



Development of the Strategic Action Plan for Climate Change Adaptation and Resilience-Enhancing Forest Management in Ecological Corridors for Large Carnivores

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Interreg
Danube Region



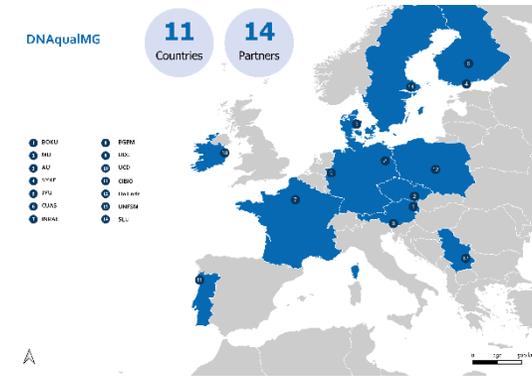
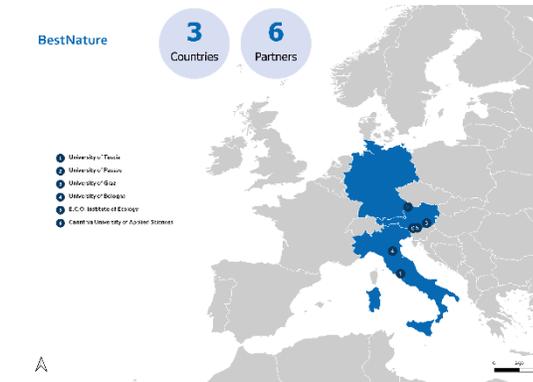
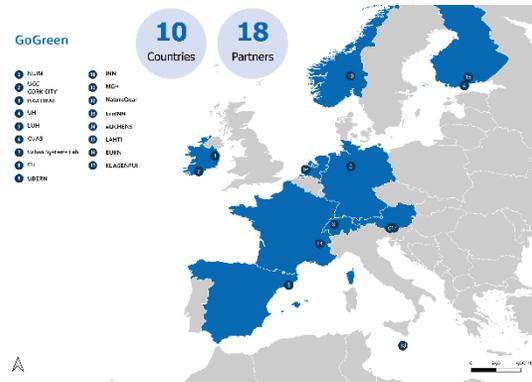
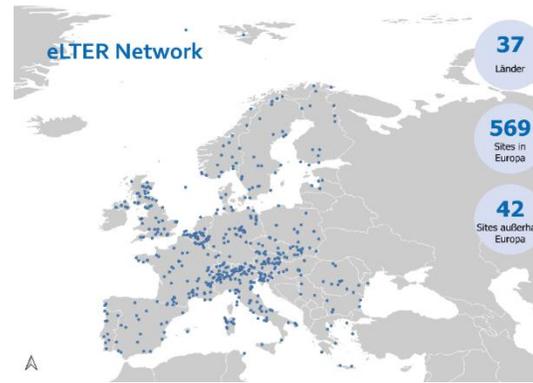
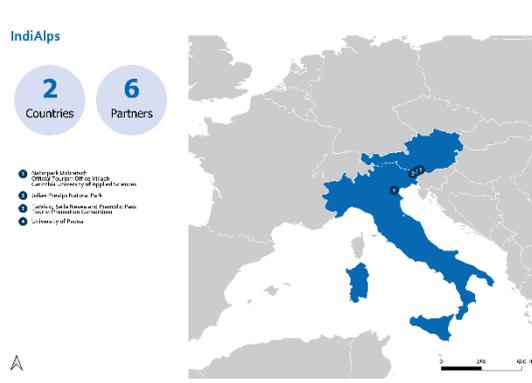
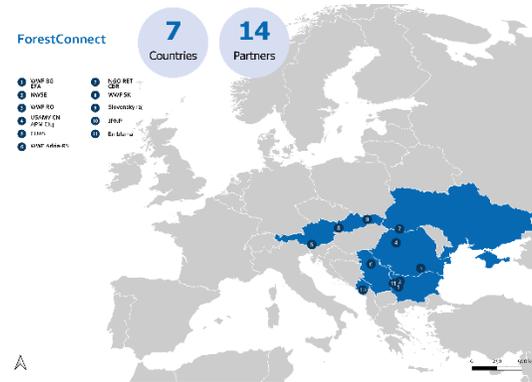
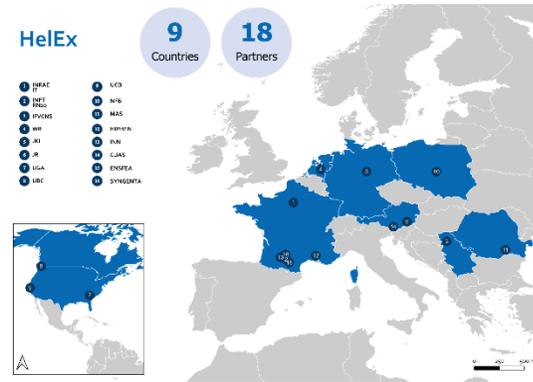
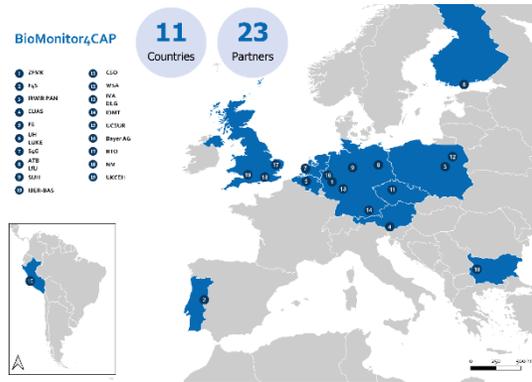
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From Conservation to Impact.

