



COORDINATED ACTION  
FOR A SUSTAINABLE FUTURE

# LAKE OHRID WATERSHED MANAGEMENT PLAN

An Activity under the GEF Drin Project



More than 2 million years old and nearly 300 meters deep, Lake Ohrid is one of the oldest and deepest lakes in Europe. Shared between Albania and North Macedonia, the UNESCO World Heritage Site supports diverse ecosystems, local livelihoods and the economy, including agriculture, fishing, hydropower and tourism.

Lake Ohrid is home to 300+ endemic<sup>1</sup> species, such as the famous Ohrid trout, snails, sponges and 'relict' species - surviving species of the Pleistocene epoch that once populated a much larger geographic area.

## Lake Ohrid is a BIODIVERSITY HOTSPOT of global importance.

The catchment area of the lake has a population of about 170,000 people, with 131,000 people living directly on the lake shore. The historic monuments, as well as the pristine lake environment make the area around Lake Ohrid a prime site for tourism. Even though most of the visitors are staying for a weekend only, tourism makes an important share of the local economy. The population in the area has increased greatly by 100,000 people in the last half century, putting the lake's fragile ecosystem under pressure.

<sup>1</sup> Endemic species are plants and animals that exist only in one geographical region.





# EXTENDED DRIN BASIN



The Lake Ohrid sub-basin is one of the sub-basins of the Drin Basin

The Lake Ohrid sub-basin is part of the extended transboundary Drin Basin, located in the South-Western part of the Balkan Peninsula and shared among Albania, Greece, Kosovo<sup>2</sup>, Montenegro and North Macedonia.

