



**Research, Assessment, and
Development of Documents
on Biodiversity, the Impact
of Climate Change on
Biodiversity, Habitat
Restoration, and Long-Term
Habitat Management**



Impact of Climate on Biodiversity

Author: SRD Institute
Publisher: EC Ma Ndryshe
Rr. Fehmi Lladrovci No. 67, Prizren,
Rr. Xhemajl Mustafa 9/1 LL-4 No. 7
www.ecmandryshe.org
info@ecmandryshe.org
029 222 771

The report “Impact of Climate on Biodiversity” was produced within the framework of the project “Empowering Environmental Civil Society Organizations in Kosovo (EECSOK)”, supported by the Swedish Embassy in Pristina and implemented by the Community Development Fund – CDF. The content and views presented herein do not represent the official position of the donors.



2025

EXECUTIVE SUMMARY

This project “Research, assessment, and development of documents on biodiversity, the impact of climate change on biodiversity, habitat restoration, and long-term habitat management” offers an interdisciplinary approach by integrating spatial planning, legal frameworks, and ecological expertise alongside qualitative, scientific analysis. By combining knowledge from various fields, the aim is to create a comprehensive understanding of biodiversity challenges. The project emphasizes the importance of collaboration among environmental science, policy, and spatial design, creating a foundation for adaptive management strategies informed by both ecological data and spatial dynamics. This ensures that future actions are grounded in a well-informed, comprehensive perspective.

The project aims to identify and map key biodiversity areas at risk, focusing on Prizren, Suharekë, and the Sharr Mountains. Through field assessments, GIS data, spatial maps, spatial ecology analyses, and existing management plan reviews, critical habitats will be identified. These will be compared with historical and current climate patterns to predict future ecological changes and assess the impact of climate variability on biodiversity. Additionally, the project will evaluate the need for habitat restoration, documenting both the ecological and social benefits of restoration efforts.

This report investigates the interplay between climate change and biodiversity in the Sharr Mountains, Prizren, and surrounding areas, situating local ecological systems within broader climatic pressures. It develops a methodological framework centered on aquatic ecosystems, using aquatic insects as sensitive bioindicators of ecosystem vulnerability.

BACKGROUND

Kosovo's ecosystems are already experiencing measurable climate change: rising temperatures, declining snowfall, shifting precipitation regimes, and more frequent extremes. These shifts threaten biodiversity—especially in mountainous and hydrologically sensitive areas—while also disrupting agriculture, water availability, and forest resilience. In the Sharr Mountains, Prizren, and surrounding areas, long-term observations show warming trends, more winter rain (less snow), and intensification of extreme events, all of which cascade into altered flows, thermal stress in rivers, and habitat fragmentation.

Within this regional picture, freshwater systems are pivotal. The White Drin/Drini i Bardhë, Lumbardhi i Prizrenit, and Toplluha support rich aquatic and riparian assemblages but are increasingly exposed to pollution, altered hydrology, heat stress, and erosion—pressures expected to intensify with climate change. These rivers also host sensitive taxa whose responses provide early warnings of systemic stress, making them strategic entry points for climate-aware biodiversity planning.

To move beyond static species lists and reactive risk registers, the project adopts a habitat-centred approach that treats biodiversity as relationships embedded in space. We use aquatic insects—notably mayflies, caddisflies, and stoneflies—as bioindicators spanning aquatic and terrestrial phases. Their ecological specificity (clean, oxygenated waters; intact riparian edges; shaded forest buffers) makes them sensitive sentinels of changing temperature, flow, and water quality. Tracking their abundance, diversity, and distribution offers a scalable way to detect early signals, visualize vulnerability, and prioritize conservation in places where pressures are converging.

Concretely, the mapping framework focuses on three linked habitat types that underpin these life cycles: (1) riverbeds and secondary tributaries, (2) riparian edge zones, and (3) forested buffer zones. By identifying where these habitats overlap—and how they intersect with land use and projected climate shifts—the analysis reveals sensitive zones, guides restoration, and supports adaptive water and habitat management across the Sharr–Prizren landscape.

INTRODUCTION

The interplay between climate and biodiversity is both intricate and increasingly urgent. Climate change stands as one of the principal drivers of biodiversity loss, reshaping habitats, altering species distributions, disrupting ecological balances, and threatening the survival of vulnerable organisms. As ecosystems respond to rising temperatures, shifting precipitation regimes, and the intensification of extreme events, species are forced to adapt, migrate, or face extinction. These transformations ripple beyond individual species, undermining ecological functions and the ecosystem services upon which both human and non-human communities depend.

This report examines the impacts of climate change on biodiversity in the Sharr Mountains, Prizren, and surrounding areas—a region of high ecological value and cultural significance. Drawing from international and local scientific assessments, legislative frameworks, and field-based research, it highlights the urgent need to understand vulnerability not only at the level of individual species but also within the broader ecological systems that sustain them. By situating biodiversity within the context of climate pressures, the report underscores the necessity of integrated approaches that merge scientific evidence, spatial analysis, and socio-ecological perspectives to inform conservation and policy.

