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COOPERATION ON CLIMATE VULNERABILITIES:

Adding Regional Dimensions to the National Climate Change
Adaptation Planning in the Eastern Partnership Countries

EU4Dialogue
Component 1
Concept Paper



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EU4Dialogue (Component 1) Concept Paper

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Cover photo:

Didgalishtoba, glacial lake, located at 2700 m above sea level in Samegrelo region of Georgia. Climate change has a significant negative impact on glaciers, causing their rapid degradation, melting of small and retreat of big glaciers. (Nino Alavidze.)

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Background

The EU4Dialogue (Component 1) aims to establish an environment conducive to defusing tension, encouraging dialogue and fostering better understanding across the divides in the South Caucasus and the Republic of Moldova. The Climate, Energy Transition and Water Dialogue Platforms have brought together subject matter experts from across the South Caucasus region and the Republic of Moldova since 2022 to discuss issues of mutual interest. The topics and the recommendations presented in this Concept Paper have been identified and developed by participants of a specific Climate Vulnerability Task Force. The opinions expressed do not necessarily reflect the positions of any particular individual.

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Agricultural fires in Dedplistskaro border region between Georgia and Azerbaijan. Agricultural burning is widely used to clear crop residue, eliminate pests and weeds. Climate change further aggravates the risks of spreading fires. (Teimuraz Popiashvili.)

RATIONALE

Climate change is increasingly affecting the economy of all nations and the lifestyles of the populations in many countries. The European Union's Eastern Partnership (EaP) countries – Armenia, Azerbaijan, Georgia, Moldova and Ukraine – are also vulnerable to the impacts of climate change. In this mentioned region, the sharp changes in temperature and precipitation intensifies catastrophic events like flash floods and landslides. Extended warmer temperatures increase risks of droughts and water scarcity, especially in seasons most needed. Melting glaciers and more frequent and severe forest fires introduce longer-term shifts in the region's ecosystems. Immediate action is needed to protect current and future populations living in these countries.

EaP countries are taking initial steps to protect themselves from climate vulnerabilities. Development of National Adaptation Plans (NAPs) is among these. These Plans, however, are developed from a national perspective, fragmenting the region by political boundaries while disregarding the natural characteristics and environmental interconnectedness of the region. Such a fragmented approach is inadequate in reducing climate vulnerabilities. Joint, collaborative efforts to adapt to climate change by taking into account the natural patterns in the whole region and recognition of the shared challenges could yield greater results. The authors of this document suggest the concept of regional adaptation planning based on the following premises:

- Climate change is not restricted to political boundaries, but rather goes beyond to a territorial, regional, and global scales.
- Traditionally, climate change adaptation activities have been compartmentalized and fragmented because of the gradual nature and elusive manifestation of most climate change impacts.
- National Adaptation Plans are limited by their political borders and therefore are constrained in adequate consideration of transboundary influences.
- Adaptation activities at the regional level (across national borders), utilization of Regional Adaptation Plans (RAPs) can be an important tool in reducing climate vulnerabilities.

The main purpose of this paper is to identify the key factors contributing to climate vulnerability in the EaP countries at a regional scale and to demonstrate the contribution of transboundary cooperation in decreasing these vulnerabilities. As such, the authors of this study suggest that NAPs developed and implemented only at a national level, are too fragmented and are unable to tackle vulnerabilities rooted at a regional scale. Countries currently working on NAP projects can take significant steps in reducing climate vulnerabilities by strengthening regional cooperation and by jointly working on RAPs. This paper explores the possible directions of cooperation, offers the main focus areas and an outline of future RAPs.

RESEARCH BACKGROUND AND LITERATURE REVIEW

2

Climate change vulnerability is a state of unpreparedness for the hazards that may arise because of these changes (Mearns and Norton, 2020; Wisner and Luce, 1993; Zakour, et al., 2013; Abbasov, 2018;). Shifts in the climate bring changes that societies cannot adapt too quickly. The lack of preparedness to face these changes is accompanied by great economic, social, and moral losses (Bolin and Kurtz, 2018). Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

There is a broad range of dimensions for climate change vulnerability (Depietri, 2020; Turner, 2016), including social, environmental, economic, physical (infrastructure), and institutional ones. Social vulnerability refers to the inability of communities and the population to cope with the negative effects of climate change (Cutter, et al., 2012). People are unable to respond appropriately to the negative effects of climate and since they are powerless as a social group in the face of all the negative consequences of climate change (Mearns and Norton, 2009; Brondizio and Moran 2008; Otto, et al. 2017).

The environmental dimension of vulnerability is well explained by Renaud (2006), Huq et al. (2020) and many others (e.g., Eakin and Luers, 2006; Cutter, et al., 2012). These authors argue that the ecosystem services can be threatened without proper land use and environmental management practices (Cutter, 1996).

Economic vulnerability refers to the vulnerability of human societies to natural hazards (Whelan and Maître, 2005; Kumpulainen, 2006). In many cases, the economy of states and communities cannot withstand climate changes, and as a result, they experience both economic and social losses (Scheuer, et al., 2011). Most authors describe economic vulnerability as the inability of the states (Jeganathan, et al., 2021), communities (Putten van, et al., 2017; Abbasov, 2018), cities (Tascon, et al., 2024; Kumar, et al., 2016), and administrative territories (Hambardzumyan and Yengibaryan, 2019; Abbasov 2018) to cope with natural hazards. Economic vulnerability can be referred to as a sectoral vulnerability, when one of the important sectors of the economy has no capacity to handle climate-related hazards, such as droughts, scarce water sources, and extreme temperatures (Andreoni and Miola, 2014; Galstyan, et al., 2022).

Many studies confirm that there are close relationships between poverty and climate-driven disasters (e.g. Halebatti, et al., 2020; Korstanje, 2011). Poor societies, communities, and families have less capacity to meet and withstand hazards. Poverty increases the vulnerability of communities, families, and individuals to meet hazards properly, while wealthy societies and communities usually are well protected from adverse impact of hazards with their greater power and resources (Winsemius, et al., 2018; Fothergill and Peek, 2004; Awasthi, 2019; Sabates-Wheeler, et al., 2008). In addition, analysts highlight that climate change vulnerabilities are not “gender neutral”. Women and girls are facing the disproportionate effects of climate change, exacerbating existing gender inequalities and threatening their livelihoods, health and security. Men and women have different adaptive capacities and different access and control over resources (UN Women, 2022).

Concepts that define physical vulnerability vary (e.g. Pavia and Mason, 2014; Papathoma-Köhle, et al., 2011). In many cases physical vulnerability and structural safety are understood in the context of the built environment (e.g. Menzies, 1995; Roy and Matsagar, 2023). Although physical vulnerability is often confused with economic and environmental vulnerability, it focuses more on the physical elements. It mostly manifests as the unpreparedness of the built environment (e.g. buildings, bridges, roads, schools, etc.) for natural hazards (Malgwi, et al., 2020; Hufschmidt, 2011; Guillard-Gonçalves, et al., 2016; Tascon, et al., 2024).

The institutional roots of climate change vulnerability are often linked with the insufficient functioning of different kinds of institutions, including government organizations, civil society, communities and professional associations, and their incapability to ensure normal adaptation processes. For example, in most developing countries, the capacity of public institutions to adapt to climate change is characterized by the lack of well-trained professionals and lack of necessary programs and strategies. This situation is often accompanied by the inadequacy of the legislative framework or enforcement mechanisms.

In many cases, the weak development of civil society institutions, the absence of women's organizations, the failure of insurance programs to protect poor farmers can be considered as part of the institutional dimension of climate change vulnerability.

