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The interlinked challenges of climate change, water scarcity and migration

KEY MESSAGE

- Significant research gaps persist in smallholder adaptation to climate change (e.g., the development of tailored irrigation technologies), the climate-mobility nexus (including the issue of immobility among vulnerable groups), and multi-level water resource tensions.
- Solution to the climate-water-mobility nexus requires collaboration across related issues based on evidence-based research.
- For meaningfully addressing the nexus, there is an urgent need to enhance data accessibility and invest in repositories for relevant indicators in the region.

INTRODUCTION

Climate change stands as one of the most significant challenges we face today. The countries in Central Asia find themselves at the forefront of this crisis. According to estimates, the region is expected to experience increasing temperatures of up to 2-3 degrees Celsius by 2050, accompanied by shifting weather patterns and worsening droughts.[1] Combined, these problems may endanger agricultural output and exacerbate food insecurity, while potentially leading to water shortages and internal displacement within the region.[2] The crisis also worsens due to existing inefficient water management and deteriorating infrastructure, further exacerbating environmental degradation.

The nexus between climate, water and migration in this region is a vicious cycle. Climate change becomes visible through rising temperatures, melting glaciers, and shifting precipitation patterns. It exacerbates water scarcity by diminishing fresh-

[1] Mosello, B., Foong, A., Viehoff, A. and Rüttinger, L. (2023). Regional consultation on climate change and security in Central Asia. Berlin: adelphi research; Vienna: OSCE

[2] Spoor, M. (2018). 25 years of rural development in post-Soviet Central Asia: Sustaining inequalities. ***Eastern European Countryside***, 24(1), pp. 63–79. https://doi.org/10.2478/eec-2018-0004

water supplies from various water sources that are critical for irrigation and drinking water. The water shortage, in turn, undermines agricultural productivity and livelihoods, forcing vulnerable populations, particularly in rural areas, to migrate to urban centers or abroad as a coping mechanism.[3] In other words, environmental degradation is directly linked to human mobility. Such grave issues necessitate urgent action on integrated policies. Without addressing climate-driven water shortages through cooperation, both local and regional, on resource management, migration flows could increase, putting strain on social systems and economies. Thus, the climate-water-migration nexus warrants further investigation in the context of Central Asia to inform adaptive strategies that mitigate these interconnected risks.[4]

To unify the region's approach to addressing these interlinked issues, Westminster International University in Tashkent (WIUT), in collaboration with Leibniz Institute of Agricultural Development in Transition Economies (IAMO), hosted two international conferences in October 2024[5] and October 2025.[6] These conferences aimed to discuss areas of necessary cooperation in the regions in the effort to build resilience against the interconnected issues of climate change, water scarcity, and migration. For this, the conferences brought together stakeholders, policymakers, and research professionals, who deliberated on developing practical policy recommendations for local, national, and regional decision-making based on country case studies and best practices.

In line with the important points raised during the conference, this brief argues that the interlinked issues of climate change, water scarcity, and mobility pose a grave risk to sustainable development in the Central Asia region. It also highlights the need for further research into future venues that require in-depth investigation to address these issues. It aims to initiate a policy discussion on a unified framework that mitigates the adverse effects of these environmental challenges. The brief presents specific recommendations to enhance the capacity of Central Asian countries to address

[3] Wrathall, D.J., van den Hoek, J., Devenish, A. and Walters, A. (2018). ***Water stress and human migration: A global, georeferenced review of empirical research***. FAO Land and Water Discussion Paper No. 11. Rome: FAO

[4] Hermans, K., Djanibekov, N., Abdullaev, I., Abduvalieva, N., Assubayeva, A., Blondin, S. ... , Umirbekov, A. (2024). Future research directions for understanding the interconnections between climate change, water scarcity, and mobility in rural Central Asia. ***Climate and Development***, 17 (7), pp. 638-647. https://doi.org/10.1080/17565529.2024.2436090

[5] Westminster International University in Tashkent and Leibniz Institute of Agricultural Development in Transition Economies (2024). ***Beyond Borders: Central Asia in the Face of Climate Change, Water Scarcity, and Migration Challenges***, conference, 15–16 October 2024, Tashkent, Uzbekistan. https://conference.wiut.uz/nexus2024

[6] Westminster International University in Tashkent and Leibniz Institute of Agricultural Development in Transition Economies (2025). ***Navigating Change: Agricultural Sustainability and Rural Development in Central Asia,*** conference, 14–15 October 2025, Tashkent, Uzbekistan.

climate change challenges, thereby creating a path toward sustainable resilience.