The letters 'MGA' are rendered in a large, 3D, light-brown font, standing on a rocky shore. The background is a scenic view of a turquoise lake with a forested mountain in the distance. In the foreground, there are some dry, yellowish reeds on the left and some bare branches on the right. The overall scene is bright and clear, suggesting a sunny day.

MGA

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ForestConnect

Towards a Climate-smart Forest Connectivity for Large Carnivores in the Balkan-Carpathian-Dinaric Region

Interreg
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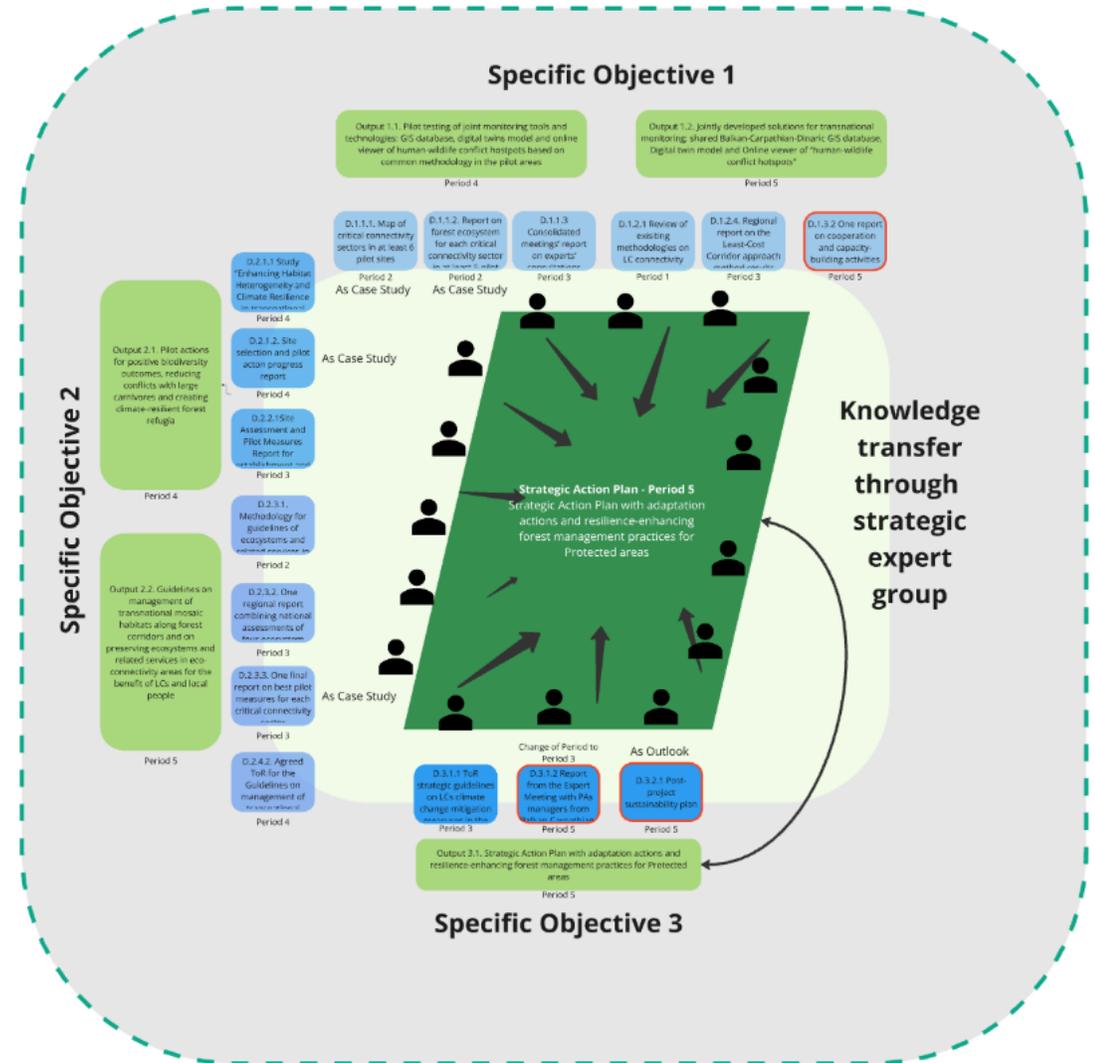
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Strategic Action Plan

Strategic Action Plan for Climate Change Adaptation and Resilience-Enhancing Forest Management in Ecological Corridors for Large Carnivores (Output 3.1.)

Subtitle: Practical Recommendations for Protected Area/Land Managers in the Carpathian, Balkan, and Dinaric Regions



Participative processes structure:

1. Initial stage of the Strategic Action Plan development:

- Workshop in February 2025 in Villach, 50+ participants
- Involvement of protected area managers from Danube region, survey on current measures, future plans, and needs, additional meetings

2. Developing the actions:

- review of survey responses from protected area managers, past international action plan, workshop in Villach, literature review
- Strategic expert group, 4 working groups,
selection and development of actions

3. Involvement of interested stakeholders, commenting on actions with various feedback loops

- National meetings in project partner countries
- Involving other interested stakeholders

Working Group Name
Forest Management
Awareness & Communication
Human-Wildlife Conflicts
Ecological Corridors

Strategic Action Plan with Adaptation Actions and Climate Resilience-Enhancing Forest Management Practices for Protected Areas

Improving Ecological Corridors
and Habitats for Movement of
Large Carnivores in the
Carpathian, Dinaric and Balkan
Mountains

Infrastructure and Ecological Connectivity

- Action 1:** Ensuring Safe Wildlife Movement in Connected Habitats
- Action 2:** Maintaining Ecological Connectivity through Wildlife Corridors and Infrastructure Planning and Adaptation
- Action 3:** Measures to Prevent and Reduce Wildlife Mortality on Roads and Railways
- Action 4:** Wildlife Monitoring in Ecological Corridors