Vulnerability to climate change appears as a manifestation of multiple factors separately or as a result of the interaction of these factors. However, often strategies and plans aimed at vulnerability reduction are often limited by administrative boundaries, making it difficult, sometimes impossible, to successfully accomplish these strategies. For example, although climate change impacts are often regional and sometimes global in nature, the developed strategies and plans cover only a certain administrative area. In this context, the natural linkages between upstream and downstream countries often create mutually reinforced vulnerabilities.

Climate change adaptation is considered as the main opportunity to reduce the impact of adverse consequences and the vulnerability to climate change. Adaptation to the negative effects of climate change should also be understood as elimination or reduction of vulnerability. In this regard, increasing preparedness for natural disasters, strengthening security and social protection, transitioning economies to a model more resilient to climate change, and many similar activities play a key role in reducing climate change impacts. In other words, climate change adaptation as a long-term process is the mainstreaming of climate change risk management into the development processes of businesses, society, and education. Ultimately it is a process that can lead to the minimization of climate vulnerabilities at all levels.

Solutions-based on multi-directional actions are being implemented by various countries to prevent climate vulnerabilities and gradually adapt to climate changes. For this purpose, countries are working on multi-purpose strategies and plans at the national and sectoral levels. For example, the "Support to the National Adaptation Program" project implemented in Azerbaijan prioritizes three main sectors, water, agriculture and coastal management, and prepares plans and programs to adapt to climate changes in these sectors.

Similar NAP or NAP-related projects are implemented in Armenia, Georgia, Moldova, and Ukraine. Although there are significant differences between these projects, they are all aimed at the adaptation to the adverse climate change effects at different levels and sectors. Despite some progress, efforts are mostly limited to the borders of one political territory and do not consider cross-border collaborations with the additional dividends they would generate.



Climate change-induced degraded lands in Qobustan, Azerbaijan. (Rovshan Abbasov.)

TRANSBOUNDARY DIMENSIONS OF CLIMATE CHANGE VULNERABILITY

3

Assessing Transboundary Aspects of Climate Vulnerability

A natural hazard is an event that can cause damage and loss to property, infrastructure, human life, ecosystems, whether it is human, or nature-based (Gaillard and Texier, 2010). As a result of climate change pressures on our planet in the last 200 years, the frequency and extremes of many natural hazards have increased, and new climate-related hazards have appeared in parallel. Climate change-driven hazards can be short-term (e.g., floods or droughts) or long-term (e.g., climate change, rising ocean levels, land degradation).

Climate vulnerability is a state determined by physical, social, economic, and environmental factors or processes, which increase the need of a community or nation to defend itself against the impact of climate change hazards. Capacity is a resource, skill and strength possessed by people, communities, societies or nations, which enables them to prevent, mitigate, prepare for, withstand, or quickly recover from a disaster. Increased capacities reduce vulnerability and vice-versa (Abbasov, 2018) and make societies more resilient.

Climate vulnerability could be mitigated in different ways in a transboundary context. For example, in case of natural disasters, the nearest hospital may be located in the territory of a neighbouring country. Or, in some remote areas, in urgent situations neighbouring country could dispatch emergency services in much shorter response times if adequate agreements would be in place. The location of important water resources in the territory of the neighbouring country could make a major contribution in areas where cross-border relations are strong.

Unlike inland areas, border areas experience more and additional challenges to solve climate change problems along with natural factors. These problems occur mostly in river basins that cross two or more countries, in the areas where international lakes are located, and in the border regions of states that share the same geographical area. Such problems often give rise to disputes between countries, as well as to the emergence of fragmented solutions, when countries ignore climate-related geographic features and try to solve their problems unilaterally. Moreover, improper organization of climate change adaptation in the territory of a country affects neighbouring countries and increases the latter's vulnerability to climate change as well (Table 1).

Table 1. Transboundary dimensions of climate vulnerability

Environmental
<ul style="list-style-type: none">• Floods in bordering regions• Droughts• Low streamflow• Forest fires
Social
<ul style="list-style-type: none">• No access to border areas• No access to markets in bordering countries• Limited ability for social services in bordering countries• Limited transportation routes
Economic
<ul style="list-style-type: none">• Poverty caused by transboundary disputes• Isolation due to limited access to major routes• Impoverishment due to limited access to jobs• Loss of incomes due to reduced economic activities in border regions
Institutional
<ul style="list-style-type: none">• Absence of regional institutions• Absence of cooperation between local bordering governments
Physical
<ul style="list-style-type: none">• Unauthorized settlements• No access to medical and emergency services in the border areas• Limited access to information on climate hazards

During natural disasters, droughts, and heatwaves, those suffering from poverty are more vulnerable and affected. In conflict areas and in those with poor transboundary relations, sensitivity to climate change may be higher. The lack of transport links, poor development of bilateral relations, lack of trade links are significant contributors to poverty. Thus, vulnerability to climate change is widespread and has a long-term impact on areas where poverty is high. In this regard, the lack of cross-border relations is one of the main factors that exacerbate poverty and, thus, increase vulnerability.

Social Dimension

The social dimensions of climate change vulnerability involve understanding how social factors influence the susceptibility of different groups of population to the impacts of climate change. This dimension recognizes that vulnerability is not only a result of physical exposure to climate risks but also that of the social and economic contexts in which people live.

Climatic change increases people's vulnerability in the agricultural sector by affecting their traditional sources of income. From the cross-border perspective, confined access to markets, limited transportation routes, and lack of connectivity to social institutions in neighbouring countries increase the adverse effects of climate change making people more vulnerable.

There are significant economic disparities between rural and urban areas in the EaP countries reflected in the poverty rates. The situation in remote rural areas is characterized by the limited access to quality education, healthcare, markets, job opportunities, and prevailing skill gaps, as well as social norms regarding work and family roles. For example, in Armenia, rural poverty stands at 29%, compared to 22.1% in urban areas (ArmStat, 2020). A similar situation is observed in other countries of the region.

Social inequality and marginalization are a persistent issue in the Eastern Partnership countries manifested in various forms, including economic disparities and limited political representation. Climate change vulnerability also affects different genders differently. Despite progress in some areas, social norms often restrict women's rights and opportunities, and women in the region continue to face significant barriers to achieving gender equality.

Women in the region are more likely to be employed in low-paying, informal sectors (such as human health and social services, education, art and recreation) with limited job security and benefits. The gender pay-gap remains significant, and women's economic contributions are often undervalued. For instance, women in Azerbaijan earn on average 72.9% of men's wages, with particularly wide discrepancies in professional, scientific, and technical activities, where women earn only 49.4% of men's wages (Stat Azerbaijan, 2023).

Women, particularly those in rural areas, often face compounded vulnerability issues due to their limited access to resources, education, healthcare, and employment opportunities. Social norms around work and family further exacerbate these challenges, restricting women's participation in decision-making processes and access to climate adaptation resources.

Climate change can force people to migrate due to loss of livelihoods, rising sea levels, or extreme weather events. This climate-driven migration presents complex challenges that significantly affect the quality of life for those impacted. As people relocate due to environmental pressures, they can be deprived of equitable access to health services and a clean, safe environment. Therefore, climate justice integration into migration policies is necessary to address these disparities, especially in the context of climate-induced migration.

The effects of climate change on minorities, marginalized communities, and individuals with disabilities represent a crucial aspect of climate vulnerability. People with disabilities and those living in hazard-prone areas are disproportionately affected due to their dependence on climate-sensitive ecosystems and the additional barriers they face in accessing resources and support. Factors, such as disruptions to traditional livelihoods and forced displacement, gaps in legal frameworks and policies contribute to the vulnerability of these groups. The foregoing underscores the urgent need for climate adaptation strategies that consider income, gender, and other social dimensions.

