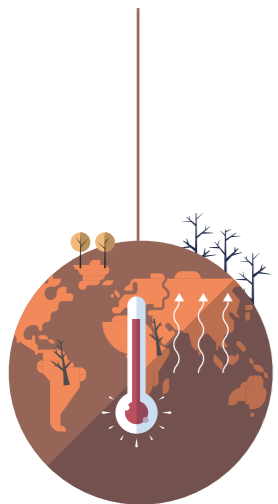




Nature-based Solutions for climate:

A compendium of best practices in
the Western Balkans





CLIMATE CHANGE

All areas of Europe are feeling the impacts of climate change, though the south-eastern and southern parts are anticipated to be the most affected, with a majority of sectors and areas facing severe consequences. This positions the Western Balkans among Europe's most at-risk regions, as highly susceptible to the detrimental impacts of climate change.

Research on the implications of climate change has forecasted several challenges for this region due to ongoing climatic shifts.

The main concerns include:

- ▶ a current temperature rise of 1.2°C that is expected to further increase between 1.7 – 4.0°C, potentially surpassing 5.0°C by the end of the century;
- ▶ growing frequency and duration of heat waves, which will pose significant health risks, especially in low-altitude river basins, where many densely populated urban centres are located;
- ▶ marked increase in the potential for forest fires;
- ▶ decrease in annual river flows that might disrupt freshwater availability, impact ecosystems and several socio-economic sectors, including abstraction for drinking water, agriculture and industry;
- ▶ significant increase of trends in drought intensity and severity, affecting citizens and most economic sectors, particularly agriculture and energy production;
- ▶ increased probability of hazard occurrence;
- ▶ increased threats to human well-being, safety, quality of life, and economic stability.

WHAT CAN NATURE OFFER?

Conservation initiatives that could simultaneously protect, sustainably manage and restore the environment while delivering tangible and sustainable benefits to people, are widely known as Nature-based Solutions (NbS). It has been documented that NbS actions, if well designed, can generate income for vulnerable local communities, and benefits for municipalities and local self-government units that depend on these ecosystem resources for their prosperity, health and well-being.

In order to operationalise NbS by providing a common language and framework for the design, verification and scale-up of NbS applications and policies, IUCN launched the [IUCN Global Standard for Nature-based Solutions™](#) in July 2020. The Standard defines NbS as actions to protect, sustainably manage and restore natural and modified ecosystems in a way that addresses societal challenges effectively and adaptively, to ensure both human well-being and biodiversity benefits.



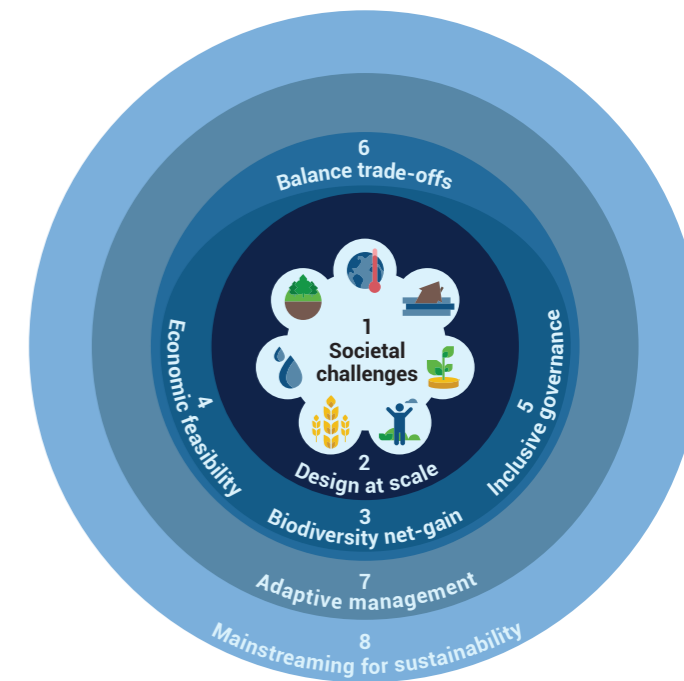
Major societal challenges addressed by NbS
(Source: IUCN Global Standard for Nature-based Solutions)

The IUCN Global Standard for Nature-based Solutions consists of eight criteria and associated indicators that address the pillars of sustainable development (biodiversity, economy and society) and resilient project management. The Guidance for using the IUCN Global Standard for Nature-based Solutions instructs users how to perform a self-assessment to: 1) design new Nature-based Solutions; 2) upscale pilots by identifying gaps, and 3) verify past projects and future proposals.

