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Luminița DIACONU¹
lumidiaconu74@gmail.com

ECOLOGICAL SECURITY DIMENSIONS IN THE CLIMATE CHANGE ERA: STRATEGIES, FRAMEWORKS AND POLICY IMPLICATIONS FOR MOLDOVA AND THE EU NEIGHBOURHOOD

Abstract: *In an era of unprecedented climate change, ecological security has emerged as a critical dimension of human, national, and regional security. This paper examines the complex interplay between environmental degradation, climate variability, and socio-political vulnerabilities in Moldova and the broader EU neighborhood, with a focus on transboundary resource management and policy responses.*

Aim: *By integrating scenario-based planning, adaptive governance frameworks, and ecological peacebuilding strategies, the study demonstrates how climate-induced ecological stress functions as a “threat multiplier,” exacerbating water scarcity, agricultural disruption, energy insecurity, and socio-political tensions. The Dniester River Basin case study exemplifies the urgent challenges of managing shared water resources under uncertain climate trajectories, highlighting the need for multi-level governance, predictive monitoring, and community engagement.*

Methodology: *Comparative analyses of Moldova, Eastern Partnership countries, and EU member states reveal both governance gaps and opportunities for proactive, coordinated policy. The paper argues that effective ecological security requires not only technical solutions but a moral and strategic commitment to human well-being, social resilience, and regional cooperation.*

Discussions and results: *Ultimately, it contends that the failure to integrate ecological considerations into national and regional security frameworks risks cascading crises, whereas anticipatory, collaborative, and human-centered strategies can transform vulnerability into resilience, forging a pathway toward sustainable peace and prosperity in the face of accelerating environmental change.*

Keywords: *ecological security, climate change, transboundary resource management, adaptive governance.*

¹ PhD, Academy of Economic Studies of Moldova (ROR: <https://ror.org/04d26v797>), e-mail: rectorat@ase.md; ORCID ID: <https://orcid.org/0000-0002-6736-6344>, e-mail: lumidiaconu74@gmail.com

DIMENSIUNILE SECURITĂȚII ECOLOGICE ÎN ERA SCHIMBĂRILOR CLIMATICE: STRATEGII, CADRE INSTITUȚIONALE ȘI IMPLICĂRI POLITICE PENTRU R. MOLDOVA ȘI VECINĂTATEA UE

Abstract: Într-o eră marcată de schimbări climatice fără precedent, securitatea ecologică a devenit o dimensiune esențială a siguranței umane, naționale și regionale. Lucrarea examinează interacțiunea complexă dintre degradarea mediului, variabilitatea climatică și vulnerabilitățile socio-politice în Republica Moldova și în vecinătatea extinsă a Uniunii Europene, cu accentul pus pe gestionarea transfrontalieră a resurselor și reacțiile politice.

Scopul: Prin integrarea planificării bazate pe scenarii a cadrelor de guvernare adaptivă și a strategiilor de construire a păcii ecologice, studiul evidențiază modul în care stresul ecologic indus de schimbările climatice funcționează ca un „multiplicator de amenințări”, amplificând penuria de apă, perturbarea agriculturii, insecuritatea energetică și tensiunile socio-politice. Studiul de caz al bazinului râului Nistru ilustrează provocările urgente privind gestionarea resurselor de apă comune în condițiile unor traiectorii climatice incerte, evidențiind necesitatea unei guvernări multi-nivel, a monitorizării predictive și a implicării comunităților.

Metodologie: Analizele comparative ale Republicii Moldova, țărilor Parteneriatului Estic și statelor membre UE relevă atât lacune în guvernare, cât și oportunități pentru politici pro-active și coordonate. Lucrarea dată susține că securitatea ecologică eficientă necesită nu doar soluții tehnice, ci și un angajament moral și strategic față de bunăstarea umană, reziliența socială și cooperarea regională.

Discuții și rezultate: În cele din urmă, se afirmă că eșecul integrării considerentelor ecologice în cadrele de securitate naționale și regionale riscă să provoace declanșarea unor crize în lanț, în timp ce strategiile anticipative, de colaborare și centrate pe oameni pot transforma vulnerabilitatea în reziliență, deschizând calea către pace și prosperitate durabilă în fața accelerării schimbărilor de mediu.

Cuvinte-cheie: securitate ecologică, schimbări climatice, gestionarea resurselor transfrontaliere, guvernare adaptivă.

1. INTRODUCTION

The rapid intensification of global climate change has transformed ecological security from a peripheral concern into a central element of national, regional, and international security strategies. Environmental degradation, previously treated as an externality in economic and security planning, now constitutes a direct and multifaceted threat to state stability, human well-being, and geopolitical equilibrium. This is particularly acute in regions such as Eastern Europe, where post-Soviet environmental legacies intersect with limited governance capacity, demographic vulnerability, and ongoing geopolitical tensions.

Ecological security is a multidimensional concept, encompassing the integrity of ecosystems, the protection of human livelihoods, the resilience of socio-economic systems, and the stability of geopolitical arrangements. Early conceptualizations, rooted in the environmental security discourse of the 1970s and 1980s, focused on resource scarcity and the potential for conflict over environmental assets¹. However, the acceleration of climate change, coupled with the increasing frequency of extreme weather events, has expanded the scope of ecological security to include systemic risks arising from inter-linked socio-ecological systems².

Modern ecological security frameworks emphasize several core principles:

1. Resilience – the ability of ecological and social systems to absorb shocks without

¹ Ullman, R. H. (1983) 'Redefining Security,' *International Security*, 8(1), pp. 129–153.

² Homer-Dixon, T. (1999) *Environment, Scarcity, and Violence*. Princeton: Princeton University Press.

systemic collapse³.

2. Sustainability – ensuring that development does not compromise the integrity of ecosystems upon which human survival depends⁴.

3. Inclusivity – engaging a broad range of stakeholders, from local communities to international organizations, in decision-making processes⁵.

4. Adaptive Management – incorporating continuous monitoring, feedback mechanisms, and policy adjustments to respond to evolving environmental conditions⁶.

These principles are operationalized through institutional coordination, scenario planning, early-warning systems, and integrated policy frameworks that link environmental management with security and development objectives.

The Eastern European context exemplifies the urgency of this approach. Moldova, located in the nexus of EU, Eastern Partnership, and post-Soviet spaces, faces multiple intersecting ecological and security challenges: climate-sensitive agriculture, water insecurity in transboundary basins, soil degradation, and vulnerability to energy shocks. The Dniester River Basin, a critical water resource shared with Ukraine, illustrates the operational implications of these intersecting pressures, from seasonal water variability to potential socio-political conflict arising from transboundary governance gaps.