Environmental Dimension

In a transboundary context, management of the environment from a climate vulnerability perspective requires a focus on water, forests, biodiversity, air quality, and natural disasters. Transboundary natural areas include river and other aquatic ecosystems, forest ecosystems, landscapes and natural monuments, species habitats that cross national borders, and built infrastructure that could cause significant environmental damage in case of disasters. Natural hazards in transboundary areas can easily turn into disasters, and transboundary hazards can be much larger than in other areas. Challenges include managing wildfires in border areas, joint use of protected areas, environmentally sustainable operation of tourism and recreation facilities, and regulating upstream-downstream relations in the management of transboundary rivers. Low-level political cooperation, lack of institutions and practices, and occasional conflicts between neighbouring states hinder effective responses to these challenges.

Climate-related hazards, which are becoming more frequent and severe due to climate change, are increasing the vulnerability of local communities, threatening their property and agricultural or industrial activities. The absence of direct cooperation between communities and municipalities in different neighbouring countries makes local populations more susceptible to these threats. Furthermore, the lack of joint early warning systems between upstream and downstream countries exacerbates the situation.

In a positive scenario, existing agreements between fire and rescue services of neighbouring countries can speed up their response to cross-border forest fires. Effective flood management in river basins would require a high level of upstream-downstream cooperation.

Economic Dimension

Climate change is significantly impacting the economies of countries and the region. Changes in temperature and precipitation patterns negatively affect all sectors of national economies. Rising temperatures and heat waves create increasing vulnerabilities and challenges related to energy, agriculture, water management, tourism, and overall community life. The economic dimension of vulnerability refers to the sensitivity of an economy in which individuals and communities face exposure to external shocks. Such exogenous shocks can lead to the following disturbances:

- Increased poverty level (disaggregated by gender and age, including female-headed households);
- Migration to cities (disaggregated by gender and age, rural-urban dynamics, seasonal workers, etc.);
- Reduced output in agriculture, fisheries, tourism, service sector, etc.;
- Shocks in energy/power sector, industry/manufacturing.

The impact of climate change on agricultural crops is mainly due to disruptions in the temperature and precipitation patterns, such as long dry seasons, flash floods which can lead to soil and nutrient erosion. At the local level, declining agricultural productivity reduces subsistence farmers' incomes and makes them more vulnerable to poverty and food insecurity.

Many agricultural crops, such as potatoes and grapes, which used to be cultivated in the hilly areas of Azerbaijan, Armenia, and Georgia, now require irrigation. In this case, farmers should either build irrigation systems or abandon traditional occupations and switch to other types of activities. Farmers that quit agriculture migrate to cities and leave their traditional work activities. In the areas where the male population has left, the gender balance is gradually disturbed.

While climate change has temporarily increased the production of certain agricultural products in countries like Moldova and Ukraine, this trend is not sustainable. Future temperature fluctuations may lead to decreased yields, and rising pest populations due to hotter conditions can further jeopardize crop growth.

Physical (Infrastructural) Dimension

Climate vulnerability also has a physical dimension, which includes settlement typology, unplanned and under-serviced neighbourhoods, proximity to coastal areas, etc. In a transboundary context, the relationships between upstream and downstream areas are crucial and can foster positive measures. However, when settlements, constructions, and infrastructure are built without proper planning and do not account for transboundary impacts, they can lead to issues such as flash floods, debris flows, and water pollution. Improper settlement patterns can create numerous problems due to water pollution and poor solid waste management, making local populations more vulnerable to the effects of climate change.

Linear infrastructure, including main gas lines, fuel pipes, and storage can also be hazardous if not properly planned and communicated to neighbouring countries. In this case, upstream accidents can lead to river pollution, reduced access to water, and, as a result, further sensitization of the population both upstream and downstream.

The construction of hydropower plants, water pipelines, and irrigation canals might have negative impacts on equitable water allocation among neighbourhood countries including the shared underground water reserves. Poorly designed industrial infrastructure may contribute to air, soil, and water pollution, increasing the vulnerabilities of nearby communities. Additionally, unplanned actions in downstream areas can create significant problems upstream. For example, excessive water withdrawal and river pollution downstream can hinder fish migrations, adversely affecting upstream communities' livelihoods.

Moreover, military conflicts and closed borders restrict access to essential infrastructure, such as roads, hospitals, firefighting, and emergency services, preventing local communities and authorities from responding effectively to natural hazards.

Institutional Dimension

The institutional dimension of climate vulnerability includes the level of access of local governments to national-level decision-making and financing as well as capacities to develop and implement policies and programs regionally, nationally, or locally. To reduce transboundary climate vulnerabilities and minimize possible climate-related risks, it is important to have developed and well-organized regional and local institutions. These institutions include state organizations, local government bodies, and local and regional civil society organizations, as well as regional organizations that promote cooperation at all levels. Lack of mutual agreements and coordination between neighbouring countries often increases the climate vulnerability of countries and local communities.

The absence of calibrated/standardized data on a regional and cross-border level is another major problem as when data is collected with different methodologies the data sets cannot be easily compared and used for collaborative planning. For instance, unharmonized methodologies and standards of calculation (e.g. water balance and environmental flows) make it difficult to use the data for planning purposes. The availability of jointly monitored or comparable data is essential to make informed decisions on policy mechanisms required for climate adaptation action.

4

REVIEW OF NATIONAL ADAPTATION ACTIVITIES

The countries of the region often act alone in climate change adaptation processes. The National Adaptation Plan processes implemented in the EaP countries cover activities within the national boundaries. These programs are invariably limited by the borders of one country and rarely consider the mitigation of transboundary climate risks originated in neighbouring or other countries. However, transboundary climate risks occur at regional and global scales, often covering large areas and moving from one country to another (Challinor et al, 2018; Bednar-Friedl, Birgit, et al. 2022).

Within the framework of NAP activities, countries are often unable to prepare adequate responses to transboundary climate risks. Moreover, countries that import various “climate-related risks” from upstream countries also ignore downstream countries and “export” other climate risks as well. Table 2 summarizes the status of NAPs for climate change, highlighting their key focus areas and identifying gaps. To date, all plans lack a thorough assessment and integration of regional and transboundary aspects of climate vulnerabilities.

It is critical that, in addition to NAPs, Regional Adaptation Plans (RAPs) are developed. RAPs could address various climatic, economic, and social risks that are transferred across national borders from both downstream and upstream countries.

*For more information see Appendix (p.40)



Table 2. Summary of Climate Adaptation National Action Plans for EaP countries and their focus on transboundary issues

Country	Approval Status	Key Focus Areas	Gaps and Challenges
Armenia	Approved (2021)	Social protection, health care, business opportunities	No proper financial mechanisms, lack of regional and transboundary perspectives, inadequate civil society involvement in implementation
Azerbaijan	In progress, expected (2025)	Agriculture, water management, Caspian Sea level	To date, no transboundary risk consideration, lack of measures for upstream water management in transboundary rivers, regional cooperation gaps
Georgia	In progress	Water resources, mountain ecosystems, forestry, agriculture, tourism, health	To date, no consideration of transboundary aspects or joint action potential with neighbouring countries, NAP in the development stage
Moldova	In progress	Agriculture, water, health, forestry, energy, transport	To date, no consideration of transboundary risks, lack of neighbouring infrastructure use, and unaddressed sea access issues
Ukraine	Approved (2021)	Biodiversity, water, energy, public health, agriculture	Focuses on sectoral and local policy integration, but lack of detailed transboundary risk assessments



Fires in Shiraki valley, Georgia, caused by uncontrolled spreading of agricultural burning and exacerbated by climate change. (Teimuraz Popiashvili.)



EU4Dialogue Component 1 Dialogue activities bringing technical experts together from across the South Caucasus, taking place in Machakhela National Park, Georgia. (Dimitri Saramonow.)

PROPOSING REGIONAL ADAPTATION PLANNING: A WAY FORWARD

5

Climate change may exacerbate regional pressures and conflicts, and national adaptation strategies that overlook the plans of neighbouring countries risk producing ineffective outcomes. Regional Adaptation Plans encompass a broader scope than National Adaptation Plans, which are confined to national boundaries. RAP considers the geographical features of regions by covering larger areas and opening a new avenue for climate change adaptation. Management challenges arising from political borders can be addressed more flexibly through RAP approaches.