Nature-based Solutions are applicable through three basic types of action:

- ▶ preservation and better use of existing, functional ecosystems;
- ▶ improvement of ecosystem management for sustainable human use, and
- ▶ restoration of degraded ecosystems or the renaturation of ecosystem (or even creation of new ecosystems).

NbS are a powerful mechanism for climate change mitigation due to their capacity to prevent degradation and loss of natural ecosystems, and to improve the state of ecosystems through restoration actions. Moreover, natural and modified ecosystems can also effectively contribute to combating climate change thanks to their function of a 'natural carbon sink', i.e., reduction of CO₂ emissions and sequestration.



Criteria of the IUCN Global Standard for Nature-based Solutions
(Source: IUCN Global Standard for Nature-based Solutions)

WHAT DOES THIS CASE STUDY COMPENDIUM OFFER?

The primary objective of this compendium is to present diverse examples of NbS and related actions across the Western Balkans. The selected examples illustrate the application of proven and piloted solutions for climate change adaptation and disaster risk reduction, covering issues like flood prevention and mitigation, erosion control, preventing and managing wildfires, wastewater, mitigating pollution and biodiversity loss, in various landscape zones and ecosystems (e.g., coastal, forest, lakes and streams, etc.). Only two featured cases, implemented in the framework of the ADAPT project, strictly adhere to the IUCN Global Standard for Nature-based Solutions™. Meanwhile, the inclusion of other cases was based on comprehensive research. They were selected for their relevance to the NbS concept, the societal challenges they address, and the measures they applied. However, they were not screened through the NbS self-assessment tool and related criteria, a crucial step to ensure compliance of projects with the IUCN NbS Global Standard.

This compendium has been developed within the *ADAPT: Nature-based Solutions for resilient societies in the Western Balkans* project that aims to increase ecosystem and community resilience to climate change and environmental degradation in the Western Balkans. This regional umbrella initiative works with six Western Balkan economies, including regional, national and local partners.

SOURCES:

European Environmental Agency (2017). *Climate change, impacts and vulnerability in Europe 2106*. Luxembourg: Publications Office of the European Union.

IUCN (2020). *Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS. First edition*. Gland, Switzerland: IUCN.

Regional Cooperation Council (2018). *Study on climate change in the Western Balkans region*. Sarajevo, Bosnia and Herzegovina: RCC.

Building the resilience of the Kune-Vaini Lagoon through Ecosystem-based Adaptation (EbA)

Project ID

Project title: Building the resilience of the Kune-Vaini Lagoon through Ecosystem-based Adaptation (EbA)

Implementing organization: United Nations Environment Programme (UNEP)

NbS type: Ecosystem Based Adaptation (EbA)

Type of landscape/ecosystem: Sea lagoon including sand dunes, Forest ecosystem

Location: Kune-Vaini Lagoon system, Albania

Timeframe: 2016 – 2020

Budget: USD 1.9 million (co-financing: USD 11.5 million)

Main donor: Global Environment Facility (GEF)

Status: Completed



CONTEXT:

The Kune-Vaini Lagoon system (KVLS) is situated on the coast of Adriatic Sea in Albania, within the Drini-Mati River Delta in the Lezha region. The lagoon acts as a natural barrier or buffer, protecting the surrounding villages from maritime threats, and providing a wide range of valuable goods and ecosystem services to vulnerable communities. Most residents in nearby communities rely on fishing or farming for their livelihoods.

However, the area has seen rapid population growth coupled with widespread poverty that overall have led to increased pressures on ecosystem goods and services in the lagoon. As a result, modifications of the lagoon's surrounding buffer zone, primarily due

to the mismanagement of its natural resources, have also diminished tourism assets such as beaches. The repercussions of such actions are evident in the overuse of critical natural resources, adversely impacting the local community's income sources and livelihoods.

Over time, these pressures have caused a drop in lagoon depth, affecting both water quality and quantity. This in turn has reduced lagoon productivity and increased flooding of coastal zones, intensifying coastal erosion processes and consequently threatening biodiversity through loss of important habitats for flora and fauna.

The resilience of the KVLS to adapt to climate change has weakened over time, making it insufficient to provide vital goods and services to local communities. Furthermore, the local population is lacking in capacities and knowledge to apply Nature-based Solutions (NbS) and EbA solutions.