Habitat Protection and Management

- Action 5:** Quiet Zone Conservation Through Reducing Human Disturbance
- Action 6:** Planting Fruiting Trees and Shrubs to Secure Seasonal Food Sources for a Resilient Ecosystem
- Action 7:** Restoration and Regeneration of Forests Affected by Disturbances
- Action 8:** Strategic Fencing in Wildlife Movement Corridors

Management Aspects for Climate Resilience

- Action 9:** Enhancing Forest Structural Diversity for Climate Resilience
- Action 10:** Adjusting Grazing Intensity to Climate and Vegetation Conditions
- Action 11:** Integrated Management of Bark Beetle Outbreaks in Coniferous Forest Ecosystems
- Action 12:** Sharing of Climate-Resilient Forest and Pasture Management Practices

Human-Wildlife Coexistence

- Action 13:** Monitoring and Early Warning of Human-Wildlife Conflicts
- Action 14:** Protocol for Institutional Response to Problem Wildlife Behavior
- Action 15:** Fostering Local Partnerships for Sustainable Conservation
- Action 16:** Empowering Conservation Through Evidence-Based Awareness Raising
- Action 17:** Responsible Citizen and Media Interactions for Human-Wildlife Coexistence

Ensuring Safe Wildlife Movement in Connected Habitats

Designing, implementing, and integrating ecological connectivity measures play a critical role in mitigating the barrier effects caused by roads, railways and other fenced areas. These measures will help preserve ecological connectivity, minimize wildlife-traffic collisions, and ensure the long-term viability of species that require extensive home ranges, such as bears and wolves. Integrating wildlife protection measures into infrastructure planning and development fosters coexistence between human and nature, while advancing biodiversity conservation efforts. Effects of measures can be modeled under current and predicted climate scenarios.

Objectives

- Maintain genetic diversity by facilitating dispersal and gene flow between wildlife populations.
- Ensure safe movement of wildlife across landscapes.
- Reduce wildlife-traffic collisions and improve safety for both wildlife and humans.
- Support transboundary conservation efforts, particularly in regions with shared wildlife populations, such as the Carpathians, Dinarides, and Balkans.
- Align with EU biodiversity goals, such as the Habitats Directive, the Nature Restoration Regulation, and the EU Green Infrastructure Strategy, which emphasize ecological corridors and species conservation.



Key Activities / Implementation Steps

- 1. Identification of Priority Areas:** Use habitat modelling, wildlife-traffic collisions data, and species movement studies to identify potential conflict points and barriers for wildlife. Prioritize areas with high incidence of collisions and known movement routes for large mammals and other species, considering that when measures are planned based on likely future scenarios, ecological connectivity can be preserved in a changing climate.
- 2. Design and Construction of Wildlife-Friendly Measures:** Plan and construct ecological connectivity measures in new development projects. Implement wildlife-friendly features, such as water features, native trees and shrubs, and fencing to guide wildlife to areas where human-wildlife conflicts could be avoided. Ensure that implemented measures are designed to accommodate the target species and local ecological conditions.
- 3. Monitoring and Evaluation:** Monitor the use of implemented measures by using camera traps, track surveys, and automated counters. Evaluate the effectiveness of implemented measures for improving connectivity.
- 4. Community Awareness Raising:** Conduct public awareness raising campaigns to educate both locals and visitors about the importance of implemented measures in areas frequented by wildlife. Promote social connectivity, helping to reduce human-wildlife conflicts.
- 5. Public Engagement:** Involve local communities in the planning and implementation of connectivity measures.



Required Resources

Personnel: Engineers, wildlife ecologists, hunters, transportation planners, and local communities for design, construction, and monitoring.

Materials: Construction materials for ecological connectivity; monitoring equipment such as camera traps and automated counters.

Funding: EU Green Infrastructure funds, national transportation budgets, and private sector contributions.

Technical Resources: Technical design guidelines for wildlife crossings, habitat connectivity models and ecological data.

