# A SYNTHESIS REPORT

# Ecosystem-based adaptation in Moldova: priority landscapes, climate risks, and strategic pathways

Part of the Black Sea Region EbA Scoping Study under PAABS Project

Prepared for: **Michael Succow Foundation** within the framework of the project "Supporting Ukraine in the Implementation of the Paris Agreement and Adaptation to the Impact of Climate Change in the Black Sea Region (PAABS)".

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"*In the EbA sense: what stands the way becomes it*"

(from Marcus Aurelius)

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**Abbreviations**

AFD - Agence Française de Développement
AI – Aridity Index
ANR – Assisted Natural Regeneration
CBD – Convention on Biological Diversity
CCDR – Country Climate and Development Report
CVI – Climate Vulnerability Index
EbA – Ecosystem-based Adaptation
EEA – European Environment Agency
EIB – European Investment Bank
EU – European Union
FAO – Food and Agriculture Organization of the United Nations
GEF – Global Environment Facility
GIS – Geographic Information System
GoM – Government of Moldova
HCVF – High Conservation Value Forest
IBA – Important Bird Area
ICAS - Forest Research & Management Institute
ID – Identifier
IEA – International Energy Agency
IKI – International Climate Initiative
IMF – International Monetary Fund
IOM – International Organization for Migration
IPCC – Intergovernmental Panel on Climate Change
IUCN – International Union for Conservation of Nature
KBA – Key Biodiversity Area
LDN – Land Degradation Neutrality
LPAs – Local Public Authorities
MAFI – Ministry of Agriculture and Food Industry
MLSP – Ministry of Labor and Social Protection
MoE – Ministry of Environment
MP – Management Plan
MSF – Michael Succow Foundation
MSU – Moldova State University
NAP – National Adaptation Plan
NBS – National Bureau of Statistics
NbS – Nature-based Solutions
NBSAP – National Biodiversity Strategy and Action Plan
NCCAP – National Climate Change Adaptation Programme
NDCs – Nationally Determined Contributions
NEN – National Ecological Network
NFERP – National Forest Extension and Restoration Programme
NOIEP - National Office for the Implementation of Environmental Projects
OECM – Other Effective Area-based Conservation Measure
PA – Protected Area
PAABS – Protected Areas for Adaptation to Climate Change in the Black Sea Region
PARC – Protected Area Related Connectedness
PNERP – National Program on Extension and Rehabilitation of Forests
ProtConn – Protected Area Connectedness Index
RE-MAP – Restoring Ecosystems for Marine Pollution Prevention
SDF – Standard Data Form
SFE – State Forestry Enterprise
ToR – Terms of Reference
UNDP – United Nations Development Programme
UNEP – United Nations Environment Programme
WB – World Bank

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## Executive Summary

This report provides a national synthesis of Ecosystem-based Adaptation (EbA) opportunities in the Republic of Moldova, prepared within the framework of the Supporting Ukraine in the Implementation of the Paris Agreement and Adaptation to the Impact of Climate Change in the Black Sea Region (PAABS) initiative.

Moldova is experiencing rapidly intensifying climate pressures, including rising temperatures, recurrent droughts, declining water availability, and increasing hydrological variability. These pressures interact with long-standing structural challenges such as extensive landscape fragmentation, degradation of wetlands and riparian systems, simplified agricultural and forest ecosystems, and weakened ecological connectivity. Climate risks therefore manifest systemically, affecting ecosystems, rural livelihoods, water security, and land productivity simultaneously, rather than in isolated sectors.

Despite advanced degradation, the assessment demonstrates that Moldova retains substantial and actionable EbA potential. Many ecosystems remain close to functional thresholds where targeted restoration of hydrological processes, ecological structure, and connectivity can generate significant resilience gains. EbA thus represents a core adaptation pathway, particularly relevant in a country with limited grey infrastructure options and high dependence on natural capital.

The analysis identifies several priority EbA entry points that are ecologically robust and compatible with existing policy frameworks:

- Hydrological regulation and water retention, through floodplain connectivity restoration, wetland hydrology, and riparian vegetation, soil water storage enhancement through ecosystem recovery, and applying micro-retention measures;
- Landscape-scale climate buffering, via forest restoration, strengthening of ecological corridors, shelterbelts, and conservation of steppe and meadow micro-refugia;
- Soil and slope stabilization, including erosion control, ravine rehabilitation, and agroforestry systems;
- Human well-being and local resilience, supported by green infrastructure in urban and peri-urban areas and climate-resilient rural landscapes.

Forests, wetlands, agricultural land, grasslands, and linear landscape elements function as interconnected components of a single adaptation system, particularly through their combined influence on hydrology, microclimate regulation, and soil stability. National assessments indicate that a substantial share of Moldova's forests, including a high proportion identified as High Conservation Value Forests, provide ecosystem services essential for climate adaptation. At the same time, pressures such as invasive species, excessive ungulate populations, and structural constraints in forestry financing increasingly undermine forest regeneration and resilience.

Moldova already possesses a significant institutional and spatial foundation relevant for EbA, including PA system, Emerald Network, and the National Ecological Network (NEN). However, these instruments remain insufficiently operationalized for climate adaptation, due to fragmentation, mismatches between legal designations and ecological realities, and limited cross-sector coordination. Ongoing efforts led by the Ministry of Environment (MoE), in cooperation with civil society, to modernize the conservation legal framework represent a timely opportunity to better align biodiversity conservation, adaptive management, and climate-resilience objectives.

Donor engagement in Moldova is strong, involving the European Union, the World Bank, UN agencies, and bilateral partners. The principal challenge is not the availability of support, but the need for greater coherence across sectors, programmes, and spatial scales. Improved coordination and landscape-level planning would significantly enhance the effectiveness and durability of existing investments.

Looking ahead, the report outlines strategic directions for scaling EbA during 2025–2035, emphasizing a transition from isolated pilot projects to landscape-scale systems, re-centring adaptation around hydrology, strengthening ecological connectivity as climate infrastructure, embedding EbA within agriculture and rural development, and aligning national efforts with EU accession processes and regional Black Sea cooperation.

By treating ecosystems as living infrastructure and strengthening the functional role of PAs and connected landscapes, Moldova can move toward a proactive, nature-based adaptation pathway that safeguards biodiversity while enhancing long-term climate resilience and human well-being.

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## Background

This national Ecosystem-based Adaptation (EbA) scoping assessment has been prepared under the regional project "Ecosystem-based Adaptation Practices across Ukraine and the Black Sea Region (PAABS)", financed by the German Federal Ministry for Economic Affairs and Climate Action (BMWK) through the International Climate Initiative (IKI). The PAABS project is implemented by GIZ in partnership with the Michael Succow Foundation (MSF) and supports participating countries (Ukraine, Moldova, Georgia, Türkiye, Romania, and Bulgaria) in strengthening climate-adaptation capacities through nature-based solutions (NbS).

In line with the PAABS Terms of Reference, the role of MSF is to provide independent, science-based assessments that (i) identify priority ecosystems and landscapes for EbA, (ii) strengthen the role of PAs in climate adaptation, and (iii) support evidence-based planning and cross-country learning within the Black Sea region. The present assessment constitutes Moldova's national contribution to this regional framework and responds directly to the TOR requirement for country-level EbA scoping exercises that are methodologically robust, policy-relevant, and spatially explicit.

Moldova's inclusion in PAABS is of particular relevance, given that the country lies entirely within the Black Sea basin and shares its two major hydrological systems, the Prut and the Dniester rivers, with Romania and Ukraine. Climate-adaptation choices made at national level therefore have direct transboundary implications, especially with regard to hydrological regulation, wetland and floodplain management, biodiversity connectivity, and ecosystem services. This assessment is designed to align national EbA priorities with regional adaptation objectives under PAABS and to complement parallel scoping and pilot activities undertaken in neighbouring Black Sea countries.

The assessment builds on a growing body of prior work conducted in Moldova in recent years, including climate-risk assessments, biodiversity and ecosystem diagnostics, Emerald Network and PA planning, land degradation neutrality initiatives, forestry and wetland studies, and donor-supported restoration projects. Rather than duplicating these efforts, the study synthesizes existing knowledge, identifies gaps, and reframes available evidence through an EbA lens, with particular attention to landscape-scale processes and functional ecosystem roles.

In accordance with the TORs, the objectives of the assessment are to:

- analyse the climate, ecological, and socio-economic context shaping EbA needs and opportunities in Moldova;
- review and synthesize existing adaptation-relevant practices and ecosystem-management approaches, highlighting transferable lessons;
- analyse existing EbA and adaptation-related knowledge resources and exchange platforms in Moldova through a preliminary inventory and categorisation of available knowledge products;
- assess the role of key digital and institutional platforms in disseminating adaptation- and EbA-relevant information;
- identify gaps and provide recommendations to improve knowledge management and dissemination in support of EbA planning and implementation;
- identify and substantiate priority EbA landscapes and sites using transparent criteria, geospatial screening, and expert judgement; and
- outline investment-relevant EbA opportunities that can inform PAABS regional programming, national policy processes, and future donor engagement.

Methodologically, the assessment integrates a targeted review of national strategies, legal and policy frameworks, scientific literature, and geospatial datasets with field-based observations from representative landscapes across the country. Consultations with key institutions active in climate adaptation, nature conservation, forestry, water management, and agriculture were undertaken to ensure that identified EbA priorities are realistic, nationally anchored, and consistent with ongoing sectoral reforms. Additional inputs include site-specific travel notes and expert assessments used to validate climate-risk patterns, ecosystem conditions, and potential EbA entry points.

Overall, the study adopts a systems-based approach, analyzing interactions between climate, ecosystems, and society and identifying leverage points where ecosystem restoration and improved management can meaningfully reduce vulnerability. By doing so, it responds directly to the PAABS and IKI emphasis on nature-based, scalable, and regionally coherent adaptation solutions, while providing a clear evidence base for Moldova's future engagement in EbA programming at national and Black Sea basin levels.

# 1 National Context Diagnostics for EbA

## 1.1. General and nature resource context

### 1.1.1. Biophysical features

The Republic of Moldova's biophysical foundation is shaped by its position within the forest–steppe transition zone of Eastern Europe, where temperate broadleaf forests historically intermingled with extensive steppe grasslands. The country's relief is dominated by rolling loess plateaus, deeply incised river valleys, and a mosaic of gently undulating to steep hilly terrain. This topographical diversity creates highly variable microclimates, soil moisture regimes, and erosion susceptibilities are factors that directly influence the suitability, effectiveness, and urgency of EbA measures.

The loess-derived soils of Moldova include some of the most fertile chernozems in Europe, supporting a long tradition of intensive agriculture. However, their inherent vulnerability to water and wind erosion, coupled with steep slopes and reduced vegetative cover, has made land degradation a pervasive challenge. Similarly, Moldova's hydrological systems, dominated by the Dniester and Prut river basins and their tributary networks. depend heavily on precipitation, vegetation cover, and soil structure to regulate runoff, infiltration, and groundwater recharge. Changes in land use, combined with climate variability, have significantly disrupted these processes.

Together, these biophysical characteristics form the ecological baseline within which all EbA options must be designed. Understanding Moldova's natural resource distribution, topography, soil properties, and hydrological functioning is essential for identifying priority areas where nature-based interventions can stabilize slopes, retain moisture, reduce erosion, and restore landscape resilience.

### 1.1.2. Landscape structure

Moldova's landscape structure is commonly divided into three major physiographic zones: (1) the Northern Moldavian Plateau, (2) the Central Codru Plateau, and (3) the Southern Bugeac Plain, each with distinct ecological, geomorphological, and hydrological characteristics relevant to EbA planning.


**Figure 1**. Historical ecological regions of the Republic of Moldova. Reproduced from Sulesco et al. (2015); sampling points were removed to better display regional patterns.

Across much of the country, plateau-dominated terrain occurs at elevations between 200–350 m with numerous slope gradients exceeding 7–12%, which dramatically increase erosion risk. Landscapes are strongly dissected, being carved by hundreds of ravines ("hârtoape"), seasonal valleys, and gully systems that accelerate runoff and sediment transport. Deep river valleys of the Dniester and Prut create steep escarpments and unique microclimatic conditions suitable for forest regeneration, riparian buffers, and slope stabilization measures.

Chernozem soils dominate agricultural regions, providing high fertility but showing rapid structural breakdown under intensive tillage and rainfall extremes. Loess soils, which underlie much of Moldova, are particularly prone to gullying when exposed. Alluvial soils along river valleys offer high moisture retention but are increasingly disconnected from natural flooding cycles due to hydromorphological changes.

Moldova lies entirely within the Black Sea Basin, divided mainly between:

- the Dniester River Basin (67% of territory)
- the Prut River Basin (33%)

Numerous small tributaries, springs, and ephemeral streams historically contributed to groundwater recharge, sediment retention, and floodplain functioning. Many of these systems are now degraded or hydrologically disconnected due to land conversion, drainage, erosion, and climate-driven hydrological shifts.

Natural habitats persist mainly in central forests, southern steppe remnants, and riverine corridors, forming a patchwork of semi-natural landscapes. Ecological connectivity is low, limiting species migration, genetic flow, and the natural movement of water across the landscape.

Overall, Moldova’s landscape structure makes it both highly vulnerable to climate change and highly responsive to EbA measures. The prevalence of steep slopes, erodible loess substrates, and hydrologically sensitive valleys means that interventions such as shelterbelts, ravine afforestation, wetland reconnection, and riparian restoration can produce significant ecological and climate-resilience benefits when strategically applied.

### 1.1.3. Degradation patterns

Land degradation is one of Moldova’s most systemic environmental challenges, undermining soils, water resources, and the country’s overall adaptive capacity. These trends are accelerating due to unsustainable land use, increasing climate pressures, and weak landscape-level management.

Soil erosion affects about 1.5 million ha of agricultural land with average losses of 18.5 t/ ha/year and the highest in hotspots around 180 t/ha. Depth erosion is most powerful and concentrated on the slope land (60%) in the southern steppe and central silvo-steppe zones of Moldova (Leah, 2017).

Gully and ravine expansion continues across the country, driven by uncontrolled runoff and more intense rainfall. Expanding gullies disrupt hydrology, increase sediment loads, and degrade agricultural land. The rate of expansion is alarming. The total destroyed land area increases annually by 450–500 hectares, with the gully area itself increasing by 300 hectares per year due to the active growth of depth erosion (Leah, 2017).

Groundwater decline and hydrological imbalance are evident through falling water tables, drying springs and small streams, more frequent flash floods, and reduced baseflows. Forecast scenarios for Moldova suggest that climate change is expected to decrease surface water flows by 16–20% by 2030, reducing annual runoff by 13% between 2010 and 2040 (NCCAP, 2023). These conditions exacerbate falling groundwater levels and cause many wells and small rivers to dry out during intensive drought years (e.g., 2003, 2007, 2012), signaling a major loss of landscape water retention (Daradur et al., 2014).

Loss of natural vegetation cover, including forest canopy degradation, invasive shrub expansion in steppe areas, and drained or disconnected wetlands, reduces ecological buffering capacity.

Decline of agricultural ecological infrastructure, particularly the widespread removal of shelterbelts, has intensified wind erosion, reduced soil moisture, and heightened microclimatic stress on crops (Daradur et al., 2014).

These widespread degradation processes severely weaken Moldova's natural ability to store water, stabilize soils, and moderate climate extremes. Land degradation compromises soil health and decreases its water retention capacity, exacerbating the effects of drought. Therefore, reversing these negative trends through EbA and NbS is viewed as fundamental to strengthening climate resilience. The national strategy specifically aims to halt land degradation and restore degraded lands to increase drought resiliency, adaptation capacity and biodiversity services of agricultural ecosystems. For instance, large-scale reforestation stabilizes vulnerable hillsides against erosion while maximizing long-term carbon sequestration potential

## 1.2. Climate context

### 1.2.1. Climate risk and hazard exposure

Europe is the fastest-warming continent in the world (EEA, 2024), and the Republic of Moldova is widely recognised as one of the most climate-vulnerable countries in Europe (Fig. 2).


**Figure 2**. Climate risk and vulnerability in Moldova and peer countries. Countries are rated using a benchmark approach: those rated at high risk (red) are in the top one-third, medium risk (yellow) are in the middle one-third, and low risk (blue) are in the lowest one-third. SLR denotes sea level rise. Source: WB CCDR, 2024.

A combination of steadily rising temperatures, recurrent droughts, increasingly erratic precipitation (see Figure 3), and a national economy heavily dependent on climate-sensitive sectors exposes the country to significant and growing risks (WB, 2024; UNDP, 2023; IOM, 2025).

Observed climatic trends show a 1.4°C increase in annual mean surface temperature between 1960 and 2024, and most projections foresee an additional 2–3°C warming by mid-century, depending on global emissions pathways (NCCAP, 2023; IOM, 2025). These changes already influence hydrological regimes, agricultural productivity, and the viability of rural livelihoods.

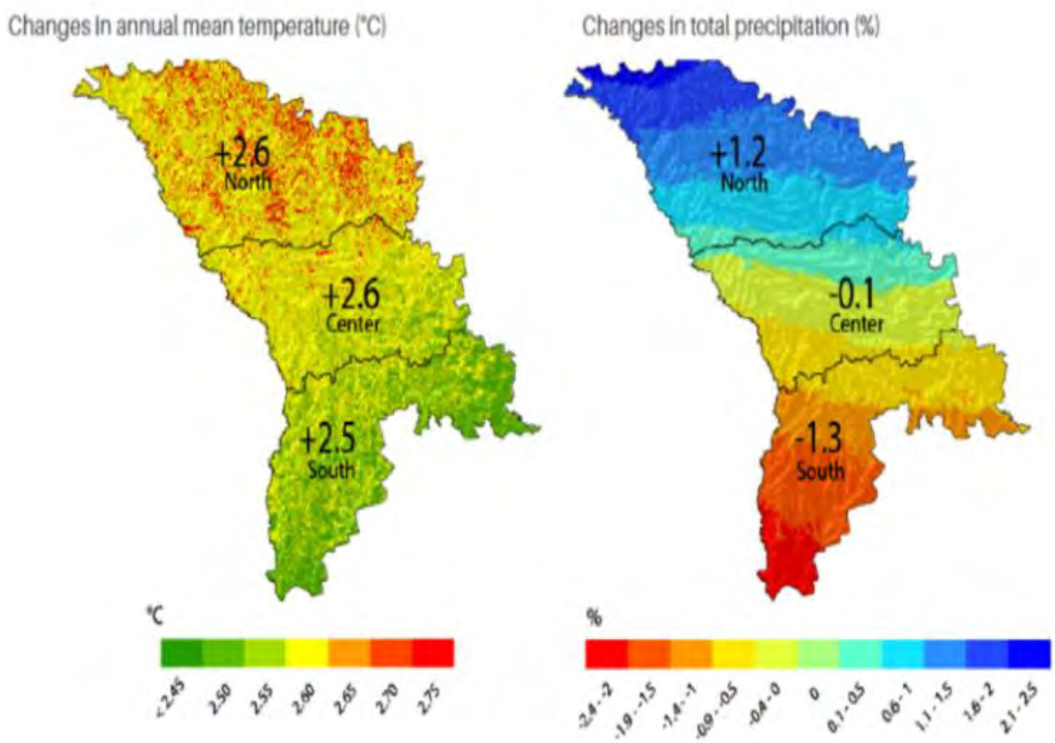

**Figure 3**. Projected changes in temperature and precipitation in Moldova by 2050 (WB GFDRR, 2020)

Climate warming is closely linked to a progressive decline in hydrological stability. The National Climate Change Adaptation Programme anticipates a 16–20% decrease in surface water availability by 2030, due to reduced precipitation, diminished snow cover, and increased evapotranspiration (NCCAP, 2023). Field evidence and national assessments point to widespread drying of small streams, springs, and wetland complexes as early signals of systemic hydrological stress across the landscape.

### 1.2.2. Hydro-climatic extremes: drought, heat and flood dynamics

Weather patterns have become increasingly unpredictable, with hydro-climatic extremes intensifying. The frequency of major droughts has intensified over the past two decades, while extreme rainfall events are becoming more intense, generating flash floods, rapid runoff, and accelerated soil erosion (Falaleeva, 2025). Moldova is increasingly exposed to compound risks, where droughts and extreme precipitation occur within the same growing season, undermining recovery capacity in both natural and agricultural systems.

Agriculture, which is Moldova's most climate-sensitive sector, absorbs the bulk of these impacts. As a primary economic pillar and livelihood source for a predominantly rural population, the sector is exceptionally exposed to hydrological variability. The 2020 drought alone caused losses exceeding USD 1.2 billion (IOM, 2025). Current climate-related damages already impose significant economic costs on Moldova. Average annual losses from multiple climate hazards are estimated at around 1.3% of GDP, with floods alone accounting for approximately 0.8% of GDP each year. In the absence of adaptation measures, climate-related losses are projected to increase substantially, exceeding 2.8% of GDP by 2050 as warming and climate variability intensify (WB MCEM, 2023; IOM, 2025).

These extreme dynamics place additional pressure on soils, surface water availability, irrigation systems, and the ecological integrity of the Prut and Dniester river basins. Increased evapotranspiration and prolonged dry spells amplify water stress, while short, intense rainfall events degrade land through erosion and sedimentation.

Beyond seasonal flow alteration, short-term hydrological variability represents an additional constraint for EbA in the Dniester basin. The operation of upstream hydropower infrastructure generates pronounced intra-day water-level fluctuations (hydropeaking) over extended river sections downstream, affecting riverbanks, riparian vegetation, spawning habitats, and floodplain connectivity. Such rapid fluctuations reduce the effectiveness of riverine ecosystems as natural buffers and complicate the design of EbA measures that rely on stable hydrological conditions (UNDP, 2022).

### 1.2.3. Vulnerability of ecological and socio-economic systems

The compound effects of warming, hydrological instability, and extreme weather events heighten the vulnerability of both ecological and human systems. Hydrological instability acts as a key climate-risk amplifier, because alternating dry spells and intense precipitation can generate non-linear stresses on soils, ecosystems, and infrastructure that are difficult to manage through isolated, sectoral responses (NCCAP, 2023). Ecosystem fragmentation further increases exposure by reducing the natural buffering capacity of landscapes and limiting recovery processes.

Critical systems are now at risk:

- irrigation infrastructure and rural water supply,
- hydropower reliability and energy security,
- biodiversity and habitat integrity,
- soil productivity and crop yields,
- wetlands, riparian corridors, and river basin ecosystems,
- rural livelihoods and food security.

If not addressed through adaptive and EbA approaches, Moldova's climate vulnerability will continue to deepen, with cascading consequences for public health, rural economies, migration pressures, and national socio-economic stability (WB CCDR, 2024).

## 1.3. Ecological context

Moldova lies within a complex ecological transition zone shaped by the interaction of several major European biogeographical regions. The country spans three principal zones (Cocîrță, 2012): the Central European region covering the Codrii plateau (54% of territory), the Eurasian forest–steppe and steppe region (30%), and the Mediterranean xerophytic steppe region in the south (16%). Historically, this transitional position created a mosaic of forests, xerophytic grasslands, riparian systems, and wooded steppe. Today, however, over 75% of the national territory is used for agriculture (FAO, 2021), leading to profound ecological simplification and reducing the landscape's natural capacity to buffer climatic shocks.

### 1.3.1. Agricultural landscapes and soils

Agricultural landscapes dominate Moldova's territory and form the ecological matrix within which all remaining natural and semi-natural ecosystems exist. Their condition strongly shapes the country's resilience to climate change because soils, vegetation cover and agroecological structure regulate water infiltration, carbon storage, erosion control and microclimate stability (Bejan et al., 2022; NBS, 2025). Healthy, organic-rich soils with stable structure can buffer rainfall variability, retain moisture during droughts, and sustain biological activity essential for nutrient cycling (Lupu & Jităreanu, 2018). Vegetative elements – such as shelterbelts, field margins, hedgerows and perennial crop systems – mitigate heat extremes, reduce evapotranspiration and stabilise slopes (Gherasimov et al., 2019; EU4Environment, 2023).

Over recent decades, however, Moldova's agricultural ecosystems have undergone deep structural simplification. Removal of shelterbelts, consolidation of large fields, continuous tillage and drainage of small depressions have reduced heterogeneity and weakened hydrological regulation (Lupu et al., 2020; Bejan et al., 2022). Compaction and declining soil organic matter have become widespread, particularly in central and southern districts (Sturzu et al., 2017). These changes reduce infiltration, increase runoff, accelerate erosion, and elevate drought sensitivity (WB CCDR, 2024). In many areas, erosion now exceeds natural soil formation rates, contributing to downstream sedimentation and the degradation of wetland ecosystems see (Figure 4) (Jităreanu & Lupașcu, 2019; Bejan et al., 2022).

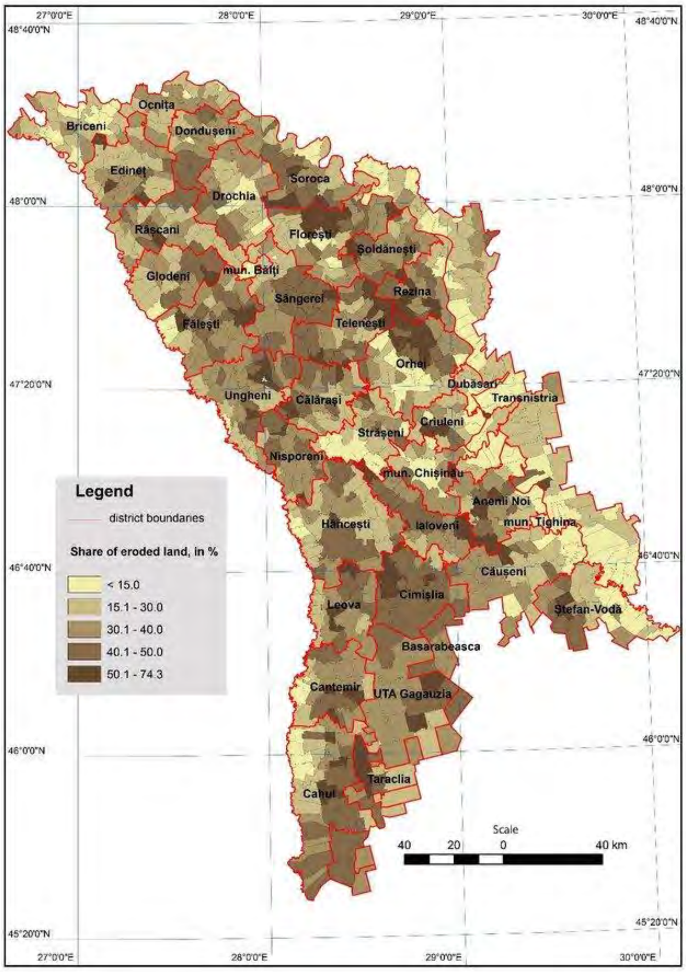

**Figure 4.** Share of eroded land per commune in 2021 (Bejan et al., 2022).

These trends interact with climate extremes to create reinforcing vulnerability loops: rapid runoff during intense precipitation, desiccation during droughts, and crop stress during heatwaves. With more than three-quarters of the national land base under cultivation, agricultural landscapes represent both Moldova's greatest vulnerability and its greatest opportunity for EbA. Strategic interventions such as agroforestry lines, shelterbelt restoration, conservation agriculture, riparian buffers, micro-wetland reconnection, and soil-carbon rebuilding can offer some of the most effective pathways for strengthening ecological functionality and climate resilience.

### 1.3.2. Forest ecosystems

Prior to large-scale land conversion, Moldova's forests were dominated by oak formations (*Quercus robur, Q. petraea, Q. pubescens*), with isolated beech (*Fagus sylvatica*) populations occurring in cooler northern and central districts (CBD, 2005). At present, Moldova is a poorly forested country, possessing one of the lowest forest covers in Europe with only around 11% of the national territory covered by functioning ("true") forest ecosystems (Donica et al., 2024), while the official category of "forests and lands covered with forestry vegetation" reports 14.7% (462,000 ha) (NBS, 2025) (see Annex 4.1 for the forest cover map). This discrepancy reflects the widespread presence of structurally simplified stands, plantations, and degraded forest formations with reduced ecological functionality. Overall, Moldova's forests are highly fragmented, structurally simplified, and increasingly exposed to climate stress (Fig. 5).

Landscape-scale metrics further illustrate declining forest integrity. Mean forest patch size decreased from 293 ha in 1975 to 268 ha in 2023, while edge density increased from 28.6 to 42.7 m/ha, indicating intensifying fragmentation pressure (Angheluță et al., 2024). Oak-dominated forests, in particular, exhibit widespread regeneration failure and drought-related decline (Boaghie, 2021). Moldova currently lacks intact forest landscapes and retains only small, isolated areas of relatively high forest integrity, making connectivity-oriented EbA measures especially critical.

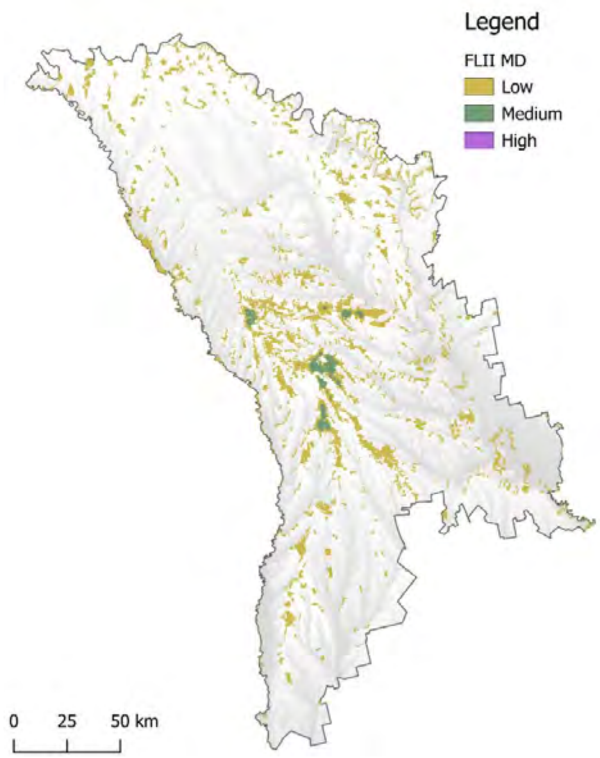


**Figure 5**. Forest Landscape Integrity Index. Source: Data derived from GEE, published by Grantham et al., 2020.

Recent national assessments further highlight the functional importance of remaining forest ecosystems for climate adaptation. The national identification of High Conservation Value Forests (HCVF) indicates that approximately 47% of Moldova's forest area qualifies under one or more HCVF categories, with a substantial share falling under HCVF Category 4, which covers forests essential for water regulation, erosion control, slope stabilisation, microclimate buffering, and protection of agricultural land (EU4Environment, 2023). These forests are predominantly located in river basins, hilly and erosion-prone landscapes, floodplain margins, and forest–agriculture interfaces, underscoring their role as natural infrastructure for EbA at landscape scale.

Ongoing climate-driven heat stress and recurrent droughts further weaken forest physiological resilience, increase tree mortality and favour the spread of opportunistic and invasive tree species (Nyssen et al., 2024) such as *Acer negundo, Ailanthus altissima*, and *Robinia pseudoacacia*. These species rapidly colonise canopy gaps, alter successional pathways, and reduce the long-term restoration potential of native broadleaf communities. From an EbA perspective, forest interventions must therefore prioritise structural restoration, assisted natural regeneration (ANR), reinforcement of native regeneration niches, control of invasive species, and enhancement of ecological connectivity across fragmented agro-landscapes.

In addition to climatic stressors, forest resilience is increasingly constrained by excessive ungulate pressure, particularly in and around strictly PAs. Overpopulation of deer, including introduced Sika deer (*Cervus nippon*) and hybrids with native red deer (*Cervus elaphus*), has resulted in intensive browsing of saplings and regeneration layers. This pressure substantially limits natural regeneration, alters species composition, and weakens forests' capacity to function as effective climate buffers, thereby directly undermining EbA objectives.

### 1.3.3. Steppe and grassland ecosystems

Natural steppe habitats once widespread across southern and central Moldova are now among the most threatened ecosystems in the country. Less than 2% of the national territory retains steppe or steppe-associated meadows (CBD, 2005, 2019). Remaining patches occur as small, isolated fragments embedded within intensive agricultural landscapes, where ecological processes are heavily constrained. Dominant xerophytic grasses such as *Stipa* spp., *Festuca valesiaca, Bothriochloa ischaemum, Agropyron cristatum* survive mostly in degraded or secondary forms.

Pastures dominated by steppe/meadow assemblages cover roughly 9.1% (350,400 ha) of Moldova's territory, but face rapid encroachment by invasive or ruderal species, including *Xanthium strumarium, Ambrosia artemisiifolia*, and *Elaeagnus angustifolia*. Overgrazing, fragmentation, soil erosion and lack of adaptive management further weaken ecological function.

EbA priorities for steppe would include:

- preventing further fragmentation;
- restoring native xerophytic grasses;
- managing shrub encroachment and invasive species;
- re-establishing ecological processes through rotational grazing or controlled biomass removal;
- improving connectivity between grassland remnants and adjacent forest–steppe mosaics.

Given their rarity, steppe remnants hold disproportionate conservation and EbA value, functioning as climate-resilient refugia for drought-tolerant species and as key biodiversity reservoirs.

### 1.3.4. Wetland and riparian systems

Wetland and riparian ecosystems (rivers, oxbow lakes, meadows, floodplains and small depressional wetlands) once formed a dense hydrological network across Moldova's lowlands. Extensive drainage, agricultural conversion and river regulation have dramatically reduced their extent and altered hydrological dynamics. Moldova has lost an estimated 70-80% of its historical floodplain wetlands (UNEP/GRID Arendal, 2019) (See Annex 4.1 for the current wetland distribution). Riparian forests have been narrowed or removed along many watercourses, decreasing hydraulic roughness, reducing bank stability, and accelerating runoff during storm events. Many remaining small wetlands, springs and streams have dried or become seasonally ephemeral. Climate-induced hydrological instability exacerbates these pressures. Reduced baseflows, diminished snowpack, and elevated evapotranspiration weaken groundwater recharge, while intense rainfall events generate flash floods, channel incision and sedimentation. These changes undermine the ecological integrity of the Prut and Dniester basins, reduce natural water storage, and magnify flood-drought cycles.

Altered sediment transport represents a further limitation to EbA in the Dniester valley (UNDP, 2022). The retention of sediments upstream of hydropower reservoirs has led to a drastic reduction in suspended sediment loads downstream, contributing to riverbed incision in some sectors and excessive macrophyte development and siltation in others. These processes reduce channel dynamics, degrade floodplain habitats, and weaken regulating ecosystem services such as self-purification, erosion control, and habitat renewal.

A critical structural limitation for wetland conservation and EbA planning in Moldova is the absence of a comprehensive national wetland inventory based on clear ecological and hydrological criteria. Existing data are fragmented, outdated, or derived from project-specific mapping exercises, while many wetlands continue to degrade or disappear under agricultural pressure and hydrological alteration, a process increasingly exacerbated by climate change. This data gap has also contributed to administrative inconsistencies, most visibly within Ramsar sites, where large areas of intensively used agricultural land (including orchards, arable fields, and private parcels) have been included despite lacking wetland characteristics. It is now essential to resolve these boundary and classification issues through a systematic wetland inventory, functional habitat delineation, and legal clarification. All this will help restore the ecological credibility of Ramsar designations and to enable effective governance, land administration, and EbA implementation.

A recent European synthesis on peatland distribution and condition (Tanneberger et al., 2021) provides a continental overview of mire ecosystems but includes Moldova within aggregated datasets without ground-verified evidence. Similar proxy-based inclusions can also be found in other international datasets and syntheses. This is ecologically irrelevant in the national context, as Moldova does not possess, and has never historically supported, peat-forming ecosystems, and such inclusions may therefore inadvertently mislead interpretation if not explicitly clarified[1].

For remaining floodplains, wetland-related EbA opportunities would include:

- reconnection of floodplains and abandoned channels;
- restoration of small depressional wetlands and spring-fed micro-systems;
- riparian buffer expansion;
- removal or modification of obsolete embankments and drainage structures;
- re-establishment of hydrological connectivity between wetlands and adjacent agricultural landscapes.

Such measures enhance water retention, reduce peak flows, improve water quality, and support high biodiversity while strengthening climate resilience at basin scale.

#### 1.3.5. Ecosystem fragmentation and thresholds

Ecosystem fragmentation is a defining structural feature of Moldova’s landscape. With nearly 75% of the country’s territory dedicated to agriculture (FAO, 2021), natural and semi-natural habitats persist mainly as small, isolated remnants. Forest blocks, steppe patches, riparian strips, and wetland fragments are embedded within intensively used land, limiting ecological continuity and weakening the capacity of ecosystems to buffer climate extremes.

This fragmentation reduces functional connectivity, restricts dispersal and regeneration processes, and increases the vulnerability of ecosystems to drought, heatwaves, and hydrological disruption. It also places many species at risk, especially those occurring at the edge of their natural geographical range, where Moldova’s forest–steppe transition position makes populations naturally sensitive to isolation and environmental change.

While no virgin ecosystems remain, Moldova still retains high-value “islands” of semi-natural habitats – forest cores, limestone steppe outcrops, old shelterbelt networks, riparian fragments, and small wetland pockets. These areas, despite being isolated, often preserve typical community structure and ecological processes, making them important reservoirs for recovery. Their distribution creates clear opportunities for EbA: reconnecting these patches, expanding them through natural regeneration, or restoring hydrological links can rebuild landscape-level resilience with relatively modest interventions.

Fragmentation therefore represents both a limitation and a strategic entry point. Many ecosystems are close to or below critical thresholds in size, hydrological function, or connectivity; yet precisely because these thresholds are visible, they allow the identification of priority corridors, buffer zones, and restoration nodes. Strengthening linkages between existing semi-natural patches, rather than attempting to recreate lost wilderness, offers one of the most realistic and effective pathways for EbA in Moldova

[1] Moldova has no **natural peatlands**. All wetland-type ecosystems occur on mineral substrates and are associated with floodplains, river corridors, springs, and shallow depressions rather than peat-forming systems. Such inclusions typically result from the use of coarse-scale European or global datasets, habitat proxies, or soil classifications, rather than from field-verified peat thickness, peat accumulation processes, or the presence of functional mire ecosystems.

## 1.4. Socio-economic context

### 1.4.1. Rural livelihoods and land dependency

Moldova remains a predominantly rural country, with approximately 57% of the population living in villages and depending directly or indirectly on agriculture for their livelihoods (WB CCDR, 2024; NBS, 2023). Although agriculture contributes only around 12% of national GDP, it plays a far more significant role at the household level: small-scale farming, seasonal labour, remittances, and informal agri-food chains provide essential income and subsistence for rural families.

