepancy between water supply and demand, increasing competition over water across sectors and regions.

Agriculture remains the primary source of income for the majority of the population in the Zarafshan Valley, making rural livelihoods highly dependent on the continued functioning of land and water systems. If farmers are unable to adapt their cultivation practices to changing climatic conditions, they will increasingly rely on an already degraded and overstressed system to sustain their production. This dynamic creates a self-reinforcing cycle. Declining water availability and rising climatic stress reduce agricultural productivity, prompting farmers to intensify water use, expand cultivation into marginal lands, or maintain practices that were developed under more stable climatic conditions. These responses further increase pressure on land, water, and the remaining riparian ecosystem. As ecological functions deteriorate, the system's capacity to support agriculture declines even further, increasing farmers' vulnerability and reinforcing socio-economic insecurity. However, climate change adaptation by farmers is by far not only a socio-economic necessity but a critical environmental concern. Without effective adaptation pathways, farmers externalize climate impacts onto the riparian ecosystem which serves as important habitat for endangered wildlife species such as the Bukhara deer.

For environmental governance, this interdependence is decisive. Supporting climate-resilient agricultural practices is essential to prevent further overexploitation of land and water resources and to stabilize the ecological foundations on which rural livelihoods and biodiversity depend. Failure to act will deepen socio-economic vulnerability, increase pressure on already degraded ecosystems, and raise the risk that environmental degradation becomes irreversible,



↑ Climate change scenarios. Groll, M., Opp, R., Kulmatov, R., Normatov, I., Stulina, G. & Shermatov, N. (2014) in *Central Asia – status quo and future conflicts in transboundary river catchments – the example of the Zarafshan River (Tajikistan–Uzbekistan)*. Conference paper.

making future conservation and restoration efforts significantly more difficult and costly. Addressing farmers’ climate adaptation needs is therefore a prerequisite for safeguarding ecosystem integrity and ensuring the long-term sustainability of the Zarafshan Valley as a wildlife habitat between Uzbekistan and Tajikistan.

FINDINGS

Across both countries, farmers perceive clear climatic changes. They report higher summer temperatures, declining precipitation and snowfall, and more frequent drought periods. These changes directly affect agricultural production, resulting in declining crop yields, deteriorating soil conditions, and increasing pest pressure. Livestock keepers additionally face feed shortages and more frequent animal diseases, leading some households to reduce herd sizes. As agricultural income becomes less reliable, many households increasingly rely on migration or non-farm income as a coping strategy.

While climate-related changes are clearly visible, adaptation measures remain limited. Most responses are short-term and reactive, such as increasing irrigation where possible, applying more fertilizer or pesticides, or leaving parts of fields uncultivated. The use of drought- and wind-resistant crop varieties is more widespread. However, the access to improved seeds remains strongly constrained by accessibility and financial resources. As all of these varieties originate from Uzbekistan, Tajik farmers explicitly call for closer cross-border cooperation to reduce barriers to seed exchange. Structural adaptation measures such as crop diversification or technological upgrading, including drip irrigation, remain rare and unevenly distributed. These inventions are predominantly found in Uzbekistan, mainly among farmers with larger landholdings, higher education levels, and greater financial capacity but even here, adoption remains limited due to high investment costs. In contrast, the majority of farmers emphasize the need to maintain or expand existing irrigation systems as their primary response to increasing water scarcity. This suggests that longer-term consequences of remaining in current practices under changing climatic conditions are not understood, are not fully considered, or are outweighed by immediate economic pressure.

Despite clearly felt climate impacts, institutional support for adaptation is widely perceived as insufficient. Farmers report little effective state assistance, limited access to relevant knowledge, and low confidence that political decision-makers prioritize their concerns. Many farmers state uncertainty about what practical adaptation options are available to them. At the same time,

informal farmer-to-farmer cooperation is strong in the area. Mutual support through sharing seeds, machinery, water access, and information represents the most reliable safety net under increasing climatic stress. However, farmers also report a lack of visible, locally applicable examples of successful climate change adaptation. This absence of practical reference points limits learning opportunities and slows the uptake of adaptive practices, even though many farmers express openness to learning from other farmers if adaptation measures prove successful under similar local conditions.

Overall, the findings show that adaptation is constrained by a combination of limited knowledge about climate change and applicable adaptation options, lack of financial resources, and the absence of institutions that actively accompany and support the adaptation process. Currently, most farmers remain locked into short-term coping strategies that risk reinforcing vulnerability in the long term.