ABOUT THE PROJECT:

The "Building the resilience of the Kune-Vaini Lagoon through Ecosystem-based Adaptation (EbA)" is a pilot project, intended to serve as a basis and to inspire future Ecosystem-based Adaptation (EbA) projects in Albania. The EbA approach includes measures tailored to increase climate resilience of marine and coastal areas, particularly in the Adriatic Sea region where increased temperatures, rising sea levels, and changes in rainfall patterns are affecting coastal ecosystems and the essential services they provide.

The project for the KVLS integrate a comprehensive array of adaptation actions, in which EbA stands as a prominent strategy to better adapt to climate change. Over time, this approach was perceived to be more cost effective when compared to grey, hard infrastructure measures. EbA interventions ensured multiple benefits for local communities, the economy and the environment, including reduced flooding, improved biodiversity and enhanced fisheries production. Adaption interventions and Eba also improved the capacity of local communities to adapt to the negative impacts of climate change.

The project introduced the following NbS/EbA interventions:

opening a tidal channel between the Adriatic Sea and the KVLS,

reforestation of 7 ha of degraded forest to secure habitat restoration and improve biodiversity,

dune stabilisation by planting native grasses and shrubs on 2 ha, which has an important role in erosion control.

The project responded to observed challenges through:

strengthening technical and institutional capacities of policy and decision-makers in Albania to implement adaptation interventions,

increasing local community awareness of the benefits of EbA,

demonstrating EbA interventions within the KVLS through tidal channel construction, controlling erosion through sand dune rehabilitation, and reforestation of degraded land through tree planting activities on the dunes (and consequently improvement of biodiversity)



Adriatic Sea (left) and the Kune-Vaini Lagoon system (right)
(Source: UNEP official website)



Kune-Vaini Lagoon system
(Source: Gallery – Kune Vain)

BENEFITS:



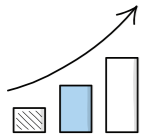
Environmental benefits:

- ▶ Improve lagoon water quality
- ▶ Increase biodiversity
- ▶ Enhance natural habitats
- ▶ Decrease flooding risks
- ▶ Prevent deterioration of the protected area/lagoon



Social benefits:

- ▶ Raise awareness and knowledge among local communities and national stakeholders
- ▶ Improve living standards of local communities
- ▶ Enhance the economic value of the fishing and tourism sectors
- ▶ Climate change adaptation



Economic benefits:

- ▶ 2000 m of coastal dunes protected
- ▶ 10 hectares of degraded forests restored
- ▶ Local population with improved access to resources through prevention of further degradation of the buffer zone, and preservation of the lagoon that provides fishing and agricultural resources for the local population
- ▶ Increased income from tourism and fisheries in the area

SOURCES:

Ministry of Environment, Albania (2020). *Albania: "Building The Resilience Of Kune-Vaini Lagoon Through Ecosystem-Based Adaptation (Eba)" (Special Climate Change Fund) – Final report.*

UN Environmental Programme [website]. *Building the Resilience of Kune-Vaini Lagoon through Ecosystem-based Adaptation – Project information.*

ADAPT: Nature-based Solutions for resilient societies in the Western Balkans

Project ID

Project title: ADAPT: Nature-based Solutions for resilient societies in the Western Balkans

Implementing organization: IUCN Regional Office for Eastern Europe and Central Asia

NbS type: Forest Landscape Restoration

Type of landscape/ecosystem: Forest ecosystem, pastures

Location: Shkumbini River basin, Elbasan Municipality, Albania

Timeframe: Ongoing

Budget: Estimated to EUR 250,000

Main donor: Swedish International Development Cooperation Agency (Sida)

Status: Ongoing



CONTEXT:

The Municipality of Elbasan is one of the largest in Albanian and the third largest in terms of population. It is located in the upper part of the Shkumbini River basin, which hosts diverse natural habitats, from mountainous lakes and torrents to large floodplains and coastal wetlands. The area is particularly vulnerable to floods and soil erosion, due to degradation of forests upstream and frequent occurrence of extreme rainfalls. The intensity and occurrence of these events, and their impacts on livelihood and infrastructure, have been further

exacerbated by climate change. The presence of several metallurgical production sites in Elbasan only further increases the risk of water pollution carried downstream by floodwaters and contaminating water sources.

The degradation of forest landscapes results in visible effects, such as arid and infertile soils, landslides, floods and biodiversity loss. This in turn lessens the ecosystem services of those forests, including the generation of oxygen and carbon sequestration, hosting habitats for biodiversity, and generating natural sources of incomes for local communities. Consequently, these environmental challenges have significant impacts on livelihood, infrastructure and biodiversity within the Elbasan municipality.