Wildlife Monitoring in Ecological Corridors

Establishing a systematic wildlife monitoring programme in ecological corridors is essential for tracking large carnivores and other target species. This action focuses on monitoring species presence, seasonal movements, population trends and structure, and mortality (including wildlife-traffic collisions) while evaluating the effectiveness of mitigation measures like wildlife crossings and fencing. The collected data will inform adaptive management and conservation planning, ensuring the sustained functionality of ecological corridors and enhancing the resilience of wildlife populations to the impacts of climate change.

Objectives

- Monitor wildlife presence, abundance, and seasonal movement patterns in corridor areas.
- Detect and report mortality events, particularly wildlife-traffic collisions, to identify high-risk areas.
- Evaluate the effectiveness of mitigation measures, such as wildlife crossings and fencing.
- Support adaptive management and conservation planning by providing reliable data, including on genetic diversity.
- Strengthen collaboration through shared data and reporting.



Key Activities / Implementation Steps

1. **Development of Monitoring Protocols:** Create standardized monitoring protocols tailored to the specific conditions of ecological corridors, target species, and selected modelling methods. When possible, use existing protocols that have already been prepared in other projects to strengthen analysis. Include methods for tracking species presence, movement, and mortality, e.g., wildlife-traffic collisions. Keep in mind that data collection and statistical design will affect the results of analysis. Consideration of the analysis in advance of data collection will guide the way data are collected in the field.
2. **Data collection:** Install wildlife camera traps, passive acoustic monitoring devices, GPS collars and automated counters. Targeted eDNA sampling may be performed according to the monitoring objectives. Use sand strips and field surveys to detect wildlife tracks, scat, and other signs of presence. Regularly maintain devices and perform data back-ups as part of a data management plan.
3. **Data Analysis:** Regularly analyze data on species distribution, movement patterns, and mortality events. Compile annual reports on species-specific trends and spatial distribution changes.
4. **Evaluation of Mitigation Measures:** Assess the usage and effectiveness of wildlife crossings, underpasses, overpasses, and fencing. Identify wildlife-traffic collision hotspots and recommend targeted interventions to reduce mortality. Documenting the measures makes the impact visible.
5. **Stakeholder Collaboration and Reporting:** Share monitoring results with wildlife and hunting authorities, protected area managers, transportation authorities, forestry agencies, and other stakeholders. Use findings to inform infrastructure planning and adaptive management strategies.
6. **Sharing Data Across Borders:** Uploading monitoring data onto biodiversity platforms such as CCIBIS and GBIF will provide access to key information for other institutions. This activity can improve cross-border collaboration to benefit large carnivore populations.



Required Resources

Personnel: Trained field staff for monitoring, data collection, analysis and reporting.

Materials: Wildlife trail cameras, GPS collars, automated counters, and AI-assisted image recognition software.

Funding: National and EU biodiversity funds, protected area budgets, and private sector contributions.

Technical Resources: Data management software, CCIBIS/GBIF, Data Storage, spatial and statistical analysis tools, and monitoring protocols.

Quiet Zone Conservation Through Reducing Human Disturbance

Establishing legally protected "quiet zones" within core wildlife habitats is intended to reduce human disturbances during sensitive periods like spring cub-rearing for bears. These zones should limit activities such as logging, hunting, berry and mushroom picking, off-trail tourism, off-road (motor)biking, and grazing near known dens. Creating quiet zone refuges helps mitigate human-wildlife conflicts, preserve key habitats, and enhance the stability and reproductive success of wildlife populations. Effective implementation relies on collaboration with local authorities, forest managers, rangers, and communities to ensure compliance and long-term success.

Objectives

- Reduce disturbances during critical life stages of target wildlife, such as periods of denning and cub-rearing.
- Minimize human-wildlife encounters and potential conflicts in sensitive areas.
- Maintain stable wildlife populations and support healthy reproductive success rates.
- Protect key habitats from degradation during sensitive periods.