Given the diverse economic and environmental characteristics of the region, it is essential to evaluate the economic effectiveness of RAPs. RAPs encourage long-term planning by setting out clear adaptation goals and actions. They also include mechanisms for monitoring and evaluating the effectiveness of these actions, allowing for adjustments as new information becomes available or as climate conditions change. This dynamic approach ensures that adaptation efforts remain relevant and effective over time.

Preparing RAPs requires regional collaboration and sufficient time. Several critical stages in this process include:

- 1. Hazard identification:** At this stage, all countries of the region should identify all climate-induced hazards related to transboundary risks in their territories and their magnitudes. These hazards primarily include heat waves, meteorological droughts, extreme temperatures, sea-level changes, floods, water shortages, and other possible hazards of transboundary scale.
- 2. Vulnerability assessment:** This stage involves evaluating each country's vulnerability to transboundary climate hazards using a specialized scale. Assessing vulnerability in the context of climate change requires a nuanced approach that recognizes the challenges faced by countries, communities and marginalized groups, particularly in regions like the Eastern Partnership countries. In this sense, vulnerability is the lack of adequate responses to the challenges posed by climate change at the regional, national, state, and community levels. In addition, specific vulnerabilities, whether driven by socio-economic status, gender, displacement, or disability, must be identified and mapped to ensure no group is left behind in adaptation efforts.
- 3. Risk assessment:** Risk assessment is based on the ratio of hazard and vulnerability. If the country does not have any transboundary preparedness against possible climate hazards, then the risk is considered high. Similarly, if the country does not have any strategy or plan to overcome climate threats at different levels together with neighbouring countries, then the risk increases. Conversely, if the country could use the resources of neighbouring countries during climate-related threats and disasters, then the climate vulnerability and risk are reduced.
- 4. Developing transboundary adaptation strategies and tailored action plans:** These adaptation plans should encompass transboundary climate risks and responses to those risks. They should also include relevant cross-border adaptation activities within the framework of existing agreements with neighbouring countries.

Common research topics for the region regarding climate change include the assessment of regional climate variability and its impacts on agriculture, water resources, and public health. These countries share similar climatic conditions and vulnerabilities in some areas, which require studying the patterns and projections of climate related indicators changing across the region. Furthermore, research is needed on the development and implementation of sustainable water management practices, given the fluctuating precipitation patterns and increasing incidence of droughts.

Additionally, investigating the effectiveness of different climate adaptation and mitigation strategies, including the establishment of robust Monitoring, Reporting, and Verification (MRV) systems, is crucial for enhancing climate resilience. Collaborative studies on the socio-economic impacts of climate change and its mainstreaming will further support regional efforts to address climate challenges. Improved data quality and sharing among these countries can significantly enhance the accuracy of climate models and the effectiveness of policy responses, making it a vital area of joint research.

Environmental Dimension of Regional Adaptation

For instance, maintaining the connectivity of forest and freshwater ecosystems across national borders contributes to climate mitigation and adaptation. One practical application of this approach could be the development of national forest adaptation strategies in coordination with neighbouring countries, utilizing aligned and harmonized methodologies.

The regional approach to the protection, conservation, and restoration of ecosystems enables bordering countries to align their strategies, measures, standards, and norms, facilitating the management of interconnected ecological systems. Regional cooperation will strengthen and improve the efficacy of national efforts to protect and restore ecosystems. For example, ensuring the connectivity of forest and freshwater ecosystems across national boundaries contributes to climate mitigation and adaptation; it bolsters the resilience of ecosystems and biodiversity by providing refuges against climate change impacts, allowing both ecosystems and populations the space to adapt. Additionally, this approach fosters collaboration in research and monitoring throughout the ecoregion (WWF Caucasus 2020).

Protected areas located along national borders often do not connect with those in neighbouring countries, reducing the effectiveness of species protection. Migratory animals frequently cross into neighbouring territories, where they may be hunted. Additionally, some wild species may migrate in large numbers due to safety concerns, which can exert pressure on ecosystems and lead to land or ecosystem degradation. Thus, it is crucial to adopt regional approaches as part of integrated solutions. In this context, regional adaptation plans can enhance ecosystem services and improve wildlife protection.

There are many areas in neighbouring countries that should be jointly protected. These areas include both river basins and woodlands or other ecosystems. In many cases, two neighbouring countries have two national parks or other protected areas close to each other. For example, Shikahogh park and Zangezur sanctuary located in Armenia, Zangezur National Park located in Azerbaijan, as well as Ordbad reserve are located in nearby areas. In the future, coordination between these protected areas can play a positive role in forest fire management and better protection of ecosystems. The same idea can be applied to the Zagatala reserve of Azerbaijan and protected areas of Lagodekhi in Georgia. Coordinated management of these areas between states can give a serious impetus to the improvement of the ecosystem services of these natural objects and the development of tourism at the regional level.

A RAP would allow the application of forest and biodiversity management approaches on regional, national and local levels that would improve the protection of wild species and forests. For example, forest fire management can be more effectively addressed at the transboundary level, with countries supporting each other through shared firefighting resources.

Establishing regional early warning systems may help to develop better response measures. Additionally, fostering relationships between upstream and downstream areas may facilitate integrated solutions for hazard identification, forecasting, and disaster risk reduction.

Integrated solutions should also focus on enhancing infrastructure to prevent water pollution and improve roads, bridges, and hydraulic systems. Strengthening these solutions in upstream areas can increase access to both drinking and irrigation water, benefiting downstream regions as well.

Suggested measures:

Short-term (1-3 years)

State agencies share experiences and approaches to address the environmental dimension. A good example of this is the EU4Environment-funded exchanges between hydro-meteorological agencies of Armenia, Azerbaijan, and Georgia. Similar collaborations can occur regarding transboundary water issues, such as quantity and quality monitoring, and the alignment of methodologies, measures, and standards. Another example is the USAID-funded exchange of experience and study tours between Georgian and Armenian hydrometeorological and environmental monitoring agencies.

Involvement of civil society organizations and academia can enable joint research, education, discussions on methodologies, implementation of pilot initiatives, while also raising awareness. These efforts can strengthen the connections and understanding among regional actors, fostering a more collaborative environment for addressing climate change risks.

Medium-term (4-7 years)

Agreement on the next steps for aligning and harmonizing environmental monitoring and planning regulations, standards, and guidelines is essential. This includes piloting regional climate vulnerability assessments.

Expanding academic cooperation in research and education is also crucial. This could involve developing joint or dual degree programs in environmental and sustainability fields, as well as promoting student exchanges. Additionally, establishing joint certifications in environmental and energy auditing and green skills would be beneficial.

Supporting small and medium-sized enterprises (SMEs) in adopting green technologies and facilitating cooperation among business sectors will enable and promote cross-border commerce.

Long-term (8-15 years)

This is related to the development of joint frameworks for regional cooperation addressing climate vulnerability issues and related activities (e.g. integrated financial scheme, supporting and expanding commerce and business).



Khor Virap wetland, Armenia, endangered by climate change due to escalating evaporation and evapotranspiration. (Sergo Arakelyan.)

Economic Dimension of Regional Adaptation

Regional cooperation in addressing economic aspects of climate change induced vulnerabilities is critical. Specialization in agricultural products, which are very diverse from the climate point of view, will increase opportunities for product exchange between countries and create conditions for applying more and more trade-off schemes. Regular heatwaves in both urban and rural areas reduce people's ability to maintain previous amounts of working hours, while the cost for indoor cooling continues to rise. Regional cooperation can alleviate some of the economic costs while also providing some economic benefits as outlined in Table 3.