Eroded lands around Shushica village
(Source: IUCN ECARO, 2022)

ABOUT THE PROJECT:

The project aimed to implement NbS measures to address socio-economic and environmental challenges related to the high risk of soil erosion, flooding and landslides, combined with low ecosystem resilience that endanger agricultural production, limit tourism potential and negatively impact community livelihood, especially for women and vulnerable groups.

In order to identify the most suitable site for the pilot project, and to recommend feasible NbS measures, a multidisciplinary baseline assessment was conducted in the Elbasan Municipality.

The baseline assessment covered the topics of water management, biodiversity, and socio-economic and gender inclusiveness. It identified the Gurra catchment, a tributary of the Shkumbini River basin, as a suitable pilot site for NbS measures. During the process, various local and national stakeholders were consulted to ensure that their concerns and expectations were reflected in the analysis. Stakeholders identified the mitigation of floods and soil erosion, reduction of water pollution, and enrichment of ecosystems and biodiversity as key environmental targets to be addressed.

The NbS assessment shows the potential of the Shushica village, given its favourable climate for vegetable growing, and high potential crop productivity, particularly fruit trees. The village is also among the national list of 100 potential tourism villages in Albania, with tourism potential for agro-tourism and the alluvial forest near the Shkumbini River.

The baseline assessment was followed by the project design phase, when detailed actions were planned, and a combination of NbS interventions were proposed for implementation on the ground:

- ▶ Forest Landscape Restoration: tree planting, creation of grass strips and direct grass seeding in nine heavily eroded zones (covering 8.2 ha), combined with the construction of gabion and brushwood check-dams to restore gullies,
- ▶ Grazing management plan at the Gurra catchment level,
- ▶ Guidelines for restoration of the Gurra stream



Shkumbini River in Elbasan Municipality
(Source: IUCN ECARO, 2021)

BENEFITS:



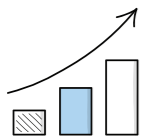
Environmental benefits:

- ▶ Mitigate intensive erosion and landslides
- ▶ Prevent sediment transport and accumulation downstream
- ▶ Enhance biodiversity
- ▶ Increase forest stability and resilience to climate change



Social benefits:

- ▶ Reduce flooding of agricultural land and households
- ▶ Improve community resilience to flooding and soil erosion risks
- ▶ Raise awareness and knowledge of NbS among the local communities
- ▶ Improve climate change adaptation



Economic benefits:

- ▶ Improve the livelihoods of 1,100 households or 4,000 inhabitants
- ▶ Provide better economic value of crops and fruit trees
- ▶ Improve tourism and agro-tourism potential

SOURCES:

IUCN ECARO [website]. *Nature-based Solutions for floods and climate change in Albania – Project brochure*.
Panorama [website]. *Recommendations for an NbS pilot intervention in Elbasan Municipality, Albania, defined through the NbS Baseline Assessment of the Shkumbini River basin*

Technology transfer for climate resilient flood management in the Vrbas River Basin

Project ID

Project title: Technology transfer for climate resilient flood management in the Vrbas River Basin

Implementing organization(s): UNDP

NbS type: Watershed Management

Type of landscape/ecosystem: River basin, forests, agricultural land, urban areas

Location: Banja Luka, Bosnia and Herzegovina

Timeframe: 2015 – 2020

Budget: USD 82,410,000

Main donor: Global Environment Facility (GEF)

Status: Completed



CONTEXT:

Bosnia and Herzegovina (BiH) is highly exposed to the extreme events and threats of climate change, with limited capacity to adapt to its negative impacts. These are particularly pronounced in vulnerable regions along the Vrbas, Sava and Bosna Rivers that are important for agriculture and food production, affecting key economic sectors such as agriculture and energy.

The Vrbas River is a right tributary of the Sava River, and one of the largest tributaries of the Danube River. The Vrbas River Basin covers an area of 6,386 km², or 12.5% of the total land area of BiH. The Vrbas River Basin is characterised by a large rural population comprised of the poorest and most vulnerable communities in BiH, including war returnees and displaced people, with high exposure to flooding and its devastating impacts.



Vrbas River
(Source: UNDP website)

ABOUT THE PROJECT:

The project "Technology transfer for climate resilient flood management in the Vrbas River Basin" aimed to enhance flood risk management systems, and to improve capacities and understanding to enable the stakeholders and vulnerable communities within the Vrbas River Basin.