Global frameworks, including the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement, the Sendai Framework for Disaster Risk Reduction, and the Convention on Biological Diversity, provide overarching guidance for integrating ecological considerations into security planning. However, translating these frameworks into context-specific strategies in Moldova and the wider Eastern European neighborhood requires understanding regional socio-economic conditions, governance capacity, and geopolitical sensitivities.

2.METHODOLOGY

This paper seeks to synthesize theoretical, empirical, and policy-relevant insights into ecological security, focusing particularly on how climate change exacerbates risks and opportunities in Eastern Europe and the EU Neighborhood. It integrates a comprehensive literature review, theoretical analysis, scenario-based planning approaches, and detailed case studies, culminating in policy recommendations aimed at both national governments and international organizations. By emphasizing the Dniester River Basin as a focal case study, this paper illustrates how ecological security challenges are both globally interconnected and regionally specific.

The following sections will explore the evolution of ecological security theory, empirical evidence linking environmental change to social and political instability, and frameworks for preventive diplomacy and adaptive governance. Particular attention is given to Moldova and its transboundary ecological systems, demonstrating the critical need for integrated, multi-level approaches that combine environmental, security, and development policy objectives.

Ecological security has evolved as an interdisciplinary field, drawing on political

³ Folke, C. et al. (2005) 'Adaptive Governance of Social-Ecological Systems,' *Annual Review of Environment and Resources*, 30, pp. 441–473.

⁴ WCED (1987) *Our Common Future*. Oxford: Oxford University Press.

⁵ Adger, W. N. (2000) 'Social and Ecological Resilience: Are They Related?' *Progress in Human Geography*, 24(3), pp. 347–364.

⁶ Berkes, F., Colding, J. and Folke, C. (2003) *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press.

science, international relations, environmental law, ecological economics, and disaster studies. Its theoretical foundations provide a conceptual lens to understand how climate change, environmental degradation, and resource variability interact with human, institutional, and geopolitical systems. Scholars have developed distinct yet complementary approaches that inform policy and operational strategies.

2.1 Realist and Neorealist Perspectives

Realist perspectives, grounded in classical international relations theory, maintain that states are the primary actors in security⁷. From this standpoint, ecological stress—such as water scarcity, loss of arable land, or energy disruptions—becomes a potential source of competition and conflict between states. Climate change, according to realist theorists, acts as a **threat multiplier**: it exacerbates existing rivalries, pressures border regions, and shifts the distribution of resources⁸.

Eastern European scholars have emphasized the importance of geostrategic vulnerabilities in the post-Soviet space. For instance, energy dependency and hydrogeopolitics are identified as critical vectors of state fragility⁹. In Moldova, reliance on external energy imports and the vulnerability of transboundary rivers such as the Dniester accentuate these threats. By highlighting material dependencies, realists underscore the necessity for states to adopt climate-resilient strategies within broader national security doctrines.

2.2 Liberal Institutionalism

Contrasting with realism, liberal institutionalism emphasizes the role of international institutions, cooperation, and rule-based governance in mitigating ecological insecurity. The European Union (EU) exemplifies this approach by integrating climate and ecological considerations into foreign and security policies¹⁰. Regional frameworks such as the **EU Green Deal**, the **Eastern Partnership (EaP) Green Agenda**, and EU climate adaptation strategies provide instruments for proactive risk management, resource sharing, and cross-border environmental diplomacy.

In the context of Moldova and the wider Eastern European neighborhood, liberal institutionalism supports:

- Harmonization of national laws with EU environmental directives (Water Framework Directive, Habitats Directive).
- Regional cooperation on transboundary waters (Dniester and Danube river basins).
- Participation in multilateral climate finance and adaptation programs (EU4Environment, EaP climate resilience projects).

These cooperative mechanisms are not only technical or administrative but also **strategic**, fostering trust and reducing the likelihood of disputes over scarce resources.

2.3 Constructivist Perspectives and Securitization Theory

Constructivist approaches focus on norms, discourse, and social processes in shaping ecological security. The **securitization theory**, popularized by Buzan et al., argues that issues become matters of security when political actors frame them as existential

⁷ Waltz, K. (1979) *Theory of International Politics*. Reading, MA: Addison-Wesley.

⁸ Carus, A., Dabelko, G. D., & Wolf, A. T. (2018) *Water, Climate, and Conflict*. Berlin: Springer.

⁹ Götz, G., & Meier, P. (2015) 'Energy Security in Eastern Europe,' *European Security Review*, 23, pp. 45–62.

¹⁰ Keohane, R. O., & Nye, J. S. (2012) *Power and Interdependence*. 4th edn. Boston: Longman.

threats requiring emergency measures¹¹. Climate change and ecological degradation have increasingly been securitized in EU and UN policy spaces, legitimizing dedicated institutional responses, strategic planning, and diplomatic initiatives.

In Moldova and the EU neighborhood, securitization has enabled:

- Allocation of resources for water monitoring and climate adaptation.
- Integration of climate risks into national security strategies.
- Enhanced cross-border diplomacy in sensitive river basins, notably the Dniester.

However, constructivist scholars caution against over-securitization, which can lead to militarized responses or marginalize local communities' participation in ecological governance¹².

2.4 Human Security and Vulnerability Frameworks

Human security approaches shift the referent from the state to the individual, emphasizing protection of livelihoods, food, water, health, and shelter¹³. UNDP's human security framework recognizes that climate-induced shocks—droughts, floods, heatwaves—pose direct threats to human well-being, particularly in regions with weak governance or fragile economies.

Eastern European studies highlight the disproportionate vulnerability of rural populations, smallholder farmers, and marginalized communities to climate variability. In Moldova:

- Droughts threaten maize, wheat, and sunflower yields, which form the backbone of rural livelihoods.
- Water scarcity in the Dniester River Basin increases risk of public health stress and internal displacement.
- Energy insecurity exacerbates vulnerabilities, especially in winter months.

Human security perspectives encourage **inclusive governance**, community-based adaptation, and social safety nets, complementing state-centric security strategies.

2.5 Ecological Economics and Resilience Theory

Ecological economics introduces the concept of **biophysical limits** and planetary boundaries, asserting that ecological stability underpins economic and social systems¹⁴. Resilience theory extends this by emphasizing the adaptive capacity of coupled social-ecological systems to absorb shocks, reorganize, and continue to function under stress¹⁵.

In the context of Eastern Europe, resilience theory highlights:

- The importance of maintaining ecosystem services (soil fertility, water purification, flood regulation).
- Adaptive governance mechanisms capable of responding to uncertainty and non-linear climate impacts.
- Integration of ecological monitoring, predictive modeling, and scenario-based planning into policy design.