Rural poverty levels remain comparatively high, and remittances equivalent to 14% of GDP (IMF, 2023) function as a critical coping mechanism in years of climatic or economic stress. However, this dependence on external income also reveals the structural vulnerabilities of rural households, many of whom lack the resources to invest in adaptive practices such as improved soil management, irrigation, or climate-resilient crops.

Water and energy insecurity further intensify rural vulnerability. Only 48% of rural residents have piped water on household premises compared to nearly 90% in urban areas (WB MWSSP, 2020), and Moldova's low domestic energy self-sufficiency (25%) exposes rural areas to price shocks and supply instability (IEA, 2022). Together, these factors heighten household exposure to drought, reduce agricultural productivity and increase climate-related socio-economic risk.

### 1.4.2. Demographic pressures

Moldova's demographic trends significantly shape its adaptive capacity (IOM, 2025). Outward migration of working-age adults, particularly from rural districts, has reduced the agricultural labour force and undermines the continuity of land management practices. An ageing rural population and declining household size further constrain the availability of labour is available for routine actions that directly support ecosystem function and risk reduction, such as soil conservation, orchard maintenance, pasture management, and upkeep of small water infrastructure (e.g., drainage channels, springs, small ponds).

In principle, population decline can reduce certain pressures on ecosystems. In practice, in Moldova it often produces the opposite effect because many landscapes are "maintenance-dependent". When labour and local stewardship decline, land is more likely to be abandoned or under-managed, especially in hilly and erosion-prone areas where sustained effort is needed to control runoff, stabilize ravines, and maintain vegetative cover. Under these conditions, abandonment frequently increases erosion, accelerates gully development, facilitates the spread of invasive species, and allows waste dumping and uncontrolled burning to persist, all of which can amplify climate sensitivity rather than reduce it. In other areas, land remains cultivated but shifts toward low-input extensive systems with limited soil and water protection measures, which are more exposed to climatic variability and often yield lower economic returns.

These patterns are consistent with district-level vulnerability assessments, where reduced access to services, weakened institutional capacity, and socio-economic constraints are associated with higher overall vulnerability. The results of the Climate Vulnerability Index (CVI) analysis (Ţăranu & Gutium, 2023) reflect this logic: districts characterised by weaker adaptive capacity, including limited service provision and institutional resources often linked to demographic decline, tend to display elevated combined vulnerability scores. While migration and ageing are not always captured as explicit indicators, their effects are indirectly reflected through the adaptive capacity component of the CVI.

Migration also reduces community capacity for collective action (IOM, 2025). Many EbA interventions, including shelterbelts, riparian buffers or small wetland restoration, require periodic maintenance, monitoring, and enforcement (e.g., grazing control, invasive regrowth removal, repair of small hydrological structures). Demographic shrinkage can therefore weaken the long-term sustainability of such measures unless LPA, community-based organizations or or targeted financing arrangements compensate for the declining workforce and support long-term stewardship.

### 1.4.3. Land tenue structure

Moldova's land tenure structure is highly fragmented and remains a major constraint for landscape-scale EbA implementation. The country is characterized by a dual system: a large number of small private parcels, often

1–3 ha, highly dispersed and managed independently, and extensive blocks operated by large agricultural enterprises (FAO, 2020). This configuration limits coordinated land management, reduces incentives for long-term soil and water conservation, and complicates the establishment of contiguous ecological corridors or restoration zones.

Communal and state lands, though limited in extent, often contain the remaining semi-natural habitats and degraded areas with high EbA potential. However, unclear responsibilities, inconsistent cadastral records, and limited local planning capacity frequently delay or prevent integrated interventions.

For EbA, the current tenure landscape presents both constraints and opportunities: fragmented private parcels hinder landscape coherence, while strategically located public and communal lands can serve as anchors for restoration and connectivity. Effective EbA scaling will depend on targeted cooperation mechanisms between landowners, community-owned, and state agencies, supported by clear incentives and simplified administrative procedures.

### 1.4.4. Energy and water insecurity

Energy and water insecurity significantly shape Moldova's vulnerability profile and directly influence the feasibility of EbA interventions. The country remains highly energy-dependent, importing about 75% of energy and gas demand (IEA, 2022). Although ongoing reforms and investment aim to diversify sources and improve grid resilience (Energy Community Secretariat, 2025), dependency on external supply continues to expose rural communities and critical infrastructure to economic and climatic shocks. At the household level, uneven access to gas networks further constrains adaptive capacity, particularly in rural regions where dependence on biomass or inefficient heating systems increases sensitivity to both price volatility and extreme weather events (Fig. 6).

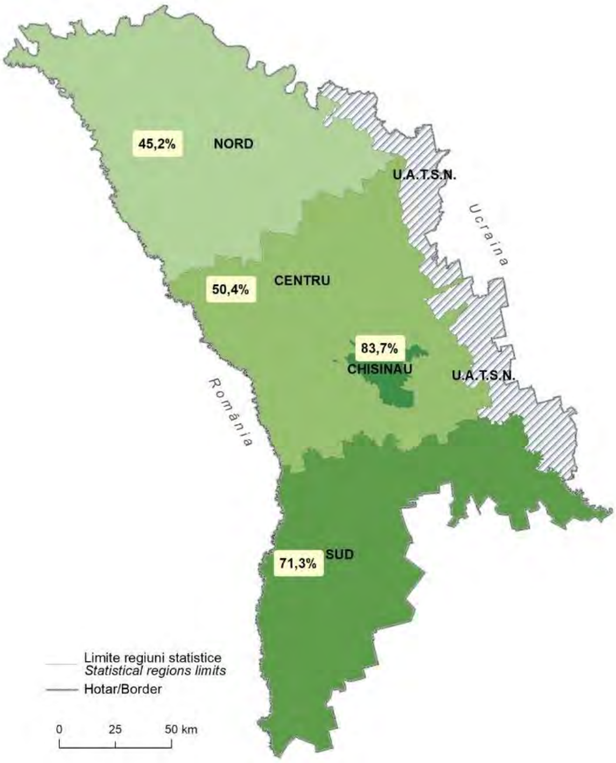


**Figure 6.** Households equipped with gas from the network, by statistical regions (NBS, 2024)

Water scarcity is an even more acute constraint. Large parts of the country experience structural water deficits. Only a portion of rural households have reliable access to piped water, limiting adaptive capacity by reducing households' flexibility to cope with drought and forcing reliance on climate-sensitive sources such as shallow wells, springs, or surface water. This increases vulnerability during dry years, particularly for elderly and low-income households, who have limited physical and financial capacity to secure alternative water sources or absorb prolonged water shortages. Regional disparities in access to piped water supply illustrate these structural constraints and highlight pronounced differences in household-level adaptive capacity between Chișinău and other statistical regions (Fig. 7).

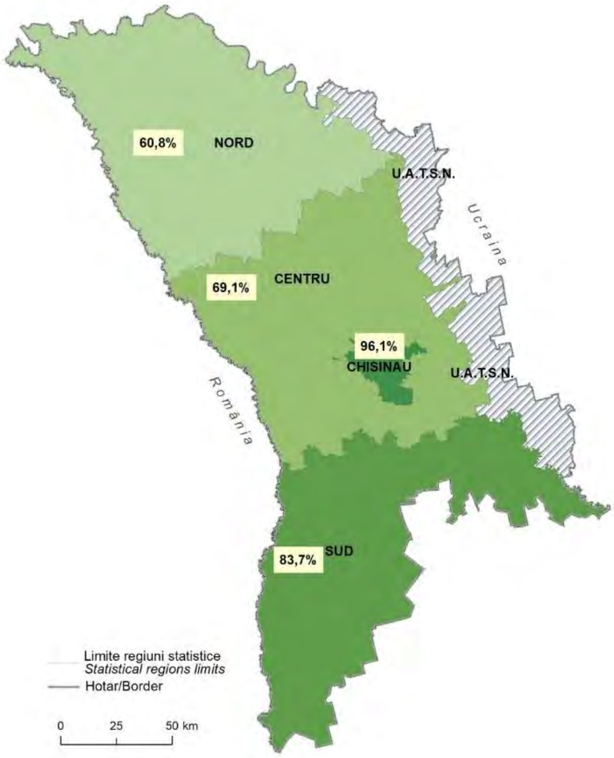


**Figure 7.** Households equipped with piped water supply, by statistical regions (NBS, 2024)

Water quality further exacerbates these challenges: about 70% of surface water in the country is classified as having very poor ecological status due to high nutrient pollution, sediment loads, and altered hydrology (ANSP, 2024). Under such conditions, the natural buffering and self-purification capacity of river systems is severely constrained. The effectiveness and cost-efficiency of low-cost EbA measures, such as riparian restoration or natural water retention, which are most effective where pollution pressures are moderate and can be attenuated through ecosystem processes alone.

For EbA, these conditions present both risks and strategic entry points. Energy dependency underscores the need for nature-based measures that reduce irrigation and cooling demands, while water scarcity elevates the importance of landscape-scale water retention, wetland reconnection, and soil-moisture restoration. Addressing energy and water insecurity is therefore closely linked to building climate resilience through EbA, but requires realistic consideration of existing infrastructure and pollution constraints.

### 1.4.5. Institutional drivers of vulnerability

Socio-economic vulnerability in Moldova is closely linked to structural and institutional constraints that limit climate resilience. Land-tenure fragmentation remains one of the most significant barriers to landscape-scale adaptation: many private parcels are 1-3 hectares, making coordinated planning difficult and hindering adoption of agroforestry, conservation tillage, rotational grazing, or soil-moisture management practices.

At the opposite end of the spectrum, large-scale operators cultivate extensive monocultures—sunflower and cereal crops (primarily wheat, barley, and maize), typically grown in simplified rotations—that simplify ecosystems and reduce natural buffering capacity against drought, erosion, and hydrological extremes. These contrasting land-use structures create an uneven distribution of vulnerability and shape the feasibility of EbA interventions across regions.

Institutional capacity gaps further amplify exposure to climate risks (Fig. 8). Rural local public authorities (LPAs) often lack the financial, technical, and administrative resources to support landscape-scale planning or coordinate adaptation initiatives. Water and irrigation systems are fragmented across multiple agencies, complicating integrated watershed management. Environmental responsibilities are divided across MoE, National Administration Apele Moldovei (NAAM), Moldsilva, and LPAs, creating coordination challenges that slow implementation of EbA measures.

Fragmented land governance, weak local capacity, subdivided responsibilities, and insufficient maintenance of ecological infrastructure are the institutional drivers that interact with demographic and climatic pressures to shape overall vulnerability. They underscore the need for community-based, cross-sector, and landscape-scale adaptation strategies that align with Moldova's socio-economic realities and can be maintained under conditions of labour scarcity and financial constraint.

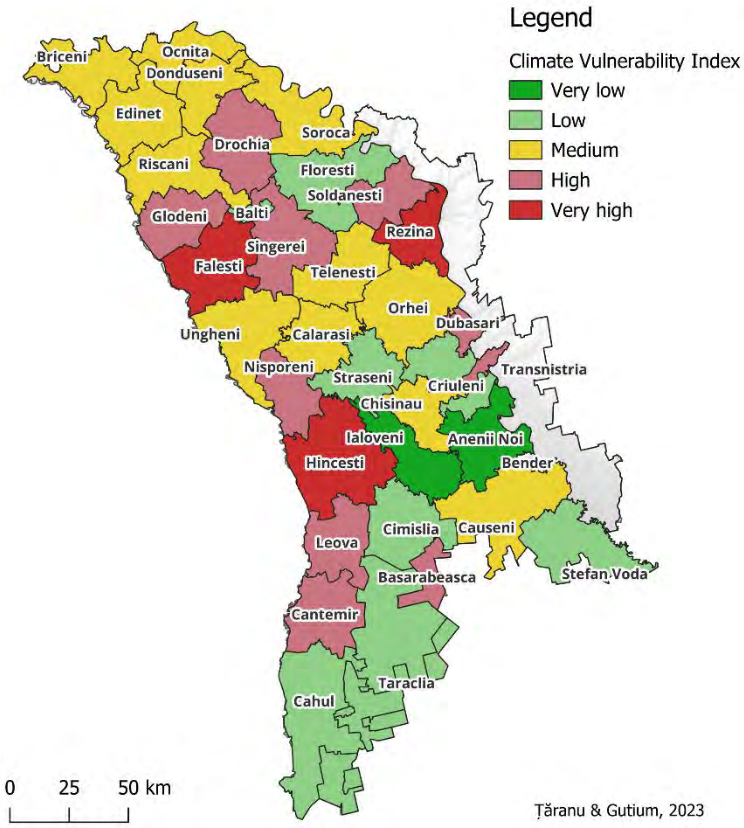


**Figure 8.** Climate Vulnerability Index (CVI) 2008-2019. Source: reproduced map of Țăranu & Gutium (2023). The map synthesizes climate exposure, socio-economic sensitivity, and adaptive-capacity indicators at district level. High-vulnerability areas correspond closely with regions affected by outward migration, fragmented land tenure, weak water infrastructure, and climate-sensitive agricultural systems.

### 1.4.6. Climate impact chains and vulnerability

Based on dominant climate impact chain (CIC) identified in Sections 1.1-1.4, a limited number of recurrent risk pathways emerge that consistently link climate hazards to ecosystem degradation and human vulnerability. These pathways cut across sectors and landscapes, confirming that Moldova's climate risks are largely systemic rather than site-specific (a detailed presentation of the CIC is provided in Annex 7).

Table 1 below synthesizes these dominant risk pathways and identifies corresponding EbA entry points, defined here as ecosystem-based interventions that directly target the underlying biophysical processes driving vulnerability (e.g. soil moisture loss, accelerated runoff, hydrological disconnection, and ecosystem fragmentation). Each entry point is linked to a core adaptation function, clarifying how ecosystem management contributes to risk reduction.

Together, these EbA entry points provide the analytical bridge between the vulnerability assessment and the site-based prioritisation and intervention options developed in subsequent chapters, ensuring that proposed EbA measures are grounded in clearly articulated climate-risk pathways rather than isolated sectoral responses.

**Table 1**. EbA entry points derived from dominant climate risk pathways

| Dominant climate risk pathway | EbA entry point | Primary adaptation function |
|---|---|---|
| Drought, soil moisture deficit, yield instability | Shelterbelts, agroforestry, assisted natural regeneration (ANR) | Microclimate buffering, educed evapotranspiration, soil moisture retention |

| | | |
|---|---|---|
| Intense rainfall, erosion, sedimentation | Ravine stabilisation, riparian buffers, slope revegetation | Reduced runoff, sediment retention, erosion control |
| Reduced baseflow and water scarcity | Floodplain reconnection, wetland (and oxbow) restoration | Water retention, groundwater recharge, baseflow support |
| Heat stress and ecosystem fragmentation | Forest connectivity, green infrastructure, ecological corridors | Local cooling, enhanced resilience of ecosystems, and recovery |
| Degradation-driven high adaptation costs | Early-stage low-input EbA (ANR, protection, zoning) | Cost-effective risk reduction, prevention of irreversible degradation |

## 1.5. Policy, legal, and institutional landscape

Given that Moldova's priority risks are drought, erosion and water insecurity (Sections 1.1–1.4), EbA requires not only ecological targeting but also an enabling governance framework. EbA in Moldova is shaped by a complex policy and institutional environment that is gradually aligning with EU frameworks but remains fragmented and uneven in implementation. Understanding this context is essential for interpreting how EbA is currently understood, applied, and constrained in practice, and for identifying structural barriers that limit the integration of ecosystem-based approaches into climate adaptation, land-use planning, water management, and biodiversity conservation.

### 1.5.1 EbA and NbS in Moldova: policy recognition and operational approach in this report

**Ecosystem-based Adaptation (EbA)** integrates the use of biodiversity and ecosystem services into an overall strategy to help people adapt to the adverse impacts of climate change. It includes the sustainable management, conservation and restoration of ecosystems to provide services that help people adapt to both current climate variability and climate change (Colls et al., 2009).

**Nature-based Solutions (NbS)** are actions to protect, sustainably manage and restore natural or modified ecosystems, which address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN, 2020).

Within the IUCN conceptual framework, NbS functions as an umbrella for multiple ecosystem-based approaches, including EbA. As such, the EbA can therefore be understood as the adaptation-specific operationalisation of NbS, where ecosystem-based interventions are explicitly designed to address climate-related risks and reduce human vulnerability (IUCN, 2020). In this report, EbA is used in this specific sense, referring to NbS interventions that are deliberately framed around climate adaptation outcomes.

**Policy recognition of EbA and NbS in Moldova**

A review of key national strategies, sectoral policies, and planning instruments relevant to climate change, environment, water management, forestry, and biodiversity indicates that the term "Ecosystem-based Adaptation" is not consistently or explicitly used in Moldovan policy documents. Climate change adaptation is primarily addressed through sectoral approaches, including agriculture, water resources, forestry, disaster risk management, and biodiversity conservation, often without a unified conceptual framework that explicitly links ecosystem management to adaptation outcomes.

Similarly, the term "Nature-based Solutions" appears only sporadically and mostly implicitly, typically in the context of ecosystem restoration, sustainable land management, green infrastructure, or biodiversity conservation associated with European Union approximation processes. Despite this limited explicit usage, many existing and planned measures correspond in substance to EbA principles, even if they are not labelled as such. These include floodplain restoration, forest and shelterbelt rehabilitation, erosion control through vegetation, wetland conservation, and interventions aimed at improving landscape connectivity and hydrological buffering.

In this sense, EbA in Moldova currently exists more as an implicit practice than as an explicit policy concept. The absence of a formal EbA definition in national policy does not indicate a lack of relevance, but rather reflects the early stage of conceptual integration of ecosystem-based approaches into national adaptation and development frameworks.

**Operational use of EbA in this report**

Given this context, the present report applies EbA as an analytical and operational framework, rather than as a reflection of an already institutionalised policy approach in Moldova. EbA is used here to structure the assessment of climate risks, ecosystem functions, and adaptation responses in a systematic and decision-oriented manner.

The analysis considers ecosystem functions primarily at landscape and catchment scale, reflecting the fact that Moldova's dominant climate-related risks – such as drought, soil erosion, flash flooding, declining water availability, and microclimatic extremes – are driven by hydrological and ecological processes that extend beyond individual sites or administrative boundaties. While these processes operate across interconnected ecosystems, their adaptation benefits are realised many at local and community level, including for farmers, water users, and rural settlements.

To ensure operational consistency, measures and priority areas are treated as EbA only when they:

(i) address a clearly defined climate hazard;
(ii) rely on a regulating ecosystem function (e.g. water retention, infiltration, shading, erosion control); and
(iii) are explicitly linked to a human vulnerability outcome (e.g. reliability of rural water supply, reduced crop stress, or reduced flood and erosion damage).

Accordingly, priority EbA areas identified in the report are understood as socio-ecological systems, where ecosystem condition and functioning directly influence human well-being and adaptive capacity. This linkage is substantiated through the combined use of social vulnerability indicators, field observations, and site-specific evidence, ensuring that EbA prioritisation is grounded in both biophysical processes and socio-economic relevance.

### 1.5.2. National policy and legal framework

Over the past decade, Moldova has advanced a broad set of climate-, environment- and land-related policies that provide a basis for EbA. Core elements include the National Climate Change Adaptation Programme (NCCAP, 2023), the Nationally Determined Contribution (NDC, 2020; NDC, 2025)), the Biodiversity Programme 2026-2030 (=NBSAP)[2], the National Program on Extension and Rehabilitation of Forests (PNERP/NFERP, GD 55/2023), river-basin management plans, and agricultural and rural development policies.

These frameworks highlight priorities such as water resource protection, soil conservation, forest restoration, and improved land governance. Moldova is also progressively aligning its legislation with EU directives under the Association Agreement, including the Water Framework Directive, Habitats and Birds Directives (via Emerald/Natura 2000 processes), and environmental information and planning standards.

However, implementation gaps persist. Many policy objectives lack operational mechanisms, dedicated funding, or coherent monitoring systems. Climate-risk considerations remain weakly mainstreamed across land-use planning, agricultural support schemes, and local development strategies, limiting the translation of national frameworks into landscape-level action.

### 1.5.3. Sectoral responsibilities and institutional mandates

EbA touches multiple sectors – forestry, water, agriculture, biodiversity, local development – each governed by different institutions with distinct mandates:

- **Ministry of Environment** (MoE) oversees climate policy, biodiversity conservation, environmental protection, and coordination of adaptation frameworks.
- **National Administration Apele Moldovei** (NAAM) manages water resources, irrigation, hydrological monitoring, and river-basin management but has limited mandates for ecological restoration.
- **Agency Moldsilva** administers state forests, forest regeneration, and protection functions but plays little role in broader landscape-scale planning outside forest land.

[2] It is under final state of public consultations now, likely to be approved soon.

- **Ministry of Agriculture and Food Industry** (MAFI) shapes agricultural incentives, extension services, land-use regulations, and farming support but has limited integration with biodiversity or hydrological objectives.
- **Local Public Authorities** (LPAs) influence land allocation, pasture use, local planning, and community-level natural resource management but often have insufficient capacity or resources.
- **Environmental Agency, Inspectorate for Environmental Protection, and research institutions** contribute monitoring, compliance, and scientific input, though often in project-based or fragmented formats.

While each institution contributes to elements of EbA, mandates often overlap, creating unclear responsibility boundaries. For example, wetland restoration, invasive species control, riparian-zone management, or agroforestry expansion may fall between sectoral silos. This fragmentation reduces efficiency and slows coordinated landscape-level adaptation.

#### 1.5.4. Governance architecture shaping EbA

Moldova's governance arrangements for EbA remain highly fragmented. Forestry, water, agriculture, biodiversity and local development institutions operate largely in parallel, with limited mechanisms for joint planning or coordinated implementation at landscape scale. Despite ongoing alignment with EU environmental directives, practical implementation is hindered by unclear mandates, overlapping responsibilities, and insufficient enforcement and monitoring capacity.

Effective scaling of EbA will require:

i. stronger coordination between the MoE, NAAM, Moldsilva and LPAs;
ii. a reinforced national monitoring system for hydrology, ecosystem condition, land degradation, and climate-risk indicators;
iii. mainstreaming hydrological restoration (wetland reconnection, riparian buffers, groundwater-recharge functions) into spatial planning, agricultural support policies, and river-basin management frameworks; and
iv. clearer governance arrangements for PAs, including Emerald sites and future Natura 2000 sites.

Without such systemic improvements, EbA interventions risk remaining isolated pilot actions rather than integrated, basin-scale adaptation solutions capable of reducing vulnerability across entire landscapes.

#### 1.5.5. Cross-sector integration challenges

EbA requires the joint action of sectors that historically operate with different planning cycles, objectives, and regulatory frameworks. Key barriers include:

a) Weak coordination across sectors: forestry initiatives focusing on afforestation or regeneration rarely integrate hydrological restoration objectives; agricultural programmes seldom consider biodiversity or riparian function; and water-sector planning often excludes soil and land-management dynamics.
b) Inconsistent methodological approaches: different monitoring and planning methods across sectors make it difficult to create shared EbA baselines or evaluate cumulative impacts.
c) Fragmented spatial planning: local development strategies, agricultural zoning, and river-basin plans are not systematically harmonized, resulting in mismatched priorities within the same landscape.
d) Limited integration of EbA into economic and infrastructure policies: hydrological restoration, connectivity planning, soil protection, or wetland management remain peripheral to investment planning or agricultural subsidy structures.

Addressing these cross-sector challenges is essential for embedding EbA into national and local development pathways and ensuring that adaptation measures function as interconnected, landscape-scale solutions rather than isolated sectoral responses.

#### 1.5.6. EU approximation relevance

EU approximation is a major driver shaping Moldova's climate, biodiversity, and natural resource policies. Alignment with the EU environmental acquis, particularly the Habitats Directive, Birds Directive, Water Framework Directive, Floods Directive, and Nature Restoration Regulation can create a clear framework within which EbA can be systematically developed and scaled. Transitioning from the Emerald Network to a functional

Natura 2000 system is a critical milestone for accession and requires robust habitat assessments, monitoring systems, and restoration planning.

EU standards emphasize integrated river-basin management, ecological connectivity, good water status, and long-term conservation objectives, all directly reinforcing the principles of EbA. Approximation therefore provides both regulatory momentum and financial opportunity, as Moldova becomes eligible for a broader range of EU funding instruments supporting nature restoration, climate adaptation, and rural development.

For EbA policy and implementation, EU approximation offers three strategic benefits:

- a coherent legislative framework for cross-sector planning;
- clear obligations for restoring degraded ecosystems and improving ecological status; and
- access to technical and financial mechanisms to operationalize large-scale, nature-based adaptation.

In this sense, EU approximation is not only a compliance process but a structural accelerator for EbA, enabling Moldova to embed resilience-building measures within its broader accession pathway.

# 2. Nature conservation framework supporting EbA

## 2.5. National protected area system

### 2.5.1. Scope, structure and management

Moldova's PAs form the core ecological infrastructure for EbA, safeguarding forest remnants, riparian corridors, steppe fragments, and wetland systems that buffer climate extremes. The PA system covers 5.6% (MoE) of national territory and includes 12 legal categories aligned with IUCN types, though many sites remain small, fragmented, and weakly managed (see Fig. 9 and Annex 1).

The system comprises 312 designated areas, dominated by nature and landscape reserves, while ecological functionality is concentrated in a few large scientific reserves (Codru, Plaiul Fagului, Pădurea Domnească, Lower Prut, Iagorlîc[3]). Most other PAs are under-resourced, lack updated management plans, or experience pressures from grazing, logging, and hydrological alteration. Functional integration into local spatial planning is limited, reducing the PA network's contribution to climate adaptation.

[3] The Iagorlîc Nature/Scientific Reserve is located in the eastern part of the country within the self-proclaimed Transnistrian region, which is not under the de-facto administrative control of the constitutional authorities of the Republic of Moldova. As a result, governance, management, and enforcement of conservation measures within the reserve fall outside the effective jurisdiction of Moldovan state institutions.

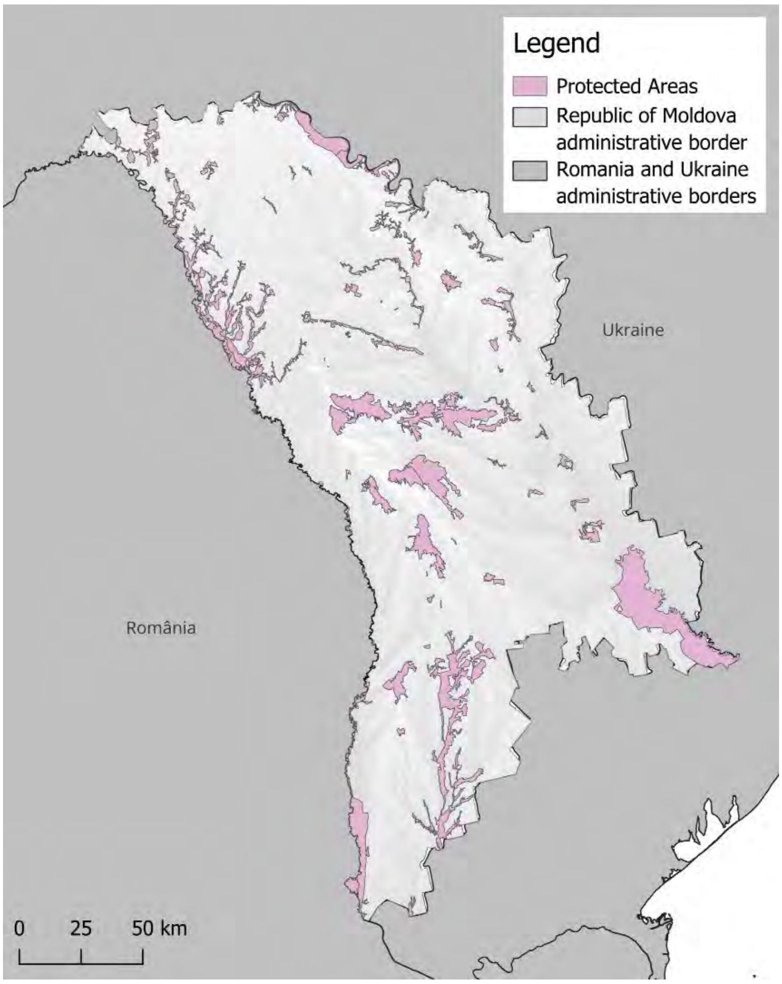


**Figure 9**. PA network distribution across the country. Source: ICAS data (2025); map produced by the authors.

In comparative perspective, Moldova remains significantly under-represented in terms of PA coverage. According to the European Environment Agency (EEA, 2023), 26.4% of EU land was designated as terrestrial PAs by the end of 2023[4]. In the same EU reporting framework, Germany reports 38.51% terrestrial PA coverage and Romania 23.45%, illustrating the substantially larger conservation footprints of many EU member States[5]. By contrast, Moldova's national PA system covers only around 5.6% of the national territory (see Table 2 below), underscoring structural limitations in representativity and resilience of the existing system.

It should be noted that Moldova's current PA system reflects a transitional stage rather than a mature conservation framework. The national conservation agenda is undergoing a profound reform, including the initial stages of transition from the Emerald Network toward alignment with the Natura 2000 framework as part of the EU accession process (see more in the sections below). Although this transition is still at an early phase, it is expected to lead to substantial changes in PA structure, management standards, and spatial coverage, with progressive alignment to EU conservation requirements. As a result, the configuration and extent of Moldova's PA system in the near future are likely to differ significantly from the present situation, including a notable increase in coverage as a share of national territory and improved functional coherence.

### 2.5.2. Evolution and current status (1998-2025)

Moldova's PA system expanded significantly over the past 25 years, but functional performance, ecological coherence, and management capacity have not kept pace with designation growth (Table 1).

Following the adoption of Law No. 1538/1998, PA coverage increased from 66,467 ha (1.96%) in 1998 to 194,974 ha (5.76%) in official statistics. The largest step increases were linked to the formal inclusion of the three Ramsar wetlands (nearly 94,700 ha in total) into the national PA system and, later, the establishment of Orhei National Park in 2013 (about 33,800 ha) (Environmental Agency, 2020).

[4] https://www.eea.europa.eu/en/analysis/indicators/terrestrial-protected-areas-in-europe?
[5] BISE: Biodiversity Information Syste for Europe (https://biodiversity.europa.eu/countries/germany?).

By 1 January 2012, the PA system covered 157,227 ha (4.65%), distributed across 12 categories. At that time, national park and biosphere reserve categories were foreseen in the legal framework but were not yet operational. Despite the expansion in coverage, management constraints persisted. Management plans were generally not prepared, and monitoring focused mainly on compliance rather than ecological condition and management effectiveness (MERM, 2012).

Subsequent reporting continued to highlight structural weaknesses. While the PA network was described as comprising 312 sites and about 189.4 thousand ha (5.61%), functional connectivity remained very low, with ProtConn at 2.1% and a PARC-Connectedness Index of 0.23 (UNDP & SCBD, 2021). These indicators point to an under-connected network with limited ecological coherence, even where formal designation exists.

Moldova's three Ramsar sites were designated in 2000, 2003, and 2005. International practice indicates that Ramsar designation does not automatically imply strict PA status, but rather recognition of wetland significance based on ecological value. The current reassessment of Ramsar sites in Moldova reflects the need to clarify conservation objectives, adjust legal regimes where appropriate, and better align Ramsar designations with functional habitat conditions and EbA priorities.

**Table 2.** Evolution of the PA coverage and status (1998–2025)

| Year | PA (ha) | Coverage (%) | Key change | Status |
|---|---|---|---|---|
| 1998 | 66,467.265 | 1.9638 | Law 1538/1998 expands PA fund | Coverage expands; capacity remains limited |
| 2006 | 161,182.065 | 4.7622 | Ramsar wetlands added to national total (94,705.5 ha) | Major step increase in area |
| 2013 | 194,974.155 | 5.7606 | Orhei National Park added (33,792.09 ha) | Largest post-2006 increase |
| 2018 | 194,974.160 | 5.7606 | Biosphere reserve introduced but overlaps, not added to total | Total stable |
| 2020 | 194,974.160 | 5.7606 | No further legal expansion in series | Total stable; effectiveness issues persist |
| 2025 | 194,974.160* | 5.7606* | Latest official statistical reporting confirms total area and 312 PAs | Total stable in statistics; new legal designations may overlap and/or be under institutionalization |

Sources: Environmental Agency (2020), time-series table "Indicatorii 1971–2020, Tabelul D-1 Zonele protejate (PA)" (used for 1998–2020 values and category notes); NCGTA (2025) used for 2025 coverage.

### 2.5.3. Representativity gaps and structural challenges

Representativity gaps and structural management weaknesses mutually reinforce each other, reducing the PA network's capacity to function as a backbone for EbA and climate resilience. Although Moldova expanded its PA surface over time, the system remains largely paper-based, underfinanced, highly fragmented, and poorly aligned with international good practice (Lozan, 2021). Similar challenges related to representativity gaps, management effectiveness, financing, and institutional fragmentation are observed in PA systems across many countries, including within the EU, reflecting broader structural constraints rather than country-specific deficiencies.

Core representativity deficiencies (adapted from Lozan, 2021):

- Semi-natural forests with high conservation value (including well-preserved patches) remain outside the current PA network despite their strategic importance.
- Steppe ecosystems are critically underrepresented, although they contain some of the last functional remnants in the region.
- Wetlands and riparian systems are weakly covered, often hydrologically disconnected due to past drainage and altered river regimes.
- Ramsar sites are oversized and misclassified, with large non-wetland areas included and no operational management structure.
- Microrefugia (ravines, cliffs, limestone outcrops, cold slopes) lack formal designation despite hosting rare and climate-sensitive biota.
- Connectivity across agricultural landscapes is extremely low, isolating PA fragments within an intensively cultivated matrix.

Systemic weaknesses that amplify the gaps:

- Fragmentation and land-use pressures (75% of land dedicated to agriculture) restrict opportunities for PA expansion and reduce ecological continuity.
- Institutional ambiguity (e.g., Scientific vs. Natural Reserves) and outdated legislation create inconsistent management regimes.
- Absence or poor quality of management plans, especially outside the forest domain, leaves many PAs unmanaged.
- Chronic underfunding, reliance on self-financing (Moldsilva), and insufficient staffing undermine the enforcement of conservation objectives.
- Weak integration of PAs into spatial planning, limiting proactive landscape-scale protection.

The presence of non-native and hybridizing species, such as Sika deer and their hybrids with native red deer, highlights the limitations of static conservation models under changing environmental conditions. Hybridisation and uncontrolled population growth within PAs, including forest reserves, compromise genetic integrity, disrupt trophic interactions, and impair ecosystem functionality. Addressing such pressures through adaptive wildlife management is essential to maintain both biodiversity values and the effectiveness of forests as EbA assets.

These shortcomings reduce ecological functionality, constrain natural adaptive capacity, and limit the ability of the PA network to act as a stabilizing backbone for EbA. At the same time, remaining islands of semi-natural habitats represent critical leverage points for strengthening ecological connectivity, piloting restoration approaches, and anchoring EbA interventions at the landscape scale.

## 2.6. Emerald Network

### 2.6.1. Ecological significance and representativeness

The Emerald Network represents Moldova's most important European-level conservation instrument and, in practice, provides broader European-level coverage than the national PA network. As of 2025, Moldova has designated 61 Emerald Sites, covered area is 277,157 ha (8.1% of national territory), and safeguarding 38 habitat types and 162 species of European importance (NCGTA, 2025). These sites encompass the country's last significant remnants of steppe, riparian forests, wetlands, and forest-steppe mosaics, as well as several micro-refugial habitats that are particularly sensitive to climate variability.

From a biogeographical perspective, the Emerald Network plays a critical role in representing habitats and species located at the eastern margin of the EU biogeographical regions, particularly forest–steppe transition systems and riverine corridors of the Black Sea basin. These edge-of-range ecosystems are inherently sensitive to climate variability and therefore hold disproportionately high value for climate adaptation and resilience, reinforcing the strategic relevance of the Emerald Network for EbA planning in Moldova.

Unlike the national PA network, historically biased toward forests and scenic formations, the Emerald Network includes habitats of high EbA value such as river corridors, floodplain systems, saline depressions, and dry grasslands. These areas are essential for hydrological regulation, erosion control, microclimatic buffering, and biodiversity movement across highly modified landscapes. Although progress has been made through EU4Environment and World Bank initiatives, Emerald sites still lack binding legal protection, secure financing, and full integration into national planning processes.

### 2.6.2. Diagnosis and development

Despite its ecological strengths, the Emerald Network remains operationally underdeveloped. A significant share of sites is fragmented and isolated within an agricultural matrix that covers roughly three-quarters of the country. The sufficiency index remains low (24%) (EU4Enviornment, 2025), indicating that several priority habitats and species are still underrepresented[6]. Even though nearly half of the Emerald Network already has

[6] The low sufficiency index reflects gaps identified during Emerald biogeographical evaluations, indicating that the current site portfolio does not yet adequately cover the full range of priority habitats and species listed under the Bern Convention; see also (https://www.eu4environment.org/app/uploads/2025/09/Developing-Emerald-Management-Plans-in-the-Republic-of-Moldova.pdf?).

management plans, implementation is variable and dependent on project-based support rather than institutionalized systems.

Key structural gaps include weak hydrological connectivity, inconsistent boundary delineation for certain habitats, and limited coordination with local public authorities and river-basin institutions. Monitoring is episodic and not yet embedded in national budget lines or long-term programmes.

These constraints mirror broader institutional fragmentation between biodiversity conservation, water management, forestry, and spatial planning authorities, limiting the Emerald Network's capacity to function as an integrated ecological system rather than a collection of individual sites.

Priority needs for 2025–2030 include:

- completing management plans for all sites;
- harmonising boundaries using updated habitat mapping;
- integrating Emerald sites into spatial planning and river-basin management;
- addressing representativity gaps (especially steppe, riparian systems, wetlands, and microrefugia);
- establishing a unified national monitoring framework for species, habitats, and hydrological processes.

These steps are essential if the Emerald Network is to serve as a foundation for Natura 2000 and national EbA strategies.

Also, the Important Bird Areas (IBA) network provides an additional ecological reference layer for EbA-relevant landscapes in Moldova (Ajder et al., 2014). Although IBAs have no formal legal status, their spatial configuration strongly overlaps with river corridors, wetlands, floodplains and forest-steppe mosaics, particularly along the Prut and Dniester valleys. IBAs have historically served as an empirical basis for subsequent Emerald site designation and highlight the importance of connectivity-driven conservation approaches rather than isolated site protection.

#### 2.6.3. Future targets

Moldova has committed to progressive expansion and consolidation of the Emerald Network, following recommendations developed under EU4Environment and national policy processes. For 2030, the country aims to increase ecological sufficiency to 50%, extend management planning to at least 80% of sites, and align all methodologies with Natura 2000 requirements. A measured expansion of coverage from the current 8.1% to approximately 11% is feasible through the inclusion of underrepresented steppe, wetland, and riparian habitats.