Table 3. Potential Economic Benefits of Integrated Solutions

Outcomes	Economic Benefits
Prevention of untreated wastewater, industrial and agricultural discharges	<ul style="list-style-type: none"> • Improved fish stocks • Improved recreational activities • Increase in black caviar production • Risk reduction in waterborne diseases • Improved public health • Improved ecosystems • Improved water supply in downstream areas • Improved basin management in upstream areas • Improved water supply for suburban agriculture
Improved basin management	<ul style="list-style-type: none"> • Improved water supply in downstream areas including for agriculture • Improved and new recreational activities • Improved ecosystems • Improved fire management • Increase in property values • Improved quality of recreational and touristic activities at transboundary scale
Establishment of regional early warning systems	<ul style="list-style-type: none"> • Improved resilience to climate-related hazards • Reduced economic losses • Better protected economic facilities • Better protected residential areas

Social Dimension of Regional and Transboundary Planning

The multiple social dimensions of climate vulnerability are complex and interconnected, affecting every aspect of human life. Addressing these dimensions requires a holistic approach that integrates social equity, justice, and inclusion into climate adaptation strategies. By focusing on the needs and strengths of vulnerable populations, and by promoting resilience at the community level, adaptation measures can be created that not only protect people from climate impacts but also ensure long-term regional sustainability.

Involving bordering local communities in planning and decision-making is necessary. This engagement helps to incorporate local knowledge and perspectives related to cross-border cooperation and mutual exchange. Vulnerable groups, including low-income families, the elderly, and marginalized communities, should be prioritized in adaptation and mitigation strategies that encompass all transborder communities.

Climate change adaptation strategies cannot be “gender neutral”. Gender sensitive adaptation addresses gendered inequalities and enhances gender equality. This can be achieved by involving men and women, their specific groups’ representatives and others, starting with needs assessment, followed by awareness raising, capacity building and addressing population challenges at all stages of the adaptation process.

Enhancing coordination, networking, and sharing of knowledge and skills among border communities can help address gender issues and better adaptation to climate-based threats. These connections ultimately lead to higher levels of education and equip individuals with skills for hazard preparedness, as well as income diversification and enhancement.

Given this context, special attention should be paid to gender equity in climate adaptation actions. Tailoring interventions to address the unique needs of women and marginalized groups is essential to ensure that climate resilience efforts are inclusive and effective. This includes improving access to essential services and enhancing economic opportunities. Integrating gender-sensitive approaches in climate adaptation regional strategies is not only a matter of social justice but also a critical factor in the success of these interventions. Addressing the gendered dimensions of climate impacts can lead to more equitable and sustainable outcomes, benefiting the entire population and fostering resilience in both rural and urban communities across the region.

Additionally, climate risk management should also be integrated into the planning and implementation of responses addressing vulnerabilities of displaced populations. These groups, often already marginalized, face heightened risks from climate-related hazards. Effective climate risk management should be embedded in displacement planning through assessing climate risks in displacement contexts and developing strategies that involve measures that reduce the exposure of displaced individuals to climate hazards.

The existence of strong connections between neighbouring areas and communities located in different countries enables creation of new sources of income and reduce unemployment. In this case, the possibilities of better adaptation to the current climate threats increase. Strengthening trade relations between neighbouring communities, establishing permanent connections between institutions, increasing student exchanges, and facilitating access to social services in neighbouring countries all contribute to reducing social vulnerability.

Having consistent climate policies among countries in the same region is crucial for effective exchange. Empowering these countries to leverage all available resources to enhance climate resilience in their policies allows them to maximize their adaptation efforts.

Suggested measures:

- **Community engagement:** Involve local bordering communities in planning and decision-making, as understanding local knowledge and perspectives helps tailor interventions effectively.
- **Equity and inclusivity:** Ensure that vulnerable groups, including low-income families, the elderly, and marginalized communities, are prioritized in adaptation and mitigation strategies that encompass all regions.
- **Education:** Increase awareness about climate risks and adaptation measures through education programs and outreach activities. This would include following activities:
 - Development of teaching materials that highlight regional problems and show their solutions at the school and college level.
 - Facilitation of the exchange of educational specialists and students at the regional level.
 - Inculcating more efficient solutions to climate preparedness problems at the regional scale through various programs.
- **Strong social networks:** Support community networks and organizations that can provide assistance and resources during climate events (Development and environmental agencies, NGOs, etc.).
- **Economic support:** Implement financial support mechanisms, such as subsidies or insurances, to help vulnerable populations cope with climate impacts.
- **Infrastructure improvement:** Invest in infrastructure that protects vulnerable communities, such as flood defences and disaster-resistant housing.
- **Policy integration:** Incorporate social vulnerability considerations into broader climate policies and strategies to ensure comprehensive approaches that will also reflect regional policy.

Regional Cooperation in Infrastructure Planning

Physical infrastructure significantly impacts the environment at both national and regional levels. To mitigate negative environmental effects that could lead to major disasters, it is essential to cooperate closely at the regional level in the planning and construction of large engineering projects, as well as linear and hazardous infrastructure.

Adding regional or cross-border elements to the vulnerability assessment for land use planning can help to identify adaptation needs, which can then be translated into specific adaptation actions - some of which may be implemented jointly or extend beyond national borders. Transboundary impact assessments are beneficial when planning new developments, including agricultural projects, that would increase utilization of shared natural resources. For example, during land use planning, transboundary impacts should be particularly evaluated in relation to industrial development.

One of the sensitive regional issues is the management and use of shared natural resources. These can include underground water reservoirs, karst caves, pastures, hydrocarbon-based resources, etc. Their joint use requires close cooperation between the states to prevent possible conflict situations, preserve resources and avoid disasters. It is crucial that cooperation takes place at different levels, from civil society to expert working groups/commissions and intergovernmental agreements, hence, establishing sustainable platforms for interaction among the stakeholders of the neighbouring countries within the region are necessary.

Partnerships through Early Warning Systems help generate more detailed information about potential meteorological and water hazards. For instance, sharing radar system data from one country with a neighbouring country can enhance information accuracy and improve forecasts. Efficient disaster response measures, including the utilization of critical infrastructure in neighbouring countries, such as roads, hospitals, firefighting, and emergency service, are essential for local communities and authorities at all levels during climate-related hazards.

The existence of jointly developed and operated water supply, irrigation and wastewater management systems, and the joint construction and operation of water reservoirs in border regions can help to increase access to water for communities in neighbouring countries, support traditional lifestyles and ultimately reduce climate vulnerability.

To establish these types of management schemes, it is important to have bilateral or multilateral agreements between governments. These agreements should strengthen cooperation between neighbouring communities, promote collaboration among NGOs, and create community-based participatory management schemes.

Suggested measures:

- **Joint stocktaking:** Conduct a comprehensive inventory of regionally connected critical infrastructure for emergency response during climate-induced hazards.
- **Environmental impact assessments:** Incorporate potential transboundary environmental impacts into environmental impact assessments.
- **Joint operation and planning:** Collaborate on the planning and operation of linear infrastructure, considering the regional contributions of such infrastructure to climate change adaptation.
- **Cooperation and oversight:** Enhance cooperation and oversight regarding the servicing and maintenance of hazard-related infrastructure.
- **Regional resource allocation:** Adopt a regional approach to the allocation of shared resources.

Institutional and Regulatory Procedures Needed to Enable Regional Adaptation Planning and Action

Institutionalisation at the regional level requires regional and bilateral agreements. Such agreements could promote the joint use of shared resources and address possible transboundary issues between states. These agreements could encompass the collaborative use of critical infrastructure, management of transboundary natural resources, stewardship of protected areas, enhanced relations between border communities, and the exchange of goods and services.

Harmonized legislation, technical regulations and methodologies on a national level will facilitate a unified approach and enable comparable data for regional vulnerability assessment, data exchange among countries and joint/coordinated adaptation planning.