Case studies from transboundary river basins demonstrate the utility of resilience-ori-

¹¹ Buzan, B., Waever, O., & de Wilde, J. (1998) *Security: A New Framework for Analysis*. Boulder: Lynne Rienner

¹² Timo, H. & Fougère, M. (2014) 'Securitisation of Climate Change in Eastern Europe,' *Environmental Politics*, 23(2), pp. 209–227.

¹³ UNDP (1994) *Human Development Report*. New York: UNDP.

¹⁴ Daly, H. (1991) *Steady-State Economics*. Washington: Island Press.

¹⁵ Folke, C. et al. (2005) 'Adaptive Governance of Social-Ecological Systems,' *Annual Review of Environment and Resources*, 30, pp. 441–473.

ented frameworks in preventing conflict and promoting cooperation under climatic stress. The Dniester Basin illustrates this concept: shared water resources require joint adaptive management to prevent shortages, ecological degradation, and social instability.

2.6 Multi-Level Governance Approaches

Ecological security requires alignment across **global, regional, and national governance levels**¹⁶. Multi-level governance ensures coherence, efficiency, and adaptive capacity in responding to climate risks:

- **Global Level:** UNFCCC, Paris Agreement, Sendai Framework for Disaster Risk Reduction.

- **Regional Level:** EU directives, EaP Green Agenda, regional water commissions, OSCE environmental diplomacy initiatives.

- **National Level:** Moldovan legislation on environmental protection, water law, national security strategy, and climate adaptation planning.

Multi-level governance facilitates:

- Consistency between international obligations and national implementation.
- Resource optimization through shared monitoring and predictive modeling.
- Coordination of preventive diplomacy, environmental peacebuilding, and development initiatives.

2.7 Integrative Conceptual Framework

Synthesizing these approaches, an integrative ecological security framework includes:

- 1. Risk Assessment:** Combining climate projections, socio-economic vulnerability, and political fragility.

- 2. Institutional Coordination:** Multi-level governance, transboundary commissions, and joint monitoring platforms.

- 3. Preventive Diplomacy:** Using environmental cooperation to reduce conflict potential.

- 4. Adaptive Management:** Iterative policy adjustments informed by scenario analysis and early-warning systems.

- 5. Human-Centered Strategies:** Protecting livelihoods, ensuring equitable access to resources, and embedding social resilience.

The framework reflects both theoretical pluralism and operational practicality. In Eastern Europe, where historical legacies, climate vulnerabilities, and transboundary dependencies intersect, such an integrative approach is essential for effective ecological security.

3. EMPIRICAL EVIDENCE- CLIMATE CHANGE AS A SECURITY RISK

Climate change increasingly functions as a **threat multiplier**, exacerbating existing social, economic, and political vulnerabilities. Empirical evidence from Eastern Europe, particularly Moldova, demonstrates that rising temperatures, altered precipitation patterns, and increasing frequency of extreme weather events translate directly into security risks for human populations, institutions, and transboundary governance systems

¹⁶ Bernauer, T., & Gampfer, R. (2018) 'International Cooperation and Climate Policy,' *Global Environmental Politics*, 18(1), pp. 92-116.

3.1 Climate Trends in Eastern Europe and Moldova

The Eastern European region is experiencing accelerated climate variability. Moldova, situated at the intersection of temperate and continental climate zones, has witnessed¹⁷.

- A mean annual temperature increase of 1.2–1.5°C over the past five decades.
- Increased frequency of **summer heatwaves** and prolonged **drought periods**, particularly affecting southern agricultural zones.
- Higher variability of precipitation, with **intense rainfall events** leading to localized flooding.
- Shifts in river hydrology, including reduced baseflows in the Dniester and Prut rivers during dry seasons, compounded by upstream water use¹⁸.

Projections indicate that by mid-century, under high-emission scenarios (RCP8.5), Moldova may face:

- Temperature rise of 2–3°C,
- 15–30% reduction in summer rainfall,
- Increased drought frequency every 2–3 years,
- Heightened risk of flash floods due to extreme precipitation events¹⁹.

These trends have direct implications for agriculture, water resources, energy supply, and public health.

3.2 Water Security and Transboundary Risks

Water scarcity is a critical dimension of ecological security in Moldova. The **Dniester River Basin**, shared with Ukraine, is the country's primary source of drinking water and irrigation²⁰. Reduced river flows, coupled with upstream hydropower operations, increase competition over water and stress ecosystem services. Transboundary water governance frameworks, such as the **2012 Dniester Treaty**, provide mechanisms for joint monitoring and cooperation, but empirical evidence indicates gaps in enforcement and real-time data sharing²¹.

Reduced water availability can generate multiple security challenges:

1. Agricultural stress: Irrigation-dependent crops, particularly maize, sunflower, and wheat, experience yield reductions during drought periods.

2. Energy vulnerabilities: Hydropower generation fluctuates with river flow, affecting electricity supply.

3. Public health concerns: Water quality degradation, including eutrophication and pollution from industrial and agricultural sources, increases disease risks.

4. Socio-political tension: Local disputes over water allocation and transboundary governance disagreements can escalate in periods of scarcity²².

Evidence from the 2007–2012 drought cycles in Moldova shows that agricultural losses reached up to 15–20% of GDP in extreme years, disproportionately affecting rural households and increasing reliance on food imports²³.

¹⁷ IPCC (2021) *Climate Change 2021: The Physical Science Basis*. Geneva: IPCC.

¹⁸ UNDP (2020) *Human Development Report: Climate Change and Eastern Europe*. New York: UNDP.

¹⁹ World Bank (2020) *Moldova Climate Risk Profile*. Washington DC: World Bank.

²⁰ UNECE (2019) *Dniester River Basin Management*. Geneva: UNECE.

²¹ Carius, A., Dabelko, G. D., & Wolf, A. T. (2018) *Water, Climate, and Conflict*. Berlin: Springer.

²² FAO (2013) *Agricultural Losses in Moldova: 2007–2012 Droughts*. Rome: FAO.

²³ IFAD (2019) *Rural Vulnerability and Migration in Moldova*. Rome: IFAD.

3.3 Agricultural Vulnerability and Food Security

Moldova's economy is heavily reliant on agriculture, which constitutes approximately **35% of GDP** and employs over **25% of the labor force**²⁴. Empirical studies demonstrate that climate variability directly affects food security:

- Crop failures during drought years reduce household incomes and export revenues.
- Soil degradation, erosion, and declining fertility intensify vulnerability to climate shocks.
- Extreme weather events, including hailstorms and heavy rainfall, damage infrastructure and storage facilities.