Longer-term targets for 2040 envision a 15% national coverage, a sufficiency index exceeding 80%, and a fully functional, nationally funded monitoring and governance system. These steps will allow the Emerald Network to mature into a strategically coherent and climate-resilient ecological system.

### 2.7. Transition to Natura 2000

#### 2.7.1. Requirements

Transitioning from Emerald to Natura 2000 is an integral part of Moldova's EU accession path. While both frameworks share methodological foundations, Natura 2000 requires a higher level of legal, scientific, and operational precision. This includes complete harmonisation of habitat typologies with Annex I, comprehensive species inventories for Annex II and IV species, biogeographical sufficiency analysis, and the adoption of site-level conservation objectives with associated management and monitoring measures.

The transition also demands significant institutional capacity: improved coordination within the MoE, strengthened roles for scientific institutions, and professionalisation of PA staff and local authorities. Establishing a robust monitoring and reporting system is essential for meeting EU obligations.

#### 2.7.2. Benefits and challenges

A Natura 2000-aligned system offers substantial benefits. It provides access to EU funding streams (e.g., LIFE, Horizon Europe), strengthens legal and management frameworks, and ensures systematic restoration and ecological monitoring. It also supports EbA by embedding habitat restoration, hydrological reconnection, and ecological connectivity into legally binding management obligations.

However, challenges remain considerable. Moldova's limited natural land base restricts the potential for large increases in coverage, requiring strategic rather than nominal expansion. Data gaps exist for several habitats and species; governance responsibilities are fragmented; and some historically designated areas (e.g., Ramsar sites) require boundary corrections or functional re-evaluation. Additionally, fully aligning national legislation with the Birds and Habitats Directives will require sustained administrative and political commitment.

#### 2.7.3. Implications for EbA

The transition to Natura 2000 reinforces Moldova's EbA readiness by ensuring that ecosystem restoration becomes a legal obligation rather than a voluntary option. Natura 2000's emphasis on hydrological processes, climate-sensitive habitats, ecological corridors, and long-term monitoring directly supports adaptation strategies. By integrating conservation with climate resilience, Moldova can leverage Natura 2000 as both an ecological and institutional accelerator for EU accession.

### 2.8. National Ecological Network (NEN)

The National Ecological Network (NEN) was established under Law 94/2007 as Moldova's national framework for ecological connectivity and as a component of the Pan-European Ecological Network. It represents Moldova's primary spatial planning framework for maintaining ecological links across PAs and managed landscapes. Operational development was formalized through the National Programme for 2011–2018, which required scientific assessment to identify network elements, preparation of site "passports" and mapping, and public participation. Early implementation guidance structures the NEN around four functional element types: (i) core areas ('zone-nucleu'), (ii) ecological corridors, (iii) geosystem buffer areas, and (iv) ecological reconstruction areas, with protective buffer zones typically defined around core areas. The 2012 Register of core areas was developed through a cooperation model involving an NGO and state and research actors: it was prepared under the NGO Biotica project, implemented in partnership with IUCN and coordinated with the MoE, with support from the Government of Norway and contributions from the Academy of Sciences of Moldova. By 2025, national assessment continues to recognize the NEN as Moldova's main connectivity instrument, reporting a network extent of 11,113 $km^2$ and emphasizing its landscape-scale role in sustaining ecological processes. It links PAs, Emerald sites, forest belts, river valleys, ravines, and multifunctional landscapes into a coherent ecological grid. In practice, implementation has progressed unevenly. Although implementation has lagged because corridors have not been fully designated and management guidance is limited, the NEN remains a critical instrument for embedding EbA principles into land-use planning. including through measures that support landscape restoration, reduce soil erosion, and improve the ecological condition of aquatic ecosystems. If operationalized, the NEN would strengthen hydrological regulation, erosion control, biodiversity mobility, and climate-resilient land management across Moldova's highly modified landscapes.

### 2.9. Transboundary corridors (Prut & Dniester)

Moldova's geography provides strong opportunities for transboundary EbA, particularly along two major river corridors (Fig. 10):

- Prut River corridor (shared with Romania and connected to the Danube basin) – a major ecological artery with high potential for riparian forest restoration, wetland reconnection, migratory bird conservation, coordinated flood/drought management, and coordinated sediment and nutrient reduction through buffer strips and land management in tributary catchments
- Dniester/Nistru corridor (with Ukraine) – a key ecological and hydrological system supporting wetlands, floodplains, and forest–steppe mosaics, with strong potential for joint climate adaptation, early warning systems, ecological flow maintenance, as well as basin-wide erosion and sediment management in tributary catchments.

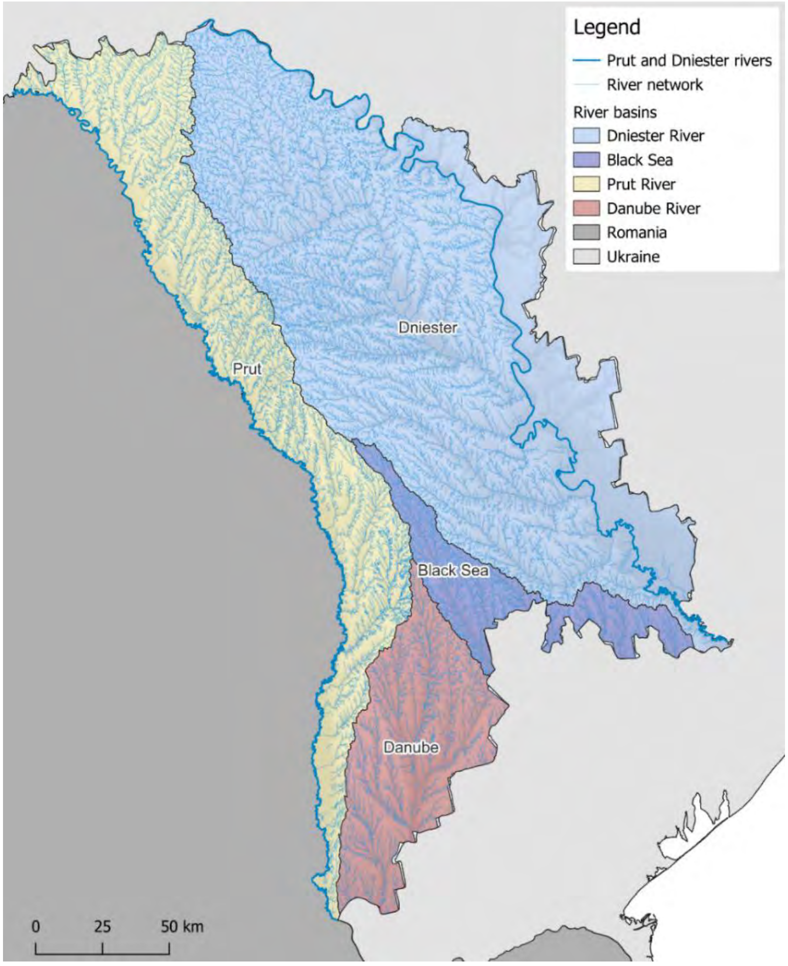


**Figure 10.** Main river basins of the Republic of Moldova, showing the Prut and Dniester rivers and the river network.

Both corridors combine high ecological value with direct relevance for flood and drought risk management, water quality, habitat connectivity, and climate-sensitive livelihoods.

Cooperation can build on existing governance frameworks, including the Moldova-Romania water cooperation arrangements for the Prut and the Costești-Stânca node[7], and the 2012 Moldova-Ukraine Dniester basin treaty and the Dniester Commission, alongside EU-style river-basin planning alignment. A core technical priority for the Dniester is flow-sensitive management: altered seasonal flow patterns and artificial thermal regimes in the Dniester have reduced floodplain inundation and eliminated large portions of natural spawning habitats, particularly for phytophilous fish species. Reduced spring flows and cold-water turbine discharges disrupt reproductive cycles, contributing to long-term declines in fish populations and associated ecosystem services. These impacts reinforce the importance of flow-sensitive, EbA approaches within transboundary river corridors.

These transboundary landscapes are essential for regional climate resilience and position Moldova as a crossroads country, linking Central European, steppe, and Black Sea ecological systems. Effective management requires cooperation under existing frameworks (Dniester Commission, bilateral agreements, EU Water Framework Directive alignment, coordinated basin planning, including shared monitoring and data exchange, aligned early warning and drought response, and integration of EbA measures into joint programmes of measures and investment pipelines.

## 2.10. Ramsar sites: functional alignment and opportunities for EbA

Moldova has so far designated three Ramsar sites under the Convention on Wetlands of International Importance, reflecting an early and commendable commitment to wetland conservation at the international

[7] The Costesti-Stânca hydrotechnical node on the Prut River is the third in Europe in terms of water retention capacity and the extent of the reservoir, also the most useful hydrotechnical constructions in Romania and Moldova (https://ro.wikipedia.org/wiki/Lacul_de_acumulare_St%C3%A2nca%E2%80%93Coste%C8%99ti).

level. These designations were established under historical data availability and interpretative frameworks that pre-dated current understandings of wetland typology, hydrological functionality, and EbA philosophy.

Evidence from the Dniester basin demonstrates that hydrological alteration can fundamentally change wetland functionality over time (UNDP, 2022). Reduced flow velocity, sediment accumulation, and disrupted seasonal dynamics have transformed large sections of riverine landscapes into systems that no longer meet classical wetland criteria, while still retaining strategic value for erosion control, connectivity, and broader landscape-scale adaptation objectives.

As climate conditions, land-use patterns, and scientific knowledge have evolved, it has become increasingly important to re-examine how these sites function today and how effectively they contribute to climate resilience, hydrological regulation, and biodiversity conservation.

The three Ramsar sites are:

- **Lower Prut Lakes** (Ramsar Site No. 1029, 9,152 ha; designated 20 June 2000) encompassing parts of the lower Prut floodplain that historically supported extensive wetland and floodplain-lake systems. While hydrological alteration and land-use change have reduced wetland extent and connectivity in recent decades, important wetland remnants remain, particularly within the Beleu–Manta lake complex. These areas retain high restoration and EbA potential, especially through hydrological reconnection and adaptive water-level management.
- **Lower Dniester (Nistrul de Jos)** (Ramsar Site No. 1316, 60,000 ha; designated 20 August 2003) covering a large and diverse landscape that includes wetlands, riparian zones, agricultural land, and settlements. Although only parts of the site currently function as classical wetlands, the area remains hydrologically and ecologically strategic at basin scale. Refining the functional focus of conservation and restoration efforts could significantly enhance the site's contribution to flood buffering, drought resilience, and biodiversity connectivity.
- **Unguri–Holoșnița** (Ramsar Site No. 1500, 15,553 ha; designated 14 September 2005) that illustrates the challenges of large-scale landscape designations where wetland presence is limited or has evolved over time. The area is currently dominated by agricultural land, orchards, and dry grassland or steppe-like habitats, with minimal active wetland features. At the same time, the site holds value as a Dniester valley landscape with potential relevance for erosion control, habitat connectivity, and broader EbA objectives beyond classical wetland conservation.

Rather than representing a constraint, the current configuration of Ramsar sites in Moldova can use Ramsar as a platform for functional alignment: (i) delineate and manage wetland-functional cores within existing boundaries, (ii) apply zoning and measures that target hydrology, retention, and floodplain reconnection where feasible, and (iii) where non-wetland landscapes dominate, complement Ramsar with appropriate national instruments and connectivity planning under the National Ecological Network and basin plans. National reporting also highlights continuing capacity and financing constraints for Ramsar implementation, which reinforces the need to embed EbA actions into funded programmes rather than stand-alone plans.

Such an adaptive approach would enhance the effectiveness and credibility of Ramsar sites in Moldova, reinforce their role within the National Ecological Network, and ensure their continued relevance under changing climatic conditions.

### 2.11. Ongoing modernization of the conservation framework

Increasing pressures on high conservation areas (including PAs, Emerald), combined with climate uncertainty and evolving land-use dynamics, have highlighted the need for a more adaptive and function-oriented conservation framework in Moldova. In response, the MoE, in cooperation with civil society organizations, is currently undertaking a comprehensive revision of the national conservation legal and policy framework.

This ongoing process aims to address mismatches between legal designations, ecological realities, and management capacity, while strengthening the role of PAs as functional components of EbA. Key directions under consideration include clearer definition of conservation objectives, improved functional zoning, enhanced integration of local communities, and greater flexibility for adaptive management under changing climatic conditions.

From an EbA implementation perspective, this modernization effort represents an important enabling condition. By aligning conservation instruments with hydrological, ecological, and socio-economic processes at landscape scale, the revised framework can help ensure that PAs (including Emerald sites) and ecological corridors contribute more effectively to climate resilience rather than remaining isolated or purely regulatory entities.

### 2.12. Forestry governance and financing as an enabler for EbA

Forests represent one of Moldova's most critical nature-based assets for climate adaptation, providing hydrological regulation, soil stabilization, microclimatic buffering, biodiversity refugia, and landscape connectivity. As such, the effectiveness of EbA at scale is closely linked to the governance and financing model of the forestry sector.

In the Republic of Moldova, the forestry sector continues to operate predominantly under a self-financing model, whereby Moldsilva (as authority for forestry and hunting) is expected to cover operational costs, staff salaries, and management expenditures largely from timber harvesting and other forest-derived revenues. While this mechanism emerged historically as a response to fiscal constraints, multiple analyses have highlighted its structural limitations in the context of conservation objectives, PA management, and climate resilience.

From an EbA perspective, this financing model creates inherent tensions between (i) the provision of public ecosystem services (water retention, climate regulation, biodiversity conservation), and (ii) the reliance on extractive activities to sustain institutional functioning.

As noted in earlier sectoral assessments, including a comprehensive review of PA legislation and governance in Moldova, continued reliance on self-financing increases pressure on forest ecosystems, particularly in PAs and HCVFs, and limits the capacity for adaptive, restoration-oriented management approaches (Lozan, 2021).

At the same time, it is important to note that forestry sector transformation is increasingly recognized as a strategic priority by national authorities, civil society, and international partners. Discussions on reforming financing mechanisms, strengthening public budget support for ecosystem services, and aligning forestry governance with EU and international practices are ongoing. These processes are occurring in parallel with broader efforts to modernize nature conservation legislation and improve coherence between forest management, biodiversity policy, and climate adaptation objectives.

Looking forward, the gradual decoupling of core conservation and ecosystem service functions from timber-dependent financing would significantly strengthen Moldova's capacity to implement EbA at scale. Such a transition would allow forests – particularly those within PA network, Emerald sites, and ecological corridors – all to function primarily as living climate infrastructure, supporting water security, landscape resilience, and long-term adaptation outcomes.

## 3. Information systems, knowledge platforms, and analytical architecture

EbA relies not only on ecological assessments, climate diagnostics, and field evidence, but also on the coherence and accessibility of the national knowledge architecture that supports evidence-based decision-making. This architecture includes data custodians, monitoring networks, GIS platforms, analytical tools, institutional knowledge nodes, and learning and exchange mechanisms that translate information into planning and implementation.

Moldova has substantial EbA-relevant data and expertise across climate, water, soils, forests, biodiversity, and land use. The primary constraint is not the absence of information, but fragmentation: uneven update cycles, restricted access to raw datasets, and weak interoperability across sectors, and limited mechanisms for knowledge exchange between science, policy, and practice. Strengthening this analytical and knowledge architecture is therefore essential to support repeatable screening, prioritisation, implementation and monitoring of EbA measures.

## 3.1. EbA knowledge platforms and exchange mechanisms

EbA-relevant knowledge in Moldova is generated, stored, and disseminated through four main channels:

1. National policy platforms, including climate, environment, water, forestry, and biodiversity strategies, action plans, and reporting instruments;
2. Sectoral data systems, maintained by public institutions responsible for climate monitoring, water management, forestry, agriculture, biodiversity, and statistics;
3. Research institutions and NGOs, which generate scientific analyses, thematic studies, and field-based evidence, often within project frameworks;
4. Project-based platforms and donor-supported tools, which temporarily consolidate data, develop analytical methods, or provide decision-support products for specific initiatives.

Multiple digital platforms and institutional repositories exist, yet none function as a unified national hub for EbA or climate adaptation knowledge. Information is often sector-specific, project-bound, or institutionally siloed, with limited cross-referencing between ecological data, socio-economic vulnerability, and planning needs.

Therefore, three structural gaps are evident from and EbA perspective:

1. Lack of a consolidated EbA/adaptation knowledge hub, integrating ecological, hydrological, climatic, and socio-economic information in a format accessible to practitioners and local authorities;
2. Limited practitioner-oriented guidance, including applied EbA manuals, site-level design standards, and monitoring frameworks tailored to Moldova's landscapes and institutional context;
3. Weak learning and feedback loops, whereby results from pilot projects, monitoring, and research are not systematically translated into updated guidance, shared standards, or adaptive planning processes.

Strengthening knowledge exchange mechanisms, improving interoperability between platforms, and linking scientific expertise more directly to planning and implementation processes represent priority entry points for EbA support.

## 3.2. National environmental and climate data systems

All EbA approaches on planning should draw on several national custodians and administrative databases, that provide baseline information on climate, water, soils, forests, biodiversity, and socio-economic conditions. Key institutions include:

- **State Hydrometeorological Service (SHS)** is the primary custodian of meteorological and hydrological observations and warnings, and supports hydrological data provision and the State Water Cadastre function. Link: https://www.meteo.md/.
- **Environmental Agency** coordinates environmental monitoring and reporting streams used for national reporting, including environmental quality datasets and periodic assessments. Link: https://am.gov.md/ro/content/monitoringul-calit%C4%83%C8%9Bii-mediului.
- **National Administration Apele Moldovei** is a central institutional entry point for water management functions and related information needs, including administrative water management workflows and basin planning. Link: https://apelemoldovei.gov.md/.
- **State Water Cadastre (SIA "Cadastrul de Stat al Apelor")** provides a map-based access point branded as the national water cadastre system. Link: https://csa.gov.md/en/default/news/detailed/id/2.
- **National Bureau of Statistics (NBS)** provides official statistics relevant for EbA feasibility and exposure context, including water supply and service indicators. Link: https://statistica.gov.md/ro/statistic_domains.
- **Forest inventory and management-planning information** is maintained under the forestry sector (Moldsilva and associated research/planning structures), covering forest cover, structure, regeneration status, and disturbances, but these datasets are not systematically integrated with biodiversity and hydrological information.

- **PA and Emerald datasets** (national PA registry and Emerald Standard Data Forms) provide site-level information on habitats, species, and pressures, but are not routinely linked to climate and land-use modelling outputs.

Data availability itself is not the main limitation. The primary constraints are restricted access to raw datasets for download and analysis, limited interoperability between custodians, and inconsistent analytical standards across sectors.

### 3.3 GIS platforms, spatial tools and analytical models

Several GIS platforms support spatial analysis in Moldova, but they remain distributed across multiple portals and institutions:

- **NSDI / INDS** supports national geospatial data sharing through catalogue and services. Link: https://inds.gov.md/en/nsdi-homepage/.
- **GEODATA.GOV.MD (AGCC thematic geoportal)** provides access to multiple reference and thematic spatial layers via network services and is practical for integrating national layers into GIS workflows. Link: https://geodata.gov.md/?locale=en#/**Cadastral geoservices** support spatial reference and administrative baselines:
    - **Cadastru GeoServer** (useful for loading services into QGIS). Link: https://map.cadastru.md/geoserver/web/?0.
    - **e-Cadastru** (formal access point for cadastral information, public and authorised layers differ). Link: https://ipcbi.gov.md/ro/content/e-cadastru?.
- **Government open data portal** provides published datasets and APIs, mostly tabular and project-based releases. Link: https://dataset.gov.md/en/.

Analytical methods commonly applied in Moldova-ready GIS workflows include:

- Soil erosion risk mapping using RUSLE-type modelling, supported by EU-scale reference layers where appropriate.
- Drought planning and mapping, anchored in national drought policy frameworks and indicator approaches.
- Water information system use in planning, including permitting, abstraction control, and basin management diagnostics.
- Climate risk screening tools (for example, CVI-type indices, drought probability, flood exposure), typically at district or basin scale.
- Hydrological and hydraulic modelling in the Prut and Dniester basins to support river restoration and wetland reconnection diagnostics.
- Biodiversity and habitat mapping workflows used for Emerald updates and Natura 2000 readiness.

Despite the existence of nationally adopted Climate Change Adaptation (CCA) frameworks, including Moldova's National Climate Change Adaptation Programme (NCCAP) 2030, and some internationally-supported projects that have added advanced datasets on ecosystem condition and land degradation (including connectivity and hydrological dynamics) (Annex 6), there is still no single integrated decision-support platform that consistently integrates hydrology, soils, ecosystems, agriculture and biodiversity into a shared ecosystem-function-based adaptation framework. As a result, adaptation planning remains fragmentated across sectors, leading to repeated assessments, inconsistent baselines, and limited capacity to identify landscape-scale adaptation priorities, particularly for EbA measures.

### 3.4 Monitoring networks for ecosystem condition and climate resilience

Effective EbA implementation requires long-term, comparable monitoring of hydrology, soils, vegetation, and biodiversity. In Moldova, monitoring capacity exists, but continuity and usability are uneven. In practice, many monitoring activities depend on state budget allocations that vary by year and on externally funded projects. As a result, long time-series are available for only a limited set of variables.

The most stable and continuous monitoring relates to basic climate parameters, especially air temperature and precipitation. However, access to raw station data for research and modelling is often constrained. Data are not routinely available for bulk download in open formats, and access may require formal requests, institutional agreements, or paid services. This reduces the ability to replicate analyses and integrate climate observations into assessment workflows.

Data coverage and quality vary strongly by parameter. Some datasets are fragmented or inconsistent. Groundwater is a major gap in the country.

Biodiversity monitoring is also uneven. Flora and fauna monitoring is generally localised, with more systematic observation in and around PAs. Bird monitoring is the most developed component, with regular field observation and route-based recording led by professional ornithologists, coordinated by the Society for the Protection of Birds and Nature (SPPN). For many other taxa, monitoring is more episodic and project driven.

Moldova's baseline for high-resolution reference imagery is also limited. National orthophoto coverage is largely represented by a single countrywide orthophoto series from 2016, while more recent orthophotos are available only for tiles (2020 coverage in limited areas). This restricts consistent, wall-to-wall validation of land-use change, riparian dynamics, and small-scale EbA interventions and increases reliance on satellite products for nationwide monitoring.

A further constraint is that results from ecological monitoring and analysis are often disseminated mainly through reports and scientific publications rather than through open, regularly updated datasets. Consequently, research institutions and expert organisations frequently become the primary source of recent ecological observations, but access to underlying data and methods can remain limited.

Key institutions contributing to ecosystem and climate-relevant monitoring in Moldova include:

**State institutions**

- State Hydrometeorological Service (SHS)
- Environmental Agency (Agenția de Mediu)
- Ministry of Environment
- National Administration "Apele Moldovei"
- State Water Cadastre (SIA "Cadastrul de Stat al Apelor")
- Agency "Moldsilva"
- Institute for Forest Research and Management Planning (ICAS)
- Ministry of Agriculture and Food Industry (MAIA)
- "Nicolae Dimo" Institute of Pedology, Agrochemistry and Soil Protection (soil monitoring and research functions, now under reorganised structures)

**Research institutions**

- Institute of Ecology and Geography (IEG, MSU) – climate, land degradation, hydrology, GIS and vulnerability research
- Institute of Zoology (MSU) – biodiversity, fauna, ecosystem monitoring
- Institute of Pedology, Agrochemistry and Soil Protection "Nicolae Dimo" (National Institute for Applied Research in Agriculture and Veterinary Medicine) – soils, erosion processes, land degradation (research and applied functions under reorganised structures)
- Institute of Genetics, Physiology and Plant Protection (MSU) – agro-biodiversity, crop resilience, plant health (indirect relevance for agro-ecosystem adaptation)
- Technical University of Moldova (Technical University of Moldova) – applied research in environmental engineering, water systems, and infrastructure–environment interfaces

**NGOs and expert organisations**

- Society for Birds and Nature Protection (SPPN) – biodiversity monitoring, particularly avifauna, and applied conservation expertise
- Ecological Society BIOTICA – biodiversity conservation, habitat assessment, and environmental advocacy
- EcoContact – environmental policy analysis, stakeholder engagement, and public communication

- Eco-TIRAS – transboundary river basin analysis, water quality assessment, and ecosystem protection in the Dniester basin

Overall, the key limitation is not the absence of monitoring actors, but the lack of stable financing, open data access, and harmonized protocols. Strengthening climate- and ecology-related monitoring require the definition of a minimum national indicator set, routine data-sharing arrangements, and clear rules for data accessibility, alongside targeted investment in gaps such as groundwater and ecosystem-condition monitoring beyond PA system.

### 3.5 Systemic constrains and implications for EbA

Moldova's information and analytical systems provide a substantial foundation for assessing climate risks, ecosystem condition, and land degradation. However, several systemic constraints reduce their effectiveness for operationalizing EbA at landscape scale.

Key constraints are:

- Fragmented data ownership across multiple agencies (SHS, NAAM, Moldsilva, LPAs, research institutions), with limited interoperability and shared standards.
- Parallel digital platforms developed through various projects, none of which serve as a unified national hub for EbA-relevant data.
- Uneven monitoring coverage, particularly for small hydrology, groundwater, soil moisture, and ecosystem-condition indicators.
- Lack of harmonised analytical baselines, making it difficult to compare ecosystem condition, vulnerability, or restoration potential across regions.
- Weak integration of scientific expertise into policy, spatial planning, and programme design, resulting in information discontinuities between analysis and implementation.
- Project-based knowledge generation, which leads to duplicated assessments and inconsistent methodological approaches across sectors.

Implications for EbA can be constrained by Moldova's capacity to:

- identify EbA priority areas using consistent, multi-sector evidence;
- evaluate the hydrological, ecological, and socio-economic impacts of interventions;
- track ecosystem function and climate resilience over time;
- support LPAs with accessible, decision-ready data;
- scale local pilots into integrated basin-wide adaptation strategies.

A strengthened information architecture with integrated, interoperable, and linked to planning instruments will therefore be essential for enabling and sustaining EbA deployment.

## 4 Current EbA strategies and practices

EbA in Moldova arises from a heterogeneous mix of practices implemented across forestry, agriculture, water management, and biodiversity conservation. Some interventions, such as forest regeneration or shelterbelts, are longstanding but seldom labelled as "EbA", while others (e.g. wetland reconnection, hydrological restoration, or landscape-scale planning) are emerging through newer programmes (EU4Environment, FAO LDN, GEF, WB projects).

This chapter synthesizes what Moldova is already doing that contributes to climate resilience, drawing lessons from field implementation, national diagnostics, and local experience. It also identifies systemic gaps that limit the scalability of these measures, preparing the analytical ground for Chapter 4 (EbA Entry Points).

### 4.1 Forest EbA-relevant restoration

#### 4.1.1 Assisted Natural Regeneration

Forests perform essential climate-regulating functions: buffering temperature extremes, stabilizing soils, slowing runoff, and improving groundwater recharge. In Moldova, several restoration pathways align naturally with EbA principles.

Assisted natural regeneration (ANR) has shown superior ecological performance across many regions and some of Moldsilva's State Forestry Enterprises (SFE) are successfully implementing it, especially in natural-by-origin forests. Regeneration under partial canopy improves microclimate, reduces evapotranspiration, preserves mycorrhizal networks, and results in higher survival compared with classical planting. Local field evidence consistently shows that ANR is particularly effective under drought conditions (Fig. 11 ).

**Figure 11.** Natural regeneration in the Dobrusa Landscape Reserve on a clearcut patch next to the reserve border, forming a young carpet of a mix of species (ash, maple, hornbeam, and oaks).

#### 4.1.2 Oak forest rehabilitation

The Codrii zone is the country's most biodiverse and structurally intact forest region, has prompted targeted rehabilitation interventions focused on restoring stand resilience rather than maximizing short-term productivity. Current rehabilitation approaches practiced by Moldsilva (the major owner of Codri's forests) include selective and sanitary thinning to reduce competition for water and nutrients, enrichment planting using locally adapted oak provenances, and measures that improve soil moisture retention, such as retaining coarse woody debris and avoiding excessive soil disturbance. Where implemented under partial canopy, these actions help stabilise microclimatic conditions, limit evapotranspiration, and support gradual recovery of oak-dominated stand structure.

From an EbA perspective, oak rehabilitation aims to maintain and restore the functional dominance of oak within mixed stands, rather than replacing declining stands through full replanting. These measures strengthen the long-term adaptive capacity of Moldova's most climate-sensitive forest type while preserving its ecological and hydrological functions.

#### 4.1.3 Container Seedling Technology

Container seedling technology is an increasingly relevant tool for forest restoration under drought and soil moisture deficit, where conventional bare-root planting often shows low survival and requires repeated replanting. Containerized seedlings maintain an intact root plug, which reduces transplant shock and improves early establishment, especially on water-stressed sites and degraded soils. In Moldova, this approach was introduced through cooperation with the U.S. Forest Service and has been applied by selected State Forestry Enterprises (SFEs) as a practical option for reforestation and rehabilitation of drought-exposed forest types.

From an EbA perspective, the main value of container stock is operational reliability under climatic stress. Higher first-year survival translates into faster ground cover and earlier canopy development. The approach is particularly relevant for native, drought-tolerant species used in forest-steppe and southern conditions, such as downy oak (*Quercus pubescens*), where establishment failure is a recurrent risk in dry years (Fig. 12).

**Figure 12.** Containerized seedling of native Downy oak (*Quercus pubescens*) and Common Oak (*Q. robur*) grown in the SFE Tighina are used for reforestation.

#### 4.1.4 Shelterbelts and agroforestry systems

Shelterbelts (forest protective strips) represent one of Moldova's most prominent EbA assets, historically forming an extensive network designed to protect agricultural lands, soils, and rural infrastructure. Their key ecological and climate-resilience functions include: (i) reducing wind speed and wind-driven soil erosion; (ii) increasing water infiltration and reducing evapotranspiration losses; (iii) moderating local temperature extremes; (iv) stabilizing crop yields during drought years; and (v) acting as linear biodiversity corridors within otherwise simplified agricultural landscapes. As such, shelterbelts play a critical role in enhancing both agricultural productivity and landscape-level resilience under increasing climate variability.

Despite their importance, the national shelterbelt network has been significantly degraded over the past decades due to unclear ownership and management responsibilities, limited maintenance, fragmentation following land privatization, and conversion pressures. Recent assessments indicate that shelterbelts in the Republic of Moldova currently cover approximately 33,000 ha (see EU4Environment, 2023), most of which are located outside the National Forest Ground[8] and remain weakly integrated into formal forest management systems. This area is substantially below the level required to provide effective agro-climatic protection at national scale.

From a climate-resilience perspective, sectoral analyses suggest that at least 4-6% of Moldova's agricultural land should be protected by shelterbelts to meaningfully reduce wind erosion, drought stress, and microclimatic extremes. Applied nationally, this translates into a required shelterbelt area of over 85,000 ha, indicating a current deficit of approximately 55,000 ha or more compared to the estimated resilience need. Closing this gap is particularly critical in the southern and central steppe and silvo-steppe zones, where wind erosion, soil moisture loss, and heat stress are most pronounced.

Recent EbA-relevant interventions have begun to address this challenge. These include targeted shelterbelt rehabilitation under FAO's LDN project, mechanized restoration and planting support under the World Bank–financed Agricultural Competitiveness Project (MACP), and community-driven replanting initiatives around pastures, vineyards, and arable fields. While these efforts demonstrate growing recognition of shelterbelts as a climate-adaptation instrument, they remain spatially limited and fragmented. Scaling up shelterbelt restoration and agroforestry systems – including through clarified tenure, integration into land-use planning, and alignment

[8] National Forest Ground (NFG) is the English translation of a legally defined concept used in Moldova's forest and land legislation. It comprises forests, lands designated for afforestation, and lands under forest management, including non-productive lands, as recorded in forest management plans (FMPs) and/or the land cadastre as forests or forest plantations, in accordance with the Forest Code.

with national climate and biodiversity objectives – remains a priority EbA pathway for strengthening Moldova's agricultural landscapes (Fig. 13).

**Figure 13**. Shelterbelts protecting agricultural fields in Moldova. Source: Gumovschi & Vinari (2023).

## 4.2 Soil conservation and agro-ecological practices

Soil conservation is a core EbA priority in Moldova because soil structure and organic matter directly control infiltration, water retention, and erosion resistance under drought and increasingly intense rainfall. EbA-aligned practices therefore focus on reducing runoff generation, keeping soil covered, and stabilizing slopes and drainage lines, especially in vineyards, orchards, and other erosion-prone agricultural landscapes (Fig. 14). Such practices include:

- conservation tillage and reduced soil disturbance,
- mulching and cover cropping,
- contour and strip farming on slopes,
- permanent groundcover in orchards and vineyards,
- organic matter and soil-carbon enhancement,
- grassed buffer strips aligned with local hydrology.

Where implemented, these measures substantially reduce runoff, improve water retention, and stabilise yields under climate stress.

**Figure 14**. Actively eroding terrace slope below the Talmaza view point in the National Park Nistruld e Jos (an Emerald site).

### 4.3 Wetland and hydrological restoration

Although still limited in scale, hydrological restoration provides some of the highest EbA returns in Moldova, particularly in areas that combine high restoration potential with urgent needs for ecological stabilisation and biodiversity conservation. Such areas function simultaneously as climate-adaptation assets and as critical biodiversity strongholds. Key examples include:

- the Lower Prut valley (with Beleu-Manta Lake/wetland system has undergone severe hydrological alteration degradation, yet remains a nationally and internationally important wetland complex;
- remnants of natural floodplain processes in the Lower Dniester (including oxbow and abandoned-channel systems, e.g., Blind Dniester / Old Dniester), which retain high ecological value despite extensive regulation;
- small depressional wetlands in the forest–steppe zones, which play a disproportionate role in local water retention, microclimate regulation, and the conservation of rare and specialised species.

These systems provide natural buffering against drought, improve water quality, support biodiversity, and reduce flood peaks. However, decades of drainage, channelization, embankment construction, and agricultural expansion have degraded their hydrological functionality.

Restoration is increasingly constrained by declining inflows and faster water retreat, driven by reduced precipitation and reduced upstream contributions, particularly in the Prut system. In several locations, this has accelerated a functional transition from wetland to pasture, shrubland, or fragmented wetland–grassland mosaics. This trajectory creates a management dilemma: some transitional habitats retain ecological value, but continued agricultural encroachment and further drainage can lock in degradation and eliminate the option of future reconnection. EbA planning should therefore prioritize actions that maintain or re-establish minimum hydrological connectivity, protect remaining wet cores, define clear land-use regimes for buffer zones or in cases where hydrological restoration is inapplicable ensure assisted natural transition to another type of functional ecosystem.

Riverbank and ravine stabilization measures are applied sporadically but can generate high returns when aligned with local hydrology. Bioengineering approaches such as grassed waterways, vegetated ravine slopes, and riparian buffer strips reduce sediment delivery, stabilize channels, and protect adjacent land during intense rainfall events. When combined with wetland reconnection and floodplain retention, these measures strengthen catchment-scale regulation rather than treating erosion as isolated points.

Riverbank and ravine stabilization. Bioengineering measures such as grassed waterways, vegetated ravine slopes, and riparian buffers, are used sporadically across Moldova. Though small in scale, these measures provide significant EbA benefits when aligned with local hydrology.

**Figure 15**. Eroded bank of a local river in Chișcăreni village.

### 4.4 Grassland and steppe systems

Natural steppe and xerophytic grasslands, among the most climate-resilient ecosystems in Eastern Europe, have been reduced to <2% of their historical coverage in Moldova (MAFI & UNEP, 2019). The overwhelming share of former steppe has been irreversibly converted to arable land, driven by the high agricultural value of chernozem soils (Parmacli, 2013) and large-scale ploughing during the 20$^{th}$ century. Smaller portions were transformed into permanent agricultural mosaics (orchards, vineyards, infrastructure) or degraded into secondary grasslands with simplified species composition and altered soil processes. The few remaining fragments (e.g., Vrănești, Vărzărești, Tigheci–Leova belt) represent relict ecosystems and are highly valuable EbA assets:

- drought-adapted flora,
- soil stability on steep erodible slopes,
- habitat refugia under extreme heat,
- carbon storage and nutrient cycling.

Most remaining patches face chronic pressure from grazing, shrub encroachment, and invasive species (*Elaeagnus, Ailanthus, Ambrosia*). Restoration remains limited but technically feasible (Fig, 16).

From an EbA perspective, protecting steppe and xerophytic grasslands is a low-cost way to stabilize erodible slopes, retain soil moisture through better soil structure, and maintain heat refugia. Restoration is technically feasible through phased actions: legal safeguarding of remaining patches, buffer zones to reduce fertiliser and pesticide drift, and recovery of native grassland structure using local-provenance seed where degradation is advanced. Monitoring can be simple and field-based, focusing on shrub cover, invasive cover, bare soil proportion.

**Figure 16.** Eroded steppe slope in Costești village used for cattle grazing.

## 5 Case studies demonstrating EbA potential

### 5.1 Rewetting and habitat rehabilitation in the "Blind Dniester" (Old Oxbow)

Implemented by: BIOTICA Ecological Society in partnership with local communities (funded by ADA)

**Context:** The "Blind Dniester" is a 43 km-long oxbow system forming a natural wetland corridor within the Lower Dniester floodplain. Due to embankments and channelization during the Soviet era, hydrological connectivity declined sharply, leading to siltation, eutrophication, reduced fish migration, and loss of wetland vegetation.
**EbA Intervention**: BIOTICA implemented one of Moldova's first explicit pilot rewetting efforts, including reopening blocked inlets and side channels, local removal of illegal dams, sediment and vegetation clearing in strategic points, reintroduction of native aquatic plants (*Trapa natans, Salvinia natans, Acorus calamus*), community awareness and local stewardship initiatives.

**EbA Benefits**: improved water exchange and prolonged retention during drought, habitat recovery and increased biodiversity, enhanced fisheries potential, cultural and educational benefits tied to local identity (Fig, 17).

Lessons. Even modest hydrological reconnection measures can generate large ecological gains. The pilot demonstrated the need for basin-level planning and legal recognition of the oxbow as a protected natural feature. However, unsustainable practices (poaching) can be an obstacle in such incentives.

**Figure 17.** European pike (*Esox lucius*) using a reconnected channel of the "Blind Dniester" (Old Oxbow) as a shallow-water refugium following hydrological reconnection, illustrating restored habitat function for spawning and feeding.