Effective climate action requires collaboration among various institutions, including government agencies, NGOs, private sector entities, and academic institutions. Poor coordination among these institutions can lead to fragmented efforts, redundancies, and inefficient use of resources. For example, community-level disaster risk management plans should be integrated across neighbouring communities, even if they are in different countries. This will allow neighbouring communities to use each other's resources more efficiently during a disaster.

Collaboration between public institutions and the private sector can further enhance the reach and impact of climate initiatives. These partnerships can bring together financial resources, technical expertise, and innovation to address climate challenges.

Suggested measures:

- **Establishment of inter-governmental bodies/councils** that would develop unified responses to climate hazards.
- **Alignment with the EU standards/legislation** through harmonization of national legislation, standards, norms, statistics, and methodology of vulnerability assessment.
- **Developing** sustainable and comprehensive, constantly evolving **regional networks** and open platforms for exchanging views, best practices, interconnectedness, etc. and establishing professional associations and community networks.
- **Integrated water management** via regional organizations such as river commissions and river basin councils.
- **Preparation of joint regional strategies** at all levels, including academia, civil society, local government, central authorities, and other sectors.
- **Ensuring** that **resource mobilization** for identification and implementation of joint projects and initiatives is based on joint strategies.

RAP as a Tool for Enhanced Transboundary Water Management

Transboundary river basins and lakes play a key role in Regional Adaptation Plans in cross-border contexts. These water bodies offer shared resources that promote cooperation and reveal regional climate impacts. Water management is central to a RAP, providing a comprehensive analysis of water use and non-use across countries, with a focus on integrated water resources management (IWRM).

RAPs address potable water, irrigation, wastewater treatment, environmental flows, and hazards like floods and droughts. They treat water supply as part of a broader strategic plan for shared catchment areas, covering drinking water, sanitation, recreation, and recycling. Recreational values, ecological flows, and effective wastewater management guide policies, ensuring long-term sustainability over immediate gains.

Transboundary application of IWRM reduces climate vulnerabilities by:

- **Implementing early warning systems** on a cross-border scale to enhance resilience against hazards such as flooding, flash floods, and mud and debris flows, thereby minimizing climate-induced losses.
- **Reducing pollution** in upstream areas to improve access to safe water downstream.
- **Ensuring environmental** flows to facilitate fish migrations from downstream to upstream, which can enhance local incomes.
- **Minimizing water losses** and transitioning to low-water technologies to strengthen the water-food-energy-environment nexus.



Dniester River branch near Coșnița village, Moldova, remains almost without water due to long-term summer drought. (Ilya Trombitsky.)

Moldova – Ukraine Case

According to the World Resources Institute, Moldova and Ukraine are among the countries with the highest risk of drought globally. Eastern Europe, in particular, is vulnerable to shifts in temperatures and rainfall patterns, that are diminishing crops and exacerbating water scarcity. While many regions in Asia, the Middle East, and North Africa also face significant drought risks, Moldova and Ukraine are unique in their heavy reliance on external sources for their renewable water resources, with Moldova depending on over 90% and Ukraine on 62% of their water supply from neighbouring countries.

Addressing this challenge requires robust and coordinated water management strategies. While both Moldova and Ukraine have recognized the urgency of the issue, and as result have developed policies aimed at improving water management, their implementation has lagged so far. One of the central frameworks guiding water resource management in the region is the European Union’s Water Framework Directive (WFD), which calls for Member States to manage water resources at the river basin level and to create River Basin Management Plans (RBMPs). These plans are essential tools for managing drought risks. However, while Moldova has adopted its second RBMP for the Dniester River, and Ukraine developed its first RBMP in 2023, there is still no joint Moldovan-Ukrainian plan, nor are there national Drought Management Plans.

A key document that offers a pathway to improving drought resilience is the “Strategic Framework for Adaptation to Climate Change in the Dniester River Basin.” This framework was created in 2015 under the Environment and Security Initiative (ENVSEC) with support from the European Union. It highlights the best practices to respond to climate change impacts in the Dniester basin, including measures for addressing the frequent floods and water quality deterioration caused by climate change. An Implementation Plan was also developed to ensure these measures are carried out.

The Strategic Framework and its Implementation Plan represent significant progress, but the lack of full execution remains a concern. Both Moldova and Ukraine have agreed at the governmental level that these policies need to be implemented, yet neither country has fully realized the frameworks laid out in these documents. The next step is the development of a joint Dniester RBMP and national Drought Management Plans, which upon successful implementation would not only enhance regional cooperation but would also serve as a model for other regions facing similar challenges, like the South Caucasus.

The South Caucasus region, which also experiences climate-related water stress, could greatly benefit from the lessons learned in the Dniester basin. By studying the policies and frameworks developed in Moldova and Ukraine, countries in the South Caucasus could adopt best practices for climate adaptation, water management, and drought mitigation. The Strategic Framework and Implementation Plan provide a valuable resource on how to address transboundary water management in the face of climate vulnerability.

Key Documents:

Strategic Framework for Adaptation to Climate Change in the Dniester River Basin
<https://www.osce.org/files/f/documents/9/b/260306.pdf>

The Implementation Plan of the Strategic Framework for Adaptation to Climate Change in the Dniester River Basin <https://www.osce.org/files/f/documents/3/b/366721.pdf>

Moldovan Dniester RBMP, https://mediu.gov.md/sites/default/files/Documente%20atasate%20Advance%20Pagines/Dniester_RBMP_en.pdf

Ukrainian Dniester RBMP, https://davr.gov.ua/fls18/tu/RBMP_Dniester/purb_dnis.pdf

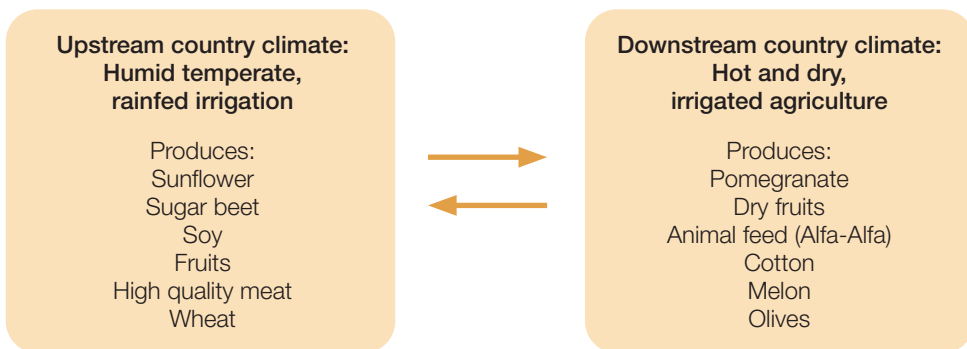
Upstream-Downstream Relations

Water resource planning and management, effective implementation of agricultural practices as well as the formulation of suitable policies, are complicated tasks that require a systematic, integrative, and interdisciplinary assessment across multiple scales. Upstream-downstream communication, cooperation, and data sharing is necessary for risk management to quantify uncertainties at basin level. They facilitate stakeholder participation and institutional mechanisms through various tools and risk assessment methodologies, helping decision-makers understand and evaluate alternative measures and choices.

Taking into account the upstream-downstream linkages in preparing a RAP are crucial of conserving water and land resources as well as managing climate-related hazards. These relationships help reducing poverty and develop more sustainable models in the face of climate change.

The table 4 below shows an example how upstream and downstream linkages can benefit exchange of agricultural goods. Strong upstream-downstream connections can help to save water and land, while simultaneously increasing the importance of other environmental values. For example, producing certain fruits in the downstream country often requires significant water and pesticide use, whereas the same fruits can be grown in the upstream country with less irrigation and fewer pesticides, due to more favourable climatic conditions.