The **food-security nexus** illustrates how environmental stress translates into socio-economic instability, particularly in regions with limited adaptive capacity. This risk is compounded by demographic pressures, including rural outmigration and declining labor availability in agriculture²⁵.

3.4 Human Mobility and Migration

Environmental pressures contribute to **internal and cross-border migration**, a key security consideration. Moldova has experienced:

- Seasonal migration to neighboring Ukraine, Romania, and Russia for agricultural labor.
- Permanent emigration from rural communities affected by repeated droughts.
- Shifts in population density toward urban centers, stressing municipal infrastructure and social services²⁶.

Climate-induced migration is both a cause and consequence of vulnerability. Reduced agricultural productivity undermines livelihoods, which in turn drives migration, potentially creating social and political tensions in host areas.

3.5 Infrastructure Vulnerability

Moldova's critical infrastructure, much of it inherited from the Soviet era, exhibits significant **climate vulnerability**:

- Flood-prone settlements along the Dniester and Prut rivers are at risk of inundation during extreme precipitation events.
- Roads, bridges, and irrigation networks suffer damage from soil erosion and landslides.
- Energy systems, including hydropower and electricity distribution, are sensitive to both droughts and floods.

The economic costs of infrastructure damage are substantial, and repeated failures can erode public confidence in institutions, amplifying governance and security challenges²⁷.

3.6 Public Health Implications

Climate variability affects public health in multiple ways:

- Heatwaves increase mortality among elderly and vulnerable populations.
- Drought and water scarcity contribute to sanitation challenges and waterborne diseases.

²⁴ IOM (2020) *Migration Trends in the EU Neighbourhood*. Geneva: IOM.

²⁵ UNDRR (2021) *Disaster Risk in Eastern Europe*. Geneva: UNDRR.

²⁶ WHO (2020) *Climate and Health in Eastern Europe*. Geneva: WHO.

²⁷ National Bureau of Statistics, Moldova (2022) *Statistical Yearbook*. Chișinău.

• Vector-borne diseases, such as West Nile Virus, expand their range under changing climatic conditions²⁸.

Public health stress intersects with economic and social vulnerability, compounding the risk profile of Moldova and similar Eastern European states.

3.7 Evidence from the EU Neighborhood

Similar patterns emerge across the EU neighborhood. In Ukraine, droughts and riverine flooding threaten agricultural productivity and hydropower infrastructure. Georgia experiences glacial retreat affecting water supply and hydroelectricity, while the Western Balkans contend with extreme heat, flooding, and energy dependency. Comparative studies indicate that **fragile governance and institutional capacity amplify the security implications of climate variability**²⁹.

The evidence demonstrates a consistent pattern: climate impacts are **not uniform**, but they are magnified in regions with weak adaptive capacity, transboundary governance challenges, and socio-economic fragility. Moldova exemplifies this dynamic, making it a critical case for studying ecological security in the EU neighborhood.

Thus, empirical evidence underscores that climate change acts as a **multi-scalar, cross-sectoral security risk** in Moldova and Eastern Europe:

- Water scarcity and transboundary disputes threaten both human and state security.
- Agriculture-dependent livelihoods are increasingly insecure under variable precipitation and temperature regimes.
- Infrastructure and energy systems are vulnerable to climatic shocks, affecting societal resilience.
- Migration and demographic shifts amplify social and political stress.
- Public health is increasingly exposed to environmental hazards.

These findings highlight the urgent need for integrated, multi-level ecological security frameworks that combine **climate monitoring, governance reform, preventive diplomacy, scenario planning, and adaptive management**. Moldova's experience offers valuable insights into operationalizing ecological security in fragile regions with high climate exposure.

4. DISCUSSIONS AND RESULTS: SCENARIO BASED PLANNING AND POLICY SIMULATIONS

Climate change presents complex, uncertain, and interconnected risks that challenge conventional planning approaches. Scenario-based planning is a methodological tool that enables policymakers to explore multiple plausible futures, anticipate vulnerabilities, and design adaptive strategies for ecological security³⁰. In the context of Eastern Europe and Moldova, scenario simulations are crucial for understanding climate-induced risks to water resources, agriculture, infrastructure, human security, and regional stability.

4.1 Methodology and Purpose of Scenario Planning

Scenario planning involves constructing diverse narratives about the future based on alternative assumptions regarding key drivers, such as greenhouse gas emissions,

²⁸ World Bank (2020) *Moldova Climate Risk Profile*. Washington DC: World Bank.

²⁹ Roe, S., et al. (2015) *Scenario Planning in Climate Change Policy*. London: Routledge.

³⁰ Roe, S., et al. (2015) *Scenario Planning in Climate Change Policy*. London: Routledge.

technological development, governance effectiveness, and socio-economic dynamics³¹. The approach emphasizes **flexibility and preparedness** rather than precise prediction. Its main purposes include:

1. Anticipating non-linear climate impacts: Extreme events such as flash floods, prolonged droughts, or unseasonable frosts can disrupt socio-ecological systems.

2. Integrating cross-sectoral vulnerabilities: Combining data on water availability, energy supply, food production, and human health.

3. Guiding preventive policy measures: Early warning, resource allocation, and transboundary cooperation are informed by potential risk trajectories.

Scenario-based approaches are particularly relevant in regions with high environmental variability and institutional fragility, such as Moldova and the Eastern Partnership (EaP) countries.

4.2 Climate-Induced Risk Trajectories in Moldova

Using climate models (RCP4.5 and RCP8.5), several plausible trajectories emerge for Moldova and the Dniester River Basin:

Scenario	Temperature Change	Precipitation Pattern	Key Ecological Risks	Socio-Security Implications
Low Emissions (RCP4.5)	+1.5°C by 2050	Moderate seasonal variability	Reduced agricultural yield, occasional droughts	Localized water stress, manageable infrastructure impacts
High Emissions (RCP8.5)	+3°C by 2050	Severe summer droughts, flash floods	Riverine depletion, soil degradation, ecosystem collapse	Food insecurity, rural displacement, transboundary water tension, energy instability
Adaptive Mitigation	+2°C by 2050	Stabilized by policy interventions	Improved water retention, ecosystem management	Strengthened resilience, reduced migration, enhanced regional cooperation

Figure 1. Climate-Induced Risk Trajectories in Moldova, generated by the author

These trajectories highlight the urgency of **adaptive strategies**, particularly for water management, agricultural planning, energy systems, and human security interventions.