## 5.2 Supporting natural forest regeneration for enhanced benefits for local communities in the central region Codrii

Implemented by a consortium TUB/ICAS under EU4Environment / World Bank activity

**Context:** In the central Codrii region, national and local authorities are strengthening biodiversity conservation and forest management, with a focus on linking nature restoration to community benefits. A dedicated activity for 2025–2026 focuses on nature restoration linked to community benefits, particularly by supporting natural regeneration and forest management planning around community-owned forestlands. Part of this is also developing "Moldova Nature Restoration Potential" analysis supposed to help both authorities and interested donor audience in investing into nature restoration.

**EbA Intervention** : Key elements include diagnostics and prioritization of restoration sites (forests, wetlands), formalization of natural forest regeneration as viable restoration pathway, ensure participatory planning with communities and LPAs, conducting forest management plans integrating hydrological and climate functions, and linkages to Emerald and future Natura 2000 planning.

**EbA benefits**: natural regeneration is more resilient and cost-effective under drought, forests contribute to hydrological stability and carbon storage, communities receive non-timber benefits and more stable ecosystem services, restoration aligns with EU biodiversity obligations.

**Lessons**. EbA interventions scale more effectively when they are embedded in established national processes and (e.g., HCVF, Emerald network, NFERP), rather than implemented as stand-alone projects. Clear and predictable incentives are essential for long-term community involvement, particularly where restoration relies on natural regeneration and temporary restrictions on land use. Linking restoration objectives with tangible social co-benefits, including access to non-timber forest products, improved water regulation, and locally valued ecosystem services, strengthens local ownership and increases the durability and sustainability of EbA outcomes.

## 5.3 Shelterbelt rehabilitation as a landscape-scale EbA measure

Implemented: by multiple projects (an advanced and still tested EbA practice in Moldova)

**Context**. Moldova's historic shelterbelt network once provided some of the strongest nature-based climate buffering in the region. After decades of decline, rehabilitation is again recognized as a national adaptation priority in response to increasing droughts, wind erosion, and soil degradation.

**EbA Intervention examples**: World Bank ACP mechanized rehabilitation squads for shelterbelt rehabilitation (south Moldova). FAO LDN Project restoration on erosion-prone lands in Orhei and Rezina. National initiatives under the NFERP.

**EbA Benefits**: reduced wind erosion and dust storms; improved soil moisture and microclimate stability; protection of perennial crops; enhanced biodiversity connectivity; carbon sequestration and increased landscape resilience.

**Lessons**: shelterbelts are most effective when managed as functional networks rather than isolated strips; tenure clarity and maintenance obligations are critical; agroforestry integration (trees + grasses + crops) produces stronger adaptation outcomes.

**Positioning**: while other EbA measures in Moldova (e.g. wetland or floodplain restoration) have been tested mainly at pilot or site-specific scale, shelterbelts remain the only EbA intervention with demonstrated scalability, policy uptake, and cross-sector relevance at national level.

### 5.4 Lessons from challenged or failed approaches

Experience from Moldova shows that several restoration and adaptation approaches have delivered limited or short-lived results when ecological and institutional conditions were not adequately considered. These cases provide important lessons for improving EbA design and implementation:

- Afforestation efforts on ecologically unsuitable dry or shallow soils, particularly in the south and forest-steppe zones, have often resulted in high seedling mortality and repeated replanting costs. Similarly, monoculture plantations have proven highly vulnerable to drought, pests, and disease, reducing long-term resilience and increasing maintenance demands. These outcomes underline the need for site-specific diagnostics and diversified, climate-adapted species selection.
- Hard-engineered interventions in riverine systems, such as channel straightening, embankments, and bank armoring have frequently accelerated ecological degradation by disconnecting floodplains, increasing flow velocity, and reducing natural retention capacity. Comparable impacts have resulted from wetland drainage and channelization, which eliminated natural buffering against floods and droughts and constrained future restoration options.
- Shelterbelt neglect linked to unclear land tenure and maintenance responsibilities has led to progressive degradation, even where belts were initially well designed. In several cases, the absence of long-term management frameworks has undermined otherwise sound EbA investments.
- Absence of maintenance and monitoring frameworks, causing benefits to decline rapidly after project completion.

Together, these lessons highlight that EbA effectiveness depends on early ecological suitability assessments, adaptive management, clear institutional responsibilities, and integration into long-term land-use and sectoral planning rather than stand-alone, one-off interventions.

### 5.5 Systemic gaps and structural limitations

Beyond site-specific challenges, EbA implementation in Moldova is constrained by a set of systemic and structural limitations that restrict scalability, coherence, and long-term effectiveness.

Key gaps include:

- lack of catchment-scale hydrological restoration, with most interventions implemented at plot or site level, limiting cumulative impacts on water retention, flood buffering, and drought resilience.
- weak integration between forestry, agriculture, water and biodiversity sectors, resulting in fragmented planning and missed opportunities for landscape-scale EbA synergies.

- absence of invasive-species control strategies, allowing invasive plants and animals to undermine restoration outcomes across forests, wetlands, and pastures.
- insufficient soil and moisture monitoring, constraining adaptive management and limiting the ability to assess EbA performance over time.
- limited incentives for agroforestry and regenerative agriculture, particularly on private and communal lands where EbA potential is high.
- low institutional capacity at LPA level, including limited technical expertise, staffing, and financial resources to plan, implement, and maintain EbA measures.
- poor landscape connectivity between forest, wetland, and steppe habitats, driven by intensive land use and infrastructure development, which reduces ecological resilience and adaptive capacity.

These systemic gaps form the backdrop for identifying EbA Entry Points in the next chapter.

# 6 Priority and candidate EbA sites

This chapter presents the identification and prioritisation of EbA opportunity areas across the country. Site selection was carried out through a two-tiered approach combining:

a) national-scale geospatial screening, and
b) expert-validated field assessments.

This combined methodology ensures that priority areas are identified both quantitatively (using spatial indicators of ecological and socio-economic relevance) and qualitatively (based on ground realities, community readiness, hydrological urgency, and ecological uniqueness).

The purpose of this chapter is therefore:

1. to identify landscapes with the highest potential for EbA interventions at national scale;
2. to explain the logic and criteria used to prioritise these areas; and
3. to outline the types of EbA interventions most suitable for each landscape context.

Detailed technical materials, including indicator definitions, scoring matrices, algorithms, full lists of connectivity zones, and extended site briefs, are provided in the Annexes in line with the ToR.

## 6.1 GIS-based national EbA screening and classification

A national GIS screening was carried out to identify landscapes with high potential for EbA interventions. Forest connectivity zones were used as the primary spatial analysis units, as they integrate ecological structure, hydrological function, and land-use context at a scale suitable for landscape-level EbA planning.

Each connectivity zone was assessed using a set of biophysical and socio-economic indicators relevant to climate resilience and ecosystem functionality. The analysis integrated six thematic dimensions:

1. forest fragmentation and structural connectivity,
2. annual precipitation and climatic moisture gradients,
3. aridity and drought-refugia potential,
4. hydrological relevance (rivers, floodplains, wetlands),
5. biodiversity value (KBAs, PAs, Emerald/Natura 2000 context),
6. social climate vulnerability (Climate Vulnerability Index, CVI).

See Table 3 for a summary of indicators, their purpose and the data sources used. Full maps and indicator descriptions are provided in Annex 4.

**Table 3**. GIS indicators used in the national EbA screening

| Thematic layer | Purpose in EbA screening | Method summary | Key data sources |
|---|---|---|---|
| **Forest fragmentation & connectivity** | Identify structural barriers, connectivity potential, and forest | High-confidence forest mask constructed from ESA WorldCover 2021 and Dynamic World (DW), with settlement buffers and <1 ha patches | ESA WorldCover (2021); Dynamic |

| | | | |
|---|---|---|---|
| | blocks suitable for restoration | removed. Forest patches classified as: islets (<10 ha), stepping-stone patches (10–100 ha), core (>100 ha). Connectivity zones identified by clustering 300 m buffers around core + stepping-stone patches. | World; Grantham et al. 2020 |
| **Annual precipitation (BIO12)** | Capture moisture gradients relevant for forest regeneration and riparian EbA | BIO12 extracted from WorldClim (1 km). Reclassified into dry (<500 mm), moderately humid (500–575 mm), humid (>575 mm). | WorldClim v1 (Hijmans et al., 2005) |
| **Aridity Index (AI)** | Represent actual moisture limitation and long-term water balance | AI rescaled from Global-AI v3 (1970–2000). Reclassified following UNEP aridity categories. | Zomer et al., 2022 |
| **Drought-refugia potential** | Identify areas with climatic buffering capacity | Combined precipitation + AI to identify “potential refugia”; intersected with forest to map “realized refugia”. | WorldClim + AI + forest mask |
| **Flood-buffering relevance** | Indicate catchments where EbA flood mitigation is beneficial | National 1% annual exceedance map and floodplain context reviewed. | Apele Moldovei |
| **Biodiversity value (KBA/PA)** | Highlight areas where restoration yields high conservation co-benefits | KBA polygons overlaid with PAs to extract presence and coverage. | World DB of KBAs; Ajder et al. 2014 |
| **Climate Vulnerability Index (CVI)** | Reflect social sensitivity to climate impacts | CVI extracted for each connectivity zone to flag areas of high socio-economic vulnerability to climate change impacts. | Țăranu & Gutium, 2023 |

This screening produced a set of forest connectivity zones with quantified indicator values (Annex 5.2). Each zone was classified using five parameters derived from the indicators:

1) Drought-refugia potential
2) Structural forest connectivity
3) Biodiversity value (KBA and PA context)
4) Hydrological relevance (rivers, wetlands and floodplain functions)
5) Social climate vulnerability (CVI)

Each parameter was scored (Annex 5.1) from low to high relevance, and scores were summed to generate a Total EbA Score. Based on this score, three national priority classes were defined:

A. EbA 1 – Highest priority (≥ 8)
B. EbA 2 – Medium priority (5–7)
C. EbA 3 – Lower priority (≤ 4)

The resulting national EbA priority map is presented in Figure 18. This GIS-based assessment provides one of the two evidence bases for selecting candidate EbA sites, together with expert-based field assessments (see Section 6.4).

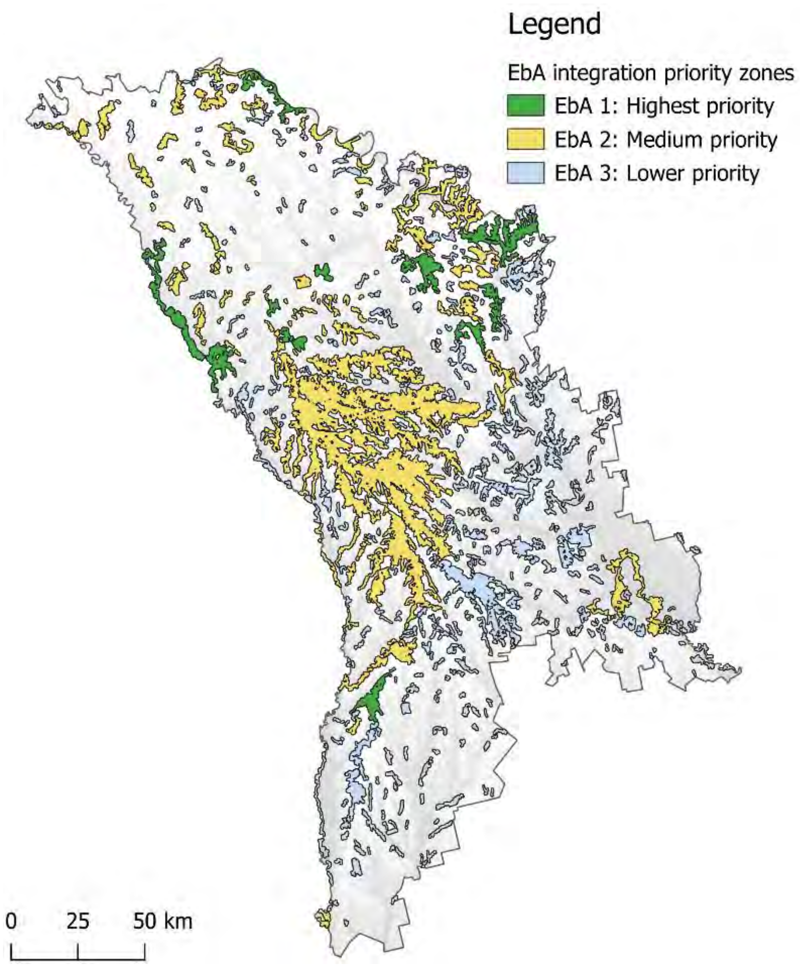


**Figure 18.** National distribution of the priority EbA integration zones

### 6.2 Priority GIS-identified EbA areas

Only zones classified as EbA 1 (highest priority) are described in detail in the main report. The complete list of all connectivity zones and their scores is included in the attribute tables of the accompanying GIS layers, which contain 526 forest connectivity zones.

EbA 1 zones were grouped into integrated EbA opportunity areas, considering ecological continuity, overlap with existing PAs and Emerald designations, and practical feasibility for implementation.

As interpretation of conservation and adaptation value, the connectivity and EbA priority maps represent indicative screening zones, derived from buffers around core and stepping-stone forest patches. These zones are not operational boundaries for interventions. Their purpose is to highlight landscapes where ecological processes, hydrological regulation, and climate adaptation benefits can be strengthened through targeted EbA interventions.

Within each zone, ecological cores (forests, wetlands, riparian systems) represent priority assets, while surrounding areas indicate where connectivity, buffering, and hydrological functions can be enhanced under appropriate conditions. Final site boundaries and intervention areas must be refined during detailed planning and implementation.

## 6.3 List and Map of EbA opportunity areas

Based on the national GIS screening, ten EbA opportunity areas were identified as the highest-priority landscapes for climate-adaptive restoration in Moldova. Given the country's small size and strong transboundary ecological linkages with Romania [EU member state] and Ukraine [under war and turmoil period], river corridors and border landscapes play a disproportionate role in biodiversity connectivity and EbA potential.

Long-term bird monitoring under the IBA framework confirms the Prut and Dniester river valleys as critical national and regional ecological corridors, supporting breeding, migration and wintering functions. These findings reinforce the role of riverine landscapes as priority EbA entry points, where hydrological restoration, wetland recovery and floodplain reconnection deliver both biodiversity and climate-adaptation benefits.

The ten EbA opportunity areas are listed below. Short technical profiles for each opportunity area, including overlaps with existing designations, EbA values, priority entry points, and options for strengthening PA and OECM coverage, are provided in Annex 2 and 5.3.

**Note on communities and site selection:**

The EbA opportunity areas presented below and in annexes are indicative analytical zones derived from spatial screening and field verification. They do not represent predefined implementation sites. The are intended to provide flexibility for implementers, highlighting zones where EbA interventions are both urgently needed and have high potential to deliver climate adaptation benefits and associated co-benefits.

The identification of key communities within each opportunity area therefore depends on the final selection of specific intervention sites within these zones. As the mapped areas are indicative, the communities that may directly benefit from EbA measures are also indicative and are best described at district level at this stage.

The final choice of EbA intervention sites, associated communities, and precise spatial boundaries will require site-specific selection by implementing partners, followed by on-the-ground validation and detailed site-specific EbA planning. This process should be aligned with local land tenure conditions, governance arrangements, and community priorities.

### 6.3.1 Middle Prut River Corridor (ID 3, 1, 25, Fig. 19)

Forest–wetland mosaic along the Prut linking Pădurea Domnească Nature Reserve (Emerald Site MD0000002) and adjacent Prutul de Mijloc Emerald Site (MD0000011), with high hydrological relevance and vulnerable riparian settlements.

**Key communities:** Rural settlements within Fălești, Glodeni, Rîșcani and Edineț districts, located along the Prut floodplain and adjacent riparian zones.

**Key climate risks:** Flooding and flash floods, drought, riverbank erosion, reduced floodplain water retention, water quality degradation, heat and moisture stress in floodplain systems.

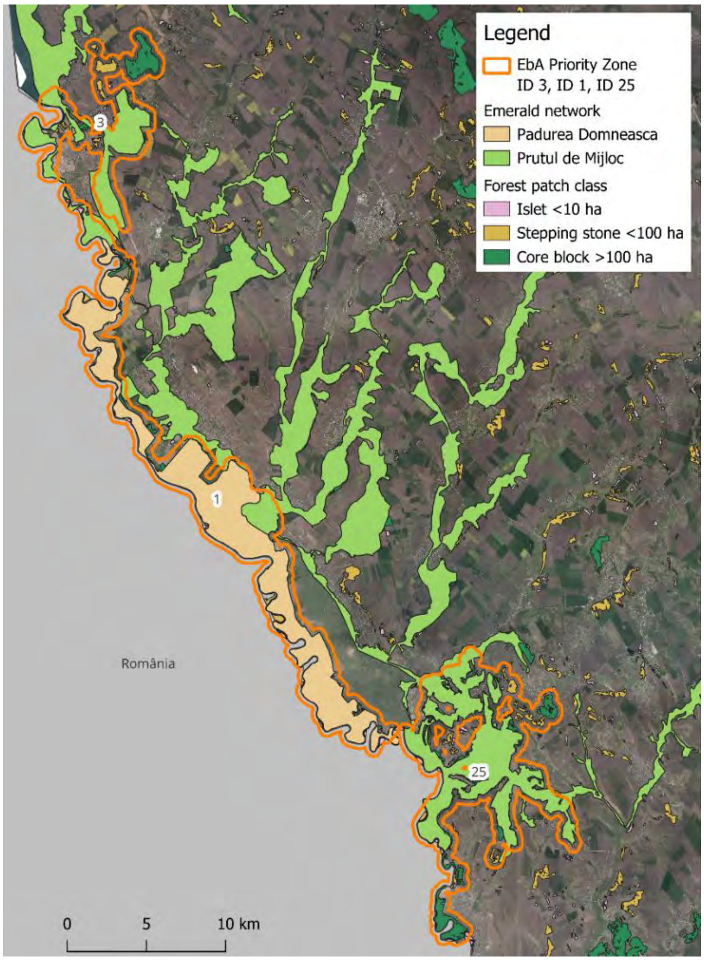


**Figure 19.** EbA zones 3, 1, and 25 merged into a single area, covering parts of the Pădurea Domnească Nature Reserve and Prutul de Mijloc Emerald Site, with clear potential for extension into a single PA for EbA integration.

### 6.3.2 Stepa Bălțiului (ID 84, Fig. 20)

Emerald Site - MD0000017. Fragmented steppe-agroecosystem with high micro-refugia potential and priority for steppe and pasture restoration.

**Key communities:** Rural settlements within Fălești, Sîngerei and Telenești districts, largely dependent on rain-fed agriculture, grazing and steppe–pasture resources.

**Key climate risks:** Drought, heat stress, soil erosion, pasture degradation, loss of steppe refugia, water scarcity for grazing.

### 6.3.3 Rădoaia–Forest Cluster (ID 142, Fig. 20)

Rădoaia Emerald Site - MD0000058. Compact forest–grassland cluster with strong connectivity and headwater importance for the Răut River.

**Key communities:** Rural settlements within Sîngerei district, located in the Răut headwater area and surrounding forest–grassland mosaics.

**Key climate risks:** Drought, reduced baseflow, headwater drying, runoff increase, soil erosion, forest–grassland edge stress.

### 6.3.4 Onești–Cotiujenii Forest Plateau (ID 106, Fig. 20)

Large, unprotected forest plateau with high refugia value and multiple small streams, suitable for community forestry and agroforestry models.

**Key communities:** Rural settlements within Sîngerei district, adjacent to forest margins and small valley systems.

**Key climate risks**: Drought, heat stress, forest fragmentation, soil erosion, reduced water regulation, agricultural vulnerability.

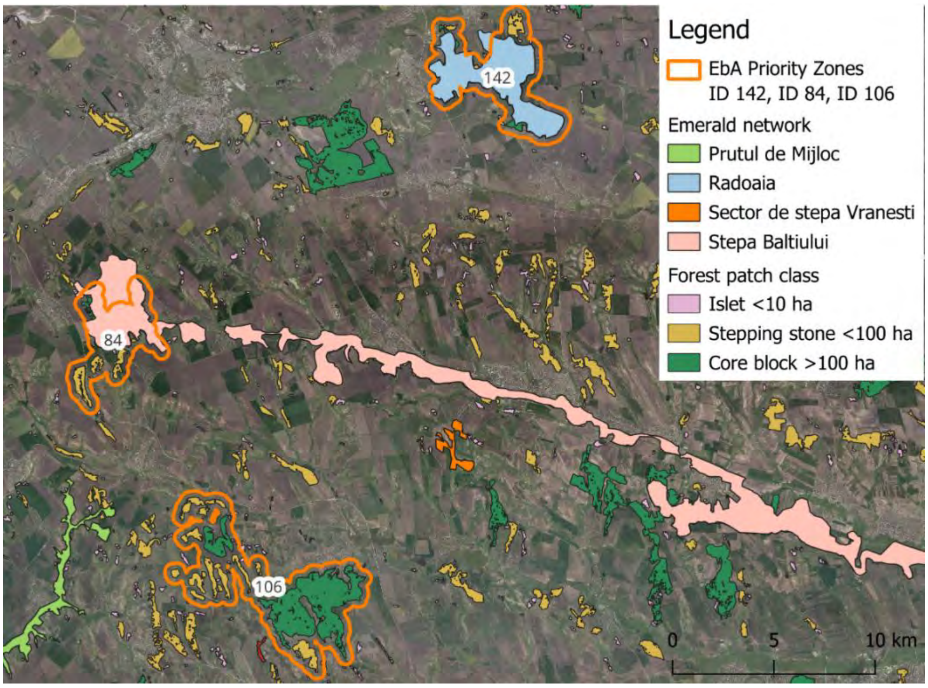


**Figure 20.** EbA zones 84, 142, and 106, overlapping with the Rădoaia (ID 142) and Stepa Bălțiului (ID 84) reserves. Zone ID 106 does not contain, nor is it adjacent to, any designated PAs.

### 6.3.5 Dobrușa Forest Plateau (ID 266, Fig. 21)

Dobrușa Emerald Site - MD0000060, One of the largest contiguous forest plateaus, with high connectivity, strong hydrological relevance and scope for reserve expansion.

**Key communities:** Rural settlements within Șoldănești district, located around the Dobrușa forest plateau and associated valley systems.

**Key climate risks:** Drought, slope erosion, runoff intensification, declining baseflow, forest margin degradation.

### 6.3.6 Pohrebeni Forest–Steppe Transition (ID 346, Fig. 21)

Pohrebeni Emerald Site - MD0000056. Forest–steppe ecotone with very high connectivity and erosion-prone slopes that are important for local EbA.

**Key communities:** Rural settlements within Orhei district, situated along forest–steppe transition zones and sloping agricultural land.

**Key climate risks:** Soil erosion, drought stress, runoff increase, loss of stabilising vegetation, forest–agriculture interface degradation.

### 6.3.7 Poiana Curătura – Climăuți de Jos Slopes (ID 372, Fig. 21)

Poiana Curătura Emerald Site - MD0000020. Narrow Dniester valley corridor with steep, erosion-sensitive slopes and fragmented forest–steppe habitats.

**Key communities:** Rural settlements within Șoldănești district, located along the Dniester valley slopes and associated terraces.

**Key climate risks:** Severe erosion, landslide risk, extreme runoff, drought stress on shallow soils, infrastructure exposure.

### 6.3.8 Rezina Nistru Terraces (ID 408, Fig. 21)

Rezina Emerald Site - MD0000015. Dissected Dniester terraces with steep slopes, small wetland pockets and high hydrological and social vulnerability.

**Key communities:** Rural settlements within Rezina district, located on river terraces and valley margins of the Dniester.

**Key climate risks:** Slope instability, erosion, altered runoff, wetland drying, drought exposure.

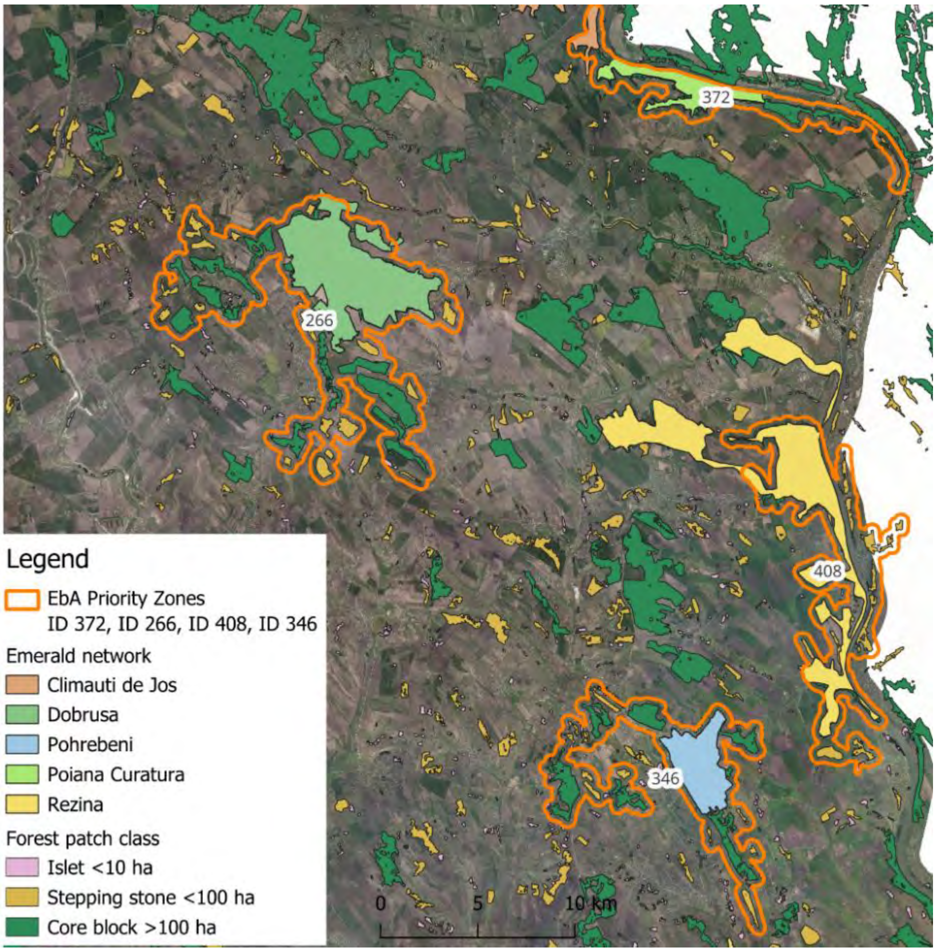


**Figure 21**. EbA zone 266, overlapping with the Dobrușa Landscape Reserve; zone 346, including the Pohrebeni Landscape Reserve; zone 372, containing the Poiana Curătura Reserve; and zone 408, containing the Țipova Landscape Reserve (306 ha), but it can be connected with the neighbouring Saharna Landscape Reserve (674 ha). All sites show potential for expansion.

### 6.3.9 Unguri–Holoșnița Riparian Plateau (ID 98, Fig. 22)

Unguri-Holoșnița Emerald Site - MD0000005 and Stîncele Nistrene - MD0000014. Functional natural core of a larger Ramsar/Emerald site, with canyon microrefugia, strong hydrological value and significant invasive pressure.

**Key communities:** Rural settlements within Soroca district, located along the Dniester valley, canyons and adjacent plateaus.

**Key climate risks:** Hydrological alteration, drought, slope erosion, microrefugia degradation, invasive species expansion.

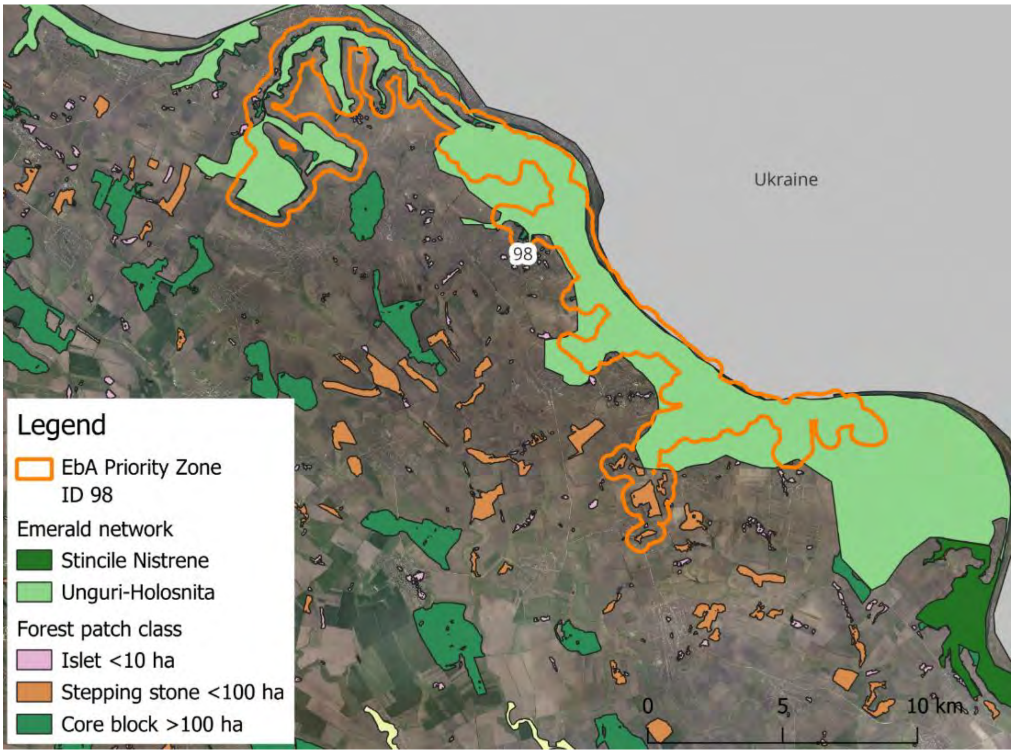


**Figure 22.** EbA zone 98, covering the core zone of the Unguri–Holoșnița Ramsar site.

### 6.3.10 Codrii Tigheci Forest System (ID 196, Fig. 23)

Codrii Tigeci Emerald Site - MD0000009. Major forest massif in southern Moldova with good internal integrity, fragmented edges and high relevance for erosion and drought risk reduction.

**Key communities:** Rural settlements within Cantemir district, adjacent to forest edges and erosion-prone agricultural land.

**Key climate risks:** Drought, forest edge fragmentation, soil erosion, reduced water retention, agricultural exposure.

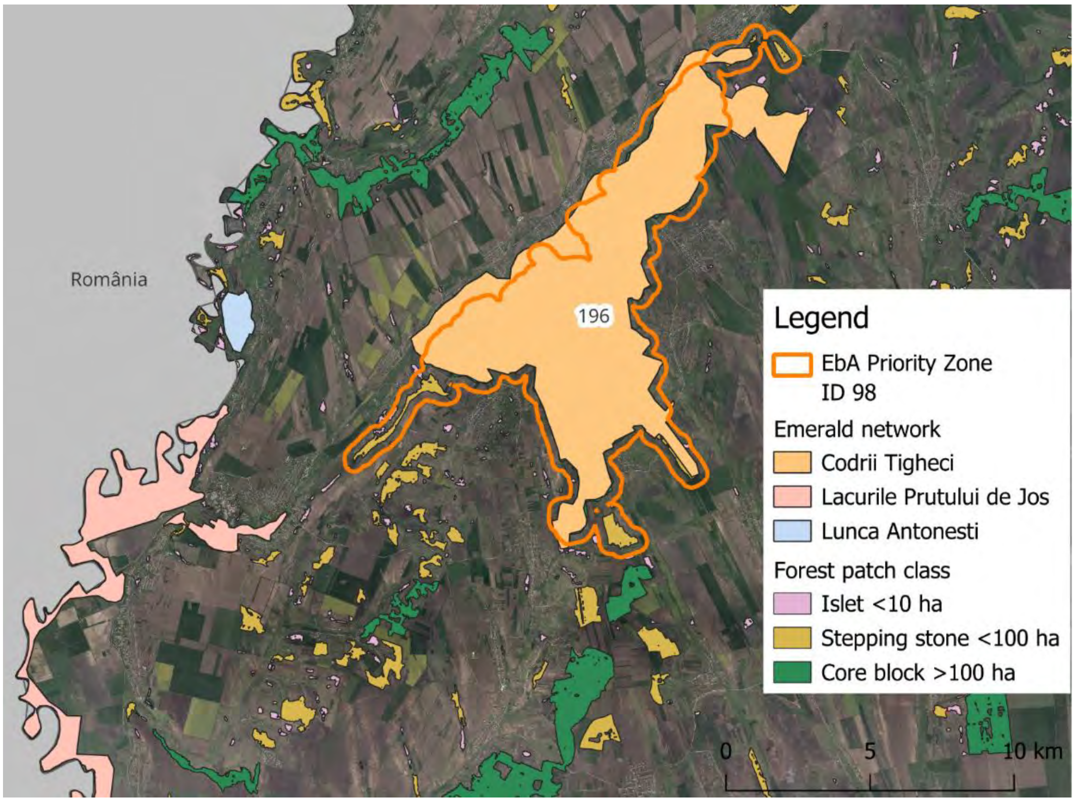


**Figure 23.** EbA zone 196, containing the Codrii Tigheci Reserve and adjacent forest stepping stones and several islets with potential for improved connectivity.

## 6.4 Expert- and field-based site identification

Parallel to GIS screening, a set of EbA-candidate sites was identified through expert analysis and field missions with national partners. These sites reflect practical considerations such as hydrological urgency, intact microrefugia, invasive species pressure, land-use conflicts, and community readiness.

This process complements the GIS-derived EbA 1 zones by incorporating place-based knowledge and local implementation feasibility.

Field-identified priority sites are listed below and described as separate sections.

### 6.4.1 Central Codrii Region

The Central Codrii Region represents the core forest massif of the Republic of Moldova and one of the most ecologically intact and continuous forest landscapes remaining in the country. Situated within the Central Moldavian Plateau, the region is characterized by extensive, predominantly forested terrain, complex collinear relief, a dense network of valleys and springs, and long-term continuity of broadleaf forest cover. These features have allowed the preservation of a high degree of forest landscape integrity and ecological functionality, unmatched elsewhere at national level.

From a conservation planning perspective, the Central Codrii Region is the most promising area in Moldova for the establishment of a large, coherent PA-category, primarily due to:

- its exceptionally high proportion of natural and semi-natural forest ecosystems, and
- strong habitat continuity and corridor connectivity, both internally and with adjacent forested landscapes.

At present, the ecological nucleus of the region is covered by two Emerald Sites:

- Emerald Site "Codru" (MD0000004), and
- Emerald Site "Codrii Strășenilor" (MD0000010).

According to their respective Standard Data Forms (SDFs), these two sites are tightly connected spatially and ecologically, forming in practice a single, continuous forest body, with no clear ecological boundary between them. Together with adjacent forested and semi-natural habitats outside the current Emerald boundaries, they constitute a large, compact forest landscape that functions as a unified ecological system.

Both SDFs highlight the presence of well-preserved nemoral forest habitats, dominated by oak (*Quercus robur, Q. petraea*) and hornbeam (*Carpinus betulus*) with isolated patches of beech (*Fagus sylvatica*), and mixed broadleaf stands, with high structural complexity, significant amounts of dead wood, old-growth elements, and a rich assemblage of forest-dependent species of European conservation interest. The region supports numerous species listed under the Bern Convention and demonstrates high resilience and functional connectivity, including along ridgelines, valley systems, and forest–forest interfaces.

Importantly, the dominant land cover and management objective across this combined forest area are clearly conservation-oriented, distinguishing the Central Codrii Region from other large designated areas in Moldova where agricultural land use prevails. This functional reality aligns well with classical PA principles, providing a strong ecological justification for large-area protection.

Given these characteristics, the joint 'Codru-Codrii Strășenilor' (Emerald sites) forest massif, together with selected adjacent habitats that contribute to connectivity and buffering, represents an excellent candidate for designation under a larger PA category in the future. In particular, it shows strong potential for:

- designation as a Biosphere Reserve, reflecting the presence of a well-defined core (strictly protected forests), buffer zones (managed forests and semi-natural habitats), and transition areas (communal forests, traditional land uses); and
- partial or full overlap with Natura 2000, once relevant habitat types and species are formally identified and assessed in line with EU requirements.

Such a designation would allow for a multi-layered conservation approach, combining strict protection of core forest ecosystems with sustainable management, ecological restoration, research, education, and community engagement in surrounding areas, while maintaining full compatibility with the Emerald Network and future Natura 2000 obligations.

Priority interventions in the Central Codrii Region are therefore strategic rather than remedial, and include:

- consolidation and coordinated management of communal forests located between and around the two Emerald sites, to prevent future fragmentation;
- promotion of natural and assisted natural regeneration on abandoned or marginal lands, strengthening ecological corridors; and
- harmonization of management objectives across administrative and ownership boundaries, preparing the ground for an integrated, landscape-scale PA designation.

Overall, the Central Codrii Region stands out as a national flagship landscape where the transition from Emerald sites to a large, internationally recognizable PA model (such as a Biosphere Reserve with Natura 2000 components) is both ecologically justified and institutionally feasible.

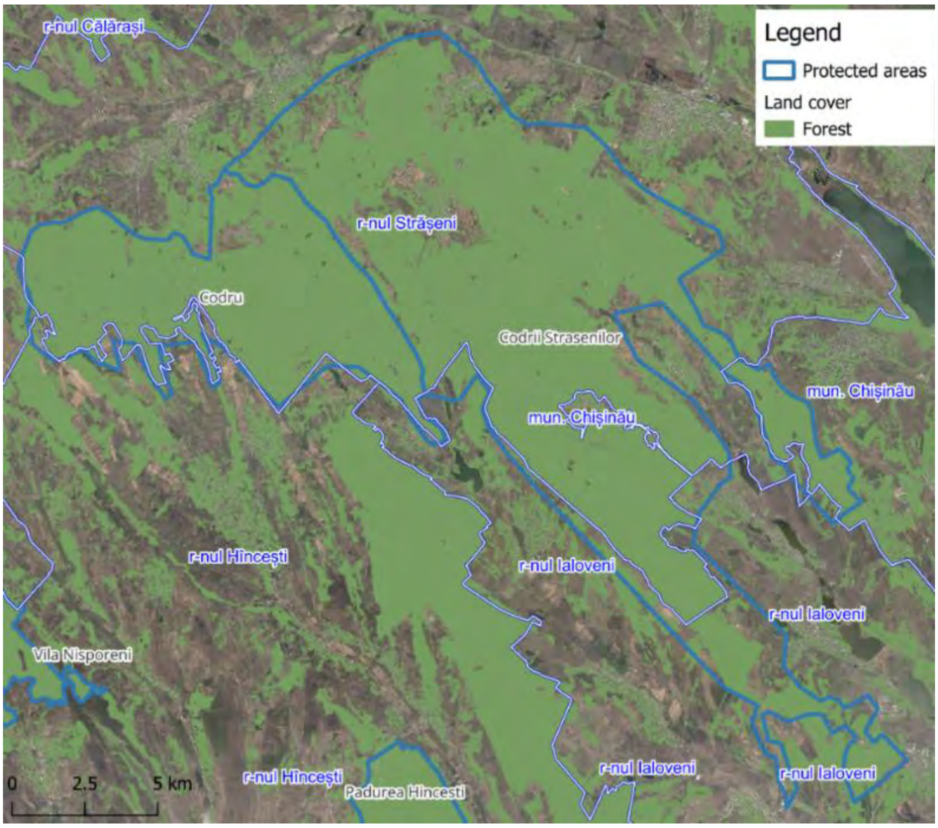


**Figure 24.** The map illustrates the spatial configuration of the Emerald Sites “Codru” and “Codrii Strășenilor” within the Central Codrii Region, highlighting their functional continuity and central position within a largely uninterrupted forest landscape.