Photo by: L. Schmalz

Photo by: B. Immerová

Photo by: E. Wiegele

Key Activities / Implementation Steps

1. **Identification and Mapping:** Identify and map priority quiet zones in core wildlife habitats using GPS data, den surveys, and camera trap monitoring. Use ecological data to determine the most critical areas for protection.
2. **Legal Protection and Regulation:** Establish legal protection status for quiet zones through management plans or other adequate legal frameworks. Implement seasonal restrictions on activities such as logging. Discourage off-trail tourism in protected areas. Close trails if they lead towards dens. Redirect grazing near known dens in other areas through providing incentives for these activities in other areas.
3. **Guidelines and Communication:** Develop and distribute guidelines to local authorities, forest managers, and tourism operators to ensure compliance with restrictions. Informational signage at zone boundaries can inform about the quiet zones.
4. **Community Engagement and Education:** Conduct outreach and education campaigns for local communities, visitors, and landowners to raise awareness about the importance of quiet zones. Train rangers and enforcement staff in monitoring and compliance procedures.
5. **Monitoring and Adaptive Management:** Monitor wildlife activity and disturbance levels using camera traps, ranger patrols, and community feedback to evaluate the effectiveness of quiet zones. Adjust zone boundaries or regulations based on ecological monitoring results and wildlife behavior patterns.



Photo by: M. Kröfel

Required Resources

Personnel: Rangers and law enforcement, wildlife ecologists, hunters, GIS specialists, tourism experts, and community outreach officers.

Materials: GPS units, camera traps, signage, and educational materials.

Funding: EU biodiversity and climate adaptation funds and national environmental funds.

Technical Resources: Digital tools for planning zones (GIS tools).

Protocol for Institutional Response to Problem Wildlife Behavior

Climate change, anthropogenic impacts, and the reduction of natural food resources are leading to increasingly frequent cases of large carnivores entering human settlements. These situations create a real risk to the life and health of people, as well as to domestic animals and wildlife. Institutional response to problem wildlife is already established in certain areas of the Balkans and could be replicated or adapted in other regions.

Objectives

- Support the development of protocols for coordination and response to wildlife habituated to human-related sources of food and lost fear of humans, ensuring effective protection of people and domestic animals across different countries and regions.
- Reduce response times to alerts of problem wildlife, to define clear roles and responsibilities of stakeholders and structures, and to establish a clear and consistent procedure for responding to received alerts.
- Implement a phased approach – from risk assessment to subsequent actions.
- Minimize the need for extreme measures through prevention and deterrence.



Key Activities / Implementation Steps

1. **Risk and Context Analysis:** Identify areas with an increased risk of human–wildlife conflicts (see Action 13).
2. **Establishment of Inter-institutional Structures:** Establish rapid response teams composed of representatives from the relevant responsible institutions as defined by legislation (e.g., laws on protected areas, biodiversity, hunting and wildlife management, use of weapons, and incident response). Teams should be organized on a regional basis according to Step 1, with clearly developed regulations and regular trainings.
3. **Development, Adoption, and Implementation of a Response Procedure/Protocol for Aversive Conditioning of Wildlife Approaching into Settlements.** The protocol should contain: Methods for receiving, registering, and verifying alerts, such as through a dedicated app or secure social media platform; team structure, decision-making procedures for specific actions, and necessary equipment and tools, including the use of deterrents or firearms; indicators for assessing the severity of the situation based on different types of animal behavior and corresponding types of response actions, including urgency (response timeframes); a sequence of steps to be taken by each institution in the different types of actions; communication channels between different team members; methods of documentation and accountability (standardized forms); outreach to communicate with the public and provide safety instructions to local residents.



Required Resources

Personnel: Trained field teams of experts – biologists, forest officers, veterinarians, hunting and firearms specialists, representatives of the Ministry of Interior and local authorities.