RECOMMENDATIONS

Climate change adaptation in agriculture is a key lever for reducing pressure on water resources, protected areas, wildlife habitats, and livelihoods. However, the findings show that adaptation is not yet in place. Policy action must therefore focus on enabling farmers to adopt climate-resilient practices through addressing financial, institutional, and knowledge-related barriers that currently prevent adaptation.

1. PROMOTE WATER-SAVING PRACTICES ACROSS SECTORS

Water-efficient irrigation technologies and practices that improve soil water retention should be actively promoted to reduce agricultural water demand. Supporting the uptake of drip irrigation and water-storing farming practices such as agroforestry or organic matter buildup can substantially lower water demand and reduce pressure on the associated riparian ecosystems. Making these practices visible through locally accessible demonstration and pilot initiatives is essential to encourage adoption. At the same time, environmental

authorities should actively engage with responsible water and agriculture authorities to jointly develop strategies for more efficient and ecologically sustainable water distribution. Developing a joint strategy across these sectors is essential to prevent an increase of overall water consumption.

2. IMPROVE ACCESS TO FINANCIAL SUPPORT FOR CLIMATE ADAPTATION

Lack of financial resources is the primary barrier preventing farmers from investing in climate-adaptive measures. Policies should prioritize accessible financial support mechanisms, such as targeted subsidies, grant schemes, or low-risk micro-financing tailored to adaptation investments. Transparent communication about available funding options and clear eligibility criteria are critical to overcome existing distrust toward credits. Supporting smallholders and migration-dependent households should be a priority to prevent further socio-economic marginalization.

3. STRENGTHEN KNOWLEDGE AND AWARENESS ON CLIMATE CHANGE AND ADAPTATION OPPORTUNITIES

Limited understanding of climate change and long-term risks constrains farmers' ability to move beyond short-term coping strategies. Policies should support applied, practice-oriented training formats that explain global climate change, why existing production models are becoming increasingly risky and which adaptation options are feasible under local conditions. Given low trust in formal institutions, cooperation with independent actors and locally accepted intermediaries is crucial. Having trustful actors could significantly improve farmers' access to knowledge. Therefore, the high level of trust within farming communities offers a major opportunity for improving adaptation. Policies should facilitate the strengthening of farmer-led cooperation structures that enable knowledge exchange, shared access to machinery and seeds, and collective learning. Farmer-to-farmer approaches and cross-village exchange can accelerate the spread of effective practices and reduce reliance on unsustainable coping strategies. Moreover, there is the need to educate farmers on climate-resilient income diversification. This may include activities such as beekeeping, small-scale processing, and eco-tourism or homestay services can help stabilize livelihoods and reduce reliance on climate-sensitive agriculture.

4. USE PROTECTED AREAS AS PLATFORMS FOR DIALOGUE AND COORDINATION

While protected areas are not agricultural extension providers, they can serve as neutral platforms for dialogue between conservation authorities, farmers, and supporting actors. Structured cooperation can help align agricultural adaptation with ecosystem protection goals by facilitating information exchange, joint pilot initiatives, and access to conservation-linked funding opportunities. Such coordination helps reduce indirect pressures on Tugay forests and wildlife habitats by stabilizing surrounding land-use practices.

5. STRENGTHEN FORMAL TRANSBOUNDARY COOPERATION ON ADAPTATION AND RESOURCE MANAGEMENT

Climate change impacts and agricultural adaptation in the Zarafshan Valley are inherently transboundary. Cross-border farmer exchange can support learning by linking complementary experiences and practices from both countries. However, informal cooperation alone is insufficient to address challenges related to resource management and access to adaptation-relevant inputs. Strengthening formal coordination between relevant authorities and institutions in both countries is therefore essential to transform existing interdependencies into more stable, climate-resilient structures, reduce uncertainty for farmers, and facilitate access to key adaptation resources such as drought-resistant crop varieties.

Environmental authorities should explicitly recognize climate-resilient agriculture as an instrument of ecosystem protection. Investing in agricultural climate adaptation is a preventive strategy to reduce long-term pressure on ecosystems and protected areas. Without enabling farmers to adapt, climate impacts will continue to be externalized onto land, water, and biodiversity, increasing future conservation costs and undermining ecological resilience across the Zarafshan Valley.



Implemented by:



**Succow
Stiftung**

The policy brief was developed by Succow Foundation within the framework of the Regional Programme „Integrative and Climate-sensitive Land Use in Central Asia“ (ILUCA), implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Government.

For more information you can contact

Ronja Braitsch, the author,

✉ ronja.braitsch@outlook.de or

Rustam Murzakanov from Succow Foundation

✉ rustam.murzakanov@succow-stiftung.de