### 6.4.2 Nisporeni Reforestation Landscape (Forest Mosaic)

The Nisporeni Mosaic represents a forest-agricultural transitional landscape in western Moldova, characterised by a fine-grained combination of Codrii-type forest cores, managed forest reserves, degraded orchards, abandoned agricultural lands, and areas undergoing spontaneous woody succession. Located at the western edge of the Central Codrii forest zone, this landscape plays an important buffering and connective role between the core Codrii forest massif and the Prut basin landscapes.

A defining structural element of the Nisporeni Mosaic is the presence of large and ecologically valuable forest areas, which provide a strong foundation for landscape-scale reforestation and future PA consolidation.

The principal ecological anchor is the Vila Nisporeni PA (3,499 ha) and Emerald Site MD0000028, the largest and most valuable forest PAs in the region. Vila Nisporeni conserves a diverse assemblage of Codrii-type forest ecosystems, including oak-type forests, mixed deciduous stands, and silvosteppe forest variants. These forests occupy a wide range of site conditions and display high structural and habitat heterogeneity. Functionally, Vila Nisporeni acts as a landscape-scale forest core, supporting biodiversity persistence and serving as a primary seed source for surrounding regenerating areas.

Complementing this core area is the Seliște-Leu Natural Forest Reserve (315 ha), a forest PA category classified under IUCN Category IV (Habitat/Species Management Area). Managed by the State Forest Enterprise Nisporeni-Silva, Seliște-Leu is designated for the active conservation of specific forest habitats and associated species and includes a medicinal plants protection area. Within the Nisporeni Mosaic, Seliște-Leu functions as a secondary biodiversity nucleus and local regeneration source, reinforcing ecological continuity around the Vila Nisporeni core.

Beyond these formally PAs, substantial parts of the Nisporeni Mosaic consist of:

- degraded or abandoned orchards,
- marginal or low-productivity agricultural lands, and
- former forest areas currently undergoing spontaneous afforestation.

These land categories exhibit clear evidence of natural succession dominated by native woody species, reflecting strong ecological memory, favourable soil conditions, and proximity to intact forest seed sources. Consequently, the landscape demonstrates a very high suitability for Assisted Natural Regeneration (ANR) and complementary, site-adapted reforestation.

Accordingly, the primary intervention priority in the Nisporeni Mosaic is to assist and guide spontaneous forest recovery, rather than to rely on large-scale plantation-based afforestation. Priority actions include:

- supporting natural afforestation on abandoned and marginal lands,
- facilitating forest regeneration in degraded orchards suitable for ANR, and
- applying selective enrichment planting with native species only where natural regeneration is incomplete or structurally simplified.

Once such reforestation and restoration measures are implemented and ecological connectivity between forest cores is restored, the Nisporeni Mosaic has the potential to evolve beyond a collection of isolated PAs. The Vila Nisporeni–Seliște-Leu system, together with restored intervening habitats, could form the basis for a larger, coherent PA category, reflecting a continuous Codrii-type forest landscape rather than fragmented units.

In this context, the Nisporeni Mosaic should be regarded as an area of high and credible potential for future PA expansion, including under Natura 2000. As restored habitats mature and functional connectivity is achieved, the landscape would increasingly meet Natura 2000 requirements related to habitat extent, coherence, and conservation status, supporting its consideration for future designation or extension of Natura 2000 sites.

Overall, the Nisporeni Mosaic represents a strategic reforestation and restoration landscape, where targeted ANR-based interventions can transform a fragmented forest–agricultural mosaic into a functionally integrated forest system, capable of underpinning both national PA development and EU-aligned conservation objectives.

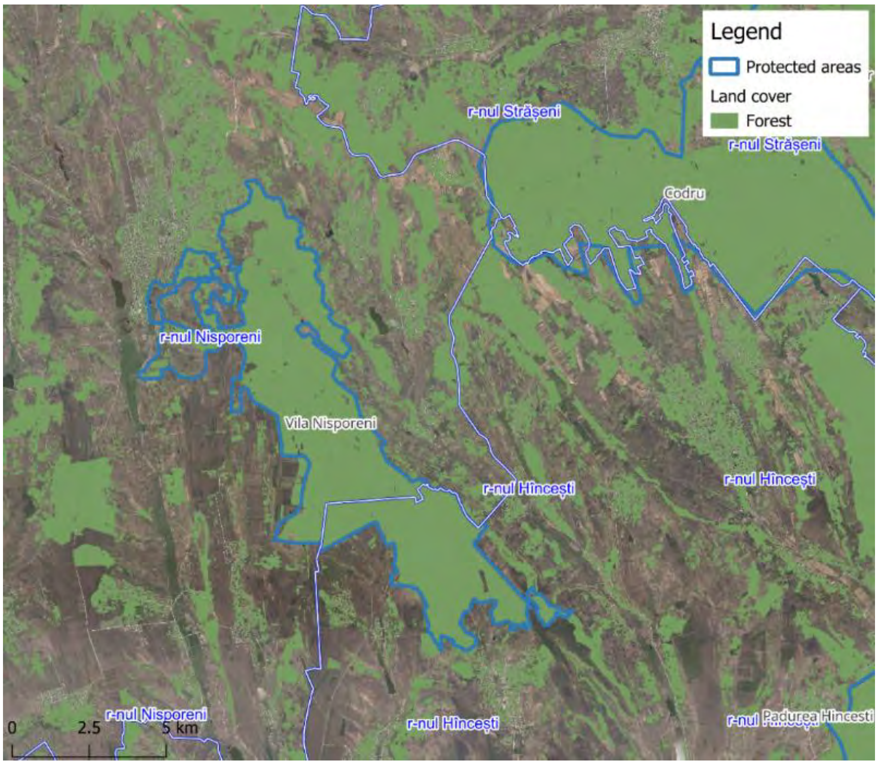


**Figure 25.** The boundaries of the Vila Nisporeni and the Seliște-Leu PAs, as well as their spatial relationship to the nature Reserve Codrii (and the Emerald site Codru).

### 6.4.3 Community-managed PA (based on community-owned forests and pastures)

This landscape represents a cluster of community-managed forests and pastures in central-northern Moldova, characterized by high ecological integrity, long-standing local stewardship traditions, and strategic proximity to major PAs. The core of this system is formed by the Boghenii-Noi commune, together with the neighbouring villages of Sinești and Hârcești, all located in the hilly zone of Ungheni district and in close proximity to the Plaiul Fagului Nature Reserve (Beech Land) – one of Moldova's most valuable forest PA and an officially designated Emerald Network site.

The Boghenii-Noi commune consists of a group of five small villages, situated among some of the highest hills in the country, where forests, pastures, and agricultural lands form a traditional and well-balanced cultural landscape. Unlike many regions dominated by state-owned forests or intensive agriculture, a substantial share of the land here, particularly forests and grasslands, is owned and managed by local public authorities (LPAs). Many of these communal forests are of natural origin, albeit historically managed, and retain high structural and ecological value.

Comparable conditions are found in Sinești and Hârcești, where communal forests and pastures remain relatively continuous, structurally diverse, and closely linked to local livelihoods. Together, these settlements manage a network of forest bodies, wooded pastures, and semi-natural grasslands that function as a coherent community-scale ecological system, rather than as isolated land parcels.

Ecologically, the community-managed forests belong to the Codrii forest zone, dominated by oak-based and mixed deciduous stands, with hornbeam, lime, maple, ash, and locally beech occurring in cooler and more humid microsites. Many forest patches display high naturalness, balanced age structure, and ongoing natural regeneration, while communal pastures often retain semi-natural characteristics, supporting diverse plant communities and serving as important transition habitats between forest and agricultural land.

A key strength of this landscape is its spatial configuration. The communal forests and pastures of Boghenii-Noi, Sinești, and Hârcești are located in direct proximity to the Plaiul Fagului Nature Reserve, providing:

- buffering functions around the reserve,
- stepping-stone connectivity between core forest areas, and
- opportunities for forest extension and corridor development through ANR and low-intensity restoration.

Although these areas are not formally designated as PAs at present, their functional role in maintaining ecological continuity with Plaiul Fagului is already evident.

The landscape shows very high potential for Forest Landscape Restoration (FLR), particularly through:

- assisted natural regeneration in communal forests and pastures,
- ecological reconstruction of degraded forest edges and former agricultural plots, and
- restoration of wooded pastures and shelterbelts to strengthen landscape connectivity.

Importantly, the community-managed character of the land creates favourable conditions for participatory governance, adaptive management, and alignment between biodiversity conservation objectives and local socio-economic interests.

Taken together, the Boghenii-Noi–Sinești– Hârcești community forest–pasture system, in combination with the Plaiul Fagului Nature Reserve, forms a coherent and scalable conservation landscape. With targeted restoration and coordinated management, this landscape could support:

- designation as a larger, integrated PA category (e.g. a landscape-scale PA with differentiated management zones), and/or
- future expansion or buffering of Natura 2000 sites, once habitats and species of European interest are formally identified and assessed.

From a strategic planning perspective, this landscape should be regarded as a high-quality candidate for Natura 2000 consideration, given its ecological continuity, dominance of natural and semi-natural habitats, and direct functional linkage to an existing Emerald site.

In this sense, the community-managed forests and pastures of Boghenii-Noi, Sinești, or Hârcești illustrate how locally governed landscapes can play a central role in national biodiversity conservation, EU-aligned PA development, and long-term landscape resilience.

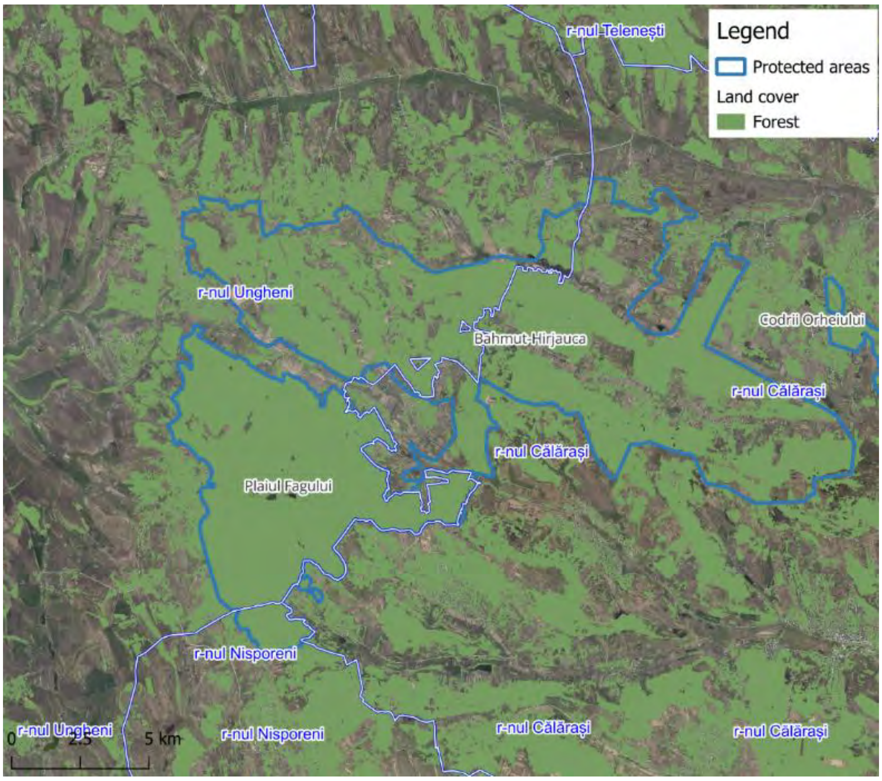


**Figure 26.** Boundaries of the "Plaiul Fagului" (both Nature Reserve and Emerald site) and the neighboring Bahmut-Hirjauca Emerald site. District names are labeled with the abbreviations "r-nul" and "mun."

### 6.4.4 Lower Dniester Wetland System

The Lower Dniester represents a former large-scale floodplain wetland system, historically composed of extensive riverine wetlands, seasonally inundated meadows, oxbows, and floodplain forests. Over recent decades, this system has been profoundly transformed through river regulation, drainage, and large-scale conversion of wetlands and wet meadows (including partially flooded forests) into agricultural land and associated infrastructure. As a result, only fragmented and highly degraded remnants of functional wetlands persist today, with much of the original floodplain hydrology and ecological connectivity lost.

The area is currently covered by three partially overlapping PA designations, reflecting different conservation logics and periods of designation:

- the Lower Dniester Ramsar Site (60,000 ha),
- the Emerald Site "Nistrul de Jos" (59,200 ha, according to the Standard Data Form, MD0000013), and
- the Lower Dniester National Park (approximately 61,884 ha).

The establishment of such large PAs is a legitimate national policy choice and reflects Moldova's recognition of the strategic ecological, hydrological, and transboundary importance of the Lower Dniester landscape. Large-area designations can be highly appropriate in river valleys and floodplains, particularly where long-term restoration, climate adaptation, and landscape-scale connectivity are envisaged.

Among the three designations, the Emerald Site "Nistrul de Jos" represents the most ecologically structured and functionally explicit framework. Its Standard Data Form (SDF) identifies 12 discrete core areas of primary conservation interest, corresponding to habitats and species of European relevance under the Bern Convention. These core areas are embedded within a wider landscape mosaic of riparian forests, wetlands, water bodies, agricultural land, and settlements, explicitly acknowledging fragmentation while maintaining a clear focus on biodiversity-relevant components.

By contrast, the Ramsar Site and the National Park designations currently show a weak correspondence between legal boundaries and functional ecosystem coverage. In the case of the Ramsar Site, nominally established to protect wetlands of international importance, actively functioning wetland habitats account for no more than approximately 4-5% of the total designated area. Most of the site consists of arable land, drained former floodplains, settlements, and infrastructure that no longer perform key wetland functions such as flood retention, groundwater recharge, or wetland biodiversity support.

Similarly, the National Park designation does not align with classical PA category principles, particularly the IUCN requirement that the assigned category reflects the dominant management objective, which should apply to the substantial majority of the PAs (commonly operationalized at around 75%; Dudley, 2008). At present, nearly 80% of the land within both the Ramsar Site and the National Park is under intensive agricultural use or agriculture-supporting infrastructure, creating a structural mismatch between designation intent and on-the-ground land use.

Importantly, this misalignment does not imply that larger PA categories are inappropriate for the Lower Dniester. On the contrary, large-scale designations are highly relevant and desirable in such landscapes, provided that a clear transition pathway exists. Alignment with classical PA objectives can be achieved if:

- ➢ significant portions of the area are progressively restored toward more natural or semi-natural floodplain ecosystems, and/or
- ➢ dominant agricultural uses transition toward organic, low-input, or biodiversity-friendly farming systems that are compatible with conservation objectives and EbA.

Under such conditions, large PAs can function as living landscapes, combining biodiversity conservation, hydrological regulation, climate resilience, and sustainable livelihoods.

Despite current limitations, the Lower Dniester landscape remains strategically important at both national and European levels. Owing to its size, transboundary position, and remaining ecological fragments, it is widely regarded as a potential long-term candidate for Natura 2000, provided that its conservation architecture is reoriented toward functional ecosystems and compatible land-use systems, rather than relying primarily on nominal boundaries.

Moving the Lower Dniester system closer to a credible and operational PA configuration requires coordinated and phased action, including:

- hydrological reconnection of the floodplain, including reactivation of former inundation zones and oxbows;

- ecosystem-based and nature-based restoration measures targeting wetlands, riparian corridors, and floodplain forests;
- adoption of a climate-resilience-oriented landscape approach, recognising water retention and flood buffering as core ecosystem services;
- targeted control of invasive species and gradual re-establishment of native floodplain vegetation; and
- refinement and differentiation of protection and management regimes, clearly distinguishing core ecological zones from areas where biodiversity-compatible agricultural use is promoted.

Without such transitions, the current designations risk remaining largely nominal or "paper" PAs, with limited effectiveness for biodiversity conservation, EbA, or future alignment with Natura 2000 requirements.

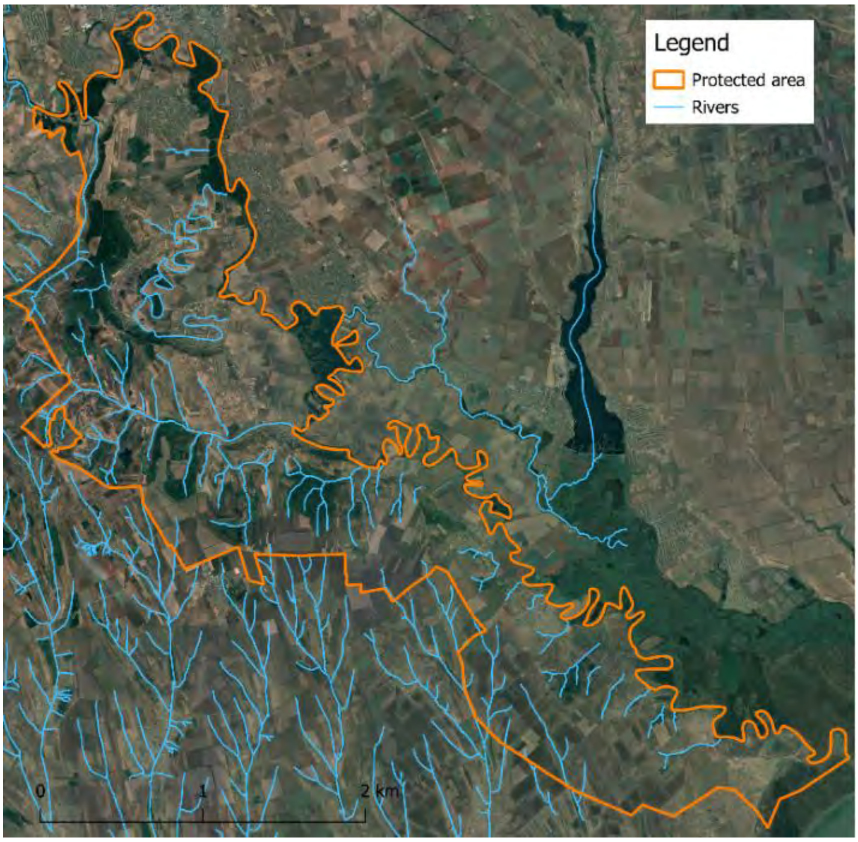


**Figure 27.** The map illustrates the discrepancy between the officially designated boundaries of the Lower Dniester Ramsar Site and the actual spatial distribution of extant wetland habitats, highlighting extensive areas where wetlands are effectively absent despite formal designation.

### 6.4.5 Lower Prut / Beleu Lake

The Lower Prut Wetland Belt represents one of the most extensive and ecologically complex wetland landscapes in the country. Extending along the lower course of the Prut River near its confluence with the Danube, this system historically comprised a continuous mosaic of shallow lakes, marshes, seasonally inundated floodplain meadows, riparian forests, and open water bodies. The core components of this belt are the Beleu Lake, Brânza Wetland, and the Manta Lakes, which together formed a functionally connected wetland complex (in fact, the remnants of the former large wetland) driven by lateral flooding, groundwater exchange, and periodic connectivity with the Prut River.

From a conservation and adaptation perspective, the Lower Prut Wetland Belt is unique in Moldova due to its scale, its role in regional hydrological regulation, and its importance for wetland biodiversity at national and international levels. The entire belt is recognised as a Key Biodiversity Area (KBA) and supports numerous bird, amphibian, reptile, and plant species of European conservation concern, including species listed under the Bern Convention and global Red Lists.

The area is covered by several overlapping conservation designations, reflecting its long-recognised ecological importance but also different designation logics and historical phases of protection:

- Lower Prut Ramsar Site, covering the entire wetland belt, including Beleu, Brânza, and Manta;
- Lower Prut Emerald Site, the same as the Ramsar Site (MD0000001)
- Lower Prut Biosphere Reserve (14,700 ha), designated in 2018, which formally encompasses the Nature Reserve Prutul de Jos (1,721 ha); and
- associated national and international biodiversity frameworks, including KBA status and Emerald Network components.

Although the Lower Prut Biosphere Reserve is a formal PA, only the Nature Reserve Prutul de Jos has an established administration and on-site management, including basic guarding functions; however, management capacity and resources remain limited. The broader Biosphere Reserve lacks a dedicated administrative authority and an operational management structure, and no integrated management plan is currently implemented, resulting in largely unmanaged conditions. In addition, hydrocarbon extraction activities continue to operate within or adjacent to the Biosphere Reserve area, despite longstanding public criticism and unresolved concerns regarding their ecological impacts.

The spatial correspondence between legal boundaries and functioning wetland ecosystems has weakened substantially. While Beleu Lake remains aquatic, the Brânza Wetland is fully desiccated, and the Manta Lakes have lost their open-water character, transitioning into terrestrial or woody successional habitats. As a result, the wetland belt now consists of a fragmented set of ecological states rather than a continuous floodplain system.

The dominant threats affecting the system are:

- biological resource use, including hunting and poaching of birds and mammals;
- agricultural and forestry pollution, leading to sedimentation and nutrient loading;
- small-holder farming and aquaculture, altering hydrology and habitat structure; and
- human disturbance, especially unregulated recreation and waste accumulation.

These pressures operate continuously and interact with climatic stress, accelerating the loss of wetland functions and favouring invasive species over native wetland vegetation.

From an EbA perspective, the Lower Prut Wetland Belt remains strategically important despite the loss of historical wetland conditions. The key challenge is no longer the full restoration of former lake systems, which may be unrealistic under current climatic trends, but rather the managed transition toward new, functionally viable ecosystems that can retain water, buffer extremes, and sustain biodiversity.

Priority EbA interventions include:

- partial hydrological reconnection with the Prut River, through cleaning, reopening, or selectively reactivating former channels and inflows, particularly where sedimentation has blocked water exchange;
- steering ecological succession toward wet or periodically flooded forests and reed–forest mosaics, rather than allowing uncontrolled dominance by invasive species;
- protection and enhancement of remaining aquatic refugia, including small brooks, channels, and residual ponds, as biodiversity hotspots and stepping stones;
- systematic control of invasive species, particularly in former lakebeds and reed-dominated transition zones; and
- strengthening management and enforcement capacity, especially to address poaching, unregulated grazing, and recreational pressure.

Such measures would not aim to recreate historical wetland states, but to stabilize the landscape into a resilient mosaic of wetlands, wet forests, grasslands, and open water patches capable of delivering hydrological regulation, climate buffering, and biodiversity support.

This area remains one of Moldova’s most important long-term candidates for a credible, functionally based large PA model, including future alignment with Natura 2000. However, achieving this requires a clear shift from nominal designation toward function-driven zoning, where core ecological areas, restoration zones, and biodiversity-compatible land uses are explicitly differentiated.

Without such reorientation, the existing Ramsar and Biosphere Reserve designations risk remaining largely symbolic. With targeted EbA interventions and adaptive management, however, the Lower Prut Wetland Belt could evolve into a flagship landscape demonstrating how degraded floodplains can be transformed into climate-resilient, biodiversity-supporting systems under increasingly dry and variable conditions.

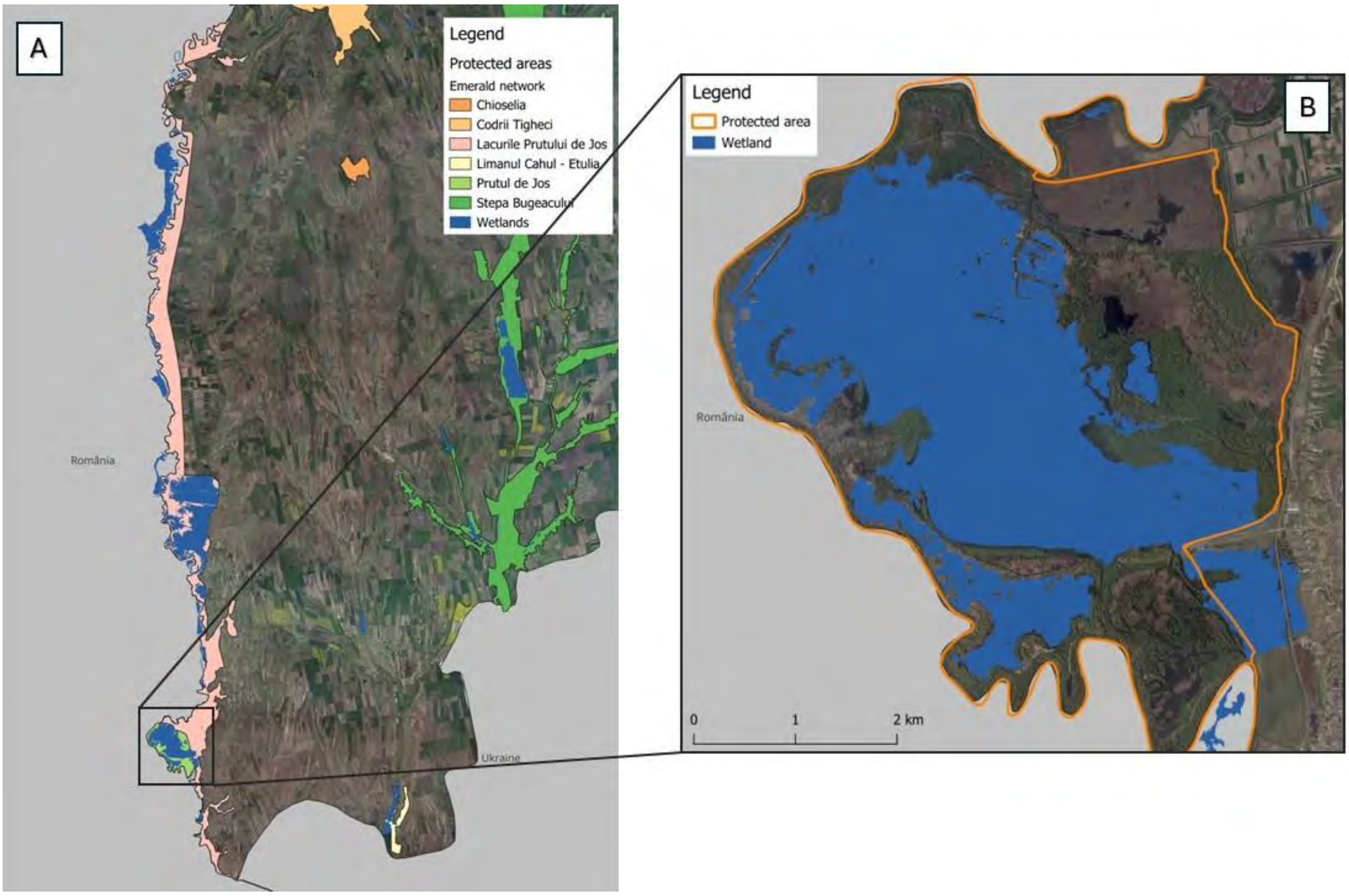


**Figure 28**. **A:** Location of the "Lower Prut" Ramsar Site (pink colour "Lacurile Prutului de Jos") and "Lake Beleu" Biosphere Reserve (light green colour "Prutul de Jos"); **B:** "Lake Beleu" Biosphere Reserves included within the "Lower Prut" Ramsar site.

### 6.4.6 Rudi–Arionești Canyon System

The Rudi-Arionești Canyon System forms part of the limestone canyon belt of the Middle Dniester and represents one of the most ecologically valuable ravine and cliff landscapes in northern Moldova. Extending along the Dniester River between Naslavcea and Soroca, this system includes a chain of steep limestone canyons, forested slopes, ravines, riparian corridors, and associated meadows that together create a continuous mosaic of terrestrial and freshwater habitats shaped by relief-driven microclimates and local hydrological gradients.

From a conservation and adaptation perspective, the system functions as a network of microrefugia, where shaded canyon floors, north-facing slopes, springs, and seepage zones buffer heat and drought stress. These conditions allow the persistence of relict forest, ravine, and chasmophytic vegetation otherwise rare in Moldova. The area is recognized as a KBA under the national site "Nistru Naslavcea - Soroca", with approximately 67% of the KBA covered by PA designations, reflecting its high regional biodiversity value.

The canyon system overlaps with several conservation zones, including:

- the Unguri–Holoșnița Ramsar Site and Emerald Site (11,180 ha, MD0000005), which formally covers large parts of the Dniester valley;
- the Emerald Network site "Stîncele Nistrene" (4,458 ha, MD0000014), encompassing major limestone cliffs and canyon forests; and
- a series of Landscape Reserves, including Rudi–Arionești, Cosăuți, and Holoșnița, which protect some of the most intact forest and ravine segments.

- the adjacent Vărancău Canyon Emerald Site (Canionul Vărancău, 731 ha, MD0000046), which forms part of the same limestone canyon system along the Dniester.

Despite this coverage, the spatial alignment between designations and functional ecosystems is uneven. While core canyon forests such as Rudi–Arionești and Cosăuți retain high ecological integrity, large parts of the Ramsar and Emerald sites include intensively used agricultural land with limited natural habitat value. As a result, the system currently functions as a set of high-quality ecological fragments embedded within a broader, highly modified matrix.

Ecologically, the canyon interiors support mature oak–hornbeam forests, ravine and slope forests with high deadwood availability, bryophyte-rich limestone outcrops, and relict fern communities (e.g. *Asplenium scolopendrium*, *A. trichomanes*). These habitats are particularly sensitive to hydrological disturbance and invasive species but remain structurally complex and resilient where canopy cover and humidity are maintained. Surrounding meadows, silvo-pastoral areas, and abandoned lands, although often degraded, play an important role as potential buffer zones and connectivity elements between canyon cores.

The dominant pressures affecting the system include:

- expansion of invasive tree species (*Robinia pseudoacacia*, *Ailanthus altissima*, *Acer negundo*);
- hydrological alteration of small tributaries and ravine streams;
- active erosion and slope instability in ravines and on adjacent plateaus;
- habitat isolation driven by intensive agriculture on plateau areas;
- overgrazing and unmanaged silvo-pastoral use;
- forest edge degradation and selective cutting in communal and poorly supervised forest parcels;
- waste dumping and litter accumulation in ravines and forest margins.

These pressures are particularly critical in ravine systems, where even minor changes can destabilize microclimatic refugia and lead to rapid biodiversity loss.

From an EbA perspective, the Rudi–Arionești Canyon System offers strong opportunities for corridor-based restoration and stabilisation, rather than large-scale habitat reconstruction. Priority EbA entry points include:

- protection and restoration of ravine hydrology, including springs, seepage zones, and small streams;
- targeted control of invasive species within canyon forests and along forest edges;
- reinforcement of forest–meadow–silvo-pastoral mosaics on adjacent slopes and plateaus to reduce erosion and improve connectivity;
- ANR on degraded lands to create ecological corridors between existing forest cores; and
- stabilisation of canyon slopes and ravine bottoms to maintain microrefugia under increasing climatic variability.

Taken as a whole, the Stîncele Nistrene-Unguri-Holoșnița canyon belt should be regarded as a single functional landscape system, rather than a collection of isolated reserves. With coordinated management and targeted EbA interventions, it has high potential to serve as a resilient north–south ecological corridor along the Dniester.

In strategic terms, the system represents a strong candidate for strengthening protection regimes within existing designations, refinement of zoning, and future alignment with Natura 2000.

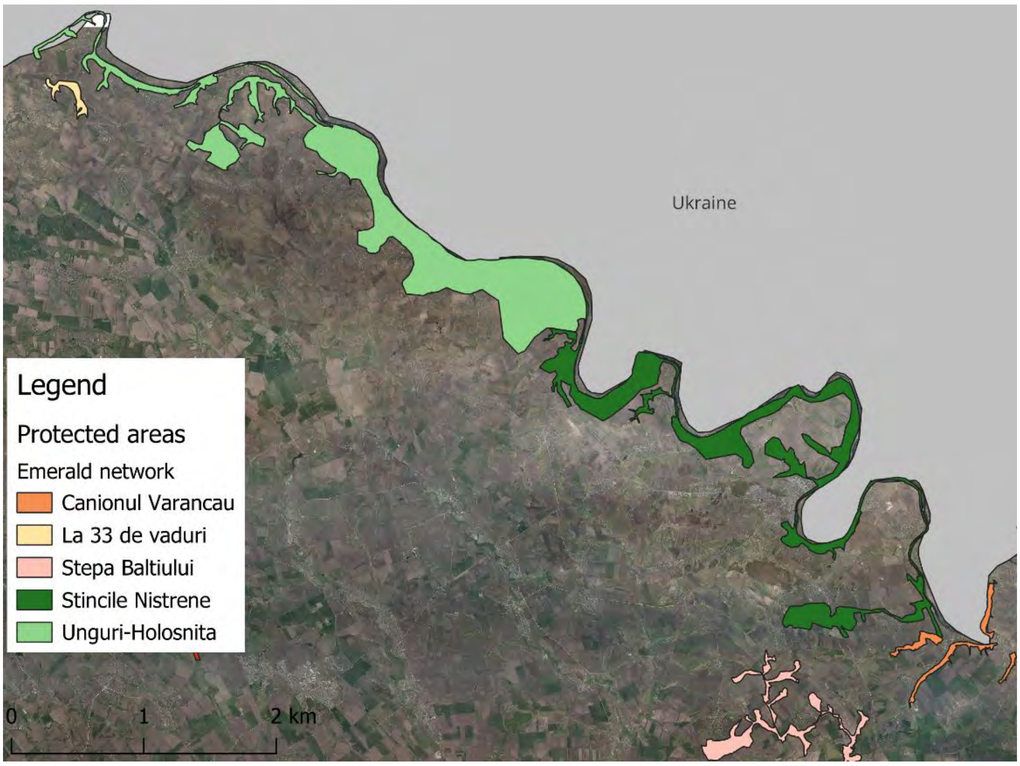


**Figure 29**. Unguri–Holoșnița Ramsar Site (light green) and the adjacent Stîncele Nistrene (dark green) and Canionul Vărancău (orange) location.

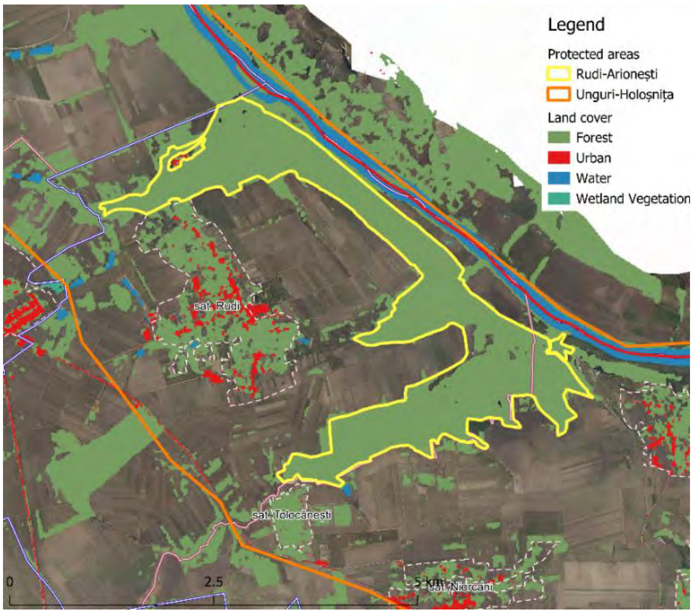


**Figure 30.** Rudi-Arionești, part of the Unguri–Holoșnița Ramsar Site.

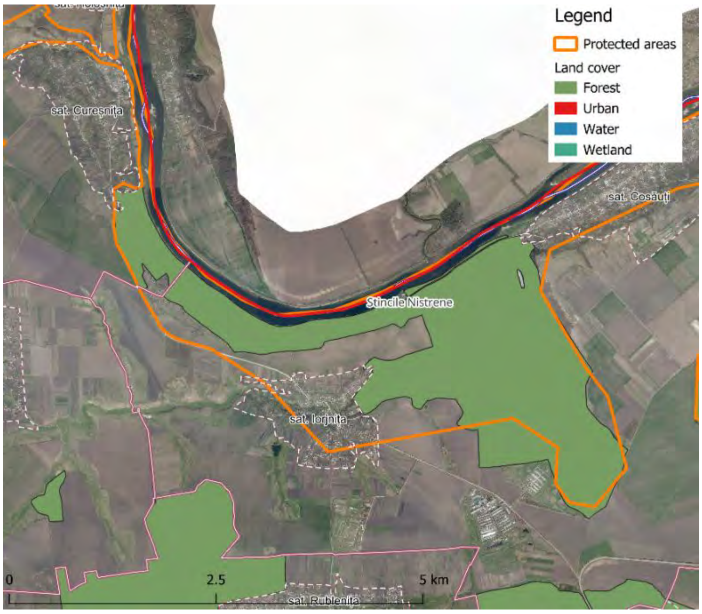


**Figure 31.** Cosăuți Landscape Reserve as an internal forest body within the Emerald site. Thermophilous forest–steppe mosaics.

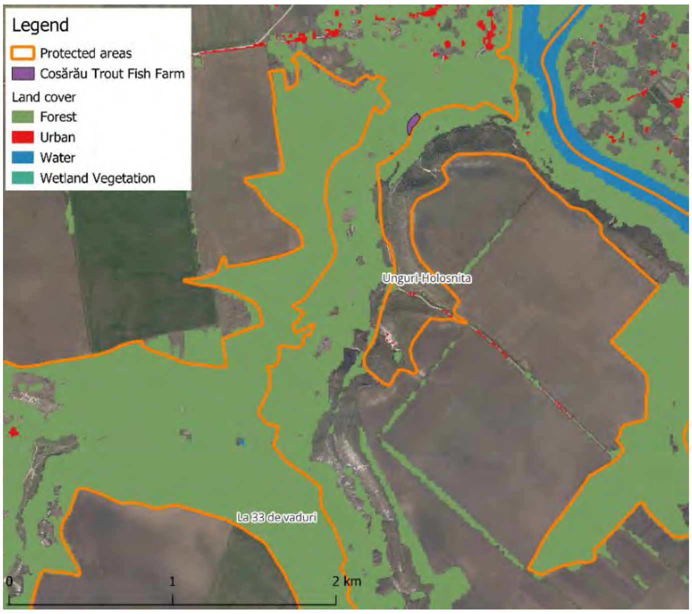


**Figure 32**. The area lies between the Unguri–Holoșnița site boundary and the "La 33 de Vaduri" Landscape Reserve. Naslavcea Ravines – micro-wetland recovery and erosion control.