The project included the transfer of modern technologies and approaches for climate resilient flood risk management within the Vrbas River Basin, increasing resilience of vulnerable communities in the area and integrating these approaches into the key relevant development strategies and public policies in BiH.

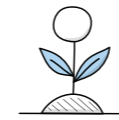
As a part of the non-structural measures, the project applied torrential flow regulation through riverbed cleaning, river bank consolidation using stones and grassing, and construction of drainage systems for surface water runoff.

The project contributed to the introduction of the following climate resilient flood management measures in the Vrbas River Basin area:

- ▶ **technical** (construction works in the watershed, including water retention structures),
- ▶ **biological** (afforestation of targeted areas upstream, introduction of new erosion resistant species, riparian buffers, vegetation belts, etc.),
- ▶ **agricultural** (sustainable agriculture measures, contour strips, minimum tillage, minimum grazing, agroforestry)

BENEFITS:

Environmental benefits:



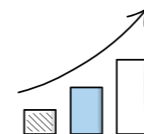
- ▶ Increase ecosystem functions
- ▶ Restore erosion and landslide prone areas
- ▶ Improve water quality
- ▶ Afforestation
- ▶ Enhance climate change adaptation

Social benefits:



- ▶ Develop a flood forecasting and early warning system (FFEWS)
- ▶ Involve local communities in flood simulation exercises and training on Flood Intervention Planning
- ▶ Reduce vulnerability to flooding and increase community resilience for 13 municipalities in the Vrbas River Basin
- ▶ Project beneficiaries include approximately 213,470 people of whom 52.2% are women
- ▶ Increase water security (quality and quantity)

Economic benefits:



- ▶ Improve climate resilience management for 638,600 ha within the Vrbas River Basin
- ▶ Implement a set of non-structural measures in 13 municipalities, valued at EUR 1.6 million

SOURCES:

UNDP Bosnia and Herzegovina [website]. *Vrbas Project: First flood simulation exercise organized for the four municipalities in the Vrbas River Basin*

UNDP, Climate Change Adaptation [website]. *Technology Transfer for Climate Resilient Flood Management in Bosnia and Herzegovina's Vrbas River Basin – Project information.*

Enabling transboundary cooperation and integrated water resources management in the White Drin and the Extended Drin River Basin

Project ID

Project title: Enabling transboundary cooperation and integrated water resources management in the White Drin and the Extended Drin River Basin

Implementing organization: UNDP

NbS type: Constructed Wetland

Location: Kramovik village, Rahovec Municipality, Kosovo

Type of landscape/ecosystem: Agroecosystem, River Basin Ecosystem

Timeframe: 2015 - 2021

**Main donor/
main implementing partner:** Global Environment Facility (GEF)

Status: Completed



CONTEXT:

The village of Kramovik with approximately 1,100 inhabitants lies on the banks of the White Drin River in Kosovo. The White Drin River is part of the Drin River catchment that extends into Kosovo, Albania, North Macedonia and Montenegro, therefore potentially transferring pollution across borders.

The quality of water in the White Drin River is heavily burdened due to household wastewaters (i.e., toilets, sinks and kitchens) from the settlement of Kramovik and others in Kosovo where wastewaters are usually discharged directly into the river without proper treatment. This represents a high risk for water quality, wildlife and the overall sustainability of the river, and a health risk for the local population that uses the river for recreational purposes.

ABOUT THE PROJECT:

In the framework of the project "Enabling transboundary cooperation and integrated water resources management in the White Drin and the Extended Drin River Basin", a pilot project "Promoting a constructed wetland for wastewater treatment in a small rural settlement – Kramovik Village, Rahovec Municipality" has been implemented in order to address the acute problem of wastewater pollution entering the White Drin River.

This pilot project tackles localised pollution-related pressures and minimises subsequent impacts on biodiversity and human health in rural areas of the Drin Basin, while also demonstrating replicable, low-cost and high-efficiency solutions suitable for small settlements of fewer than 2000 inhabitants.

The project applies Nature-based Solutions through a constructed wetland, i.e., construction of infrastructure that enables the treatment of wastewaters, removal of contaminants and pollutants, and filtering the wastewater through natural ecological processes.

The implementation of a constructed wetland has brought direct benefits to 1,100 inhabitants of Kramovik village. This intervention ensures that wastewater now has a 90% reduced pollution load, enhancing the quality of the White Drin both locally and across the Drin River Basin. This approach is not only cost-effective in terms of construction, operation, and maintenance, but also boasts high efficiency and ease of operation.