A key contribution of the report is the development of a methodological framework for assessing ecosystem vulnerability. Moving beyond broad-scale projections, it proposes a focused approach centered on freshwater ecosystems, with particular attention to aquatic insects. These organisms serve as highly sensitive bioindicators of ecological health, responding rapidly to environmental changes such as temperature fluctuations, altered hydrological regimes, and water quality degradation. By examining their diversity, abundance, and distribution patterns, it becomes possible to detect early warning signs of ecological stress and to evaluate the resilience of freshwater habitats under different climate scenarios.

Through this lens, the report not only advances a methodology for vulnerability assessment but also contributes to a broader understanding of how species-level indicators can reveal systemic risks. In doing so, it aims to guide long-term strategies for biodiversity conservation and adaptive management, offering insights that are critical for sustaining ecosystems in the face of accelerating climate change.

MAPPING THE MORE-THAN-HUMAN

3

MAPPING IS AN ACTIVE PRACTICE THAT GOES BEYOND DESCRIPTION, FUNCTIONING AS BOTH A COGNITIVE AND AESTHETIC TOOL FOR GENERATING NEW FORMS OF KNOWLEDGE. IT CHALLENGES ANTHROPOCENTRIC VIEWS BY RECOGNIZING NONHUMAN BEINGS AS VITAL SUBJECTS, EMPHASIZING RELATIONAL COEXISTENCE, AND FOSTERING NOVEL WAYS OF UNDERSTANDING AND REPRESENTING THE WORLD IN THE CONTEXT OF ECOLOGICAL CRISES.

BIODIVERSITY HOTSPOTS IN TRANSITION: THE SHARR MOUNTAINS AND THE DRINI I BARDHË BASIN

4

THE SHARR MOUNTAINS AND DRINI I BARDHË BASIN ARE MAJOR BIODIVERSITY HOTSPOTS IN KOSOVO, RICH IN ENDEMIC SPECIES AND VITAL ECOSYSTEMS THAT ACT AS ECOLOGICAL CORRIDORS AND PROVIDE KEY SERVICES LIKE WATER REGULATION. HOWEVER, THEY FACE GROWING THREATS FROM LOGGING, POLLUTION, UNREGULATED DEVELOPMENT, AND WEAK GOVERNANCE, WHILE CLIMATE CHANGE INTENSIFIES RISKS THROUGH REDUCED SNOW COVER, ALTERED FLOWS, AND EXTREME EVENTS. URGENT, CLIMATE-INFORMED CONSERVATION IS NEEDED TO PROTECT THEIR RESILIENCE AND ECOLOGICAL VALUE.

MAPPING VULNERABILITY: FROM ENDANGERED SPECIES TO LANDSCAPES IN TRANSITION

5

BIODIVERSITY IN KOSOVO FACES PRESSURES FROM CLIMATE CHANGE, HABITAT LOSS, POLLUTION, AND WEAK PROTECTION, MAKING TRADITIONAL SPECIES LISTS LIKE THE RED BOOK INSUFFICIENT FOR GUIDING ACTION. A NEW APPROACH USES AQUATIC INSECTS—HIGHLY SENSITIVE BIOINDICATORS WHOSE LIFE CYCLES SPAN RIVERS, RIPARIAN ZONES, AND FORESTS—TO MAP HABITAT VULNERABILITY AND DETECT EARLY SIGNS OF ECOLOGICAL STRESS. BY LINKING SPECIES NEEDS TO SPATIAL HABITATS, THIS METHOD IDENTIFIES WHERE CRITICAL FUNCTIONS ARE BREAKING DOWN, ENABLING MORE PROACTIVE, LANDSCAPE-BASED CONSERVATION STRATEGIES THAT SUSTAIN ECOLOGICAL RESILIENCE.

About EC

EC Ma Ndryshe is a community-based organization, established in 2006, committed to sustainable development through an inclusive approach.

EC's activism envisions a Kosovo where democratic governance is participatory, transparent, and accountable, ensuring that institutions, communities, and stakeholders work together towards sustainable development.

This vision promotes inclusive decision-making, stronger policies, and greater public participation, ensuring that sustainability is an integral part of governance at both local and national levels.

Through better institutional coordination, evidence-based policymaking, and citizen engagement, EC's work aims to bridge the gap between communities and institutions, ensuring that good governance leads to tangible and lasting change.

Vision statement

"Empowering a resilient and inclusive Kosovo, where communities actively shape sustainable, digitalized, and conscientious institutions."

Mission statement

"EC Ma Ndryshe supports democratic governance and sustainable development in Kosovo by fostering sustainable socioeconomic, cultural, and green growth through digital education, environmental stewardship, community mobilization, advocacy for participatory public decision-making, and the cultivation of strategic partnerships."