Current research gaps in the context of Central Asia

Challenges of climate adaptation by smallholders

Smallholder farmers constitute a significant part of agricultural producers in the region.[7] Smallholder farmers in Central Asian countries, who work on less than a few hectares of land, control 60-80% of agricultural output. For instance, these farmers account for over 90% of farms in Uzbekistan. The 4.94 million smallholder farmers who worked 20% of the arable land on 0.17-hectare plots produced 68% of the gross agricultural output as of January 1, 2021. This included 44% crop production and 91% livestock production in 2020.[8]

The climate-sensitive nature of their livelihoods makes smallholder farmers particularly vulnerable to the impacts of climate change. This includes decreased crop yields resulting from prolonged heatwaves. The research indicates that smallholder farmers in Uzbekistan and Tajikistan experience income fluctuations of 20-40% in farm revenues due to the warming effects and additional issues such as soil deterioration and pest infestations.[9] In contrast, large-scale farms demonstrate superior abilities to adapt to climate change when compared to smaller farms. Research in Tajikistan indicates that farms exceeding 50 hectares implement crop diversification and irrigation upgrades at a rate 2-3 times higher than that of smallholder farms.[10] Additionally, in most cases, the policies and incentive mechanisms target large-scale farms. For instance, the government in Uzbekistan provides state procurement quotas and subsidies for cotton and wheat production to large farms (50-100 hectares) through low-interest loan programs and machinery leasing initiatives, while smallholder farmers receive limited support.[11]

Large farms have better access to adaptation options because technologies primarily target their needs with solutions like land levelling and water-saving technologies. The adaptation measures designed for large farms require new equipment, skilled workers, and financial re-

[7] Lerman, Z. and Sedik, D. (2018). Transition to smallholder agriculture in Central Asia. ***Journal of Agrarian Change***, 18(4), pp. 904–912. https://doi.org/10.1111/joac.12282

[8] World Bank (2021). Uzbekistan - Second Agricultural Public Expenditure Review. [online] Washington, DC: World Bank. https://documents1.worldbank.org/curated/en/381251635752865696/pdf/Uzbekistan-

[9] Bobojonov, I. and Aw-Hassan, A. (2014). Impacts of climate change on farm income security in Central Asia: An integrated modeling approach. ***Agriculture, Ecosystems & Environment***, 188, pp. 245–255. https://doi.org/10.1016/j.agee.2014.02.033.

[10] Sharofiddinov,H., Islam, M. and Kotani, K. (2024). Adaptation indicator to climate change and farm sizes in agriculture: A reflection of farming culture and history. ***Ecological Indicators***, 170, pp.112976–112976. https://doi.org/10.1016/j.ecolind.2024.112976

[11] World Bank (2021). Uzbekistan - Second Agricultural Public Expenditure Review. [online] Washington, DC: World Bank. https://documents1.worldbank.org/curated/en/381251635752865696/pdf/Uzbekistan-

sources, including credit lines. These tools are not easily accessible to smallholder farmers who operate on a limited budget and face challenges with collateral requirements.[12] Apart from the limited access to technology and capital, institutional factors related to tenure security and farmer autonomy can also affect adaptation. Evidence from Uzbekistan suggests that farmers with more secure land tenure and greater autonomy over crop choice are significantly more likely to diversify their production and invest in adaptive practices.[13]

In this sense, research and other efforts should focus on developing adaptation technologies for smallholders, as their unique characteristics demand low-cost and community-based solutions, such as rainwater harvesting. For instance, a study conducted in the Kysylsu River Basin in Tajikistan demonstrated that rainwater harvesting systems using locally available materials, such as polyethene-lined soil pits for water storage, can efficiently capture 90-93% of available rainfall, helping to store 211 to 344 cubic meters of rainwater.[14] The water is enough to cover deficits during dry months for domestic use, livestock, and crop irrigation. Therefore, further studies are needed to highlight the absence of specific innovations that meet the needs of smallholders.