The constructed infrastructure consisted of:

a screening chamber where wastewaters are pre-treated,

a septic tank called an Anaerobic Baffled Reactor (ABR) whereby nutrients and BOD₅¹ are reduced up to 90%,

a drying bed, where sludge is turned into organic matter (that could be used as fertiliser),

a horizontal constructed wetland.

The constructed wetland wastewater treatment plant was constructed in the village of Kramovik/Kramovic and it is expected to reduce wastewater pollution by 90%.

The plant has been in operation since 2019 and represent the first of its kind in Kosovo.

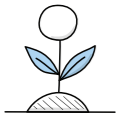
¹ Biochemical oxygen demand (BOD) refers to the amount of dissolved oxygen needed by microbes to break down organic material present in a given water sample at certain temperature over a specific time period. BOD measured in a water sample during 5 days of incubation at 20°C, is known as BOD₅.



A constructed wetland Kramovik

(Source: GEF UNDP Project 'Enabling Transboundary Cooperation and Integrated Water Resources Management in the extended Drin River Basin')

BENEFITS:



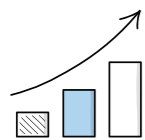
Environmental benefits:

- ▶ Reduce pollution load from village wastewaters into the White Drin River by 90%
- ▶ Improve river water quality



Social benefits:

- ▶ Improve water quality for recreational activities
- ▶ Produce high quality free fertilisers
- ▶ Increase awareness and knowledge of Nature based Solutions (low-cost, nature friendly wastewater treatment) suitable for small communities



Economic benefits:

- ▶ Implement a waste disposal system for a village with 1,100 inhabitants
- ▶ Lower cost compared to traditional wastewater treatment methods
- ▶ Cost-efficient and easy to operate solution

SOURCES:

DrinCORDA [website]. *First Constructed Wetland in Kosovo set to reduce sewage pollution in White Drin*

DrinCORDA [website]. *Nature-based Solutions for Wastewater Management*

GWP Mediterranean [YouTube Page]. *Drin #2: Constructed Wetland Pilot Activity - a solution to sewage treatment in rural areas* – Project video.

Restoration of the Prespa Lake Ecosystem

Project ID

Project title: Restoration of the Prespa Lake Ecosystem

Implementing organization: UNDP in partnership with the Municipality of Resen

NbS type: Ecosystem restoration

Type of landscape/ecosystem: Lake ecosystem

Location: Municipality of Resen, North Macedonia

Timeframe: 2012 – 2018

Budget: CHF 4,100,000

Main donor(s): Swiss Agency for Development and Cooperation (SDC)

Status: Completed



CONTEXT:

With a history spanning over 5 million years, the Prespa Lake Basin is one of the world's oldest freshwater lakes. The lake region is home to more than 2,000 species of fish, birds, mammals and plants, and also the world's largest breeding colony of Dalmatian pelican.

Prespa Lake holds an important role in securing the hydrological stability of Ohrid Lake, which is supplied with water from Prespa through a hydraulic connection. Moreover, Prespa provides a stable supply of water for households and agriculture, ensuring sustainable development of the region. For decades, it has also been one of the region's most attractive tourist destinations.

However, the past four decades have witnessed a struggling ecosystem facing serious environmental

challenges such as pollution, ineffective planning for land and water use, and poor preservation of rare and threatened species. Unsustainable agricultural, fisheries, forest, water, wastewater and solid waste management practices have had a significantly harmful effect on the ecosystem's health and stability. This has resulted in threats to endemic species, while rapid growth of biomass leads to eutrophication of lake waters and their further quality loss. Due to the unfavourable hydrological conditions, the system has lost excessive quantities of freshwater, with a 9 m decline in the lake water level over the past 25 years. This has severely affected the valuable shoreline habitats and intensified major shore erosion and land degradation processes. In turn, these processes affect biodiversity, and key economic sectors such as water management, fisheries, and tourism, as well as the overall socio-economic status and wellbeing of the local population. Consequently, these processes have caused negative demographic trends in the lake region.

ABOUT THE PROJECT:

The overall objective of the Project "Restoration of the Prespa Lake Ecosystem" was to introduce a set of comprehensive measures to significantly improve the Prespa Lake's overall health, strengthen its resilience, and ensure long-term control of eutrophication processes.