Materials: Vehicles, communication equipment, deterrence and safety equipment, immobilization equipment and medications, protective gear.

Technical Resources: Legal framework enabling response, clear communication channels, financial resources for training and equipment.

Responsible Citizen and Media Interactions for Human-Wildlife Coexistence

Promoting responsible media coverage of human-wildlife interactions is essential for reducing fear, polarization, and misinformation. Media significantly shapes public perception of wildlife. Collaborating with media outlets, journalists, and stakeholders can encourage informed, solution-oriented reporting that underscores principles of coexistence and highlights the ecological and climate-related factors influencing wildlife behavior.

Objectives

- Reduce fear and polarization in communities surrounding human-wildlife interactions.
- Address misinformation and deepfake videos with scientifically-based evidence.
- Promote awareness of human-wildlife coexistence strategies, including climate adaptation measures.
- Strengthen community resilience to wildlife movements altered by climate change.
- Encourage media professionals to communicate scientifically accurate and locally relevant information on wildlife and ecosystem dynamics.



Key Activities / Implementation Steps

1. **Media Mapping and Engagement:** Identify and map media outlets, especially local and regional platforms, that frequently cover human-wildlife conflicts. Establish partnerships with NGOs, research institutions, and wildlife departments to provide experts for interviews and fact-checking.
2. **Journalist Training and Workshops:** Conduct workshops and training sessions for journalists on the basics of ecology and climate science relevant to wildlife. Train journalists on responsible reporting practices, avoiding sensationalism, and using neutral, factual terms. Highlight coexistence strategies and community solutions to human-wildlife conflicts.
3. **Media Guidelines and Toolkits:** Develop a media guideline toolkit on climate-sensitive, responsible wildlife reporting. Include recommendations to avoid using sensational language (e.g., "monster"), graphic photos and videos, and misinformation, and instead focus on factual, solution-oriented reporting.
4. **Pilot Campaigns and Outreach:** Launch pilot campaigns in selected high-conflict areas, including social media outreach and community education through local media. Use storytelling and positive framing to highlight successful examples of coexistence and community-led solutions.
5. **Monitoring and Feedback:** Monitor media coverage for shifts in tone, accuracy, and focus on coexistence and climate-linked issues. Collect community feedback on the impact of media coverage and adjust strategies accordingly.



Required Resources

Personnel: Trainers, communication specialists, wildlife and climate experts, and media representatives.

Materials: Media guideline toolkits, training materials, and monitoring tools for media analysis.

Funding: National and international grants, NGO partnerships, and private sector sponsorships.

Technical Resources: Media monitoring software, training platforms, and communication tools.

Section 1: Infrastructure and Ecological connectivity

	Conceptualization and Planning (e.g. Month 1 - Year 1)					Early Implementation (e.g. Year 2-4)			Late Implementation (e.g. Year 5-8)			
Action 1 Ensuring Safe Wildlife Movement in Connected Habitats	Identify priority areas											
	Wildlife-friendly plantings											
	Wildlife-friendly construction											
	Public engagement								Monitoring and evaluation			
Action 2 Maintaining Ecological Connectivity through Wildlife Corridors and Infrastructure Planning and Adaptation	Identify crossing points											
	Wildlife-friendly plantings & vegetation management											
	Collaborate with stakeholders											
	Integrate structures in new construction								Monitoring and evaluation			
	Community engagement											
Action 3 Measures to Prevent and Reduce Wildlife Mortality on Roads and Railways	Identify collision hotspots											
	Install deterrents											
	Manage habitat and transportation visibility											
	Install warning systems											
						Monitoring and evaluation						
Action 4 Wildlife Monitoring in Ecological Corridors	Develop monitoring protocols											
	Data collection											
	Data analysis and annual reports								Evaluation of measures			
	Stakeholder collaboration											
						Data sharing						

Potential Funding Sources

A range of funding instruments is available for conservation and restoration initiatives. The following overview highlights common sources and their typical applications (see Underwood et al., 2025). In many cases, small-scale local funding may be the most practical option; national and local organisations can provide guidance on suitable schemes.