The field selected EbA opportunity areas are also listed in Annex 3 describing short technical profiles priority entry points, and options for strengthening PA and OECM coverage with the reference to Travel Memos documentation, fully describing the ecological state and value of each visited site and submitted together with this report.

## 6.5 EbA opportunity typology

This chapter classifies EbA opportunities identified through national GIS screening and field verification into a limited number of intervention-relevant types, based on dominant ecosystem degradation patterns and their implications for climate risk reduction. In this report, an EbA opportunity is defined as a spatially identifiable area where ecosystem condition and function can be restored or enhanced to address a specific climate-related risk.

The typology is derived from observed and mapped ecosystem conditions across Moldova, including hydrological disconnection and drainage, invasive species pressure, forest–steppe fragmentation, and the presence of high-value microrefugia in canyon, ravine, and riparian systems. Each opportunity type corresponds to a distinct EbA intervention logic (e.g. hydrological reconnection, structural vegetation restoration, connectivity enhancement) rather that to a generic habitat category.

Indicative adaptation benefits associated with each opportunity type are estimated using established international coefficients and benchmarks (e.g. IPCC, FAO, Ramsar Convention), complemented by national data and cost–effectiveness benchmarks from Moldovan forest restoration and afforestation initiatives/projects.

**EbA Opportunity Typology**

**Forest Regeneration & Assisted Natural Regeneration (ANR)**

Well-developed natural regeneration in many regions (Codrii, Dobrușa, Nisporeni, Tighina) allows low-cost restoration through release thinning, enrichment, and edge repair.

**Indicative benefits:**
- 2.5–6.0 $tCO_2$/ha/year (conservative for Moldova)
- 40–70% soil-erosion reduction in degraded edges

**Field evidence:** Dobrușa young ash-hornbeam carpets; Codrii spontaneous succession; Tighina ANR potential.

**Riparian, Ravine & Canyon Stabilisation**

Riparian belts, ravines and canyon forests are high-value microrefugia (Cosăuți, Rudi–Arionești, Naslavcea, Unguri-Holoșnița). They regulate temperature, retain humidity, protect springs and reduce erosion on steep topography.

**Indicative benefits:**
- 30–85% sediment load reduction
- runoff reduction up to 30%
- stabilization of humidity in microrefugia

**Field evidence:** canyon ferns/bryophytes; hydrological disturbance risks; invasive expansion on slopes.

**Hydrological Reconnection & Wetland Re-establishment**

Many wetlands and floodplain lakes have lost hydrological function (Beleu, Brânza, Manta, Lower Dniester). EbA requires reopening inflow/outflow channels, reconnecting oxbows, and restoring groundwater/spring flow.

**Indicative benefits:**
- 500–5,000 $m^3$/ha water retention (typical floodplain pockets)
- 10–30% local peak-flow reduction

**Field evidence:** Beleu near collapse; Brânza fully dry; Lower Dniester wetlands largely lost; Naslavcea hydrological alteration by fish farm.

**Grassland & Steppe Rehabilitation**

Applicable in northern/southern plateaus, steppe remnants, and degraded pastures (Stepa Bălțiului, Pohrebeni, Codrii pasture belts).

**Indicative benefits:**
- 1.2–2.0 $tCO_2$/ha/year
- 20–60% reduction in soil loss via contour strips/shelterbelts

**Field evidence:** Ambrosia/Xanthium-dominated abandoned lands; eroded slopes; steppe–forest transition zones.

**Invasive Species Containment & Ecotone Recovery**

All regions show severe invasion fronts (namely by *Acer negundo*, *Ailanthus altissima*, and others). EbA depends on early-stage removal and re-establishment of native ecotones.

**Field evidence:** Lower Prut (*Ambrosia, Xanthium*); Lower Dniester (*Acer negundo* dominant); North canyons (*Acer negindo* is locally ravaging); Central communal lands (namely *Elaeagnus angustifolia*).

**Connectivity Enhancement Across Forest–Agricultural Mosaics**

Large fragmentation gaps exist around Codrii, Nisporeni, Boghenii Noi, Dobrușa. ANR belts, hedgerows, and stepping-stone copses can secure dispersal and microclimate regulation.

**Field evidence:** Lozova fragmented margins; Nisporeni spontaneous forests; Dobrușa isolated blocks.

**Functional PA Boundary Adjustment for EbA Planning**

Several EbA priority areas (e.g. Lower Dniester, Unguri–Holoșnița) show a mismatch between PAs and habitat integrity. This is treated as a specific EbA entry point.

**Field evidence:** >50% cropland in Lower Dniester Ramsar; orchards inside Unguri–Holoșnița; degraded areas inside Emerald polygons.

## 6.6 Investment Briefs for Priority Sites (estimates)

Analysis of the priority sites reveals several recurring EbA investment clusters with high potential returns:

**River corridors and floodplains (Prut, Dniester):**

Sites such as the Prut River Corridor, Lower Dniester floodplain segments, and Beleu Lake complex offer some of the highest EbA returns through hydrological reconnection, riparian forest rehabilitation, and wetland restoration. These interventions improve flood buffering, drought resilience, water quality, and biodiversity connectivity, while directly reducing climate risks for riparian communities. Given the linear structure of river systems, these models are highly replicable along tributaries and downstream sections.

**Forest plateaus and headwater landscapes (Codrii, Dobrușa, Rădoaia–Șoldănești):**

Forest-dominated opportunity areas prioritize assisted natural regeneration (ANR), edge restoration, and reconnection of fragmented forest patches. Investments in these landscapes strengthen slope stability, hydrological regulation, and long-term carbon storage, while supporting low-cost, climate-resilient forest recovery. These models are well suited for scaling through communal and state forest systems.

**Forest–steppe transitions and erosion-prone slopes (Stepa Bălțiului, Pohrebeni, Dniester terraces):**

EbA investments in transition zones focus on shelterbelts, contour vegetation, pasture restoration, and ravine stabilization. These measures address acute erosion risks, heat stress, and land degradation, delivering tangible benefits for agriculture and rural livelihoods. Replication potential is high across northern and southern Moldova and comparable steppe–forest mosaics in the Black Sea region.

**Canyon and ravine microrefugia (Unguri–Holoșnița, Rudi–Arionești, Cosăuți–Soroca):**

These sites protect climatically stable microhabitats with high biodiversity value. Targeted EbA investments, such as invasive control, spring protection, and slope stabilization, yield long-term adaptation benefits disproportionate to their spatial extent. These interventions are particularly relevant for replication in other canyon systems along the Dniester and Prut.

A key strength of the identified EbA opportunity areas is their high transferability. Most intervention types correspond to landscape patterns that recur throughout Moldova and extend into Romania and Ukraine, particularly along shared river basins and steppe–forest transition zones.

The investment briefs presented in Annexes 2 and 3 are intended as a pre-feasibility layer. They provide sufficient detail to guide final selection through national prioritisation, and follow-up project design, while leaving room for site-specific feasibility studies, stakeholder consultation, and detailed costing during implementation phases.

# 7 Future conservation architecture for Moldova

This chapter outlines Moldova's forward-looking conservation architecture, identifying priority landscapes for upgrading, expansion, and conceptual designation. It synthesizes ecological diagnostics, EbA principles, and international best practice, including comparative insights from PA governance model elsewhere (Lozan 2024) in order to propose a strategic pathway toward a coherent, climate-resilient Natura 2000-aligned system.

Strategically, it focuses on where Moldova should go next in terms of new conservation directions and new PA categories, based on existing potential and development scenarios.

## 7.1 Candidate areas for upgrading or expansion

These areas already hold significant ecological value and can meaningfully contribute to Moldova's EbA and Natura 2000 objectives with targeted strengthening. They fall into four functional groups.

### 7.1.1 Emerald sites with high Natura 2000 readiness

These Emerald Network sites exhibit strong ecological representativity, suitable habitat condition, and favourable spatial structure. They are the most logical early additions to a Natura 2000 system. Below are some examples that worth further exploration:

- Rădoaia–Șoldănești – forest–steppe mosaics and xeric grasslands
- Unguri–Holoșnița – canyon systems and riparian complexes
- Rezina Nistru Terraces – limestone terraces, dry grasslands, microrefugia
- Nistrul de Jos (ESNJ) – advanced management planning and hydrological relevance

These landscapes provide essential EbA functions: microclimate regulation, erosion mitigation, steppe/forest connectivity, and refugia for climate-sensitive species.

### 7.1.2 Existing PAs requiring strengthening and boundary adjustments

Several PAs contain high-value ecological nuclei but exclude adjacent forest, wetland, or steppe elements that are functionally inseparable from the core area:

- Dobrușa Plateau – forest–dry grassland transitions
- Codrii Tigheci – structurally intact forest–steppe ecotone
- Lower Prut / Beleu – wetland reconnection potential
- Codrii region (Nature Reserves Codrii & Plaiul Fagului) – large, compact forest blocks with high EbA value

These adjustments would improve ecological processes, strengthen resilience to drought and erosion, and align Moldova with European practice, where PA boundaries reflect both ecological and administrative considerations.

### 7.1.3 Landscape-scale ecological corridors

Corridors are indispensable in a country where around 75% of land is used for agriculture. They maintain species movement, hydrological regulation, and climate buffering:

- Prut River Corridor – riparian forests, wetlands, floodplains
- Dniester River Corridor – canyon systems, terraces, oxbows
- Răut river (Dniester tributary) – still alive river with wetland remnants and canyon-shaped landscapes
- Central Codrii–Codrii Tigheciului – key for forest connectivity

For example, corridor strengthening is also consistent with the Germany's legally anchored biotope network approach (ecological connectivity) and with EU requirements to improve Natura 2000 ecological coherence, including through connectivity measures beyond designated sites (Lozan, 2024).

### 7.1.4 Other potential sites with strong EbA relevance

There are landscapes that have not classical potential to become PAs, but hold long-term conservation value through traditional and sustainable uses:

- Community-owned forests – e.g. Boghenii-Noi commune (a collection of 5 small villages that traditionally own the largest and well-preserved-and-managed communal forests in the country) in Ungheni district.
- Riparian strips and small floodplains – e.g., narrow river margins, secondary floodplains, oxbows, and periodically inundated meadows along the Prut, Dniester, and their tributaries.
- Extensive steppe-grazing landscapes – semi-natural pastures and steppe remnants maintained through low-intensity grazing, particularly in forest–steppe transition zones and southern Moldova.
- Cultural landscapes with proven ecological functions – landscapes shaped by long-term human use, such as orchard–forest mosaics, traditional hay meadows, vineyard margins, shelterbelt networks, and ravine systems.

Such geographically defined areas, outside the current PA network, but governed and managed in ways that deliver positive and sustained long-term outcomes for in situ conservation, correspond to the concept of Other Effective Area-Based Conservation Measures (OECMs). Recognizing and strengthening these areas would allow Moldova to expand its effective conservation footprint without creating major land-use restrictions, while delivering ecosystem services and climate-adaptation benefits. This approach is consistent with CBD guidance on OECMs and aligns with EU expectations regarding landscape connectivity, Natura 2000 coherence, and EbA.

## 7.2 Conceptual authors-proposed sites

These proposals are visionary but realistic, grounded in ecological evidence and international trends. They reflect lessons from some of EU countries as best examples: large, zoned, multifunctional landscapes capable of delivering EbA, biodiversity conservation, and socio-economic benefits.

In key nature reserves such as Codrii and Plaiul Fagului, excessive deer densities amplified by the presence of Sika deer and hybrids have emerged as a critical constraint to forest regeneration. Without active population management and restoration of natural regeneration dynamics, the long-term capacity of these forests to serve as climatic refugia and demonstration sites (or larger PSA categories) for EbA may be compromised.

### 7.2.1 Codrii Biosphere Reserve (or National Park)

The establishment of the Codrii Biosphere Reserve (CBR) would represent a strategic step in the modernization of Moldova's PA system and could become the country's second (or next) UNESCO Biosphere Reserve. The proposal would be anchored in the existing Codrii Scientific Nature Reserve (5,172 ha), which already functions as a strict conservation core area and forms the nucleus of the Emerald Site "Codru" (6,498 ha).

Codrii hosts one of the largest and most ecologically intact forest complexes in Moldova, characterized by high structural diversity, long ecological continuity, and a significant concentration of forest biodiversity. Owing to its fragmented relief, diverse microclimates, and mature forest stands, the area demonstrates a clear potential to function as a climatic refugium, of both national and regional relevance.

The transition to a three-zone biosphere reserve model (core – buffer – transition zones) would enable:

- strict protection of key biodiversity values in the core area;
- adaptive management, research, and monitoring in the buffer zone;
- sustainable land-use practices, community engagement, and environmental education in the transition zone.

The proposal is strongly aligned with UNESCO Man and the Biosphere (MAB) Programme guidelines and offers an ideal framework for piloting EbA and NbS in temperate broadleaf forest landscapes. In this sense, Codrii could become Moldova's flagship landscape for an adaptation-oriented PA reform, combining conservation, resilience, and sustainable development.

### 7.2.2 Plaiul Fagului Biosphere Reserve (or National Park)

The Plaiul Fagului Nature Reserve (approximately 5,640 ha) is one of the most outstanding PAs in the country and represents a distinct and complementary candidate for designation as a UNESCO Biosphere Reserve. The reserve largely overlaps with the Emerald Network site Plaiul Fagului, designated under the Bern Convention, which follows the same ecological boundaries and slightly extends beyond the strictly PA cores. Together, they form a compact and ecologically coherent forest landscape of high national and European relevance.

Plaiul Fagului hosts the easternmost natural stands of European beech (*Fagus sylvatica*), situated at the edge of the species' natural distribution range. This marginal biogeographical position gives the site exceptional relevance for understanding genetic diversity, ecological plasticity, and adaptive responses to climate stress, particularly under conditions of increasing temperature and water limitation.

The landscape is characterized by pronounced geomorphological and habitat diversity, including deeply incised ravines, rolling hills, semi-natural meadows, and structurally complex mixed beech-oak forests. This heterogeneity generates strong ecological gradients and microclimatic variation, making the area especially well suited for long-term ecological monitoring, applied research, and the testing of adaptive and close-to-nature forest management approaches.

Plaiul Fagului also offers substantial educational and demonstration potential, with opportunities for field-based training, capacity building, and the establishment of climate-resilience demonstration sites. These can support applied research on drought tolerance, forest dynamics, assisted natural regeneration, and other EbA measures relevant to temperate broadleaf forests at their climatic limits.

In the context of accelerating climate change, the area holds high strategic value for the conservation of forest genetic resources, particularly for marginal and climate-sensitive beech populations and associated forest communities. Recognition of Plaiul Fagului as a Biosphere Reserve, structured around a core–buffer–transition zoning model, would strengthen Moldova's participation in international research and conservation networks and support the country's transition toward a more adaptive, science-based, and EU-compatible PA system.

### 7.2.3 Dniester Terraces Nature Park

The Dniester Terraces represent a highly distinctive landscape unit, characterized by steep canyon formations, xeric and petrophytic grasslands, and calcareous to alkaline river terraces. This geomorphological complexity underpins an exceptional level of biogeographical diversity, combining steppe, forest-steppe, and riparian elements within a relatively compact spatial gradient.

The area is of particular importance for EbA, as its semi-natural habitats play a critical role in erosion control, slope stabilization, and the regulation of surface runoff and groundwater recharge along the Dniester valley. Maintaining vegetation cover on terraces and slopes is essential for reducing sediment loads, buffering extreme rainfall events, and enhancing hydrological stability downstream.

Designation as a Nature Park would allow for an integrated landscape-scale management approach, combining habitat conservation with sustainable land-use practices, ecological restoration of degraded slopes, and controlled recreational and educational use. The Dniester Terraces could thus function as a demonstration area for climate-resilient land management in dry and erosion-prone riverine landscapes

### 7.2.4 Prut River Natural Park / Landscape Park

The Prut River corridor encompasses a diverse mosaic of wetlands, riparian forests, floodplains, oxbow lakes, and seasonally inundated grasslands, forming one of the most important ecological systems in western Moldova. These habitats provide essential ecosystem services, including flood buffering, water purification, groundwater recharge, and biodiversity support, while also sustaining traditional land uses.

The area has strong transboundary significance, offering clear opportunities for joint conservation and management with Romania, including alignment with Natura 2000 sites, Ramsar wetlands, and EU Water Framework Directive objectives. A coordinated Prut River Natural or Landscape Park would strengthen ecological connectivity along the river and contribute to regional climate resilience.

Importantly, the Prut valley offers a unique opportunity for large-scale wetland restoration, particularly in former floodplain areas affected by drainage, river regulation, and agricultural intensification. Restoring natural hydrological dynamics would generate substantial benefits for biodiversity, climate adaptation, and local livelihoods, positioning the Prut corridor as a flagship example of nature-based flood and drought risk management.

### 7.2.5 Steppe Microrefugia Network

The Steppe Microrefugia Network would focus on safeguarding the last remaining fragments of true steppe ecosystems in Moldova, many of which persist as small, isolated patches embedded within intensively used agricultural landscapes. Despite their limited size, these sites harbor a high concentration of rare, endemic, and edge-of-range species, making them disproportionately important for national and regional biodiversity conservation.

These steppe remnants function as microrefugia and represent areas where local microclimatic, edaphic, or topographic conditions allow species to survive under increasingly adverse climatic conditions. As such, they are critical for future climate adaptation, species persistence, and potential range shifts.

Rather than creating large new PAs, this approach emphasizes a network-based conservation model, integrating small sites through targeted protection, appropriate grazing or mowing regimes, invasive species control, and ecological connectivity measures. The Steppe Microrefugia Network would represent a flexible, cost-effective conservation instrument, fully aligned with EbA principles, OECM concepts, and Moldova's long-term climate adaptation and biodiversity strategies

## 7.3 Pathways for integrating conservation areas

This section outlines how the proposed candidate and conceptual conservation areas can be integrated into a coherent, modern conservation system, aligned with Moldova's EU accession process and its gradual transition from the Emerald Network toward Natura 2000. Rather than expanding PA in isolation, the approach emphasizes functional connectivity, EbA and strategic complementarity across landscapes and governance levels.

### 7.3.1 Integration into the National Ecological Network (NEN)

The proposed candidate and conceptual conservation areas collectively contribute to strengthening Moldova's NEN by addressing key gaps in ecological representativity, landscape connectivity, and functional resilience.

The NEN itself represents one of the most forward-looking conservation planning instruments developed in Moldova. It was conceived through close cooperation between civil society (NGOs), national authorities, and local public authorities, serving as a good practice example of participatory and science-based landscape planning. The network was subsequently formalized through Law No. 94/2007 on the Ecological Network, providing a legal framework for identifying and safeguarding ecologically significant areas connected through corridors.

Within this framework, candidate and conceptual conservation sites can function as new or reinforced core areas of the network, while major river corridors, particularly the Prut and Dniester hydrographic basins, form its ecological backbone, ensuring longitudinal and lateral connectivity across regions. Smaller steppe sites, ravines, limestone outcrops, and microrefugia complement this structure by addressing long-standing representativity gaps, especially for dry grasslands, steppe species, and other climate-sensitive habitats.

Although the NEN has not yet been fully operationalized in spatial planning or management practice, its conceptual design has played an important role in shaping conservation thinking, promoting corridor-based approaches, and opening space for innovative conservation and restoration initiatives, including EbA-oriented interventions. In this sense, the NEN continues to serve as a strategic reference framework, capable of accommodating new PAs, OECMs, restoration zones, and future Natura 2000 sites.

This network-based approach mirrors well-established practices in Germany and other EU Member States, where large PAs are embedded within coherent national ecological networks, supported by green infrastructure, buffer zones, and multifunctional landscapes rather than isolated conservation "islands". Strengthening and progressively operationalizing the NEN would therefore represent a natural step toward EU-aligned landscape governance and climate-resilient spatial planning in Moldova.

### 7.3.2 Synergies with national programs

Effective integration of conservation areas is reinforced through synergies with existing national programs and sectoral policies, ensuring coherence between biodiversity objectives, land-use planning, and climate adaptation.

Key synergies include:

- The National Forest Extension and Rehabilitation Programme (NFERP), which can support afforestation, ANR and close-to-nature forestry in buffer and transition zones;
- The Land Degradation Neutrality (LDN) initiative, which aligns with steppe conservation, soil protection, and erosion control in dryland landscapes;
- Agricultural landscape reforms, enabling the recognition and support of OECMs such as traditionally managed grasslands, shelterbelts, and riparian buffers;
- The National Adaptation Plan (NAP) & Moldova's National Climate Change Adaptation Programme until 2030[9], providing the policy framework to link EbA approaches with land-use planning, water management, and rural development.

Together, these instruments create a policy-coherent enabling environment for integrating conservation and sustainable land management.

#### 7.3.3 Alignment with Natura 2000 transition process

The proposed areas also provide a clear and phased pathway toward future Natura 2000 designation, supporting Moldova's obligations under EU accession.

Well-documented candidate sites could be advanced as early Natura 2000 proposals, while larger conceptual areas would anchor long-term restoration and connectivity zones, preparing the ground for future designation once institutional and technical conditions are met. Proposed Biosphere Reserves are particularly relevant in this context, as they respond to EU expectations regarding the conservation of large, ecologically coherent forest landscapes and the integration of conservation with sustainable development.

Overall, this approach strengthens Moldova's future compliance with the EU Birds and Habitats Directives, not only through site designation, but through functional habitat management and ecological coherence.

#### 7.3.4 Transboundary and regional Integration

Finally, the integration framework explicitly supports transboundary and regional cooperation, particularly along the Prut and Dniester river corridors. These landscapes offer strong potential for development as joint EbA corridors, shared with neighboring countries, especially Romania and Ukraine.

Cooperation could include harmonized monitoring systems, coordinated ecological flow management, joint restoration initiatives, and shared climate-risk assessments. At a broader scale, this transboundary perspective contributes to Black Sea regional adaptation strategies, reinforcing Moldova's role as an active partner in regional biodiversity conservation, climate resilience, and EU-aligned environmental governance

# 8 Donor landscape and regional coordination

As a general commentary, Moldova does not lack donor engagement on EbA-relevant themes. The central challenge (and opportunity) lies in connecting existing initiatives into a more coherent, cross-sectoral, and landscape-scale adaptation pathway.

This chapter provides an overview of the current donor landscape relevant to EbA in Moldova, highlights complementarities among ongoing and planned initiatives, and identifies opportunities to strengthen cross-sectoral and regional coordination. Rather than assessing individual projects, the focus is on how existing and emerging donor-supported programmes collectively shape Moldova's capacity to scale EbA across landscapes and sectors.

## 8.1 Current donor activities relevant to EbA

[9] Moldova's National Climate Change Adaptation Programme until 2030 represents the primary national instrument for operationalizing the country's National Adaptation Plan (NAP) under the UNFCCC. While the NAP provides the overarching strategic framework and long-term adaptation priorities, the Programme translates these commitments into sector-specific measures, institutional responsibilities, and implementation pathways at national level.

Moldova hosts an active and diverse portfolio of international donor-supported activities addressing climate adaptation, biodiversity conservation, and sustainable land and water management. Among development partners, several actors play a particularly important and consistent role in supporting EbA-relevant agendas at national and landscape levels.

The European Union is the most influential and structurally embedded donor in the country (including with regard to EbA). Through a range of thematic funding platforms and policy-support instruments, such as EU4Climate and EU4Environment and broader Green Transition as EU approximation support frameworks, the EU has systematically promoted climate resilience, biodiversity conservation, ecological connectivity, and alignment with Natura 2000 and EU environmental acquis. EU support combines policy reform, capacity building, and field-level implementation, providing a strong enabling environment for EbA across sectors.

The World Bank, often in partnership with the Global Environment Facility (GEF), represents another key pillar of EbA-relevant support. The Bank acts both as a strategic investor and reform partner, financing interventions across forestry, biodiversity, agriculture, water management, and rural development. Its engagement is particularly relevant for scaling EbA from pilot initiatives to landscape- and basin-scale investments, while linking ecosystem restoration with institutional reform and long-term financing mechanisms.

The United Nations system also plays a significant role, with several agencies supporting EbA-related objectives. FAO contributes strongly to land degradation neutrality, sustainable agriculture, agroforestry, and shelterbelt restoration; UNDP supports climate adaptation planning, biodiversity mainstreaming, and local governance; and other UN entities contribute to policy development, capacity building, and community-level resilience. Together, the UN family provides important technical depth and continuity in EbA-relevant domains.

In addition, Moldova benefits from a strong presence of other (including EU Member State) countries for development cooperation, often implemented through bilateral programmes and embassy-supported initiatives. Countries such as Germany, Sweden, the United Kingdom, Japan, Czech Republic, Slovakia, and others actively support climate adaptation, biodiversity conservation, civil society engagement, and applied research. These programmes play a particularly important role in supporting NGOs, local communities, pilot EbA actions, and innovation, often complementing larger multilateral investments.

A consolidated overview of EbA-relevant donor-supported programmes and initiatives – covering recent (last 5–7 years), ongoing, and near-ready or pipeline activities – is provided in Annex 6A. This annex illustrates the breadth of donor engagement and highlights the cumulative potential for EbA scaling through improved coordination and strategic alignment.

Collectively, the current donor landscape provides a strong foundation for advancing EbA in Moldova. The principal opportunity lies not in expanding the number of initiatives, but in strengthening coherence, cross-sector integration, and landscape-scale coordination among existing and forthcoming donor-supported efforts.

## 8.2 Planned and pipeline activities

In addition to ongoing projects, several planned and pipeline initiatives are expected to further strengthen Moldova's adaptation and nature-restoration agenda. These include new programming under GEF-8, EU enlargement and approximation instruments, and bilateral climate and biodiversity funds.

Future programming cycles offer important opportunities to:

- embed EbA more explicitly within adaptation, agriculture, forestry, and water-sector investments;
- move from pilot interventions toward landscape- and basin-scale implementation;
- strengthen the integration of restoration, climate resilience, and EU accession objectives.

Early coordination between donors and national institutions will be critical to ensure that upcoming investments build on existing evidence, avoid duplication, and reinforce cumulative EbA impacts.

## 8.3 Complementarity and cross-sector linkages

Despite the strong donor presence, cross-sectoral coordination remains limited, particularly between forestry, agriculture, and water-management initiatives. Projects often operate with different timelines, planning logics, and monitoring systems, which can reduce efficiency and occasionally result in overlapping assessments or fragmented interventions within the same landscapes.

Greater harmonization of:

- land-use planning approaches,
- forest, riparian, and shelterbelt restoration methodologies, and
- hydrological restoration concepts

would significantly enhance EbA outcomes and improve cost-effectiveness. Strengthening linkages across sectors would also support more coherent implementation at catchment and landscape scale—where EbA benefits are greatest.

### 8.4 Regional coordination and transboundary synergies

Moldova's EbA priorities are closely aligned with Black Sea regional adaptation efforts, particularly in Ukraine, Romania, Georgia, Bulgaria, and Türkiye. The Prut and Dniester river corridors provide natural platforms for transboundary cooperation focused on hydrological resilience, flood and drought buffering, ecological connectivity, and invasive species management.

Participation in regional platforms, joint assessments, and technical exchanges – especially on river restoration, drought refugia, and community-based wetland recovery – can further strengthen Moldova's role as a bridge country. In this position, Moldova links Central and Eastern European EbA experience with broader Black Sea basin initiatives, contributing to shared learning and coordinated adaptation responses.

### 8.5 Gaps and opportunities for donor coordination

While donor engagement in Moldova is substantial, current support for climate resilience, forestry, agriculture, and water management remains partly fragmented, with multiple programmes operating in parallel and limited alignment of objectives, timelines, and geographic focus.

This situation presents clear opportunities rather than structural constraints. Improved coordination could:

- reduce overlaps in technical studies and field assessments;
- harmonize methodologies and monitoring frameworks;
- support integrated EbA programming across sectors and landscapes.

A national coordination mechanism or digital information platform could play a catalytic role by:

- pooling information on ongoing and planned initiatives;
- supporting shared analytical baselines and EbA indicators;
- facilitating joint planning among ministries, agencies, donors, and local authorities.

Such a mechanism would significantly improve alignment between donor portfolios and Moldova's national adaptation, restoration, and EU-approximation priorities, while enhancing the long-term impact and sustainability of EbA investments.

## 9 Conclusions and future vision: towards a climate-resilient landscape country

This final chapter synthesizes the findings of the EbA scoping assessment and translates them into strategic conclusions, priority directions, and a forward-looking vision. It does not introduce new data, but distils the core messages emerging across ecological diagnostics, policy analysis, site prioritisation, and donor coordination, with a focus on what matters most for scaling EbA in Moldova over the next decade.

Forests represent a central but under-recognized pillar of Moldova's EbA capacity. National-level assessment of HCVF (Eu4Environment, 2023) indicates that nearly half of Moldova's forest ecosystems deliver critical ecosystem services directly linked to climate adaptation, particularly water regulation, erosion control, and agricultural buffering. This confirms that effective EbA scaling in Moldova is inseparable from forestry policy reform, hydrological restoration, and the functional management of forest–agriculture interfaces.

## 9.1 Key conclusions from the EbA scoping assessment

This section synthesizes the main conclusions emerging from the EbA scoping assessment. The conclusions reflect both

a) sectoral and land-use dimensions relevant to natural resource management and economic development, and
b) a macro-ecosystemic (landscape-scale) perspective, which is essential for addressing climate risks in an integrated and effective manner.

Taken together, all the below conclusions point to a clear message that Moldova's EbA challenge is not a lack of solutions, but a need to connect existing knowledge, practices, institutions, and people into a coherent, landscape-scale adaptation pathway.

Comparative experience from EU countries confirms that the effectiveness of conservation systems depends less on the number or rigidity of PA categories and more on their functional coherence, connectivity, and integration within broader landscapes, a principle directly applicable to scaling EbA in Moldova.

### Moldova's vulnerability is systemic, not sector-specific

Climate vulnerability in Moldova does not manifest as an isolated "environmental problem", but rather as a systemic challenge affecting all sectors simultaneously. The most significant climate risks (such as hydrological instability, land degradation, declining soil moisture, erosion, and loss of ecological buffering capacity) cut across agriculture, forestry, water management, infrastructure, rural development, and public health.

Issues such as climate change and waste management illustrate this clearly: although commonly treated as environmental problems, they originate from and affect all sectors of the economy and society. Addressing them through fragmented sectoral responses inevitably leads to suboptimal outcomes. Effective EbA therefore requires a shared agenda, common objectives, and coordinated action across sectors, institutions, and governance levels.

The documented impacts of long-term river regulation on the Dniester, for example, illustrate how infrastructure decisions outside the climate domain can significantly shape adaptation capacity. Altered hydrological and thermal regimes have weakened ecosystem resilience and amplified climate risks, underscoring the need for closer alignment between water, energy, and EbA planning.

### EbA potential remains high despite advanced degradation

Despite decades of intensive land use and ecosystem degradation, Moldova retains a high and often underestimated potential for EbA. Even heavily modified landscapes continue to offer strong restoration leverage points, particularly where hydrological processes, soil structure, vegetation cover, and ecological connectivity can be re-established.

Importantly, public awareness and concern about climate risks are increasing, and EbA concepts are gradually entering both policy discourse and local practice. This growing societal concern represents a critical entry point for action, opening opportunities to translate awareness into tangible, on-the-ground adaptation measures that deliver long-term resilience benefits.

### Forests, wetlands, and agro-landscapes must be treated as one functional interconnected system

In a country such as Moldova, where more than two-thirds of the land is dedicated to agriculture and where farming systems themselves are undergoing a transition toward more sustainable and climate-responsive practices, EbA cannot be confined to PAs or isolated ecosystem types.

Forests, wetlands, rivers, agricultural land, and rural settlements form a single, interconnected landscape system. Water retention, soil fertility, biodiversity, and microclimatic regulation depend on how these components function together. Sectoral approaches underperform, while landscape-scale integration offers the most viable pathway toward a climate-resilient future, particularly under increasing drought and hydrological variability.

**Existing conservation instruments provide a solid but underused foundation**

Moldova already possesses a comprehensive set of conservation and planning instruments, including PA system, Emerald Network (61 sites, some overlap with PAs), and the NEN. These instruments provide a strong institutional and spatial foundation for EbA, yet they remain only partially operationalized and weakly interconnected.

Further progress requires continuing the ongoing reform of the PA framework by gradually moving from a predominantly strict, exclusion-based conservation model toward a more open, engaged, and adaptive approach, in which local communities are recognized as key partners in conservation and adaptation.

At the same time, some existing designations (particularly certain Ramsar sites) would benefit from functional review and alignment with current ecological realities, in order to ensure that conservation efforts are focused where they deliver the greatest biodiversity and adaptation benefits. Excessive rigidity risks undermining conservation objectives; balanced, context-specific solutions are more likely to safeguard ecosystems in the long term.

**EbA is already happening, often implicitly**

Many EbA-relevant practices are already being implemented, albeit without being explicitly framed as such. These include assisted natural regeneration (ANR), shelterbelts, riparian vegetation, traditional grassland management, and the persistence of wetland remnants.

While these practices generate real adaptation benefits, they remain fragmented, weakly coordinated, and insufficiently scaled. The pathway forward lies in recognising, consolidating, and formalising these existing practices through updated legal frameworks, clearer guidance, and the dissemination of practical, science-based models that demonstrate how EbA can be effectively implemented on the ground.

**Donor engagement is strong, but coherence is the limiting factor**

International support for climate adaptation and ecosystem restoration in Moldova is substantial and growing. The primary bottleneck is not a lack of funding or interest, but rather limited coherence between initiatives, sectors, and governance levels.

Successful EbA interventions depend critically on the active involvement of local communities and land users, of those who live and work permanently in the landscapes where adaptation measures are implemented. Without their engagement and ownership, even well-designed interventions risk underperforming or failing. Social inclusion and local participation are therefore essential components of effective EbA.

**Positive and solution-oriented communication can accelerate EbA uptake**

The way EbA is communicated matters. Overly technical or problem-focused narratives can discourage engagement, while clear, optimistic communication based on concrete examples that work can significantly improve acceptance and uptake.

Showcasing successful EbA practices, especially those that deliver visible benefits for livelihoods (for water security and agricultural productivity), can build trust, reduce resistance, and encourage replication across landscapes.

**Ecosystem services and benefits should be placed at the centre of decision-making**

Finally, EbA must be framed not only in ecological terms, but also through the lens of ecosystem services and socio-economic benefits. This includes placing monetary and non-monetary values of ecosystem services on the table during planning and investment decisions.

The objective is not to "monetize nature" per se, but to ensure wise and efficient use of public and donor funds, prioritizing interventions that sustain ecosystem functions over time. Long-term sustainability and return on investment, rather than short-term or isolated actions, should guide future EbA programming.

Evidence from the Dniester basin demonstrates that degradation of hydrological and ecological processes results in substantial losses of ecosystem services, including water supply, fisheries, regulating services, and cultural values (see UNDP, 2022). Economic assessments indicate that cumulative losses associated with altered river functioning reach tens of millions of US dollars annually, with the largest share linked to aquatic and wetland ecosystems. This reinforces the case for prioritizing EbA as a cost-effective investment in long-term resilience rather than a marginal environmental measure.

## 9.2 Strategic directions for scaling EbA (2025–2035)

This section translates the diagnostic findings of the EbA scoping assessment into strategic directions for action over the next decade. It identifies priority shifts required to move from fragmented, site-based interventions toward systemic, landscape-scale EbA, capable of delivering long-term resilience benefits for people, ecosystems, and the economy.

As a strategic message, scaling EbA in Moldova over the next decade will depend less on introducing new concepts and more on re-orienting existing efforts toward landscape scale, hydrological function, connectivity, and cross-sector integration, while leveraging EU accession and regional cooperation as structural accelerators.

### 9.2.1 Shift from site-based pilots to landscape-scale EbA systems

EbA implementation in Moldova has so far relied largely on isolated pilot projects, often limited in spatial extent and duration. While valuable for learning, such approaches are insufficient to address systemic climate risks that operate at catchment, landscape, and basin scales.

Future EbA efforts should prioritise landscape-scale functional units, including river corridors, forest plateaus, steppe mosaics, and agro-landscapes, where multiple ecosystem processes interact. Planning and investment should focus on how sites function together, rather than on individual locations, ensuring cumulative impacts on water regulation, soil stability, biodiversity, and climate resilience.

### 9.2.2 Re-centre EbA around hydrology and water retention

Hydrological instability is a central driver of climate vulnerability in Moldova. Effective EbA therefore requires placing water retention and flow regulation at the core of adaptation strategies.

Wetlands, floodplains, soils, forests, shelterbelts, and riparian zones should be treated as components of a single, integrated hydrological infrastructure. EbA interventions should aim to slow water runoff, increase infiltration, retain soil moisture, and buffer both floods and droughts. Re-establishing natural hydrological functions across landscapes is essential for sustaining agricultural productivity, ecosystem health, and rural livelihoods under changing climate conditions.

### 9.2.3 Strengthen ecological connectivity as an adaptation priority

Ecological connectivity is not only a biodiversity concern but a key adaptation mechanism, enabling species movement, ecosystem recovery, and functional resilience under climate stress.

The National Ecological Network (NEN), together with river corridors and stepping-stone habitats, provides a ready-made framework for operationalising connectivity as climate-resilient green infrastructure. EbA investments should explicitly support corridor restoration, riparian continuity, and linkages between core natural areas, transforming connectivity from a conceptual planning tool into a functional adaptation asset.

### 9.2.4 Mainstream EbA into agriculture and rural development

Given Moldova's land-use structure, EbA will only scale if it becomes integral to agricultural and rural development policy, rather than remaining confined to conservation or environmental projects.

Mainstreaming EbA requires embedding adaptation principles into agricultural incentives, advisory services, land-use planning, and rural investment schemes. Practices such as agroforestry, shelterbelts, soil conservation, diversified cropping, and water-efficient land management should be promoted as core adaptation measures, delivering both climate resilience and economic benefits for farmers and rural communities.

### 9.2.5 Align EbA scaling with EU accession and regional commitments

Moldova's EU accession pathway provides a unique strategic opportunity to accelerate EbA scaling. Instruments such as the transition toward Natura 2000, the EU Nature Restoration Regulation, and related Green Deal frameworks offer clear policy and financing entry points for landscape-scale restoration and adaptation.

At the regional level, Black Sea cooperation frameworks and transboundary initiatives along the Prut and Dniester rivers can further amplify EbA impacts. Aligning national EbA priorities with EU and regional commitments will help ensure coherence, attract sustained investment, and position Moldova as an active contributor to regional climate-resilience efforts.