4.3 Implications for Fragile and Conflict-Prone Regions

Climate change acts as a **threat multiplier** in fragile states, where environmental stress interacts with weak governance, socio-economic inequality, and geopolitical

³¹ IPCC (2022) *Climate Change 2022: Impacts, Adaptation, and Vulnerability*. Geneva: IPCC.

pressures³². In Moldova, scenario-based analysis reveals:

- **Water conflict potential:** Low-flow years in the Dniester Basin increase competition between municipal, agricultural, and industrial users, potentially generating transboundary tension with Ukraine.

- **Food insecurity:** Reduced crop yields intensify rural poverty, heighten dependency on imports, and strain social safety nets.

- **Migration and demographic stress:** Climate-induced migration can exacerbate urban overcrowding, labor shortages in agriculture, and political discontent.

- **Infrastructure fragility:** Flooding and drought cycles threaten roads, bridges, irrigation systems, and energy infrastructure.

Scenario simulations allow policymakers to **stress-test** these vulnerabilities, identify high-risk zones, and prioritize investment in adaptive measures.

4.4 Policy and Diplomatic Applications

Scenario-based planning informs **strategic, diplomatic, and policy-level interventions**. In Moldova and the EU neighborhood, key applications include:

1. **Transboundary water governance:** Using river flow scenarios to inform joint management agreements, early-warning systems, and ecological flow standards in the Dniester Basin.

2. **Climate-sensitive foreign policy:** Integrating ecological security considerations into national security doctrines, bilateral relations, and EU integration strategies.

3. **Disaster preparedness and early-warning systems:** Designing alerts for droughts, floods, and extreme heat to mitigate impacts on agriculture, energy, and public health.

4. **Conflict prevention and environmental peacebuilding:** Engaging neighboring countries in joint monitoring, data sharing, and cooperative infrastructure projects.

Evidence shows that proactive engagement, informed by scenario planning, reduces the likelihood of ecological shocks escalating into socio-political crises³³.

4.5 Integrating Scenarios into National and Regional Strategies

Effective integration requires **multi-level governance** and **institutional coordination**:

- **National Level:** Moldovan ministries of agriculture, environment, energy, and defense incorporate scenario analysis into planning, budget allocation, and legislation.

- **Regional Level:** EaP and EU mechanisms provide technical support, monitoring platforms, and policy guidance, facilitating harmonization with EU climate standards.

- **Transboundary Level:** Dniester River Basin Commission and bilateral commissions implement coordinated water management plans, informed by predictive models.

Scenario-based planning thus bridges science, policy, and diplomacy, enabling evidence-based decision-making in an uncertain and rapidly changing ecological context.

4.6 Lessons for Broader Eastern Europe

Scenario simulations in Moldova reveal transferable lessons for neighboring countries:

1. **Early action reduces cost:** Investments in resilience and preventive measures are cheaper than post-crisis recovery.

2. **Transboundary collaboration is essential:** Shared ecological resources require

³² Carus, A., Dabelko, G. D., & Wolf, A. T. (2018) *Water, Climate, and Conflict*. Berlin: Springer.

³³ UNDP (2020) *Climate Change, Migration, and Security in Eastern Europe*. New York: UNDP.

cooperative frameworks to prevent conflict.

3. Socio-economic integration strengthens adaptation: Policies must address livelihoods, migration, and inequality alongside ecological management.

4. Data and monitoring are foundational: High-quality hydrological, meteorological, and socio-economic data enable predictive modeling and scenario testing.

These lessons underscore that ecological security is not solely an environmental concern—it is a core dimension of regional stability, diplomacy, and human well-being.

5. ECOLOGICAL SECURITY FRAMEWORKS AND POLICY RECOMMENDATIONS

Addressing climate-induced ecological security threats requires **coordinated frameworks, adaptive governance, and integrated policy measures** at multiple levels. Lessons from Moldova and the broader Eastern European region illustrate the necessity of embedding ecological considerations into security, foreign policy, and development planning. The proposed ecological security framework for Moldova and the EU neighborhood rests on five strategic principles:

1. Resilience and Adaptation: Systems must be capable of absorbing shocks from climate variability, extreme weather events, and environmental degradation. This includes resilient infrastructure, diversified agriculture, and energy security strategies³⁴.

2. Sustainability: Policy decisions must prioritize long-term ecosystem integrity, avoiding overexploitation of water, land, and biodiversity resources³⁵.

3. Inclusivity and Stakeholder Engagement: Governance mechanisms should incorporate local communities, civil society, and private-sector actors, recognizing their central role in adaptation and ecological stewardship³⁶.

4. Integrated Risk Assessment: Climate, ecological, socio-economic, and political risks must be analyzed together to guide proactive decision-making.

5. Adaptive Management and Iterative Policy: Continuous monitoring and flexible policy adjustments allow governments and institutions to respond effectively to unforeseen changes³⁷.

These principles ensure that ecological security is not merely a sectoral concern but a **holistic and operationalizable approach** across governance scales.

5.1 Institutional Coordination and Multi-Level Governance

Effective ecological security requires **institutional mechanisms that enable coordination across ministries, agencies, and international partners:**

- **National Level (Moldova):** Ministries of Environment, Agriculture, Economy, Energy, and Defense must integrate climate risk analysis into strategic planning. The National Office for Emergency Situations should incorporate ecological early-warning data into disaster management systems.

- **Regional Level (Eastern Europe & EaP):** Cooperation through the **Eastern Partnership Climate & Environment Initiative** and **EU Green Deal alignment** provides tech-

³⁴ Folke, C. et al. (2005) *Adaptive Governance of Social-Ecological Systems*. Annual Review of Environment and Resources, 30, pp. 441–473.

³⁵ WCED (1987) *Our Common Future*. Oxford: Oxford University Press.

³⁶ Adger, W. N. (2000) 'Social and Ecological Resilience: Are They Related?' *Progress in Human Geography*, 24(3), pp. 347–364.

³⁷ Berkes, F., Colding, J., & Folke, C. (2003) *Navigating Social-Ecological Systems*. Cambridge: Cambridge University Press.

nical assistance, climate finance, and cross-border governance frameworks.

• **Transboundary Level:** The **Dniester River Basin Commission** exemplifies how joint monitoring, data sharing, and coordinated water management can prevent disputes and strengthen resilience. Expanded responsibilities, including climate adaptation planning and predictive scenario modeling, can enhance its effectiveness³⁸.

Institutional integration ensures that ecological security is embedded across policy domains, avoiding fragmentation and inefficiencies.

5.2 Embedding Ecological Security into Foreign Policy and Security Strategy National security strategies must incorporate **ecological risk assessments**, particularly in regions like Moldova, where transboundary water systems and energy dependencies intersect with geopolitical pressures:

• **Preventive Diplomacy:** Bilateral engagement with Ukraine over Dniester water allocation exemplifies the use of environmental cooperation to reduce conflict potential.