EU and National Public Funds:

These include grant programmes for conservation, land acquisition, restoration, and management. Relevant instruments span the LIFE Programme, Cohesion Policy funds (such as Interreg, the European Regional Development Fund, and the Cohesion Fund), as well as measures and eco-schemes under the Common Agricultural Policy. Such programmes are particularly suited to initiating or expanding restoration and planning efforts, typically require co-funding (around 50–100%), and involve defined administrative procedures.

Private Finance and User-Pays Mechanisms:

This category covers investor-backed approaches and revenue models linked to conservation outcomes. It includes user-pays mechanisms in protected areas (entrance fees, concessions, licenses), payments for ecosystem services, green and resilience bonds, debt-for-nature swaps, blended finance structures that combine public grants with private loans or guarantees, and subsidy frameworks aligned with nature-positive results. These mechanisms are especially relevant for projects with measurable outcomes or predictable cash flows, can provide upfront capital while reducing financial risk, and help secure long-term operational funding.

For further breakdown of funding options, see:

- LIFE - European Climate, Infrastructure and Environment Executive Agency. https://cinea.ec.europa.eu/programmes/life_en (2026, February 1).
- Inforegio - EU Regional and urban development. https://ec.europa.eu/regional_policy/home_en (2026, February 1).
- Programmes - Interreg EU. <https://interreg.eu/programmes/> (2026, February 1).
- CAP overview - Agriculture and rural development - European Commission. https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview_en (2026, February 1).

The following overview highlights common sources and their typical applications. For a more detailed explanation see Underwood et al. (2025).



Existing Strategies and Policies

The ForestConnect Strategic Action Plan is embedded within existing European and international policy frameworks addressing biodiversity conservation, ecological connectivity, climate adaptation, and human–wildlife coexistence. ForestConnect operationalises and complements these frameworks by translating strategic objectives into concrete, site-level management actions for protected areas and their surrounding landscapes.

The **EU Habitats Directive (92/43/EEC)** further underpins ForestConnect actions by requiring the maintenance or restoration of favourable conservation status for species of Community interest and the ecological coherence of the Natura 2000 network. Measures proposed within the SAP support the Directive's objectives to reduce fragmentation and improve habitat functionality (European Union, 1992).

At the European level, the **EU Biodiversity Strategy for 2030** provides a key reference framework by calling for the establishment of a coherent Trans-European Nature Network and the restoration of degraded ecosystems, with particular emphasis on ecological corridors and landscape permeability. These objectives directly align with ForestConnect's focus on improving forest connectivity for large carnivores and maintaining functional movement pathways under changing climatic conditions (European Commission, 2020).

Climate-related actions within the SAP are consistent with the **EU Strategy on Adaptation to Climate Change**, which emphasises ecosystem-based adaptation and the strengthening of ecosystem resilience as key responses to climate impacts (European Commission, 2021).

The **Nature Restoration Regulation** establishes legally binding targets for the large-scale restoration of degraded ecosystems across the European Union, including forests and connected landscapes that are critical for biodiversity and climate resilience. The Regulation explicitly recognises the importance of restoring ecological connectivity, improving habitat quality, and enhancing the functionality of ecological corridors as part of achieving favourable conservation outcomes (European Commission, 2025).

The ForestConnect Strategic Action Plan functions as an implementation-oriented interface between existing strategies and on-the-ground management. By aligning with established biodiversity, climate, infrastructure, and coexistence policies, it strengthens policy coherence while supporting protected area managers in applying climate-smart, connectivity-focused measures across the Balkan–Carpathian–Dinaric region and beyond.



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ForestConnect project on climate-smart forest connectivity for large carnivores in the Balkan-Carpathian-Dinaric region

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Management of
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