Despite these existing challenges, there is a lack of deep research regarding smallholders' traditional knowledge and the perception of adaptation strategies. Evidence shows that in the Himalayan region, traditional ecological knowledge (TEK) in agricultural practices provides direct support for climate adaptation and resilience.[15] This highlights the need to integrate conventional practices into regional adaptation frameworks, as socio-economic pressures threaten to erode them. Smallholders' perceptions about climate change play a crucial role in achieving successful adaptation. The way smallholders perceive climate change depends on their irrigation methods (gravity -fed versus supplemental systems) and their farming systems (upstream pastoral versus downstream arable). There has been very limited research on these

[12] Lamichhane, P., Hadjikakou, M., Miller, K.K. ***et al.*** (2022). Climate change adaptation in smallholder agriculture: Adoption, barriers, determinants, and policy implications. ***Mitigation and Adaptation Strategies for Global Change***, 27, 32. https://doi.org/10.1007/s11027-022-10010-z

[13] Bilal, M., Umirbekov, P., Djanibekov, N., Tadjiev, A., Mirkasimov, B. (2026). Land tenure, autonomy and crop choice: Institutional drivers of agricultural diversification in Uzbekistan. Agricultural Systems, 223, 104574. https://doi.org/10.1016/j.agsy.2025.104574.

[14] Domullodzhanov, D. and Rahmatilloev, R. (2023). 'Development of low-cost rainwater harvesting to support on-site water supply in rural Tajikistan', ***Central Asian Journal of Water Research***, 9(2), pp. 103–120. https://doi.org/10.29258/CAJWR/2023-R1.v9-2/103-120.eng

[15] Witharana, L., Chen, D., Curio, J. and Burman, A. (2025). Traditional ecological knowledge in High Mountain Asia: a pathway to climate resilience in agriculture amidst changing climates. ***Advances in Climate Change Research***, 16 (1), pp. 167–182 https://doi.org/10.1016/j.accre.2025.01.009

types of farming methods and farmers' perceptions in the Central Asian context.[16]

Understanding smallholders' perceptions of sustainable technologies is essential as it directly influences their willingness to invest in and adopt technologies such as drip irrigation and crop diversification. Research by Babakholov and Hasanov (2024) suggests that farmers in Uzbekistan who have received education are more likely to adopt better practices, as they tend to hold more positive views about adaptation. Moreover, integrating socioeconomic, cultural, behavioral, and psychological factors into the analysis will also enrich the findings and their relevance.

Speaking of socioeconomic factors, the gendered roles in farming are another critical factor that warrants careful examination. In Central Asia, climate change disproportionately affects women smallholder farmers, as male out-migration is driven by environmental factors such as water scarcity. It also results in the feminization of agriculture. In such circumstances, women often have to take on greater responsibilities in farm management, while still facing barriers such as limited access to land rights, credit, and agricultural extension services. These barriers indeed worsen their vulnerability. Research in rural Kyrgyzstan shows that traditional gender norms hinder women's adoption of climate-smart practices, despite their role in adapting to changing conditions through crop diversification and water conservation.[17] Consequently, addressing these gender disparities through targeted policies is crucial to enhancing smallholder resilience and promoting equitable agricultural development in the region.[18]

Climate change and (im)mobility in rural areas

Research on climate change and mobility is increasing globally. Studies have shown that human migration patterns, both within and across countries, are closely linked to climate stressors, including rising temperatures, severe weather events, and increasing sea levels.[19] Experts warn that environmental changes may displace millions of people, who will experience severe impacts, leading to both

[16] Babakholov, S. and Hasanov, S. (2024). Perceptions towards climate change, water scarcity and adaptation strategies: Case of the Zerafshan River Basin in Uzbekistan. ***Italian Review of Agricultural Economics (REA)***, 79 (2), pp. 19–33. https://doi.org/10.36253/rea-15098

[17] Standal, K., Daloz, A.S. and Kim, E. (2023). 'A gendered approach to understanding climate change impacts in rural Kyrgyzstan'. In: Sabyrbekov, R., Overland, I. and Vakulchuk, R. (eds) ***Climate Change in Central Asia.*** Springer Briefs in Climate Studies. Cham: Springer, pp. 123–134. https://doi.org/10.1007/978-3-031-29831-8_10

[18] Kovaleva, M., Leal Filho, W., Borgemeister, C. and Komagaeva, J. (2023). Central Asia: Exploring insights on gender considerations in climate change. ***Sustainability***, [online] 15(16), p.12667. https://doi.org/10.3390/su151612667.