## 9.3 Required institutional and policy shifts

This section outlines the institutional and policy shifts required to translate EbA potential into sustained, large-scale impact. These shifts do not imply radical reform or the creation of new institutional structures, but rather a progressive re-orientation of existing mandates, instruments, and practices toward landscape-scale, climate-responsive management.

Experience from EU Member States demonstrates that ecological connectivity is increasingly treated as a legal and planning obligation, not only a biodiversity objective. For example, German conservation law requires the establishment of a connected biotope network covering at least 10% of the territory of each federal state, integrating core areas, corridors, and multifunctional landscapes – an approach directly relevant for strengthening Moldova's National Ecological Network as climate adaptation infrastructure (Lozan, 2024).

Also, international practice further demonstrates that excessive isolation of PAs can undermine long-term resilience, while zoning, regulated human activity, and landscape-scale integration provide more robust foundations for biodiversity conservation and EbA.

### 9.3.1 From fragmented mandates to shared landscape responsibility

Current governance arrangements for land, water, forests, agriculture, and biodiversity remain largely sector-based, with separate mandates, planning cycles, and performance metrics. While sectoral expertise is essential, climate risks increasingly materialize at landscape and catchment scales, where responsibilities overlap.

Scaling EbA requires a shift toward shared landscape responsibility, where environment, forestry, agriculture, and water authorities coordinate around common adaptation objectives. This can be achieved through joint planning processes, shared spatial frameworks (e.g. river basins, ecological corridors), and agreed roles in landscape-level EbA delivery, without undermining existing institutional competences.

### 9.3.2 From project-based implementation to programmatic EbA delivery

EbA implementation in Moldova has been dominated by short-term, project-based interventions, often designed as pilots or demonstrations. While valuable, such approaches rarely achieve lasting systemic change.

A key shift is required toward programmatic EbA delivery, characterized by:

- multi-year time horizons,
- basin- or landscape-scale coverage,
- phased implementation combining restoration, management, and monitoring.

This shift also requires gradual alignment of forestry financing and governance with the provision of public ecosystem services, ensuring that forests can fully support long-term EbA outcomes.

Programmatic approaches allow EbA to evolve from experimentation to institutionalized practice, increasing predictability for local actors, donors, and implementing agencies.

#### 9.3.3 From static protection to adaptive management

PAs, Emerald sites, NEN, and other conservation instruments remain central to EbA, but many were designed under static conservation paradigms, with limited flexibility to respond to climate dynamics.

Embedding adaptive, climate-responsive management requires:

- periodic reassessment of management objectives,
- integration of climate and hydrological indicators,
- greater emphasis on ecosystem function alongside species protection,
- constructive engagement with local communities and land users.

Such an approach strengthens conservation outcomes while enhancing the relevance of PAs as active contributors to climate resilience.

#### 9.3.4 From data availability to decision-ready information

Moldova possesses a growing volume of ecological, climatic, and land-use data generated by national institutions, research projects, and donor-supported initiatives. However, much of this information remains fragmented and under-utilized in decision-making.

A key shift is needed toward decision-ready information, integrating existing monitoring systems into a national EbA knowledge and planning platform. Such a platform would support:

- spatial prioritization of EbA interventions,
- monitoring of adaptation outcomes,
- coordination across sectors and donors,
- evidence-based policy adjustment.

The emphasis should be on usability and relevance for planners, managers, and local authorities, and not on creating new parallel data systems.

The HCVF assessment further highlights structural limitations in the current forestry governance and financing model. The continued reliance on a self-financing mechanism, whereby forest management institutions cover operational costs primarily through timber harvesting, creates systemic pressure on forest ecosystems that are simultaneously expected to deliver climate adaptation, hydrological regulation, and biodiversity functions.

This contradiction underscores the need for a policy shift toward public financing of ecosystem services, differentiated management regimes for forests with high adaptation value, and alignment of forestry reform with Moldova’s climate resilience and EbA objectives.

#### 9.3.5 From donor parallelism to strategic donor alignment

While donor engagement in Moldova is strong, parallel planning and implementation cycles can limit cumulative impact. A shift toward strategic donor alignment would enhance coherence and efficiency.

This can be achieved through:

- shared EbA indicators and monitoring frameworks,
- coordinated geographic focus areas,
- joint planning cycles and information exchange platforms,
- alignment with national EbA priorities and EU accession objectives.

Such alignment strengthens national ownership while preserving donor flexibility and innovation.

### 9.4 A Vision for Moldova’s nature-based adaptation pathway

This section articulates a forward-looking vision for how Moldova can progressively build climate resilience through EbA. The vision is grounded in current realities but oriented toward the next decade.

Moldova’s future climate resilience will depend not on isolated interventions, but on the ability to recognize, manage, and invest in ecosystems as the country’s most reliable adaptation asset.

EbA offers a pathway where environmental integrity, economic viability, and social well-being reinforce one another.

### 9.4.1 Moldova is a climate-resilient landscape mosaic in the future

By 2035 and beyond, Moldova’s landscapes can function as integrated mosaics, where forests, rivers, wetlands, agricultural land, and settlements collectively support climate resilience. River corridors retain and regulate water, soils store moisture and carbon, forests buffer extremes, and agricultural systems are diversified and adaptive.

In this vision, local communities are active stewards of their landscapes, supported by coherent policies, predictable incentives, and practical guidance. Adaptation is no longer perceived as an external project agenda, but as an integral part of rural development and land management.

### 9.4.2 EbA as living infrastructure

EbA can be understood not as a complementary measure, but as living infrastructure as essential as roads, dams, or irrigation systems. Wetlands function as natural reservoirs, floodplains as buffers, forests as climate regulators, and soils as water-storage systems.

Investing in EbA thus becomes an investment in long-term security, productivity, and resilience, delivering multiple benefits for water supply, food systems, biodiversity, and livelihoods. This perspective helps shift adaptation from short-term risk management toward long-term societal resilience.

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## Annex 1. National PA categories of the Republic of Moldova

| National Category | Destination | Main Restrictions | Closest IUCN Category |
|---|---|---|---|
| Scientific Reserves | Long-term conservation of representative ecosystems, biodiversity, genetic resources and natural processes; research and monitoring. | Strict protection; no harvesting, grazing, construction, hunting or fishing; access only for research and authorized management. | Ia – Strict Nature Reserve |
| Nature Reserves | Protection of natural complexes with scientific, ecological or landscape value; limited research and education. | Strong restrictions on resource use; controlled access; limited traditional use; no large-scale extraction or land conversion. | Ib – Wilderness Area or IV – Habitat/Species |
| Landscape Reserves | Conservation of natural and semi-natural landscapes with ecological, cultural or aesthetic value. | Restrictions on construction, land conversion, intensive agriculture; selective use permitted if non-degrading. | V – Protected Landscape/Seascape |
| Resource Reserves | Conservation of specific resources (e.g., soils, hydrological features, forest genetic resources). | Regulated use of the specific resource; prohibition of degrading activities; restrictions depend on resource type. | IV – Habitat/Species Management |
| Areas with Multifunctional Management | Sustainable use of natural systems that combine ecological, cultural and socio-economic functions. | Regulated economic activities; emphasis on preventing degradation; zoning commonly applied. | VI – Protected Area with Sustainable Use |
| Natural Monuments | Protection of unique natural features (rock formations, springs, rare trees, small habitats). | Prohibition of damage or alteration; regulated access; surrounding land uses may be restricted. | III – Natural Monument or Feature |
| Dendrological Gardens | Conservation of tree and shrub diversity; scientific collections; education. | Controlled access; no tree removal except for management; regulated research. | IV – Habitat/Species Management or III – Monument |
| Landscape Architecture Monuments | Conservation of designed landscapes with cultural and ecological value. | Restrictions on construction, tree removal, land alteration; management maintains design and ecological balance. | V – Protected Landscape |
| Ramsar Wetlands | Protection of internationally significant wetlands; maintenance of ecological character and hydrological functions. | Restrictions on drainage, hydrological alteration, pollution, intensive hunting or fishing; sustainable use allowed under Ramsar principles. | IV – Habitat/Species Management or VI – Sustainable Use |
| Zoological Garden | Ex-situ conservation, education and research. | Regulated keeping of species; site-specific management rules. | Not directly applicable (not an in-situ protected area) |
| National Park | Conservation of ecosystems, landscapes and cultural heritage; recreation and education within regulated zones. | Zoning regime: strict protection zones, ecological restoration zones, and visitor-use zones; restrictions depend on zone. | II – National Park |

## Annex 2. GIS-Identified National Priority Sites

| Site | Priority EbA Interventions | Expected Benefits | Scaling / Replication |
|---|---|---|---|
| **Prut River Corridor (Zones 1–3–25)** | Riparian forest rehabilitation, hydrological reconnection of floodplain pockets, restoration of oxbows and side channels, invasive species control along riverbanks. | Improved riparian stability, better water quality, restoration of floodplain functions and enhanced corridor connectivity. | Strong replication along Prut/Răut tributaries |
| **Stepa Bălțiului (ID 84)** | Native steppe element recovery, contour vegetation, rehabilitation of degraded pastures, management of invasive weeds on abandoned lands. | Reduced erosion, improved soil structure, restored steppe biodiversity and landscape-level climate buffering. | High potential for other steppe remnants in N/S Moldova |
| **Rădoaia–Șoldănești (ID 142)** | ANR and edge repair in naturally regenerating stands, riparian buffers in headwaters, reconnection of stepping-stone forest patches. | Strengthened slope stability, improved hydrological regulation and increased resilience of headwater forests. | Replicable in headwater forest clusters across Moldova |
| **Onești–Cotiujenii Plateau (ID 106)** | Riparian buffer recovery, agroforestry integration, edge regeneration along forest–arable boundaries, ANR in spontaneous succession areas. | Improved soil stability, enhanced water regulation and strengthened ecological links across the plateau. | Suitable model for central forest mosaics |
| **Dobrușa Plateau (ID 266)** | Restoration of degraded margins, reconnection of outlying patches, ANR to shift stands toward native broadleaf composition. | Improved forest structure, long-term carbon and soil benefits, greater landscape connectivity and resilience. | High potential for reserve extension + OECMs |
| **Pohrebeni Transition (ID 346)** | Shelterbelts, contour vegetation strips, pasture restoration and edge reconstruction in the forest–steppe ecotone. | Reduced slope degradation, better microclimate regulation and recovery of transition-zone habitats. | Replicable for other forest–steppe zones |
| **Poiana Curătura–Climăuți Slopes (ID 372)** | Assisted regeneration on steep slopes, shrub–grassland mosaics on terraces, ravine stabilization and invasive control. | Reduced sediment mobility, restored ravine ecology and protection of canyon microrefugia. | Applicable across Dniester valley slopes |
| **Rezina Terraces (ID 408)** | Assisted regeneration on steep slopes, shrub–grassland mosaics on terraces, ravine stabilization and invasive control. | Reduced sediment mobility, restored ravine ecology and protection of canyon microrefugia. | Replicable in terrace landscapes along the Dniester |
| **Unguri–Holoșnița Plateau (ID 98)** | Invasive species removal from riparian slopes, riparian belt reconstruction, spring and ravine protection, refinement of PA boundaries. | Recovered native riparian structure, improved habitat continuity and enhanced stability of sensitive microrefugia. | High transboundary replication; boundary revision recommended |

## Annex 3. Field-Identified Additional Priority Sites (validated through site visits)

| Site | Priority EbA Interventions | Expected Benefits | Scaling / Replication |
|---|---|---|---|
| **Lower Dniester (South-East / Ștefan Vodă – Tighina memo)** | Hydrological reconnection of isolated meanders, restoration of floodplain forests with native species, invasive removal along riverbanks, community-based riparian recovery. | Re-established wetland dynamics, improved floodplain ecology and enhanced resilience of communities to water-level variability. | High relevance for other degraded Dniester floodplain segments and disconnected meanders in SE Moldova. |
| **Codrii Central Region (Central Moldova / Ungheni–Călărași memo)** | Consolidation of communal forest islands, ANR on abandoned orchards/pastures, invasive containment, reconstruction of edge belts linking Codru and Codrii Strășenilor Emerald sites. | Potential benefits: Reduced fragmentation in Moldova's largest forest massif, improved slope stability, stronger drought buffering and continuity of native oak-hornbeam forests. | Strong replication across other Codrii-edge communities and fragmented peri-forest landscapes. |
| **Nisporeni Communal and Private Forest Mosaic (Central Moldova / Ungheni–Călărași memo)** | ANR of spontaneous succession forests, consolidation of fragmented small parcels, correction of cadastral mismatches, enrichment planting with native species. | Increased forest cover around a major urban center, stabilized slopes, reduced erosion and better integration with Vila Nisporeni Reserve. | High transferability to other communal forest mosaics around urban centres (e.g., Strășeni, Călărași). |
| **Boghenii Noi Communal Forest System (Central Moldova / Ungheni–Călărași memo)** | Expansion of communal forests via integration of spontaneously afforested plots, invasive species control in pastures, corridor creation toward Plaiul Fagului. | Strengthened forest continuity across five villages, enhanced climate resilience and long-term restoration of Codrii connectivity. | Applicable for village-scale corridor creation and communal forest expansion in other Codrii foothill settlements. |
| **Lower Prut / Beleu Lake Complex (Field-Identified Urgent Priority) (South / Lower Prut memo)** | Emergency hydrological reconnection to prevent Beleu Lake desiccation, riparian belt recovery, invasive shrub/tree removal, floodplain ANR. | Potential benefits: Recovery of one of Moldova's most important wetland systems, restored flood buffering and critical biodiversity functions. | High replication potential for other Prut floodplain depressions and abandoned lake basins. |
| **Rudi–Arionești Canyon System (Northern Moldova memo, part of the Unguri–Holoșnița Ramsar site)** | Protection of canyon microrefugia, stabilization of springs and shaded ravines, control of early invasive fronts, erosion control on steep slopes. | Preservation of climatically stable habitats, improved slope stability and long-term biodiversity refugia. | Strongly replicable in other northern canyon complexes within the Dniester corridor. |
| **Cosăuți–Soroca Canyon Belt (Northern Moldova memo, Stîncele Nistrene Emerald site)** | Ravine vegetation recovery, protection of unique thermophilous oak–steppe mosaics, invasive removal from riverbanks. | Stabilized slopes, improved habitat integrity and enhanced Dniester corridor connectivity. | Applicable to thermophilous slope systems along mid-Dniester terraces. |
| **Naslavcea Ravines and Cosărău Valley (Northern Moldova memo)** | Micro-wetland recovery in ravine bottoms, erosion control on agricultural cliff edges, restoration of mixed oak–ash stands. | Reduced sediment delivery to the Dniester, preserved microclimate refugia and improved landscape stability. | Highly replicable for cliff-edge ravine complexes and agricultural escarpments throughout Northern Moldova. |

## Annex 4. Maps and Figures

It compiles the maps and figures used in the national EbA screening. These visuals complement the main text by illustrating spatial patterns in forest connectivity, climatic conditions, hydrological risk and biodiversity value that underpin the prioritization of EbA zones.

**4.1 Forest cover and wetland distribution across the country**

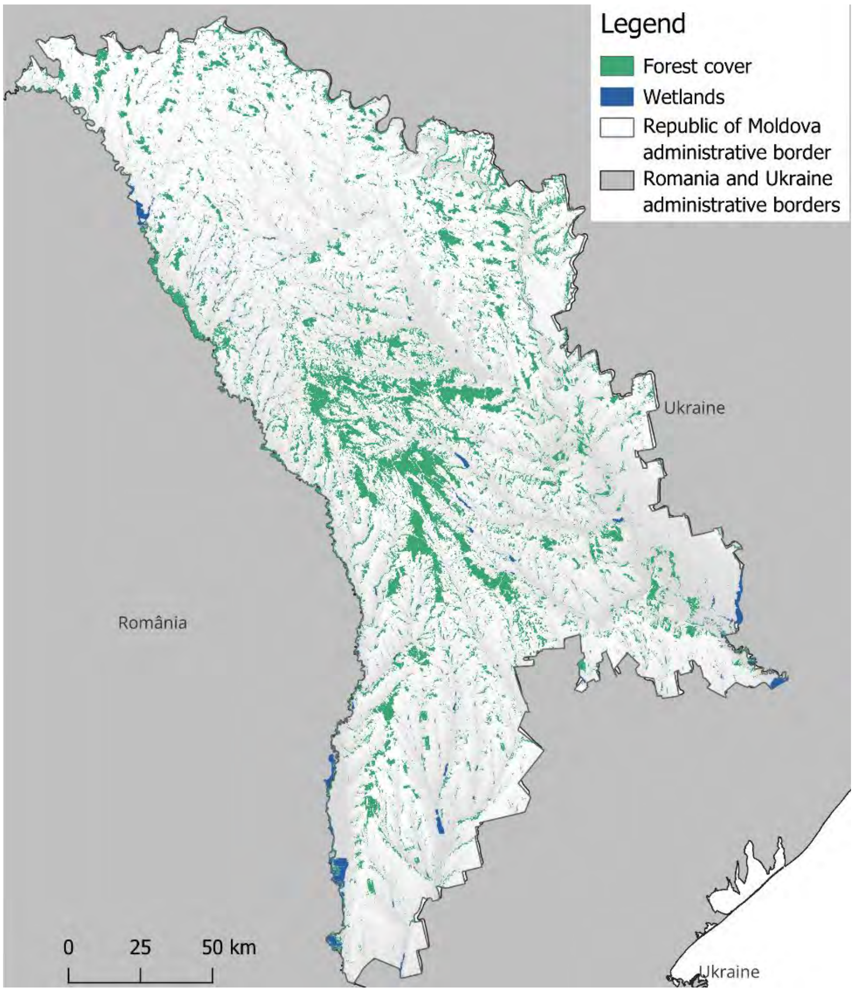


**Figure 4.1.1.** Forest cover derived from ESA WorldCover (2021) and Dynamic World; wetlands extracted from ESA WorldCover as combined herbaceous wetland and open water classes.

**4.2 Forest Connectivity**

Forest extent was mapped using ESA WorldCover 2021 and Dynamic World. These datasets were combined to reduce misclassification and to capture different aspects of woody vegetation. Vegetation pixels inside buffered built-up areas were removed and forest patches smaller than one hectare were excluded to keep the mask clean and ecologically relevant. Remaining forest patches were grouped into three categories: islets (under 10 ha), stepping-stone patches (10 to 100 ha) and core blocks (over 100 ha).

Connectivity potential was then mapped by creating 300 m buffers around core and stepping-stone patches and clustering intersecting buffers. This resulted in Forest Connectivity Potential Zones, which highlight where restoration activities can improve structural continuity. In these zones targeted EbA can measurably reduce fragmentation and decrease edge effects, and strengthen ecological resilience. Large connectivity zones (dark green, light green) indicate strategic opportunities for landscape-scale restoration, while smaller zones (orange, pink) highlight local gaps where micro-corridors or patch enlargement could substantially improve habitat continuity.

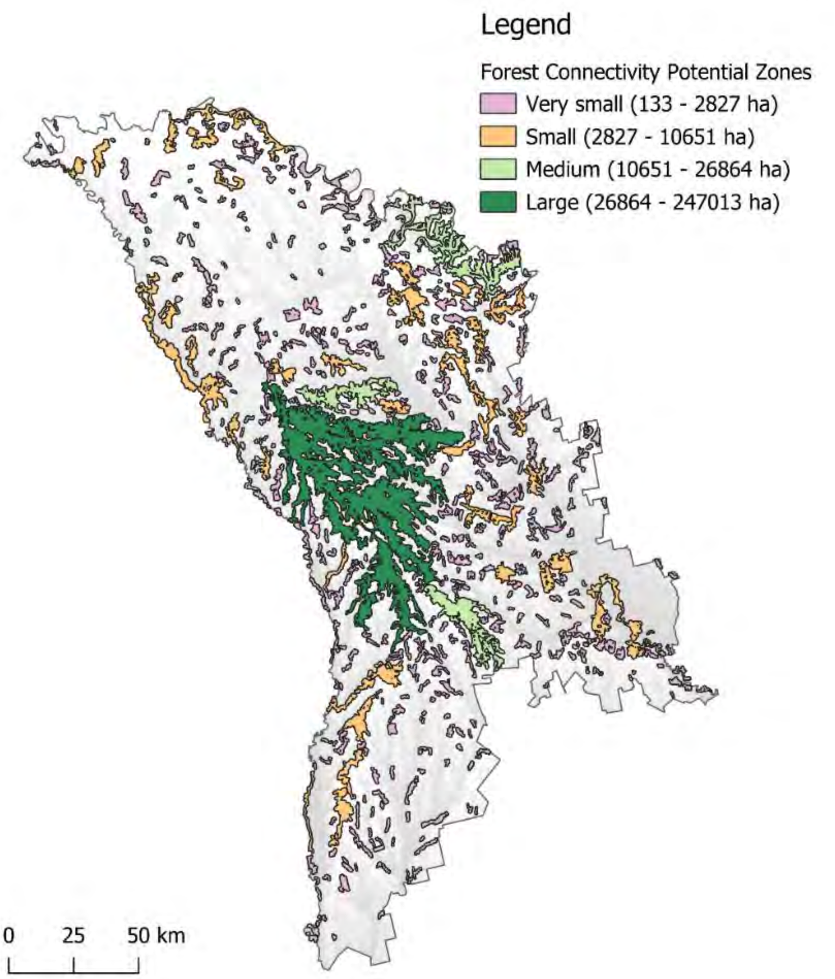


**Figure 4.2.1.** Forest Connectivity Potential Zones

### 4.3 Annual Precipitation Gradient

BIO12 annual precipitation from WorldClim ranges from about 455 to 641 mm across Moldova. Three moisture classes were identified: dry (under 500 mm), moderately humid (500 to 575 mm) and more humid (over 575 mm). Southern districts fall within the dry zone and face higher drought stress and reduced regeneration potential. Central and northern regions are more favourable for forest and riparian restoration.

These gradients indicate lower-rainfall southern landscapes face higher moisture stress, reduced natural regeneration potential, and elevated soil erosion risk, while the central–northern corridor retains the most favourable climatic envelope for long-term forest and riparian restoration.

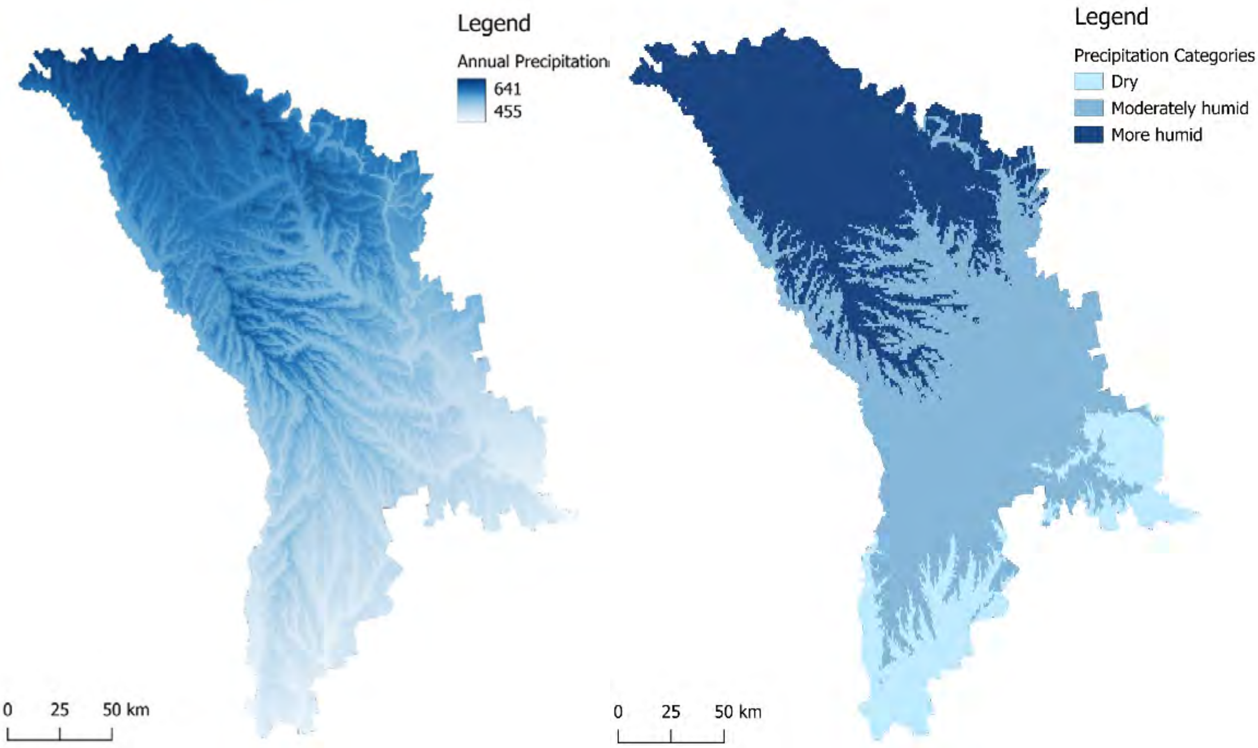


**Figure 4.3.1.** Annual Precipitation (BIO12) across Moldova.

### 4.4 Aridity Index (AI)

To complement the precipitation baseline with an index reflecting actual moisture limitation, the Global Aridity Index (AI) was incorporated. The AI expresses the ratio between mean annual precipitation (P) and atmospheric water demand (reference evapotranspiration, $ET_0$): $AI = \frac{\mathrm{P}}{\mathrm{ET_0}}$

The Aridity Index (AI) shows that Moldova lies mainly within semi-arid to dry sub-humid zones, with AI values between 0.30 and 0.65. Southern areas show the highest moisture deficits, while northern areas have more favourable moisture conditions.

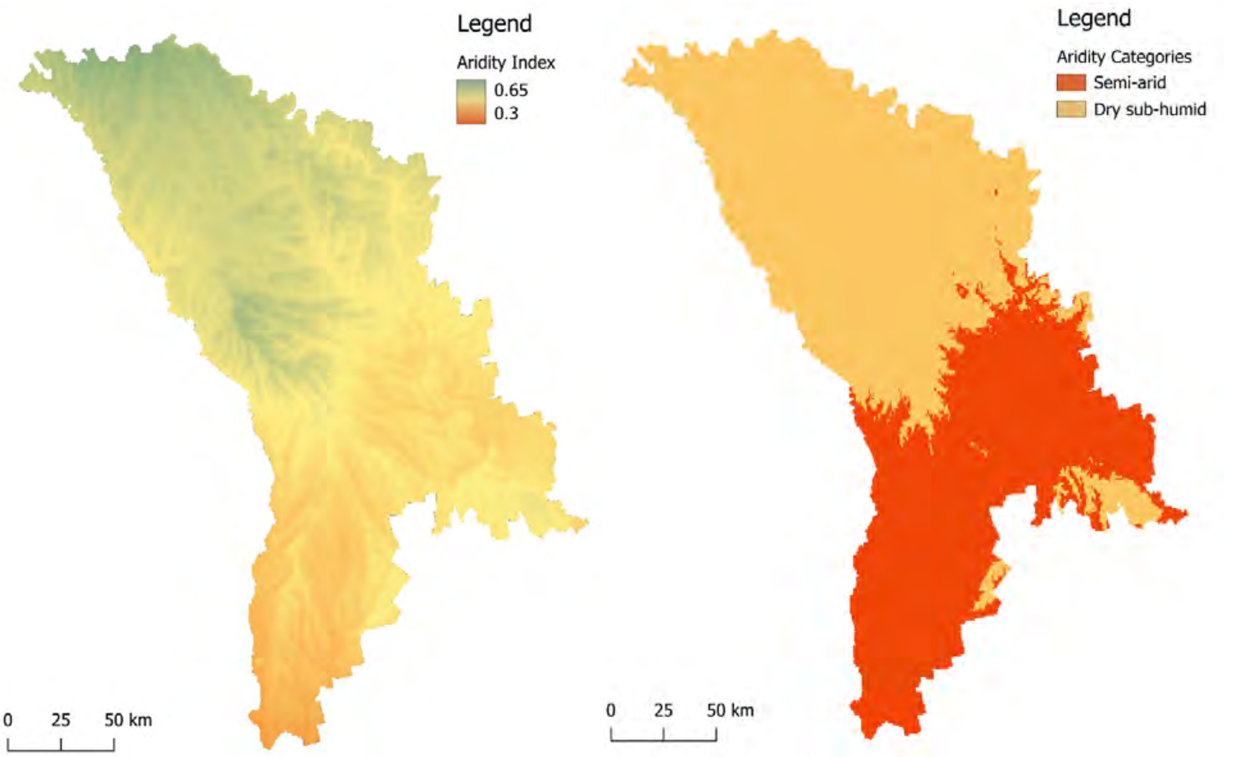


**Figure 4.4.1.** Global Aridity Index

### 4.5 Drought Refugia

Combining precipitation and aridity reveals areas with higher drought-buffering capacity. Drought-refuge potential is highest where precipitation exceeds 575 mm, AI is above about 0.55 and forest or riparian cover maintains shading and soil moisture. These areas are concentrated in the north, northwest and parts of the central plateau. Southern districts have limited refuge potential and require drought-adapted restoration methods. These drought-refuge areas are strategic for maintaining biodiversity, supporting natural regeneration, and increasing landscape-scale climate resilience.

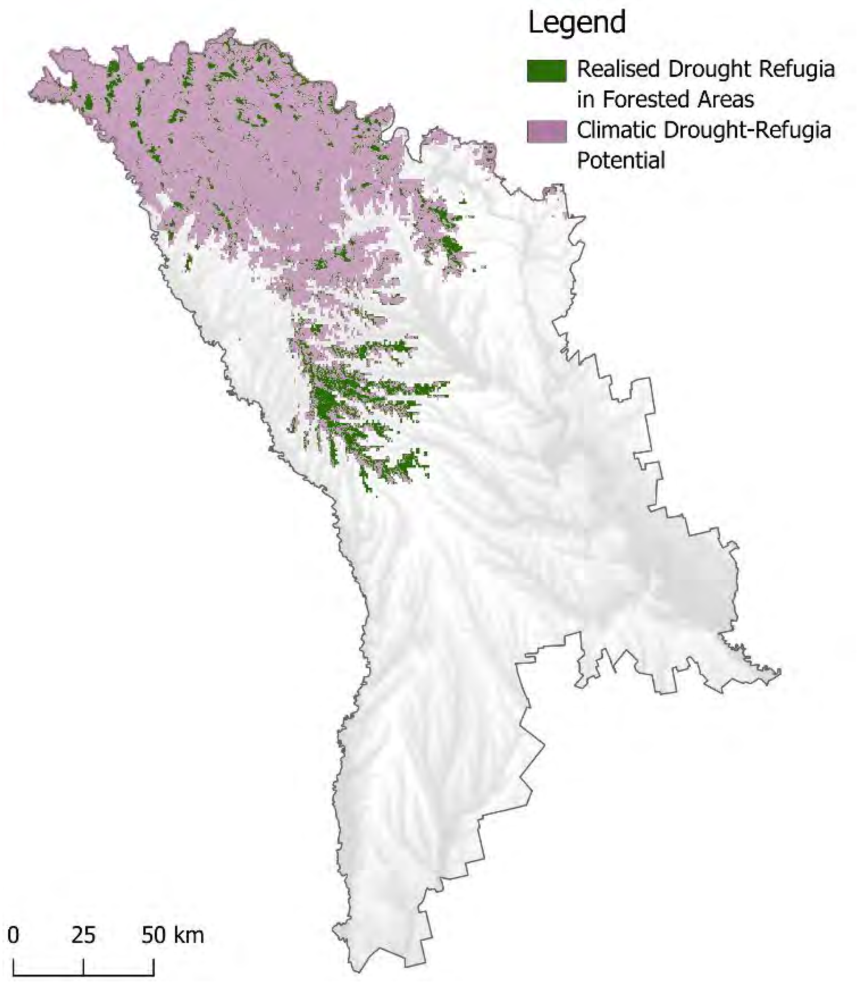


**Figure 4.5.1.** Climatic Drought-Refugia: pink colour indicates the area with refugia potential, areas where precipitation and aridity conditions indicate potential for drought buffering; Dark green indicates areas with realised drought refugia, where climatic suitability overlaps with existing forest cover, allowing refugia to function ecologically.

### 4.6 Flood buffering capacity

Flood-buffering capacity in the Republic of Moldova has not been extensively analysed, yet the available hydrological evidence and the long-term transformation of river systems indicate that the ability of riparian and floodplain ecosystems to attenuate floodwaters is currently low.

During the Soviet period, most major rivers in the country underwent substantial modification. Natural flood buffers have been significantly degraded. Moldova has lost an estimated 70-80% of its historical floodplain wetlands, largely due to drainage, agricultural expansion, and river embankment (UNEP/GRID Arendal, 2019). Riparian forests have been narrowed or removed along many watercourses, decreasing hydraulic roughness, reducing bank stability, and accelerating runoff during storm events. With arable land representing roughly 75% of national territory, large monocultural fields and sparse tree cover further amplify flash-flood risk, especially in the hilly central plateau (FAOSTAT, 2022; EEA, 2020).

Although Moldova is not highly flood prone compared with other regions, recent assessments show increasing exposure to short, intense rainfall events. Flood-buffering EbA measures are therefore relevant in many catchments. Opportunities include reconnecting isolated wetlands to channels, restoring riparian forests, recovering meadow–wetland mosaics and increasing retention through forest regeneration.

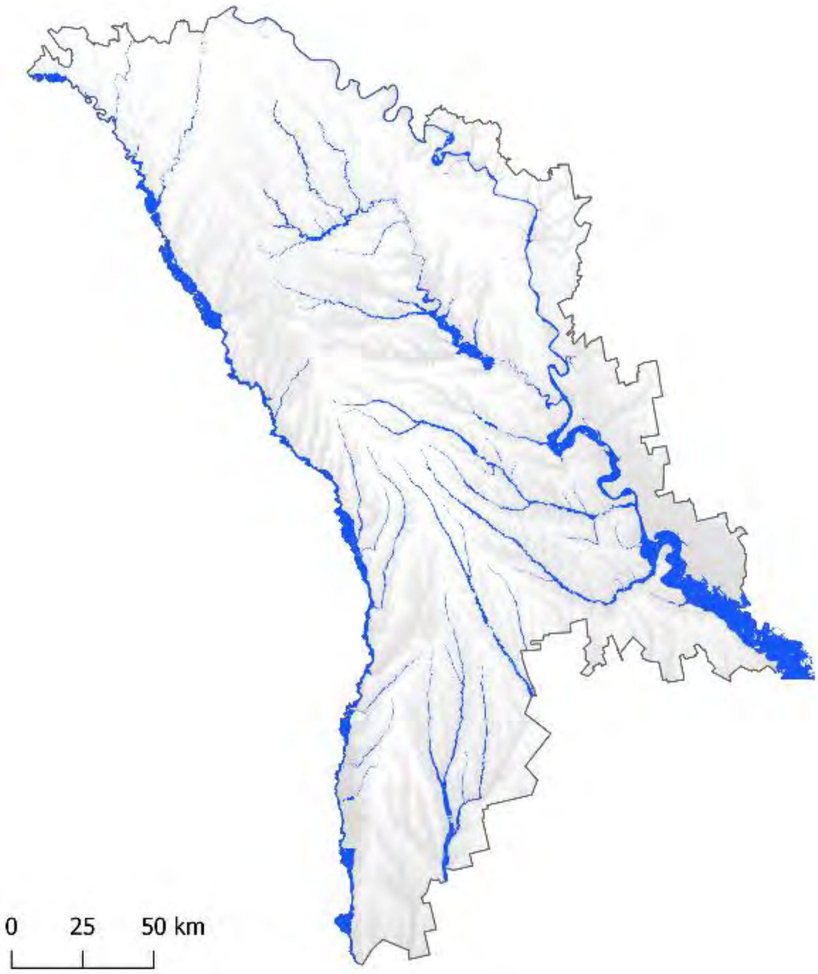


**Figure 4.6.1.** Flood Probability (1 percent annual exceedance). Source: NAAM database

### 4.7 Biodiversity value & Key Biodiversity Areas

Key Biodiversity Areas (KBAs) are sites that contribute significantly to the global persistence of biodiversity, identified through standardized criteria applied across taxa and ecosystems (KBA Partnership, 2020). For this analysis, KBA polygons for the Republic of Moldova were obtained from the World Database of Key Biodiversity Areas (2025), developed and submitted by Ajder et al. (2014). The dataset includes 11 terrestrial KBAs, most originally identified as IBAs and then carried forward into the KBA framework. The mean protected coverage of these KBAs by PAs is 67%, while one KBA currently has no formal protection (BirdLife International, 2025).

Although the current KBA network captures the most ecologically valuable sites in the country, its boundaries were last revised in 2014 and do not fully reflect recent species data and habitat assessments. Several KBAs have since been proposed for expansion following bird monitoring programmes and updated ecological evaluations. These revisions are expected to increase the total KBA area and further expose gaps in the national PA network, which currently overlaps with KBAs only partially and inconsistently across districts.

In the context of EbA screening, KBAs serve as a biodiversity value layer, indicating landscapes where maintaining ecosystem integrity is essential for species persistence and where restoration measures would yield the highest conservation benefits. Overall, KBAs highlight the core ecological areas where restoration, connectivity planning and potential upgrades of protection status can most effectively support both national conservation goals and global biodiversity commitments.

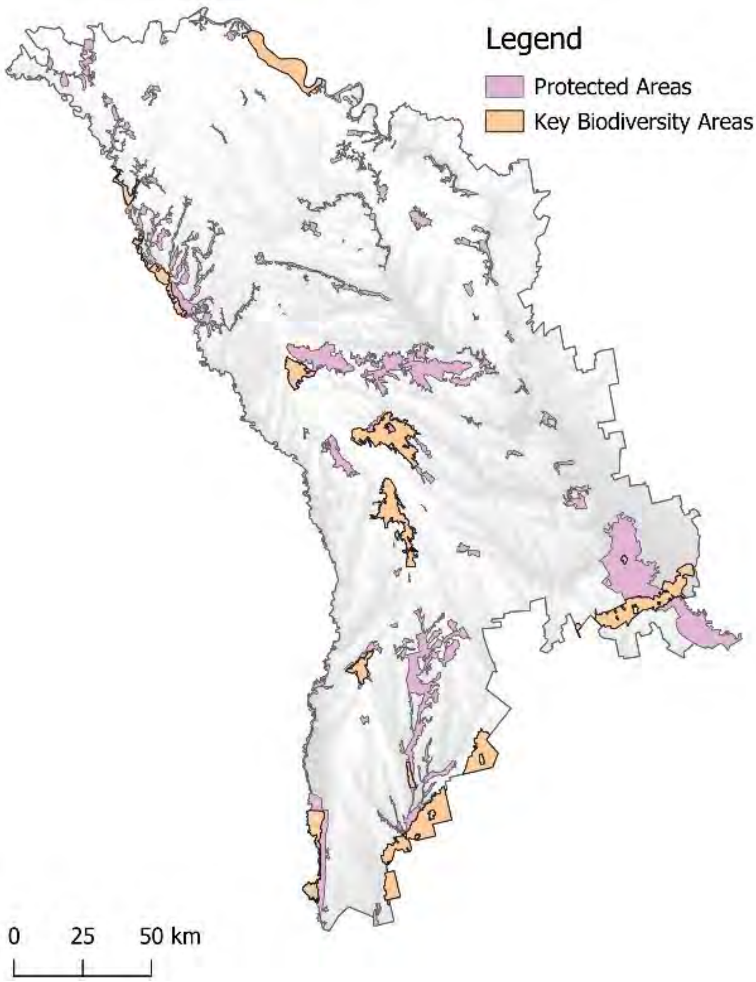


**Figure 4.7.1.** Protected Areas (PAs) and Key Biodiversity Areas (KBAs) of the Republic of Moldova.
The map shows the spatial distribution of both the national PA system and KBAs used as the primary biodiversity-value layer in the assessment.