• **Environmental Peacebuilding:** Shared resource management and collaborative infrastructure projects foster trust and stability.

• **EU Integration Pathways:** Moldova's ecological security efforts should align with EU environmental acquis, including water management, biodiversity conservation, and climate adaptation directives.

The US Department of Defense's Climate Adaptation Roadmap provides an example of **mainstreaming climate risk into strategic planning**, demonstrating that ecological considerations can be integrated into national security and defense policy³⁹.

5.3 Policy Recommendations for International Organizations and States

1. Institutionalize Ecological Security: Embed ecological risk assessment and scenario planning into **national security strategies, defense planning, and development agendas**.

2. Strengthen Transboundary Governance: Expand the **Dniester River Basin Commission** to cover climate adaptation planning, predictive modeling, and ecological flow regulation.

3. Enhance Early Warning Systems: Invest in **real-time environmental monitoring**, predictive analytics, and disaster preparedness infrastructure.

4. Promote Ecological Diplomacy: Use shared environmental resources as instruments of **preventive diplomacy and conflict prevention** in Eastern Europe and the EU neighborhood.

5. Mainstream Climate in Foreign Policy: Integrate ecological considerations into **bilateral, regional, and EU accession negotiations**, ensuring alignment with international climate commitments.

6. Invest in Human and Community Resilience: Support local adaptive capacity, climate literacy, and participation in resource management.

7. Align Financial and Trade Instruments: Reform subsidies, tariffs, and investment mechanisms to **reward sustainable practices** and discourage environmental degradation.

These recommendations combine **preventive, adaptive, and integrative strategies**, providing a roadmap for Moldova and the broader EU neighborhood to navigate the challenges of ecological security.

³⁸ UNECE (2019) *Dniester River Basin Management*. Geneva: UNECE.

³⁹ US Department of Defense (2014) *Climate Change Adaptation Roadmap*. Washington DC: DoD.

6. MOLDOVA, EASTERN EUROPE AND EU NEIGHBOURHOOD CONTEXT

The ecological security landscape in Moldova and the broader Eastern European and EU neighborhood context is shaped by a unique combination of **historical legacies, socio-economic vulnerabilities, transboundary environmental pressures, and geopolitical dynamics**. Understanding these interlinked factors is crucial for designing effective climate adaptation and security strategies.

6.1 Historical and Socio-Political Context

Moldova, a small, landlocked country located between Romania and Ukraine, has undergone significant political and economic transformations since the dissolution of the Soviet Union. Its governance structures are evolving, and the country faces challenges related to **institutional capacity, resource management, and social cohesion**.

Key historical and socio-political factors influencing ecological security include:

- **Post-Soviet environmental legacies:** Industrial pollution, unregulated irrigation networks, and degraded soils persist from Soviet-era practices⁴⁰.
- **Economic dependency:** Moldova's economy relies heavily on agriculture, remittances, and energy imports, leaving it vulnerable to climate-induced shocks and regional instability⁴¹.

- **Governance challenges:** Limited institutional capacity and bureaucratic fragmentation constrain effective climate adaptation and transboundary resource management.

These factors combine to create a context in which ecological risks translate directly into human, economic, and political vulnerabilities. Moldova's climate vulnerabilities mirror broader trends in Eastern Europe, including:

- **Rising temperatures** and increasing frequency of extreme heat events.
- **Erratic precipitation patterns**, leading to prolonged droughts, soil degradation, and occasional floods.
- **Water scarcity**, particularly in transboundary basins like the Dniester and Prut.
- **Agricultural stress**, given the reliance on rain-fed crops and limited irrigation infrastructure.

Neighboring countries in the Eastern Partnership (EaP) region, including Ukraine, Belarus, and Georgia, experience similar ecological pressures. The interconnected nature of ecosystems and socio-economic systems in this region makes **transboundary cooperation and regional governance essential**.

6.2 European Union and Transboundary Influence and Policy Alignment

Frameworks Moldova's ecological security strategies are increasingly influenced by **EU integration and cooperation mechanisms**. Key frameworks and instruments include:

- **EU Water Framework Directive (2000/60/EC):** Establishes integrated river basin management and ecological status monitoring.

- **EU Green Deal:** Provides a comprehensive framework for climate mitigation, adaptation, and sustainable development.

- **Eastern Partnership (EaP) Green Agenda:** Promotes regional collaboration on climate adaptation, energy efficiency, and environmental governance.

⁴⁰ Popa, I., & Simion, G. (2018) *Post-Soviet Governance and Environmental Challenges in Moldova*. Chisinau: Academy of Sciences.

⁴¹ World Bank (2020) *Moldova Climate Risk Profile*. Washington DC: World Bank.

Compliance with these frameworks enhances Moldova’s capacity to address ecological risks, improves access to climate finance, and strengthens its diplomatic engagement with neighboring countries⁴².

Transboundary ecological challenges are central to Moldova’s ecological security. Shared water resources, energy infrastructure, and biodiversity corridors require coordination with Ukraine, Romania, and regional institutions. Critical issues include:

- **Water allocation and quality:** The Dniester River Basin is shared with Ukraine, and water scarcity, pollution, and seasonal variability pose risks to agriculture, human health, and hydropower.

- **Energy dependency:** Moldova imports natural gas and electricity, making it vulnerable to climate-induced supply disruptions and regional geopolitical tensions.

- **Biodiversity and ecosystem services:** Deforestation, soil degradation, and wetland loss threaten ecological resilience and regional food security.

Effective ecological security policy requires **transboundary cooperation, early-warning systems, and shared governance mechanisms** to mitigate potential conflict and build resilience.

Comparative Perspective: Moldova, EaP, and EU Neighbourhood

Dimension	Moldova	EaP Countries	EU Member States
Governance Capacity	Medium; evolving institutions; fragmented ministries	Varies; Ukraine, Georgia moderate; limited enforcement	High; multi-level governance; robust monitoring
Water Security	Dniester & Prut dependent; infrastructure vulnerable	Shared rivers; uneven regulation	Integrated management; strict directives
Climate Adaptation	Draft national strategies; partial implementation	Pilot programs supported by EU/UNDP	Comprehensive national and regional plans; EU Green Deal alignment
Disaster Risk Management	Reactive focus; limited early-warning	Emerging early-warning systems; donor-supported	Proactive systems; predictive analytics; cross-border coordination
Ecological Diplomacy	Bilateral agreements with Ukraine; limited scope	Emerging cooperation mechanisms	Extensive transboundary diplomacy; environmental peacebuilding

Figure 2. Comparative Table: Moldova vs EU vs EaP generated by author

This comparative perspective highlights the **gaps and opportunities** for Moldova, emphasizing the need to strengthen governance, transboundary collaboration, and alignment with EU and regional frameworks.