[19] Garip, F. and Reed, C.A. (2025). Climate Change and Human Mobility: Considering Context, Mechanisms, and Selectivity. ***Population and Development Review***, 51 (1), pp. 449–489 https://doi.org/10.1111/padr.12716.

domestic and international migration. The migration pattern affects countries with existing socioeconomic inequalities because these vulnerabilities worsen in such nations. Scholars who study climate change and migration have attempted to understand both human migration patterns and the potential of mobility as an adaptation strategy.[20]

However, there is a dearth of empirical research in the Central Asian context that explains these interlinkages. The peculiarities of migration in Central Asia in the face of climate change include a complex interplay of environmental, social, and economic factors. Climate change intensifies migration flows but also creates "trapped populations" who are unable to move due to poverty or social constraints. Although region-specific data remain scarce, global projections suggest that between 1.7 and 2.4 million people may migrate due to climate change by 2050 under varying scenarios.[21]

The political economy of agricultural development can also influence people's mobility choices, as in the case of Uzbekistan and Turkmenistan. Miholjcic-Ivkovic (2024) shows that the decisions made by governments regarding water management in these countries have contributed to the decline of the Aral Sea and poor border water management. The decline, in turn, negatively impacted local economies, limiting the available resources and forcing local people to migrate as a result. A better understanding of mobility patterns in local contexts, such as pasturelands or irrigated areas, will help efficiently address the climate-migration nexus. This is especially true in hazard-prone regions, such as the Fergana Valley and montaneous areas of the region, where droughts, floods, and landslides are driving rural-to-urban migration.

Additionally, there is a need to conduct in-depth research on the question of why people in Central Asian countries remain immobile despite the negative impacts of climate change. In other words, individuals do not migrate despite their worsening conditions. Intuitively speaking, an attachment to a place, identity, spirituality, and social bonding may impact people's decisions to stay despite risks. We can observe this phenomenon in the Pamir Mountains of Tajikistan, where strong emotional ties to one's homeland ("watan") foster voluntary immobility even amid disaster risks.[22] Still, these and other relevant factors need to be investi-

[20] Simpson, N.P., Mach, K.J., Tebboth, M.G.L., Gilmore, E.A., Siders, A.R., Holden, P., Anderson, B., Singh, C., Sabour, S., Stringer, L.C., Sterly, H., Williams, P.A., Meyer, A.L.S., Cundill, G., Rosengaertner, S., Nunow, A., Amakrane, K. and Trisos, C.H. (2024). Research priorities for climate mobility. ***One Earth***, 7 (4), pp. 589–607. https://doi.org/10.1016/j.oneear.2024.02.002.

[21] Miholjcic-Ivkovic, N. (2024). Impact of climate change on migration trends in rural Central Asia. ***Central Asian Journal of Sustainability and Climate Research***, 3(1), pp. 74–95. https://doi.org/10.29258/cajscr/2024-r1.v3-1/74-95.eng.

gated, including how involuntary immobility traps vulnerable groups in hazard-prone areas due to poverty and lack of resources.[23]

To study how different groups address the challenges of climate change, it is also crucial to consider that the ability and desire to migrate are formed by many intersecting social factors, including gender, age, ethnicity, formal education, social networks, and marital status. As briefly explained earlier, climate-induced migration has a gender aspect attached to it. Research shows that in Central Asia, particularly in Kyrgyzstan, male-dominated migration patterns driven by climate change leave women, children, and the elderly behind in rural areas to face heightened climate risks. In such situations, women often bear the brunt of agricultural burdens and climate-related risks, particularly in regions prone to flooding.[24] Such gender dynamics not only intensify women's workload but also limit their mobility.

Water management and cooperation pathways

Climate change has triggered severe water shortage issues throughout Central Asia. The rising temperature caused major glaciers to lose between 20% and 30% of their total area throughout the last fifty years.[25] This directly causes a decline in runoff from major rivers, the Amu Darya and the Syr Darya, which are vital water sources for the region. The projections indicate that 26-35% of the Amu Darya and 22-28% of the Syr Darya might decrease by 2050 under climate change scenarios.[26] The population growth in the region, projected to exceed 95 million by 2035, increases water demand and further strains already limited resources.[27]

These challenges are compounded by mounting regional water tensions involving countries, economic sectors and smallholders. Weak transboundary water management, often rooted in the legacy of Soviet-era infrastructure, exacerbates water shortages and their inefficient use in Central Asia. The old system prioritized integrated basin-wide operations without

[22] Blondin, S. (2021). Staying despite disaster risks: Place attachment, voluntary immobility and adaptation in Tajikistan's Pamir Mountains. ***Geoforum***, 126, pp. 290–301. https://doi.org/10.1016/j.geoforum.2021.08.009.