The project promoted the Nature-based Solutions approach through the implementation of actions aimed

at reducing the pressures from agriculture, forestry, urban wastewater and solid waste management on freshwater ecosystems, while creating sustainable monitoring and increasing watershed management capacities at the local level.

The project introduced a comprehensive set of interventions and activities including:

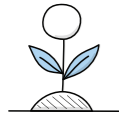
- ▶ Establishment of a sustainable waste management system, such as:
 - ▶ Cleaning illegal landfill sites in the Prespa Lakes Basin;
 - ▶ Encouraging local residents to recycle materials such as paper and metal;
 - ▶ Building a composting plant to reduce the amounts of organic waste originating from local agriculture production.

- ▶ Reduction of adverse impacts of agriculture by introducing environmental-friendly agriculture practices amongst local farmers, such as:
 - ▶ Use of organic fertiliser from compost, rather than chemical fertilizers;
 - ▶ Application of irrigation scheduling to rationalise water use and reduce agriculture runoff.
- ▶ Development of environmental infrastructure, such as a wastewater collection system, rehabilitation of water supply systems and a biodegradable waste management system, which should lead to reducing pressures on water bodies, more efficient water use, and securing savings/revenue for the municipality.
- ▶ Control of erosion processes through implementation of forest regeneration measures. Apart from long-term benefits in reducing soil loss and sediment transport processes, these actions bring additional ecosystem benefits, such as supporting biodiversity in the area and improving the capacity for carbon sequestration. Building a local forest nursery secures plant material and improves the economic status of local public enterprises.
- ▶ Wetland restoration of the degraded/canalised delta of the Golem Reka River, as the largest tributary of Prespa Lake, in order to restore the natural site values and enable filtering of polluted waters carried by the river.
- ▶ Implement sustainable watershed management by building capacities at the local level and improving cross-sectoral participatory mechanisms, as well as introducing the Lake Monitoring Station.



Prespa lake
(Source: Boris Erg)

BENEFITS:



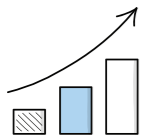
Environmental benefits:

- ▶ Increase ecosystem stability and resilience to climate change
- ▶ Retain and filter polluted waters
- ▶ Control erosion and reduce sediment load in the lake
- ▶ Restore wetlands and enhance biodiversity
- ▶ Upgrade wastewater treatment technology to improve nutrient removal
- ▶ Recover native fish populations
- ▶ Decrease waste disposal into the lake
- ▶ Improve water and soil quality



Social benefits:

- ▶ Implement agro-ecological practices among local farmers;
- ▶ Establish the Lake Monitoring System and Management Service
- ▶ Use 60% less water for irrigation;
- ▶ Ensure sustainable watershed management practices at the local level;
- ▶ Improve waste management practices;
- ▶ Raise awareness and knowledge of 15,000 inhabitants in the Resen municipality



Economic benefits:

- ▶ Use 30% fewer pesticides each season
- ▶ Generate tourism potential

SOURCES:

UNDP [website]. *Restoration of the Prespa Lake Ecosystem: Implementation of the Prespa Lake Management Plan.*

UNDP [website]. *Restoration of the Prespa Lake Ecosystem – Project document.*

UNDP [website]. *Restoration of the Prespa Lake Ecosystem – Project information.*

ADAPT: Nature-based solutions for resilient societies in the Western Balkans

Project ID

Project title: ADAPT: Nature-based solutions for resilient societies in the Western Balkans

Implementing organization: IUCN Regional Office for Eastern Europe and Central Asia

NbS type: Forest Landscape Restoration

Type of landscape/ecosystem: Forests including meadows, pastures, orchards, nursery areas

Location: Gledić village (City of Kraljevo), Serbia

Timeframe: 2020 – 2024

Budget: Estimated to EUR 250,000

Main donor: Swedish International Development Cooperation Agency (Sida)

Status: Ongoing



CONTEXT:

Kraljevo, the largest city in the Republic of Serbia in terms of area, is highly vulnerable to disasters. In recent decades, Kraljevo has been struck by numerous severe natural, climate-induced disasters, such as earthquakes, droughts, landslides and large-scale floods.

Moreover, the City of Kraljevo is facing high degradation of its natural ecosystems, particularly forests, resulting in a lower capacity of habitats to deliver essential ecosystem services. Amongst the main causes of degradation are overexploitation of natural resources and illegal logging, land use changes, forest fires and the expansion and proliferation of invasive species. Exploitation and mismanagement of forests and agricultural land, combined with uncontrolled urbanisation, have exacerbated the impact of natural and climate-induced hazards, particularly torrential floods and landslides.