6.3 Implications for Ecological Security

The regional context demonstrates several critical implications for ecological security in Moldova and the EU neighborhood:

⁴² European Commission (2021) *EU Green Deal and Eastern Partnership Climate Initiatives*. Brussels: EC.

1. Vulnerability to climate-induced shocks: Limited adaptive capacity and exposure to water scarcity and extreme weather events amplify risks to human security and infrastructure.

2. Need for integrated governance: Fragmented institutional structures hinder effective response; multi-level coordination is essential.

3. Importance of transboundary cooperation: Shared resources, particularly water, require robust agreements, monitoring systems, and joint management strategies.

4. Alignment with international and EU frameworks: Integration with EU and UN climate policies enables access to technical, financial, and diplomatic support.

5. Potential for ecological peacebuilding: Environmental cooperation can strengthen trust and reduce conflict potential in fragile regions.

This analysis sets the stage for a **detailed case study of the Dniester River Basin**, illustrating how these factors converge and how scenario-based planning, adaptive management, and multi-level governance can address complex ecological security challenges.

The **Dniester River Basin**, shared by Moldova and Ukraine, represents a critical case for understanding ecological security in a transboundary context. As the second-largest river in Moldova, the Dniester is essential for **drinking water, agriculture, energy production, and ecosystem services**, making it a linchpin of national security and regional stability⁴³. Climate change, population pressures, and evolving socio-political dynamics render the basin a high-priority area for ecological security planning. The Dniester River spans **1,362 km**, with approximately **700 km flowing through Moldova**. Its basin encompasses diverse ecosystems, including forests, wetlands, and agricultural lands, and it supports over **3 million people** in Moldova alone. Key hydrological characteristics include:

- **Seasonal flow variability:** High water during spring snowmelt, low flows in summer and early autumn.

- **Vulnerability to droughts:** Summer low flows have intensified over the last two decades, reducing water availability for irrigation, municipal use, and hydropower.

- **Flood risks:** Spring floods and extreme rainfall events cause local inundation and infrastructure damage.

- **Water quality issues:** Pollution from agriculture, industrial discharge, and untreated wastewater affects ecological and human health

The basin's hydrological dynamics, combined with human pressures, create **inter-linked ecological, economic, and social vulnerabilities**.

Climate Change Impacts

Climate models for the region indicate that the Dniester Basin is highly sensitive to climate variability:

- **Temperature rise:** Projected increase of **2–3°C by 2050** under high-emission scenarios (RCP8.5), exacerbating evaporation and reducing river flows⁴⁴.

- **Drought frequency:** Extended summer droughts threaten irrigation, hydropower generation, and water supply for municipalities.

- **Flood intensity:** Extreme precipitation events may increase localized flooding, damaging infrastructure and agricultural lands.

- **Water quality deterioration:** Higher temperatures and reduced flows concentrate pollutants, harming aquatic ecosystems and public health.

⁴³ UNECE (2019) *Dniester River Basin Management*. Geneva: UNECE.

⁴⁴ World Bank (2020) *Moldova Climate Risk Profile*. Washington DC: World Bank.

These climate-induced risks are compounded by **socio-economic pressures**, including population growth in urban centers, increased water demand for agriculture, and transboundary management challenges.

Socio-Economic Dependencies

The Dniester River supports **agriculture, energy, drinking water, and industry**, making ecological stress a direct socio-economic concern:

1. Agriculture: Approximately 40% of Moldova’s irrigated lands rely on Dniester water. Crop yields for maize, sunflower, and vegetables are highly sensitive to seasonal water availability⁴⁵.

2. Energy: Hydropower plants on the river provide a significant portion of local electricity; reduced flows threaten energy security during dry years.

3. Municipal Water Supply: Over 1 million residents in Moldova depend on the Dniester for drinking water, necessitating reliable quality and quantity management.

4. Fisheries and Ecosystem Services: Wetlands and riparian ecosystems provide food, habitat, and natural flood control, which are increasingly under stress from both climate variability and anthropogenic pressures.

The intersection of these dependencies illustrates how **ecological stress can cascade into human security, economic stability, and social resilience**.

Transboundary Governance and Institutional Challenges

Effective ecological security in the Dniester Basin requires **robust institutional coordination between Moldova and Ukraine**. Current mechanisms include:

- **Dniester River Basin Commission (DRBC):** Established under the 2012 treaty, tasked with water allocation, quality monitoring, and joint planning.

- **Data-sharing agreements:** Limited real-time monitoring and inconsistent reporting hinder proactive management.

- **Coordination with national agencies:** Ministries of Environment, Agriculture, and Energy in Moldova and Ukraine must collaborate across sectors, which is often constrained by bureaucratic fragmentation.

Despite these frameworks, gaps remain in **early-warning systems, scenario-based planning, and integration of climate adaptation measures**. Strengthening institutional capacity and cross-border cooperation is essential to prevent ecological degradation from translating into socio-political tension.

Scenario-Based Analysis in the Dniester Basin

Applying scenario-based planning to the Dniester Basin allows policymakers to anticipate ecological and socio-economic outcomes under different climate trajectories:

Scenario	Key Climate Projection	Ecological Risk	Socio-Economic Impact	Policy Implication
Baseline (Current Policies)	Moderate warming, seasonal variability	Gradual reduction in water availability	Crop yield reductions; manageable energy stress	Incremental adaptation; infrastructure upgrades

⁴⁵ FAO (2013) *Dniester Basin: Water Quality and Agricultural Impacts*. Rome: FAO.

Scenario	Key Climate Projection	Ecological Risk	Socio-Economic Impact	Policy Implication
High-Emission (RCP8.5)	+3°C by 2050; prolonged droughts	Severe river depletion, water quality decline	Agriculture crisis; municipal water shortages; hydro-power deficits	Urgent adaptive management; transboundary negotiation; emergency planning
Adaptive Mitigation	+2°C; policy interventions implemented	Stabilized flows; improved ecosystem resilience	Sustained agricultural productivity; reliable municipal water; energy security	Strengthened resilience; scenario-informed investments; community engagement

Figure 3. Scenario-Based Analysis in the Dniester Basin, developed by author

This analysis highlights the **need for flexible, evidence-based governance**, linking ecological monitoring with policy and diplomatic measures.

Policy Recommendations for the Dniester Basin

1. Strengthen Transboundary Governance: Expand the DRBC mandate to include climate adaptation, predictive modeling, and ecological flow standards.