[23] Garip, F. and Reed, C.A. (2025). Climate Change and Human Mobility: Considering Context, Mechanisms, and Selectivity. ***Population and Development Review***, 51 (1), pp. 449–489. https://doi.org/10.1111/padr.12716

[24] Miholjcic-Ivkovic, N. (2024). Impact of climate change on migration trends in rural Central Asia. ***Central Asian Journal of Sustainability and Climate Research***, 3(1), pp. 74–95. https://doi.org/10.29258/cajscr/2024-r1.v3-1/74-95.eng.

[25] Vinokurov, E. (ed.), Ahunbaev, A., Chuyev, S., Adakhayev, A. and Sarsembekov, T. (2023). 'Efficient irrigation and water conservation in Central Asia'. ***Reports and Working Papers***, 23/4. Almaty: Eurasian Development Bank.

[26] Lutz, A.F., Droogers, P. & Immerzeel, W.W. (2012). ***Climate Change Impact and Adaptation on the Water Resources in the Amu Darya and Syr Darya River Basins***. Future Water Report 110.

[27] World Population Review (2025). ***Central Asia population***. Available at: https://worldpopulationreview.com/continents/central-asia

water shortages and their inefficient use in Central Asia. The old system prioritized integrated basin-wide operations without regard for future national boundaries.[28] The construction of extensive irrigation systems at the time created water disputes, establishing post-independence dependencies between nations.[29] The newly emerged states disagreed on building new hydroelectric stations along transboundary rivers, such as the Amu Darya, because water flow modifications could damage agricultural production in lower-lying areas. The example includes the Toktogul Reservoir in Kyrgyzstan, which was designed to store water for downstream irrigation in Kazakhstan and Uzbekistan during summer but is now increasingly used for winter hydropower generation, leading to downstream flooding and summer shortages. Estimates suggest that current water mismanagement results in an estimated $2.1 billion in annual economic costs for Central Asia.[30]

Another major water issue is its use in the agricultural sector. The sector consumes 90% of Central Asia's surface water resources, which exceeds global standards. The sector directly competes with the energy sector for water resources.[31] In such situations, governments have to establish a balance between maintaining food security and providing an energy supply. For instance, the annual power generation of the Rogun hydropower dam reaches 14.4 TWh, yet this production may threaten agricultural losses worth billions in economic value to downstream areas.[32] Another matter concerns the disputes between smallholders that exist within densely populated communities. In this sense, scholars underscore the need for additional research on socioeconomic factors, such as poverty, behavioral, cultural and political factors that contribute to conflicts over water resources.

Overall, as discussed, the combined impact of climate change on water scarcity, population growth, and disagreements over allocation necessitates close collaboration among stakeholders to promote

[28] Janusz-Pawletta, B. and Gubaidullina, M. (2015). Transboundary water management in Central Asia. Legal framework to strengthen interstate cooperation and increase regional security. ***Cahiers d'Asie centrale***, 25, pp.195–215. https://journals.openedition.org/asiecentrale/3180.

[29] Weinthal, E. (2006). Water Conflict and Cooperation in Central Asia. ***Human Development Report Office Occasional Paper***; United Nations Development Programme. Available at: https://hdr.undp.org/system/files/documents/weinthalerika.pdf

[30] Caspian Policy Center (2020). ***The Vital Resource: Water Management in Central Asia***. Policy Brief. Washington, DC: Caspian Policy Center. Available at: https://api.caspianpolicy.org/media/uploads/2020/11/The-Vital-Resource-Water-Management-in-Central-Asia-01.pdf .

[31] Wong Bi Yi, P., Assaubayeva, D. and Maurel, M. (2020). Agriculture water use in North and Central Asia. ***ESCAP Blog***, 27 October. Available at: https://www.unescap.org/blog/agriculture-water-use-north-and-central-asia

[32] Drost, N., Cretti, G. and van Giersbergen, B. (2025). ***Central Asia emerging from the shadows: European Union–Central Asia relations in evolving Eurasian geopolitics***, Chapter 4 ('The water-energy-food nexus'), Clingendael Report, January. Hague: Netherlands Institute of International Relations 'Clingendael'. Available at: https://www.clingendael.org/pub/2025/central-asia-emerging-from-the-shadows/4-the-water-energy-food-nexus/

sustainable water management and peaceful coexistence.[33] Indeed, there is a recognition at the highest level that solving the transboundary water issue requires a collective approach.[34] Such an approach can be facilitated through water resource cooperation, utilizing institutions like the International Fund for Saving the Aral Sea (IFAS) and the Interstate Commission for Water Coordination (ICWC) to manage transboundary rivers. Tackling the intersectoral contradictions between agriculture, which consumes 90% of water and energy supply, governments can adopt integrated water-energy-food nexus frameworks, as demonstrated by the OECD, that encourage cross-sectoral planning. This can yield benefits such as improved energy security and a significant reduction in water waste through joint infrastructure upgrades.[35]