One of the areas most prone to disasters within the City of Kraljevo is the catchment area of the Gledić River, located in the Gledić Mountains. The catchment

includes two streams, Rakija and Todorovak, both flow into the Jablanica River, a tributary of the Gledić River. Frequent rainfall, combined with degraded land and forests, causes torrential flows on these small streams. Moreover, due to the lack of well-developed vegetation cover to absorb precipitation, the water runs freely down the slopes, creating powerful torrents downstream and creating large-scale floods throughout the area. Additionally, torrents rinse off surface layers of organic matter on surrounding lands, hindering the restoration of vegetation cover.

Forests in Gledić are a traditional source of raw materials for the local population. In the past, these forests were clear cut to create space for agriculture, construction, settlements, etc. Today, the forests are mainly used for firewood locally or for sale, while only a small portion is used in the wood panel industry. Other non-wood forest products are not widely harvested.

The constant and high risk of natural disasters, particularly floods, combined with low ecosystem resilience, has had a strong negative influence on the economy and livelihood of the affected local communities in Kraljevo, leading to inequality in development and accelerating depopulation of already deserted areas.

ABOUT THE PROJECT:

In light of the challenges detailed above, the catchment of the Gledić River was selected as a pilot area within the ADAPT project for implementation of Nature-based Solutions aimed at disaster risk reduction and adaptation to climate change. The pilot location was selected based on multi-sector stakeholder engagement and in accordance with the Restoration Opportunities Assessment Methodology – ROAM.

The pilot project in Gledić foresees implementation of Forest Landscape Restoration (FLR) measures on

selected sites, aimed to address the high risks of floods and soil erosion, biodiversity loss, weak forest resilience, and negative effects on community livelihood, especially for women and vulnerable groups. The envisioned FLR measures embody the principles of Nature-based Solutions that will enhance the protection of existing ecosystems, increase forest stability, and reduce erosion and flood risks. Collectively, these measures are anticipated to contribute to community resilience both within Gledić and the broader City of Kraljevo.

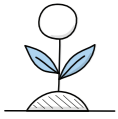
Proposed FLR measures include:

- ▶ **Natural Forest Rehabilitation (NFR)** aimed to increase forest stability and resilience, to stabilise the soil, reduce erosion, and increase soil water retention capacity by transition from coppice to high forest. This measure will be applied through silviculture by natural and assisted natural regeneration.
- ▶ **Rehabilitation by planting** aimed to restore degraded forest and ecosystem functions on bare land or in very degraded forests. This measure will be applied through direct planting of autochthonous tree species at appropriate sites.
- ▶ **Underplanting and enrichment planting** aimed to increase forest stability and resilience, increase biodiversity, and provide high value timber and non-wood forest products. This measure includes planting combined with management of the existing residual forest, with low disturbance of vegetation structure.
- ▶ Building **loose-stone check dams**, with relatively small rocks placed across a gully, for controlling channel erosion along the gully bed and stopping waterfall erosion.
- ▶ **Creation of a silvo-pastoral system** that includes fencing an area suitable for grazing using natural materials, as well as planting fruit and other multipurpose tree species or a valuable timber tree species.



Forest in Gledić
(Source: IUCN, ADAPT Project)

BENEFITS:



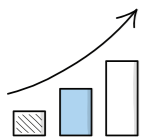
Environmental benefits:

- ▶ Restore approximately 180 ha of forest on degraded land in Gledić
- ▶ Enhance biodiversity
- ▶ Increase forest stability and resilience
- ▶ Stabilise the soil and reduce erosion



Social benefits:

- ▶ Improve community resilience to flood risks
- ▶ Increase security of existing and create conditions for additional income from non-timber products for local inhabitants
- ▶ Improve livelihood conditions, especially for women and vulnerable groups
- ▶ Slow depopulation from the priority area



Economic benefits:

- ▶ Reduce the risk of disaster for approximately 30,000 inhabitants along the watercourse
- ▶ Establish a local civil protection unit trained to react timely to degradation and disaster risks
- ▶ Enable equal economic development throughout the municipality area

SOURCES:

IUCN ECARO [website]. *Nature-based Solutions for floods and climate change in Serbia* – Project brochure.

Panorama [website]. *Reducing disaster risks and preventing floods through the implementation of Nature-based Solutions in Gledić (Kraljevo), Serbia*



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