Table 4. Upstream-downstream linkages in agriculture



Co-management of pesticides can on one hand provide multiple benefits for transboundary communities, which can reduce pesticide-use and other subsequent negative impacts on economic activity (e.g., adverse effects on beekeeping, etc.), while on the other hand, compliance with pesticide standards can further minimize various side effects.

Regional cooperation mechanisms are essential for addressing these issues. Organizations like the UN, EU, International Development Banks, as well as various bilateral agreements such as the Convention on Transboundary Water Courses, Rivers and Lakes (Helsinki Convention), aim to foster dialogue and promote equitable water management practices.

Examples of successful upstream-downstream collaboration include the Rhine, Danube, and Mekong River basins. The Mekong River Commission (MRC) initiated the Climate Change and Adaptation Initiative (CCAI) to help countries adapt to climate impacts, for instance by assisting Vietnam to sufficiently prepare for the sea-level rise and saltwater intrusion in the Mekong Delta, whilst working with upstream countries to regulate water flows.

In preparation of a RAP it is crucial to address upstream-downstream relationships for conserving water and land resources, reducing conflict risks around water allocation, as well as managing climate-related hazards. These linkages help to reduce poverty and promote sustainable development in the face of climate change.

South-Caucasus Case

The three countries of the South Caucasus, Armenia, Azerbaijan and Georgia, are closely related to each other due to their geography. Beyond their shared socio-cultural space, these countries have similar geographical features, climatic conditions, landscapes, and transboundary water resources within the Kura-Araks River Basin. This makes it essential to study the changing patterns and projections of climate-related indicators across the region. The cooperation on vulnerability assessment is especially important at the transboundary basin scale where regional cooperation for water-related adaptation could be mutually beneficial, as reducing vulnerability in one part of the basin can positively impact vulnerability elsewhere. For this reason, developing a common understanding of the basin-wide vulnerability is necessary, along with creating common models and scenarios based on agreed upon information and methodologies. The vulnerability assessment can then serve as the basis for elaborating a basin-wide adaptation strategy and plan to address climate change impacts. Comprehensive information and data from the entire basin are needed for developing the strategy and identifying vulnerabilities and impacts. Therefore, it is necessary to ensure the collection and sharing of relevant data, information, and models across the entire water cycle. A monitoring system is necessary for the regular update of the assessments, the scenarios of change, and the water balance projections to facilitate flexible adaptation (Water and Climate Change Adaptation in Transboundary Basins, UNECE 2015).

Joint research is also needed to assess regional climate variability and its impacts on agriculture. The risks of climate change in the South Caucasus are expected to have serious consequences for the agricultural sectors in Armenia, Azerbaijan, and Georgia (Ahouissoussi, et al., 2014). The urgency for action at the national and subnational levels cannot be overemphasized. However, it is advisable for the countries of the South Caucasus to address climate change vulnerability through the coordinated management of shared water resources, as this approach can effectively enhance food security.

Coordinated water management has the potential to provide the following key benefits:

Transboundary integrated water resource management for hydropower development and water management can provide an opportunity to optimize water use across all demand categories throughout the Kura-Araks basin. This optimization could yield benefits for agriculture and hydropower, potentially contributing to one or more riparian countries or the region as a whole.

Regional water quality management and monitoring would provide economic and environmental benefits across the basins. Interventions such as improved on-farm drainage, along with better fertilizer and pesticide management by upstream riparian, could lead to significant downstream advantages, including increased production at reduced costs and enhanced water quality. Protection of riverine aquatic ecosystems, and the Black and Caspian Seas, will require collaboration among the riparian countries resulting in better water quality for all uses.

Collaboration on regional adaptation strategies is needed to maximize the shared benefits and avoid conflicts between countries. For example, if an upstream country selects increased irrigation as its adaptation preference, it may leave little to no water for downstream users. A regional adaptation approach could help avoid such scenarios. Additionally, enhancing irrigation efficiency in any upstream riparian will not only benefit local communities economically but also increase water availability downstream.

Payments for Ecosystem Services

In view of growing concerns related to ecosystem degradation, it is vital to develop ways that would enable the management of ecosystems in a more sustained way. To promote conservation and protection of natural resources and improve services provided by ecosystems, various types of market driven mechanisms can be designed. An important category of market-based mechanisms is known as payments for ecosystem services (PES). Through PES, landowners are supported financially to change their land-use styles and provide ecosystem services. The beneficiaries (buyers) of such ecosystem services can be direct users (having direct welfare gain in purchasing such services) or non-users interested in improving ecosystem services.

In almost all PES schemes, managers of natural resources and ecosystems are paid to manage their resources more effectively. This includes protecting land, preserving biodiversity, and enhancing carbon sequestration capabilities through practices such as replanting trees, reducing grazing, and adopting more environmentally friendly agricultural methods.

Payment of ecosystem services at the transboundary scale can be made for clean water and co-management of climate-related hazards. Thus, the upstream country can implement payment or investment schemes for the prevention of water pollution, land degradation and deforestation in its territory. In turn, a downstream country can compensate the upstream country for its pollution prevention efforts in the basin or for sustainable forest management practices. Potential options for the downstream country include investing in sustainable development and effective basin management within the upstream country or both countries participating directly in integrated water management schemes (Table 5).

Table 5. Payment for Ecosystem Services within RAP

Main PES types		
Co-management	Public PES	Cap and Trade
<p>Downstream country directly pays upstream country to improve ecosystem services</p> <p>Involved countries share costs for integrated management of water and land resources</p> <p>Downstream country makes investment to proper land use management in upstream country</p>	<p>Fiscal mechanisms driven by downstream government (e.g. subsidies to landowners in upstream)</p> <p>Voluntary payments to PES funds</p>	<p>Establishing a cap (an aggregate maximum amount) for water pollution or abstractions in both countries</p> <p>Water withdrawal and pollution permits in both countries</p> <p>Maximum allowable use permits</p> <p>Trading with permits</p>

PES-type economic-based schemes are thought to play a crucial role in reducing climate vulnerability. Key features of these schemes include access to clean water, adaptation to extreme climate events, and effective management of forest fires.

Water-Energy-Food-Ecosystem Nexus

Water-Energy-Food-Ecosystem (WEFE) nexus approach enables countries on a cross-border scale to achieve better environmental protection results by facilitating the exchange of goods and optimizing resource use. This approach enhances both economic conditions and environmental sustainability in the long term.

A sustainable energy sector is crucial for climate adaptation. By integrating energy systems across neighbouring countries, nations can save energy and reduce costs through mutual support during crises, ensuring the provision of energy and food while maintaining strong environmental relations. Efficient energy production not only conserves water but also enhances environmental protection and boosts food production.

Joint investments in renewable energy sources can increase the energy security of partner countries, increase resilience to climate change, and contribute to reduced carbon emissions. Energy and water exchange can foster partnerships between countries ensuring the ecological flow of rivers and enhancing security and climate resilience in border communities.



Climate change-driven river water decline, affecting biodiversity, damages economic sectors, such as fish farming, irrigation and energy. (Kristine Ter-Matevosyan.)



Mount Kazbegi, Mkinvartsveri, Georgia. Studies indicate a significant decrease in Caucasus glaciers as a result of climate change. (Nino Alavidze.)

6

CONCLUSIONS

The primary purpose of a RAP is to enhance the capacity of a region to cope with and adapt to the adverse effects of climate change, as well as to promote sustainable development while safeguarding the well-being of local communities and ecosystems.

The current approach to climate adaptation based on National Adaptation Plans, is less sustainable for several reasons.

Secondly, the lack of cooperation between countries does not allow efficient use of the resources, including natural, infrastructure and energy assets. Collaborative resource management can lead to greater success in adapting to climate change. In this context, easing political boundaries allows for more effective resource utilization and fosters new areas of activity, such as tourism and sustainable agriculture.