A way forward

The climate-water-mobility nexus in Central Asia requires research-based solutions that necessitate improved collaboration, data integration, and targeted funding to address its challenges. The research reveals that climate stressors are intensifying water scarcity and migration pressures in Central Asia because adaptive responses remain fragmented due to insufficient empirical data on smallholder perceptions, immobility dynamics, and multi-level tensions.[36] Future research needs to inform policy, addressing the limiting factors in the knowledge infrastructure to overcome these challenges and build long-term resilience. The following practical recommendations are based on the identified constraints and informed by regional and global best practices:

- The integration of traditional ecological knowledge (TEK) should be included in smallholder adaptation frameworks. The policies should incorporate local practices regarding sustainability to enhance the resilience of smallholder farmers. As mentioned earlier, such traditional methods have been successful in mountainous areas by reducing soil erosion and enhancing yields under various rainfall patterns. They counter the preference for large-scale technologies. However, they still require in-depth research to document their efficacy further. Research indicates that educating farmers about climate perceptions enhances the adoption rates of sustainable

[33] Nakispekova, A. (2024). 'Central Asia faces window of opportunity amid population growth', ***The Astana Times***, 8 April. Available at: https://astanatimes.com/2024/04/central-asia-faces-window-of-opportunity-amid-population-growth/

[34] President of the Republic of Uzbekistan (2025). 'Central Asia on the verge of a new era', ***Official website of the President of the Republic of Uzbekistan***. Available at: https://president.uz/en/lists/view/8653

[35] Botta, E., M. Griffiths and T. Kato (2022). Benefits of regional co-operation on the energy-water-land use nexus transformation in Central Asia. ***OECD Green Growth Papers***, No. 2022/01, OECD Publishing, Paris, https://doi.org/10.1787/7fcec36c-en.

[36] IAMO and WIUT collected farm-level data on the adaptation of sustainable practices in four regions of Uzbekistan under the "UzFarmBarometer", project jointly financed by the Uzbek and German governments. For more: https://cpro.wiut.uz/project/uzfarmbarometer

- Develop tailored, low-cost adaptation technologies for smallholders with support for vulnerable groups. Governments and donors should prioritize R&D for affordable innovations like drought-resistant seeds and micro-irrigation systems suited to small plots, potentially boosting food security. This includes subsidies and training programs targeting women, youth and low-income households, who bear increased burdens in male-migration contexts, where female-headed and low-income households adapt less effectively without access to credit. The measures implemented in similar arid zones have proven effective in reducing heatwave-related yield losses while correcting policy preferences that benefit large farms.

- Incorporate immobility and gendered dimensions into climate-mobility research and policies. The climate-mobility nexus necessitates a focus on "trapped populations" who are unable to migrate due to poverty or social ties. National adaptation plans need to incorporate mobility support for rural livelihoods to prevent forced displacement. Social protection programs should be developed to facilitate adaptive decisions, as male-dominated migration increases women's vulnerabilities in areas prone to hazards. Gendered strategies should be implemented to protect women and youth from increased risks in hazard-prone areas.

- Enhance regional data repositories and transdisciplinary collaboration for evidence-based decision-making. The development of unified platforms for climate, water, and mobility indicators should be based on global models to eliminate data silos and improve forecasting accuracy. The current lack of climate observation networks, combined with inadequate data quality, hinders the development of advanced water resource projections in Central Asia. The development of comprehensive climate change adaptation models requires data at the smallholder level for their creation. The validity of climate models remains limited when socio-economic data from smallholders is not integrated into the system. The existing databases and knowledge platforms for water management and climate change research (e.g. https://ca-climate.org/eng/cacip.php) need to be explored, validated, and updated, particularly by improving the accessibility, coherence and the scale of observations. The development of regional data repositories should focus on improving data collection, accessibility, applicability, and comparability to promote interdisciplinary collaboration on the nexus topic.

DISCLAIMER

The study's findings, interpretations, views, conclusions, and recommendations, as contained in this publication, reflect the authors' and do not necessarily reflect the official opinion of WIUT or CPRO.

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