# Annex 5. Tables and Matrices

## 5.1 Site selection criteria and scoring matrix

Annex 5.1 describes the criteria, indicators and scoring thresholds used to classify forest connectivity zones into EbA priority classes.

**Table 5.1.1. Site Selection Criteria**

| | |
|---|---|
| **1.1 Climate-Refuge Potential** | |
| Indicator: | mean proportion of each zone overlapping drought-refuge pixels. |
| Rationale: | areas providing microclimatic buffering are more suitable for long-term EbA. |
| **1.2 Forest Connectivity Condition** | |
| Indicator: | internal fragmentation and number/size of forest patches. |
| Rationale: | zones with high fragmentation gain the most from connectivity-oriented EbA. |
| **1.3 Biodiversity Importance** | |
| Indicator: | intersection with Key Biodiversity Areas (KBA), Protected Areas (PAs), and mapped wetlands. |
| Rationale: | EbA actions produce higher conservation benefits where biodiversity value is elevated. |
| **1.4 Hydrological Importance** | |
| Indicator: | overlap with wetlands, riparian corridors, and number of river segments. |
| Rationale: | hydrological functions (erosion control, retention, flood buffering) strengthen EbA benefits. |
| **1.5 Climate Vulnerability** | |
| Indicator: | maximum CVI value per forest zone. |
| Rationale: | zones facing higher climatic stress derive greater benefit from EbA interventions. |

**Table 5.1.2. Scoring Matrix**

All parameters were translated into numeric scores using the thresholds below. The final Tot_score is the sum of all attributes.

| | | |
|---|---|---|
| **1.1 Climate-Refuge Potential (proportion of polygon overlap with climatic refuge area)** | | |
| 0.00 | No refuge/ Zone fully exposed | **0** |
| 0.01–0.19 | Low refuge/ Tiny fragments only | **0** |
| 0.20–0.49 | Moderate refuge/ Partial moisture stability | **1** |
| ≥0.50 | High refuge/ Zone strongly buffered | **2** |
| **1.2 Forest Connectivity Condition (Number of forest patches in zone, distribution-based thresholds)** | | |
| 1-5 | Low fragmentation / limited connectivity gain | **1** |
| 6-15 | Moderate fragmentation / good connectivity potential | **2** |
| >15 | High fragmentation / very strong connectivity potential | **3** |
| **1.3 Biodiversity Importance** | | |
| No biodiversity features | | 0 |
| At least one biodiversity feature (PA, wetland) | | 1 |
| High biodiversity importance (KBA present OR ≥ 2 features) | | 2 |
| **1.4 Hydrological Importance** | | |
| No wetland or river overlap | | 0 |
| Overlap with either wetlands or rivers | | 1 |
| Strong hydrological relevance: wetlands + multiple river segments (>10) | | 2 |
| **1.5 Climate Vulnerability (CVI class)** | | |
| Very high | Critical vulnerability: urgent adaptation need | **+2** |
| High | Significant vulnerability | **+1** |
| Medium | Moderate vulnerability | **0** |
| Low | Lower vulnerability | **–1** |
| Very low | Very low vulnerability | **–2** |
| **Total score – the sum of all scores - combined potential of each forest zone (Distribution-based thresholds)** | | |
| 8–10 | Core national EbA priority zones | EbA 1 |
| 5–7 | High potential EbA zones | EbA 2 |
| 0–4 | Other forest zones, lower priority | EbA 3 |

## 5.2 Highest-priority EbA zones (EbA 1)

List of all forest connectivity zones classified as EbA 1, together with their indicator scores and total EbA score.

| Zone ID | Area (ha) | Refuge class | Connectivity class | Vulnerability class | Biodiversity score | Hydrology score | Vulnerability score | Total EbA score | Priority EbA class |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10650.96 | No refuge | 3 | Very high | 2 | 2 | 2 | 9 | 1 |
| 3 | 4111.55 | High refuge | 2 | Medium | 2 | 2 | 0 | 8 | 1 |
| 25 | 8906.86 | Low refuge | 3 | Very high | 1 | 2 | 2 | 8 | 1 |
| 84 | 1629.95 | High refuge | 2 | Very high | 1 | 2 | 2 | 9 | 1 |
| 98 | 7679.51 | High refuge | 3 | Medium | 2 | 2 | 0 | 9 | 1 |
| 106 | 3737.19 | High refuge | 2 | Very high | 0 | 2 | 2 | 8 | 1 |
| 142 | 2395.42 | High refuge | 2 | High | 1 | 2 | 1 | 8 | 1 |
| 196 | 7529.3 | No refuge | 3 | High | 2 | 2 | 1 | 8 | 1 |
| 266 | 10134.9 | High refuge | 3 | Very high | 1 | 2 | 2 | 10 | 1 |
| 346 | 5052.87 | No refuge | 3 | Very high | 1 | 2 | 2 | 8 | 1 |
| 372 | 17881.57 | Low refuge | 3 | Very high | 1 | 2 | 2 | 8 | 1 |
| 408 | 5804.09 | No refuge | 3 | Very high | 1 | 2 | 2 | 8 | 1 |

### 5.3 EbA opportunity area briefs

This annex provides concise briefs for each of the ten integrated EbA opportunity areas derived from EbA 1 zones. For each area, it summarises location, overlap with conservation designations, key EbA values, indicative entry points and potential pathways for strengthening PA or OECM coverage.

**1. EbA Opportunity Area: Prut River Corridor (ID 3, 1, 25)**

**Location:** Western Moldova, along the Prut River.

**Approximate indicative area:** 23,500 ha (combined buffer-derived zones).

**Key communities:** Rural settlements within Fălești, Glodeni, Rîșcani and Edineț districts, located along the Prut floodplain and adjacent riparian zones.

**Key climate risks:** Flooding and flash floods, drought, riverbank erosion, reduced floodplain water retention, water quality degradation, heat and moisture stress in floodplain systems.

**Overlap with conservation designations**

- Emerald Network sites: Pădurea Domnească, Prutul de Mijloc.
- National protected areas:
    - Prutul de Mijloc – 32,775 ha
    - Pădurea Domnească – 6,110 ha
- Includes one Key Biodiversity Area.
- Several core and stepping-stone forest patches and wetland elements lie immediately outside existing boundaries.

**Key EbA values (climate, hydrology, vulnerability)**

- **Hydrological importance:** >90 river and wetland nodes; high potential for flood attenuation, bank stabilization and river–floodplain reconnection.

- **Refugia and microclimate:** Mixed drought-refugia potential across zones; riparian forests and lower terraces provide shading, humidity and temperature buffering.
- **Social vulnerability:** Multiple settlements with high to very high CVI; EbA measures can reduce erosion, drought and flash-flood risks and support climate-sensitive livelihoods.

**Priority EbA entry points**

- Riparian forest rehabilitation along the Prut riverbank.
- Reconnection of fragmented core and stepping-stone forest patches.
- Assisted natural regeneration and enrichment in degraded margins.
- Micro-corridors linking islets and semi-natural vegetation to the main forest belt.
- Restoration of floodplain wetlands where hydrological conditions allow.
- Shelterbelts and buffer strips at the agricultural interface.

**Pathway to PA / OECM / Emerald strengthening**

- OECM designation for adjacent unprotected forest and riparian areas that support the corridor.
- Improved ecological coherence between Pădurea Domnească and Prutul de Mijloc and upgraded forest–wetland corridor status along the Prut.

### 2. EbA Opportunity Area: Stepa Bălțiului (ID 84)

**Location:** Central–northern Moldova, between Bălți and Sîngerei.

**Key communities:** Rural settlements within Fălești, Sîngerei and Telenești districts, largely dependent on rain-fed agriculture, grazing and steppe–pasture resources.

**Key climate risks:** Drought, heat stress, soil erosion, pasture degradation, loss of steppe refugia, water scarcity for grazing.

**Approximate indicative area:** 1,630 ha (buffer-derived).

**Overlap with conservation designations**

- Emerald Network site: Stepa Bălțiului.
- Several steppe and semi-natural grassland remnants within the wider PA boundary.
- Eight modified wetland depressions (drainage channels, divided basins).
- Adjacent unprotected steppe patches functionally linked to the core site.

**Key EbA values (climate, hydrology, vulnerability)**

- **Drought refugia:** High local refugia due to topography and moisture pockets that maintain steppe vegetation.
- **Hydrological relevance:** Presence of old meander structures, humid depressions and small reservoirs offering micro-scale water retention.
- **Social vulnerability:** Surrounding villages have very high CVI, with strong dependence on climate-sensitive agriculture.

**Priority EbA entry points**

- Recovery of native steppe vegetation (seeding, low-input restoration).
- Removal of shrub encroachment and invasives where present.
- Shelterbelts and contour buffer strips to reduce erosion on exposed fields.
- Micro-corridors linking fragmented steppe patches.
- Assisted recovery of semi-natural pastures and agro-steppe mosaics.

**Pathway to PA / OECM / Emerald strengthening**

- Strong potential to consolidate the existing Emerald site through restoration of continuous steppe habitat.
- Adjacent community-managed grasslands could qualify as OECMs supporting long-term steppe connectivity and erosion control.

### 3. EbA Opportunity Area: Rădoaia–Șoldănești Forest Cluster (ID 142)

**Location:** Northeastern Moldova.

**Approximate indicative area:** 2,400 ha (buffer-derived).

**Key communities:** Rural settlements within Sîngerei district, located in the Răut headwater area and surrounding forest–grassland mosaics.

**Key climate risks:** Drought, reduced baseflow, headwater drying, runoff increase, soil erosion, forest–grassland edge stress.

**Overlap with conservation designations**

- Emerald Network site: Rădoaia.
- Core forest blocks interspersed with semi-natural grasslands and stepping-stone patches.
- Several outlying forest islets functionally connected to the central Emerald core.

**Key EbA values (climate, hydrology, vulnerability)**

- **Drought refugia:** Very high refugia stability; forest–grassland transitions retain humidity and reduce microclimate stress.
- **Hydrological relevance:** At least 14 springs and multiple small valleys forming the headwaters of the Răut River; strong potential for runoff and erosion control.
- **Social vulnerability:** Villages around the cluster show medium to high CVI, with direct exposure to land degradation and water scarcity.

**Priority EbA entry points**

- Assisted natural regeneration and edge repair in degraded margins.
- Reconnection of stepping-stone patches to core forests.
- Establishment of riparian and spring protection buffers.
- Silvopastoral rehabilitation in transitional grasslands to reduce pressure on forest edges.

**Pathway to PA / OECM / Emerald strengthening**

- The area reinforces the ecological coherence of the Rădoaia Emerald site.
- Adjacent unprotected forest and grassland patches are suitable candidates for OECM designation or for formal ecological corridor status linking the headwater system.

### 4. EbA Opportunity Area: Onești–Cotiujenii Forest Plateau (ID 106)

**Location:** Central Moldova, between multiple villages and near the Prutul de Mijloc ecological network.

**Key communities:** Rural settlements within Sîngerei district, adjacent to forest margins and small valley systems.

**Key climate risks**: Drought, heat stress, forest fragmentation, soil erosion, reduced water regulation, agricultural vulnerability.

**Approximate indicative area:** 3,740 ha (buffer-derived).

**Overlap with conservation designations**

- No national PA status.
- Ecologically linked to the Prutul de Mijloc Emerald corridor.
- Contains large core forest blocks and extensive stepping-stone networks.

**Key EbA values (climate, hydrology, vulnerability)**

- **Drought refugia:** High refugia potential supported by compact forest geometry and internal shading.
- **Hydrological relevance:** Numerous small streams and valley lines; strong potential for erosion control and improved base flow.
- **Social vulnerability:** Several adjacent villages show high CVI, making forest-based EbA directly relevant for reducing land degradation and heat stress.

**Priority EbA entry points**

- Reconnection of fragmented forest edges and stepping-stone patches.
- Riparian strip recovery along small tributaries.
- Assisted natural regeneration in degraded margins.
- Community forestry agreements to stabilize forest edges.

- Agroforestry demonstration plots on erosion-prone agricultural land.

**Pathway to PA / OECM / Emerald strengthening**
• Strong long-term potential for OECM designation, particularly for communal or private forest parcels.
• Functions as a logical ecological extension zone supporting the wider Prutul de Mijloc connectivity network.

### 5. EbA Opportunity Area: Dobrușa Forest Plateau (ID 266)

**Location:** Central–northern Moldova, south of Rezina.

**Approximate indicative area:** 10,430 ha (buffer-derived).

**Key communities:** Rural settlements within Șoldănești district, located around the Dobrușa forest plateau and associated valley systems.

**Key climate risks:** Drought, slope erosion, runoff intensification, declining baseflow, forest margin degradation.

**Overlap with conservation designations**
- Emerald / national landscape reserve Dobrușa (central core).
- Multiple unprotected forest blocks, valleys and lake nodes functionally linked to the reserve.
- Several high-value patches lie immediately outside the official boundary.

**Key EbA values (climate, hydrology, vulnerability)**
- **Drought refugia:** High refugia potential due to compact forest geometry, deep shading and topographic moisture retention.
- **Hydrology:** Numerous small valleys and streams provide strong opportunities for erosion control, runoff reduction and base-flow support.
- Social vulnerability: Surrounding communities have very high CVI, making forest-based EbA directly beneficial for slope stability and climate resilience.

**Priority EbA entry points**
- Assisted natural regeneration in degraded edges and internal clearings.
- Reconnection of outlying core and stepping-stone patches to the main plateau.
- Riparian and valley-side restoration to reduce erosion and stabilise slopes.
- Targeted grazing management on valley margins.

**Pathway to PA / OECM / Emerald strengthening**
- Clear potential to extend the Dobrușa reserve to incorporate adjacent forest blocks of high ecological value.
- High suitability for OECM designation of community and communal forest areas that support connectivity and hydrological regulation around the Emerald core.

### 6. EbA Opportunity Area: Pohrebeni Forest–Steppe Transition (ID 346)

**Location:** Central Moldova, south of Dobrușa, near Pohrebeni.

**Approximate indicative area:** 5,060 ha (buffer-derived).

**Key communities:** Rural settlements within Orhei district, situated along forest–steppe transition zones and sloping agricultural land.

**Key climate risks:** Soil erosion, drought stress, runoff increase, loss of stabilising vegetation, forest–agriculture interface degradation.

**Overlap with conservation designations**
- Emerald / landscape reserve Pohrebeni (central forest block).
- Surrounding unprotected forest margins and steppe-like slopes with high connectivity value.

**Key EbA values (climate, hydrology, vulnerability)**
- Drought refugia: Limited climatic refugia, but forest–steppe mosaics provide microclimatic buffering and habitat heterogeneity.

- Hydrological relevance: Dense network of small valleys draining toward the Dniester; high potential for slope and erosion control.
- Social vulnerability: Adjacent villages have very high CVI, making erosion reduction and slope stabilization crucial.

**Priority EbA entry points**
- Consolidation of fragmented forest edges and reconnection of stepping-stone patches.
- Shelterbelts and contour buffer strips along the agriculture–forest interface.
- Rehabilitation of semi-natural pastures on steeper slopes.
- Agri-environment and grazing schemes that maintain forest–steppe mosaics.

**Pathway to PA / OECM / Emerald strengthening**
- Logical extension of the Pohrebeni reserve to include outlying forest patches.
- Potential OECM designation for community-managed slopes that provide functional connectivity between core forests.

### 7. EbA Opportunity Area: Poiana Curătura – Climăuți de Jos Nistru Slopes (ID 372)

**Location:** Eastern Moldova, on the Dniester valley slopes north of Rezina.

**Approximate indicative area:** 2,610 ha (buffer-derived).

**Key communities:** Rural settlements within Șoldănești district, located along the Dniester valley slopes and associated terraces.

**Key climate risks:** Severe erosion, landslide risk, extreme runoff, drought stress on shallow soils, infrastructure exposure.

**Overlap with conservation designations**
- Emerald / landscape reserves Poiana Curătura and Climăuți de Jos.
- Numerous forest, shrub–grassland and steppe fragments forming a valley-slope mosaic.
- Functionally operates as a single ecological corridor despite formal subdivision.

**Key EbA values (climate, hydrology, vulnerability)**
- **Drought refugia:** Low overall, but ravines and shaded slopes host local micro-refugia valuable during dry periods.
- **Hydrological relevance:** Very high; steep slopes, terraces and gullies drain directly to the Dniester, providing major potential for runoff reduction and landslide risk mitigation.
- **Social vulnerability:** Adjacent settlements have very high CVI, benefiting directly from slope stabilization and erosion control.

**Priority EbA entry points**
- Stabilization of steep slopes through assisted forest regeneration and deep-rooted vegetation.
- Restoration of grassland–shrub mosaics on erosion-prone terraces.
- Buffer strips along gullies and small tributaries feeding the Dniester.
- Collaborative grazing management to prevent overuse of semi-natural pastures.

**Pathway to PA / OECM / Emerald strengthening**
- Strengthens functional connectivity between Poiana Curătura and Climăuți de Jos within the Emerald framework.
- OECM designation suitable for communal lands that maintain slope stability and ecological continuity along the Dniester valley.

### 8. EbA Opportunity Area: Rezina Nistru Terraces (ID 408)

**Location:** Eastern Moldova, along the Dniester River near Rezina.

**Approximate indicative area:** 6,000 ha (buffer-derived).

**Key communities:** Rural settlements within Rezina district, located on river terraces and valley margins of the Dniester.

**Key climate risks:** Slope instability, erosion, altered runoff, wetland drying, drought exposure.

**Overlap with conservation designations**
- Emerald / landscape reserve Țâpova (and Saharna too) as central terrace and slope complex.
- Extensive unprotected forest, shrubland and riparian elements along the valley.
- Over 30 wetland or wet-soil depressions embedded within agricultural landscapes.

**Key EbA values (climate, hydrology, vulnerability)**
- **Drought refugia:** Limited, but local moisture pockets persist in shaded ravines and wet depressions.
- **Hydrological relevance:** Very high; multiple side valleys, terraces and floodplain remnants provide strong potential for runoff reduction and erosion control.
- Social vulnerability: Communities along the terraces show very high CVI, facing direct risks from slope instability, erosion and altered runoff.

**Priority EbA entry points**

- Riparian and slope-foot restoration using deep-rooted trees and shrubs.
- Reconnection of fragmented forest strips along the valley edge.
- Restoration of wetland pockets in depressions and abandoned floodplain fields.
- Shelterbelts and contour planting on exposed terraces to stabilise soils.

**Pathway to PA / OECM / Emerald strengthening**
- Opportunity to extend the existing landscape reserve(s) to incorporate ecologically functional slope and terrace units.
- High suitability for OECM designation of communal or private lands managed to maintain slope stability, hydrological function and valley-scale connectivity.

### 9. EbA Opportunity Area: Unguri–Holoșnița Riparian Plateau (ID 98)

**Location:** Northern Moldova, Ocnita District, along the Dniester River.

**Approximate indicative area:** 7,680 ha (buffer-derived).

**Key communities:** Rural settlements within Soroca district, located along the Dniester valley, canyons and adjacent plateaus.

**Key climate risks:** Hydrological alteration, drought, slope erosion, microrefugia degradation, invasive species expansion.

**Overlap with conservation designations**
- Unguri–Holoșnița Ramsar Site (15,553 ha).
- Emerald Network site Unguri–Holoșnița (MD0000005) (11,180 ha).
- Adjacent to canyon reserves Rudi–Arionești and Cosăuți.
- Zone 98 contains the functional natural habitats within a larger polygon that includes extensive farmland.

**Key EbA values (climate, hydrology, vulnerability)**
- **Drought refugia:** Strong refugia signal; field observations confirm persistent humidity and old-growth structural elements even in dry summers.
- **Hydrological relevance:** Intersects 62 river and wetland nodes, including seepage zones, ponds and canyon springs offering multiple NbS entry points.
- **Social vulnerability:** Villages have medium CVI but are highly exposed to drought, erosion and water scarcity; EbA supports critical flood-buffering and microclimate regulation along the Dniester.

**Priority EbA entry points**
- Hydrological rehabilitation in small canyons and river branches (removal of artificial barriers, bank stabilization, re-naturalization of ponds).
- Control of invasive alien species.
- Restoration of native riparian belts.
- Reconnection of stepping-stones and islets inside and outside the Emerald polygon.
- Protection of canyon microrefugia through no-intervention buffer zones.

- Community-supported grassland and meadow restoration.
- Micro-corridors linking canyon habitats with forest blocks of Stîncele Nistrene and Rudi-Arionești.

**Pathway to PA / OECM / Emerald strengthening**

- High-quality canyon and riparian habitats suitable for OECM designation, complementing the Emerald site.
- Hydrological and invasive-species restoration would increase the ecological integrity of current PA boundaries, which include large non-natural areas.
- Acts as a strategic ecological corridor linking Stîncele Nistrene, Cosăuți and Rudi-Arionești, with strong transboundary relevance for cooperation with Ukraine.

### 10. EbA Opportunity Area: Codrii Tigheci Forest System (ID 196)

**Location:** Southern Moldova, Leova and Cantemir districts (expanding into Cahul district).

**Approximate indicative area:** 7,540 ha (buffer-derived).

**Key communities:** Rural settlements within Cantemir district, adjacent to forest edges and erosion-prone agricultural land.

**Key climate risks:** Drought, forest edge fragmentation, soil erosion, reduced water retention, agricultural exposure.

**Overlap with conservation designations**

- Emerald Network site "Codrii Tigheciului" (part of it is the Codrii Tigheci Landscape Reserve) – 6,482 ha.
- Adjacent to Emerald site Lunca Antonești.
- Near Emerald site Lacurile Prutului de Jos.
- Several high-value core forest blocks extend beyond current PA boundaries.

**Key EbA values (climate, hydrology, vulnerability)**

- **Drought refugia:** No landscape-scale refugia, but local microtopography creates moisture pockets and temperature buffering.
- **Hydrological relevance:** Numerous streams and valley systems with strong potential for erosion reduction, runoff regulation and slope stabilization.
- **Social vulnerability:** Surrounding settlements show high CVI, highlighting the importance of forest-based EbA in a drought- and erosion-prone region.

**Priority EbA entry points**

- Reconnection of unprotected stepping-stone patches and forest islets with the main massif.
- Assisted regeneration and edge repair in degraded forest margins.
- Riparian buffer restoration in erosion-prone ravines and tributaries.
- Vegetation strips along agricultural interfaces to reduce runoff and soil loss.
- Targeted control of invasive woody species.

**Pathway to PA / OECM / Emerald strengthening**

- Peripheral forest blocks suitable for OECM designation.
- Clear ecological basis for extending or complementing the Codrii Tigheciului area.
- Restoration actions would significantly strengthen structural and functional connectivity across the wider southwestern forest landscape.

## Annex 6. Selected EbA/NbS-related projects in Moldova (both national and regional)

A. Ongoing and currently run projects

| N/o | Project Name / Title | Donor & Implementor(s) | Budget | Period | Short Description |
|---|---|---|---|---|---|
| 1. | **GCF – National Adaptation Plan (NAP-2) with EbA Mainstreaming** | Donor: GCF; Implementor: UNDP + Gov. | $3 million | 2020–2026 | Integrates EbA/NbS into national policies: forest, water, agriculture, biodiversity adaptation measures; strengthens national institutions. |
| 2. | **EU4Environment – Result 4 (Ecosystem Services and Livelihoods)** (Armenia, Georgia, Moldova, and Ukraine) | Donor: EU<br><br>Implementor: World Bank | Regional €20 million | 2021–2026 | NbS planning through HCVF assessment, forest typology, community forest planning, Emerald MP development, National Forest Programme support, ecosystem-service integration. |
| 3. | **GEF–UNDP High Nature Value Wetlands in the Prut Basin** | Donor: GEF<br><br>Implementor: UNDP + MoE/NOEPI | $0.9 million | 2022–2027 | Wetland restoration in Beleu–Manta and Camenca; ecological flow reactivation; reedbed management; hydrological and biodiversity monitoring; PA strengthening. |
| 4. | **Enabling a Policy Environment for Integrated Natural Resources Management and Implementation of an Integrated Approach to Achieve Land Degradation Neutrality in Moldova** | Donor: GEF<br><br>Implementor: FAO<br><br>National Partners: MoE (Moldsilva, LPAs, NAAM) | $3.5 million (GEF grant) | 2022-2026 | Supports Moldova to achieve Land Degradation Neutrality (LDN) by strengthening national policies and capacity for integrated natural resources management (INRM). Focuses on sustainable land-use planning, agroforestry and shelterbelt rehabilitation, erosion control, restoration of degraded lands, monitoring & MRV systems, and mainstreaming ecosystem-based approaches into agriculture and land-use governance. \| |
| 5. | **Modernizing forest governance in Moldova for sustainable afforestation and EU alignment** | Donor: AFD<br><br>Implementor: MoE NOEPI, MoF | €40 million (loan) + 1.2 million grant | 2023-2028 | Modernization of key legislation governing forestry activities in Moldova. Assisting in MoE's restructuring of forest-related departments and public institutions overseen. |
| 6. | **EU4Environment Water & Data – NbS for Water Management** (Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine) | Donor: EU; Implementors: AFD/EIB + partners | Regional €12 million | 2023–2026 | NbS catalogue, riparian forest restoration pilots, river restoration options for climate adaptation, water retention and biodiversity. |
| 7. | **LIFE RENATA project: Roadmap for the alignment of Emerald network establishment and management to Natura 2000 standards in Moldova** | Donor: EU<br><br>Implementor: MoE & Moldsilva/ICAS & EcoContact & LEVER Development Consultants (Greece) | €989,664 | 2024-2026 | Advancing the establishment and management of the Emerald Network of PA system and to move closer to the EU standards for the conservation of species and habitats. |

| | | | | | |
|---|---|---|---|---|---|
| 8. | **GEF–UNDP Biodiversity Finance (GBF implementation)** | Donor: GEF; Implementor: UNDP | $1.5 million (regional) | 2024–2028 | Supports financing frameworks for biodiversity and ecosystem services, including NbS and EbA investments aligned with NBSAP & GBF targets. |
| 9. | **Moldova Forest Development Programme (FDP)** | Donor: European Investment Bank<br><br>Implementor: MoE / NOIEP | €200 million (loan) from EIB + 75 million from the GoM | 2024-2026 (Phase I) 2026-2028 (Phase II) | It will support the modernisation of the forestry sector in Moldova through investments aiming to enhance forest governance and regulatory framework, strengthen the institutional capacities, infrastructure and equipment base. Also to reinforce the production capacity of forest reproductive material and focus on the restoration and rehabilitation of about 63,000 ha degraded lands and forests. |
| 10. | **Advancing Climate Resilience and Women's Empowerment in Moldova** | Donor: Government of Canada<br><br>Implementors: UNDP / UNWOMEN & MoE, MAFI, MLSP | $4,5 million | 2025-2029 | Increasing climate resilience and gender equality in Moldova through sustainable management of forests, pastures and agricultural resources, together with the economic empowerment of women. |
| 11. | **WB/REMAP – Restoring Ecosystems for Marine Pollution Prevention (Dniester Basin)** | Donor: GEF8;<br><br>Implementor: MoE / NOIEP guided by the World Bank | $7.9 million (GEF grant) | 2025–2030 | Large-scale NbS/EbA interventions for wetland/river restoration, pollution reduction, riparian forest rehabilitation, community engagement & climate resilience in the Dniester basin and subsequently Black Sea. |
| 12. | **Dniester SAP Implementation Project (Phase II) – "Strengthening Cross-Border Cooperation and IWRM in the Dniester Basin through SAP Implementation"[10]** (Moldova and Ukraine) | Implementing Agency: UNDP<br><br>Executing Agency: OSCE<br><br>Partners: Governments of Moldova & Ukraine; UNECE | TBD (new GEF envelope; not yet publicly disclosed) | 2025–2030 | Implements SAP actions: basin governance, climate-informed water management, pollution control, hydrological monitoring, biodiversity protection, drought/flood NbS, operationalizing the Dniester Commission. |
| 13. | **Blueing the Black Sea (BBSEA) – Regional Pollution Reduction & Blue Economy Initiative** (Georgia, Moldova, Türkiye, and Ukraine) | Donor: GEF<br><br>Implementors: UNOPS (main implementing agency); World Bank (technical partner); BSEC Secretariat (regional coordination) | $6.39 million | 2025-2028 | Regional project reducing marine/land-based pollution, promoting NbS, supporting innovation grants, strengthening governance, and enhancing regional coordination among Moldova, Ukraine, Georgia, Türkiye, Romania, Bulgaria. |
| 14. | **Climate-Informed Management of the** | Donor: UNDP + UNECE/OSCE | $3-4 million (regional) | 2025–2028 | Climate-informed basin management, transboundary early warning, water & ecosystem |

[10] This is the second project, a continuation / follow-on of the implemented project "Enabling Transboundary Cooperation and Integrated Water Resources Management in the Dniester River Basin" (GEF ID 9359 / PIMS 5269), period 2017–2021 (finalization into 2022) (see below).

| | | | | | |
|---|---|---|---|---|---|
| | **Dniester (Moldova–Ukraine)** | Implementors: MoE + UA partners | | | restoration planning; NbS for flood/drought management. |

B. Implemented Projects (Last 5–10 Years)

| N/o | Project Name / Title | Donor & Implementor(s) | Budget | Period | Short Description |
|---|---|---|---|---|---|
| **1.** | **Moldova Soil Conservation Project (MSCP)** | Donor: WB + PCF (carbon finance); Implementor: Moldsilva | $25 million | 2002–2015 (long-term effects continue) | Large-scale afforestation of 20,000 ha degraded land; erosion control, soil carbon sequestration (3.6–4.3 Mt $CO_2$), community forest planting. |
| **2.** | **GEF Small Grants Programme (SGP) – NbS/EbA Portfolio** | Donor: GEF; Implementor: UNDP | >250 micro-projects; typical grants $25–50k | 2010–present | Community-level NbS/EbA: shelterbelts, wetland micro-restoration, riverbank stabilization, agro-ecological practices, biodiversity-friendly farming. |
| **3.** | **MAC-P: Moldova Agriculture Competitiveness Project** | Donor: World Bank<br><br>Implementor: World Bank & MoF / MAFI | $83.94 million | 2012-2025 | It aimed at enhancing the competitiveness of the agro-food sector by supporting the modernization of the food safety management system, facilitating market access for farmers, and mainstreaming agro-environmental and sustainable land management practices. |
| **4.** | **UNECE/OSCE Pilot – Ecosystem-based Flood Management (Lower Dniester)** | Donor: UNECE/OSCE; Implementor: National partners | $0.3–0.5 million | 2015–2016 | Pilot wetland reconnection, shallow reservoirs & island creation for floodplain regeneration, EbA-based flood regulation. |
| **5.** | **EbA in the Lower Dniester Ramsar Site** | Donor: ADA; Implementors: Biotica + EcoContact | 1.5 million | 2017–2021 | EbA for riparian communities: climate-resilient water supply, riparian forest strips, wetland micro-restoration, community capacity & climate risk reduction. |
| **6.** | **"Enabling Transboundary Cooperation and Integrated Water Resources Management in the Dniester River Basin" (Phase I)** | GEF | $1.95 million (GEF grant)<br><br>co-financing (Moldova, Ukraine, OSCE, UNECE) | 2017–2021 (finalization into 2022) | Developed Strategic Action Programme (SAP); strengthened basin governance, monitoring, IWRM planning, and ecosystem-based management foundations. |
| **7.** | **GEF Dniester IWRM & Adaptation Project** | Donor: GEF; Implementors: UNDP + OSCE + UNECE | $5 million | 2017–2021 | Basin-wide adaptation strategy, wetland restoration planning, ecosystem-based flood management, climate-resilient water governance between Moldova & Ukraine. |
| **8.** | **EU4Climate (regional –** Armenia, Azerbaijan, Georgia, Moldova, and Ukraine) | Donor: EU<br><br>Implementor: UNDP | €1,082,838 | 2019-2023 | The project goal was to contribute to climate change mitigation and adaptation and to the development towards a low-emissions and climate-resilient economy in line with the 2015 Paris Agreement on Climate Change in all six EU EaP countries. |
| **9.** | **EU4Environment – Water Resources and** | Donor: EU Implementor(s): MoE, UBA, ADA, | €12.75 million | 2021-2024 | It aimed to improve people's wellbeing in the EU's Eastern partner countries and enabling their green |

| | | | | | |
|---|---|---|---|---|---|
| | **Environmental Data** (Armenia, Azerbaijan, Georgia, Moldova, and Ukraine) | OiEau, OECD, UNECE | | | transformation in line with the European Green Deal and the Sustainable Development Goals (SDGs). |

## Annex 7. Climate Impact Chain (CIC)

This Climate Impact Chain (CIC) synthesises information presented in this report on how key climate hazards in Moldova interact with land-use patterns, ecosystem degradation, and governance constraints to generate risks to water availability, agricultural productivity, and ecosystem buffering functions.

The CIC is used as an internal analytical framework to consolidate findings from field missions, spatial analysis, and thematic chapters, and to make explicit the causal links between observed degradation processes and priority EbA entry points identified in the site assessments. It does not represent a standalone or quantitative risk model, but serves to support prioritisation and justification of EbA measures proposed in this report.

~~CIC linking climate hazards, exposure, sensitivity factors, adaptive-capacity constraints, and priority risks in the Republic of Moldova~~.

**Methodological note:**

The CIC was developed through expert synthesis based on:

- review of national climate, water, forestry, biodiversity, and land-use policy documents;
- analysis of spatial datasets;
- targeted field missions conducted between September–November 2025 (see Travel Memos);
- semi-structured discussions with local authorities, protected area managers, foresters, and landowners;
- consolidation of findings across thematic chapters of this report.

The CIC was not developed through a formal participatory workshop, but represents an analytical framework integrating empirical field observations and stakeholder input with scientific literature and expert judgement.

| **Climate hazards:** | | |
|---|---|---|
| **Climate hazard** | **Observed / projected trend** | **Spatial relevance** |
| Increased summer drought | Longer dry spells, soil moisture deficit | Nationwide, strongest in south and centre |
| Increased rainfall intensity | More episodic heavy rain | Hilly and dissected terrain |
| Reduced baseflow | Drying of small rivers and springs | Small catchments, headwaters |
| Hydrological instability (incl. hydropeaking) | Altered flow regime, rapid fluctuations | Dniester and regulated rivers |
| Heat stress | Higher summer maxima | Urban and agricultural areas |

| **Exposure** | | |
|---|---|---|
| **Exposure unit** | **Description** | **EbA relevance** |
| Rainfed agriculture | Small and medium farms | Highly climate-sensitive livelihoods |
| Rural communities | Villages relying on local water & land | Direct human vulnerability |
| Forest belts and communal forests | Outside strict PA network | Key buffering ecosystems |

| | | |
|---|---|---|
| Wetlands, floodplains, ravines | Degraded or disconnected | High adaptation potential |

| **Sensitivity and degradation factors** | |
|---|---|
| **Factor** | **Effect on system** |
| Soil erosion and compaction | Reduced infiltration, runoff dominance |
| Gully expansion and slope instability | Land loss, sediment mobilisation |
| Wetland drainage and disconnection | Loss of water retention |
| Reduced baseflow and drying springs | Chronic water scarcity |
| Shelterbelt loss and simplified landscapes | Increased wind and heat stress |
| Forest regeneration limits (ungulate pressure) | Reduced resilience of forests |
| Ecosystem fragmentation | Loss of connectivity and buffering |
| Invasive species spread | Reduced ecosystem function |
| Fragmented land management | Limits coordinated response |

| **Impact pathways** | |
|---|---|
| **Pathway** | **Description** |
| Drought → reduced soil moisture → yield instability | Affects rainfed farming and food security |
| Intense rain → erosion → sedimentation | Degrades rivers, wetlands, reservoirs |
| Hydrological alteration → reduced baseflow | Impacts households, livestock, ecosystems |
| Reduced baseflow → water scarcity | |
| Heat + fragmentation → ecosystem stress | Weakens buffering capacity |
| Degradation + fragmentation → loss of buffering | Increases exposure to extremes |
| Accumulated degradation → higher intervention cost | Limits feasibility of adaptation |

| **Priority climate-related risks** | |
|---|---|
| **Risk** | **Description** |
| Reduced yields and food security | Increasing instability of rainfed agriculture |
| Water insecurity | Seasonal and chronic shortages |
| Loss of ecosystem buffering capacity | Reduced regulation of floods, heat, and drought |

| **Adaptive capacity constraints** | |
|---|---|
| **Constraint** | **Description** |
| Outward migration and labour scarcity | Reduce land management capacity |
| Energy dependency | Increases vulnerability of rural systems |
| Ageing water and land-use infrastructure | Limits system reliability |
| Fragmented land tenure | Constrains landscape-scale EbA measures |
| Weak LPA capacity | Limits planning, enforcement, and maintenance |
| Limited and project-based finance | Increases long-term adaptation costs |

| **EbA entry points derived from dominant climate risk pathways** | | |
|---|---|---|
| **Dominant risk pathway** | **EbA entry point** | **Adaptation function** |
| Drought, soil moisture deficit, yield instability | Shelterbelts, agroforestry, assisted natural regeneration (ANR) | Microclimate buffering, soil moisture retention |

| | | |
|---|---|---|
| Intense rainfall, erosion, sedimentation | Ravine stabilisation, riparian buffers, slope revegetation | Reduced runoff, sediment control |
| Reduced baseflow and water scarcity | Floodplain reconnection, wetland restoration | Water retention, baseflow support |
| Heat stress and ecosystem fragmentation | Forest connectivity, green corridors | Local cooling, resilience of ecosystems |
| Degradation-driven high adaptation costs | Early-stage low-input EbA (ANR, protection, zoning) | Cost-effective risk reduction |