Thirdly, the diversity of stakeholders at the transboundary level, combined with fragmented approaches to climate hazard management, makes partitioned planning inherently inconsistent and a potential source of conflict. This can ultimately undermine the effectiveness of various plans and negatively impact the involved stakeholders.

A RAP, being a broader and more detailed approach, considers the impact of climate changes on the regional level and allows for the joint use of countries' resources by minimizing shortcomings of political boundaries. Recognizing that climate vulnerability is primarily a social phenomenon, the development of joint adaptation strategies enables the shared utilization of human, infrastructure, energy, and water resources, enhancing resilience to climate impacts on regional, national and local levels.

Final suggestions:

- Preparing Regional Adaption Plans for specific dimensions.
- Applying transboundary integrated water resources management.
- Implementing early warning systems on a cross-border scale.
- Conducting joint regional research, planning, and oversight.
- Preparing joint regional strategies at all levels, including academia, civil society, local government, central authorities, and other sectors.
- Involving local bordering communities and vulnerable groups in planning and decision-making.
- Increasing awareness about regional climate risks and adaptation measures.
- Establishing regional inter-governmental bodies/councils that would develop unified responses to climate hazards.

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Dniester river tributary near Rădeni village, Moldova, remains without water due to long summer droughts and sub-basin deforestation. (Ilya Trombitsky.)

APPENDIX

National Adaptation Plans

NAP Armenia

The Government of Armenia approved the National Plan of Adaptation to Climate Change in 2021, which includes a list of measures for 2021-2025. NAP Armenia assures that the implementation of the considered actions will lead to tangible results ensuring social protection and health care, reduced risks of natural disasters, and new opportunities for business and investments safety.

However, Armenia's NAP does not consider several important factors related to transboundary climate risks and is more tailored to the local context. Firstly, it has no proper financial mechanism necessary for the effective and regular implementation of activities included in the NAP. Secondly, essential gap is the lack of real and justified actions on regional cooperation, as well as a lack of assessment of transboundary climate risks and a collaborative approach that is acceptable to all parties involved in addressing these challenges.

Lack of access to the sea is one of the reasons for the high vulnerability of the country. It complicates the transfer of technologies. In the developed regional adaptation plan, special attention should be paid to this factor, which is important for Armenia and Azerbaijan. The NAP of Armenia also does not consider the issue of using the capabilities of neighbouring countries (roads, resources, infrastructure, social institutions, etc.) to reduce climate impacts.

Among other disadvantages, the most important is the fact that civil society is practically not involved in the implementation of the National Adaptation Plan. The population, as the primary beneficiary of the country's natural (including climate) resources, lacks the means to actively participate in climate change adaptation efforts, particularly in terms of financial resources.

NAP Azerbaijan

In Azerbaijan, the approval of the NAP document is expected in 2025. The NAP prepared by the Government of Azerbaijan currently considers three major areas: agriculture, water management and Caspian Sea level fluctuations. According to the NAP of Azerbaijan, main outcomes will be improved data access and sharing for decision making, increased institutional and technical capacity, increased mainstreaming of adaptation activities at national, regional and local planning through the development of applied tools, improved legal framework and monitoring. Within the framework of the set goals, it is planned to prepare a NAP for the management of water, agriculture and coastal areas.

However, the NAP of Azerbaijan does not consider climate risks on a transboundary scale. Besides, it does not envisage actions to reduce other risks arising from the lack of transboundary climate risk reduction. The NAP mainly envisages the preparation of adaptation measures for administrative regions. However, measures related to water and agricultural management in the border regions are not considered within the initiatives to be implemented in the neighbouring country. On the other hand, Azerbaijan's NAP does not address climate vulnerabilities that stem from regional non-cooperation, which can only be resolved through collaborative efforts. As a result, it lacks sufficient resources to effectively tackle adaptation challenges within the country. For instance, if an administrative district is situated downstream of a transboundary river, the plan does not take upstream water management measures into account.

NAP Georgia

In response to the climate threats facing the country, Georgia has identified national adaptation priorities, which are based on prioritized resources (above- and below-ground water resources, mountain ecosystems, biodiversity) and priority sectors (forestry, agriculture, tourism, health, energy, and strategic infrastructure). More specifically, adaptation measures to be included in the National Adaptation Plan are given in Georgia's updated Nationally Determined Contribution Document (2021) and includes:

- Assessment of the impact of climate change on glaciers, economic situation of the mountainous and coastal regions and livelihoods of the local population for the sustainable management of these regions.
- Assessment of the impact of climate change on the availability of groundwater and surface water resources for sustainable use in agriculture (irrigation), energy production and household purposes in a long-term perspective.
- Assessment and development of the adaptive capacities for the agricultural productions that have the largest share in national GDP (e.g. grape, hazelnut, tangerine) and/or for domestic unique products (such as Georgian honey, non-timber forest products).
- Development of adaptive capacity of the most vulnerable winter and coastal resorts.
- Encouragement of conservation of the species that are endemic, protected under the Red List, as well as indigenous species with a significant importance for food and agriculture.
- Assessment of climate change effects on human health through the interdisciplinary study of the relationships between social, economic, biological, ecological and physical systems.
- Facilitation of the measures for reduction of losses and damages caused by extreme weather events.

Despite the obvious advantages and benefits of addressing climate change adaptation from the transboundary and regional perspective, this dimension is unfortunately missing. Shared river basins, common ecosystems and significant social and economic connections with its neighbouring countries, are likely to serve as a catalyst for joint actions. However, at present, transboundary aspects are rarely considered in the adaptation agenda of Georgia.

Georgia has acquired resources to develop a NAP and the work is ongoing.

NAP Moldova

The National Climate Change Adaptation Program (NCCAP), adopted by the Government of the Republic of Moldova in August 2023, was developed with the support of the UNDP Moldova project “Promoting the national adaptation planning process of the Republic of Moldova to climate change”, financed by the Green Climate Fund.

The Republic of Moldova has proposed to align itself with global efforts to limit the negative impact of climate change: “The national climate change adaptation program” until 2030 consists in ensuring the integration of adaptation measures in sectoral policies, in synergy with policy documents in the field of adaptation to climate change, as well as in the field of disaster risk management. The program was developed to increase the country’s climate resilience. To this end, policies with targeted actions are needed. That is why the program focuses on several sectors vulnerable to climate change.

The aim of the NCCAP 2030 is to integrate climate change adaptation measures into development planning at all priority levels and sectors ensuring environmental sustainability and long-term climate resilience for economic, social, and ecological systems. In this regard, the focus will be maintained on the six vulnerable sectors - agriculture, water resources, health, forestry, energy and transport - to achieve the national development agenda embedded in the National Development Strategy (NDS) “European Moldova 2030.

The NAP document of Moldova does not consider transboundary climate risks nor the resources available in neighbouring countries to reduce climate vulnerabilities. Issues such as facilitating access to the sea, managing cross-border river risks, and using the infrastructure of neighbouring countries are not included.

The Environmental Security and Climate Adaptation Strategy of Ukraine

The Ukrainian Environmental Security and Climate Adaptation Strategy until 2030, complemented by the Operational Action Plan, was approved on 20 October 2021. It is designed to increase environmental safety, reduce the effects and consequences of climate change in Ukraine.

The Strategy sets the framework for adaptation action in Ukraine, focusing on essential steps to assess climate impacts on society, economy and environment, integrating adaptation in sectoral and local policies, and ensuring more effective use of climate data. The Action Plan sets out required changes to legislation, including the integration of climate adaptation into local economic and social development strategies, as well as enhancements to the environmental assessment and environmental impact assessment processes.

According to the Strategy, the most vulnerable sectors to the effects of climate change in Ukraine are biodiversity, water resources, energy, public health, forestry, coastal areas, fisheries, agriculture, soils, etc. These areas will be the primary focus of the Government’s activities under the implementation of the document.