2. Enhance Early-Warning Systems: Implement real-time monitoring of water levels, quality, and weather events; integrate data with national disaster response systems.

3. Invest in Ecological Infrastructure: Upgrade irrigation, flood control, and hydropower systems to withstand extreme events; restore wetlands to enhance natural resilience.

4. Promote Community Engagement: Support local water user associations, agricultural cooperatives, and citizen monitoring initiatives.

5. Align with EU and International Frameworks: Integrate basin management with EU Water Framework Directive, Eastern Partnership initiatives, and UN climate adaptation programs.

6. Scenario-Based Planning and Policy Simulation: Regularly update predictive models, stress-test infrastructure, and adjust policies based on emerging climate trajectories⁴⁶.

By implementing these measures, Moldova and Ukraine can **mitigate ecological risks, protect livelihoods, and reduce the potential for transboundary conflict**.

Obviously, there are some lessons to be learned

The Dniester Basin illustrates broader principles of ecological security:

- **Interconnected Risks:** Climate, ecological, economic, and social systems are deeply intertwined.

- **Transboundary Collaboration is Essential:** Shared resources require joint governance, data sharing, and cooperative investment.

- **Scenario Planning is Critical:** Anticipatory models inform adaptive policy, reducing vulnerability to shocks.

- **Community Engagement Strengthens Resilience:** Local knowledge and participation improve resource management and compliance.

⁴⁶ Popa, I., & Simion, G. (2018) *Post-Soviet Governance and Environmental Challenges in Moldova*. Chisinau: Academy of Sciences.

These lessons are applicable not only to Moldova but also to other **fragile regions in the EU neighborhood**, highlighting the importance of integrating ecological security into regional and national planning.

7. CONCLUSIONS AND RECOMMENDATIONS

The ecological challenges facing Moldova and the broader EU neighborhood are not abstract policy issues—they are deeply **human problems**. Every drop of water in the Dniester, every hectare of fertile soil, every kilowatt of hydropower, translates directly into the lives of farmers, children, families, and communities. Climate change is no longer a distant threat; it is already shaping the realities of people in rural villages, small towns, and cities across Eastern Europe.

Rising temperatures and unpredictable rainfall do more than alter crop cycles—they threaten **livelihoods, nutrition, and social stability**. In Moldova, farmers struggle to grow maize and sunflower under increasingly erratic conditions, while families in urban areas confront rising water bills and intermittent electricity⁴⁷. Prolonged droughts can force families to leave their homes, creating waves of internal migration that strain social services and local governance. Every ecological shock carries a human face: a child walking miles for clean water, a farmer watching his harvest fail, or a family displaced by floods.

Climate change acts as a **threat multiplier**, intensifying pre-existing vulnerabilities. Poverty, weak institutions, and transboundary disputes transform environmental stress into social tension, sometimes erupting in localized conflict. The stakes are high: ecological mismanagement is inseparable from **human suffering and political fragility**⁴⁸. Ensuring ecological security is not merely a technical exercise—it is a **moral obligation**. The people of Moldova and its neighbors are entitled to access clean water, safe food, and sustainable livelihoods. Ignoring ecological risks is effectively **denying these rights**. Decision-makers face a choice: act decisively to safeguard both the environment and human lives, or allow preventable crises to escalate.

The Dniester River Basin exemplifies this moral dimension. Joint management of the river is not only about hydrological flows but also about ensuring that children in Ripeni or Soroca can drink safe water, that farmers in Hîncești can cultivate crops without fear, and that communities do not face displacement due to preventable droughts or floods⁴⁹.

Our recommendations are as follows:

1. Institutionalize Ecological Security: Embed climate and ecological considerations into **national and regional planning**. Policies must prioritize **human well-being alongside environmental outcomes**, ensuring that decisions on water allocation, agriculture, and energy reflect the needs of communities.

2. Strengthen Transboundary Cooperation: Moldova and Ukraine must manage shared resources not as abstract assets but as **lifelines for people**. Expanding the Dniester River Basin Commission's mandate to include community engagement, early warning, and adaptive planning ensures human security is central.

3. Invest in Early Warning and Resilience: Real-time monitoring, flood alerts, and drought prediction systems must **reach the local level**, providing farmers, schools, and municipalities with actionable information to protect lives and livelihoods.

⁴⁷ FAO (2013) *Agricultural Losses in Moldova: 2007–2012 Droughts*. Rome: FAO.

⁴⁸ UNDP (2020) *Climate Change, Migration, and Security in Eastern Europe*. New York: UNDP.

⁴⁹ UNECE (2019) *Dniester River Basin Management*. Geneva: UNECE.

4. Promote Ecological Diplomacy and Peacebuilding: Environmental cooperation is a tool to foster **trust, stability, and shared human security**. Joint restoration projects, river monitoring, and sustainable infrastructure investments are not just technical solutions—they are investments in **community resilience and regional solidarity**.

5. Support Community and Livelihood Resilience: Programs must empower **local actors**, from farmers to civic groups, equipping them with knowledge, tools, and financial resources to adapt to climate stress while maintaining dignity and self-sufficiency.

6. Integrate Scenario Planning into Everyday Policy: Predictive models should inform **real human decisions**, from crop planning to municipal water distribution, ensuring that communities can anticipate shocks and respond proactively⁵⁰.

7. Broader European and Regional Implications The human story in Moldova resonates across the Eastern Partnership and EU neighborhood. Families, farmers, and communities in Ukraine, Georgia, and Belarus face similar climate-induced risks. By prioritizing ecological security, the EU and regional partners are not only protecting ecosystems—they are **safeguarding people, livelihoods, and social cohesion**. Moldova's experience offers a **roadmap for resilience**, demonstrating that ecological foresight and human-centered governance go hand in hand.

Evidently, ecological security is **the foundation upon which human security rests**. Without clean water, fertile soil, and stable ecosystems, peace, prosperity, and social cohesion are fragile. The choices made today will define the experiences of generations to come: whether children in Moldova can grow up with reliable food and water, whether communities can withstand climate shocks, and whether societies can thrive in harmony with the natural systems that sustain them. Time is short and the stakes are high. The challenge is not only technical or political—it is profoundly human. By embedding ecological security at the heart of policy, diplomacy, and governance, Moldova and its neighbors have the opportunity to **turn a crisis into a story of resilience, cooperation, and hope**. Every policy, every investment, and every cooperative initiative is ultimately about protecting lives, nurturing communities, and sustaining the fragile web of human and ecological systems upon which all societies depend.

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⁵⁰ Roe, S., et al. (2015) *Scenario Planning in Climate Change Policy*. London: Routledge.

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