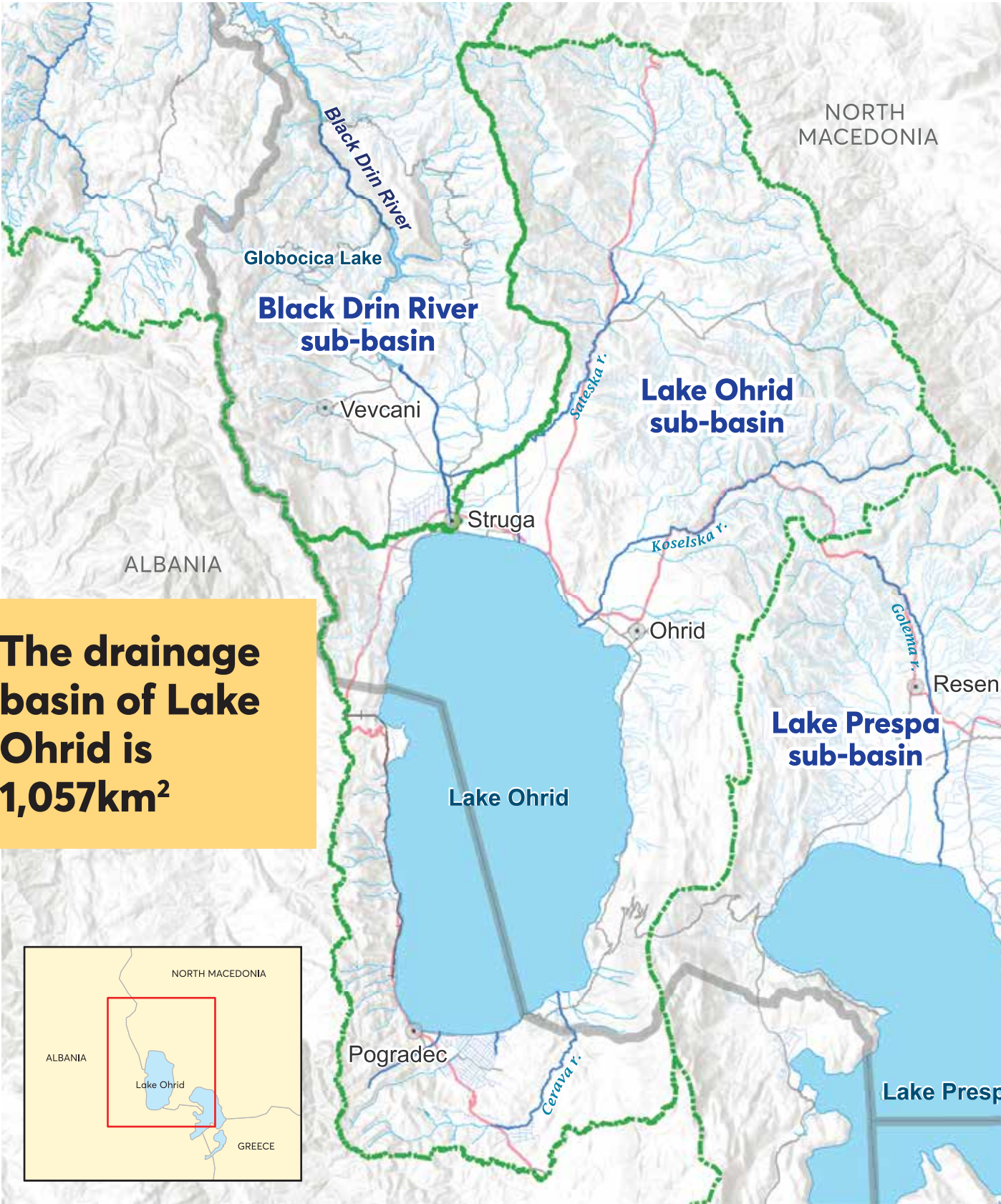
## LEGEND

- Hydrological border of the extended Drin River Basin
- Sub-basins of the extended Drin River Basin
- Extended Drin River Basin – outer borders of the River Basin Districts designated or proposed for designation in the Riparians
- Riparian borders
- City
- Territorial water
- ROAD NETWORK
  - Primary road
  - Secondary road
  - Railway
- WATER BODY
  - Lake
  - Reservoir
  - Marine area
- HYDROGRAPHY
  - River
  - Stream

<sup>2</sup> All references to Kosovo are made in the context of UN Security Council Resolution 1244 (1999)



# LAKE OHRID SUB-BASIN



The drainage basin of Lake Ohrid is 1,057km<sup>2</sup>

## LEGEND

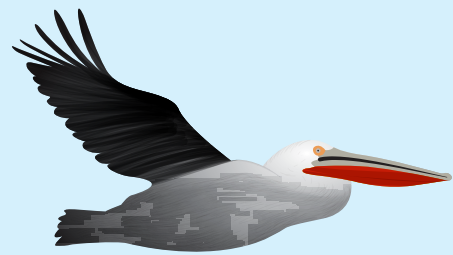
- Drin Basin - Ohrid sub-basin
- Riparian borders
- City
- ROAD NETWORK
  - Primary road
  - Secondary road
  - Railway
- WATER BODY
  - Lake
  - Reservoir
- HYDROGRAPHY
  - River
  - Stream
  - Canal
  - Penerate Stream
  - Seasonal Stream





# Biodiversity Factfile

Located in the Alpine biogeographical region, the ecosystem in Lake Ohrid is unique.



DALMATIAN PELICAN

Despite its relatively small size, the lake contains a considerable number of aquatic species, many of which are endemic.

Harboring more than **300 endemic species**

Lake Ohrid has one of the highest levels of endemism of all ancient lakes.

Of the 1,200 *animal* species reported, 212 are considered endemic. 7 of the 21 native fish species of Lake Ohrid are endemic, as are many of the lake's snails, worms, and sponges. No less than 68 species of freshwater snails have been identified. According to the International Union for Conservation of Nature (IUCN) Red List, the European Eel which once frequented the area is now considered critically endangered.

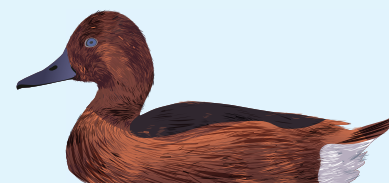
A TOTAL OF

9

PROTECTED AND SENSITIVE AREAS are located in the Lake Ohrid Sub-Basin.

The lakeshore reed beds and wetlands serve as a spawning site for many fish species and provide critical habitat for thousands of wintering water birds. More than twenty species of water birds populate the area, including rare and threatened species such as the Dalmatian pelican, ferruginous duck, swan, spotted eagle and eastern imperial eagle.

FERRUGINOUS DUCK



# Hydrological Factfile

Two-thirds of the water leaves Lake Ohrid through its only outlet, the **Black Drin River**, which flows in a northerly direction through the town of Struga, eventually reaching the **Adriatic Sea**.

Sateska river

The water in Lake Ohrid is exceptionally clear with transparencies to a depth of

**22 metres!**

The lake contains an estimated

**55.4 km<sup>3</sup> of water.**

It is over 30km long and nearly 15km wide, with a shoreline of around 90km.

The drainage basin of Lake Ohrid covers an area of 1,057 km<sup>2</sup>.

Approximately 80% is located within North Macedonia and 20% in Albania.

One third of the water leaves Lake Ohrid by **evaporation**.

About 60% of Lake Ohrid's water is coming from precipitation and reaches the lake through **surface inflow**. Sateska on the north side and Cerrava on the south are the most important tributaries.

More than 40% of the water flowing into Lake Ohrid comes from the nearby Lake Prespa via **karstic aquifers** (fractured rock) and numerous under-ground springs, primarily St. Naum and Tushemisht.

Cerrava river



# Environmental Challenges

Lake Ohrid is experiencing many environmental challenges.

## HABITAT DESTRUCTION

Development has changed the natural habitats along the shoreline, especially in the areas around Ohrid, Struga, Peshtani, St. Naum, Tushemisht, and Pogradec. In these areas, the native reed zones have been drastically reduced. The changes in shoreline vegetation have also interrupted the connections between the lake and the shoreline channels and wetlands. This is of great concern, as the shallow water sites are particularly rich in endemic bottom fauna, and provide habitat for water birds.

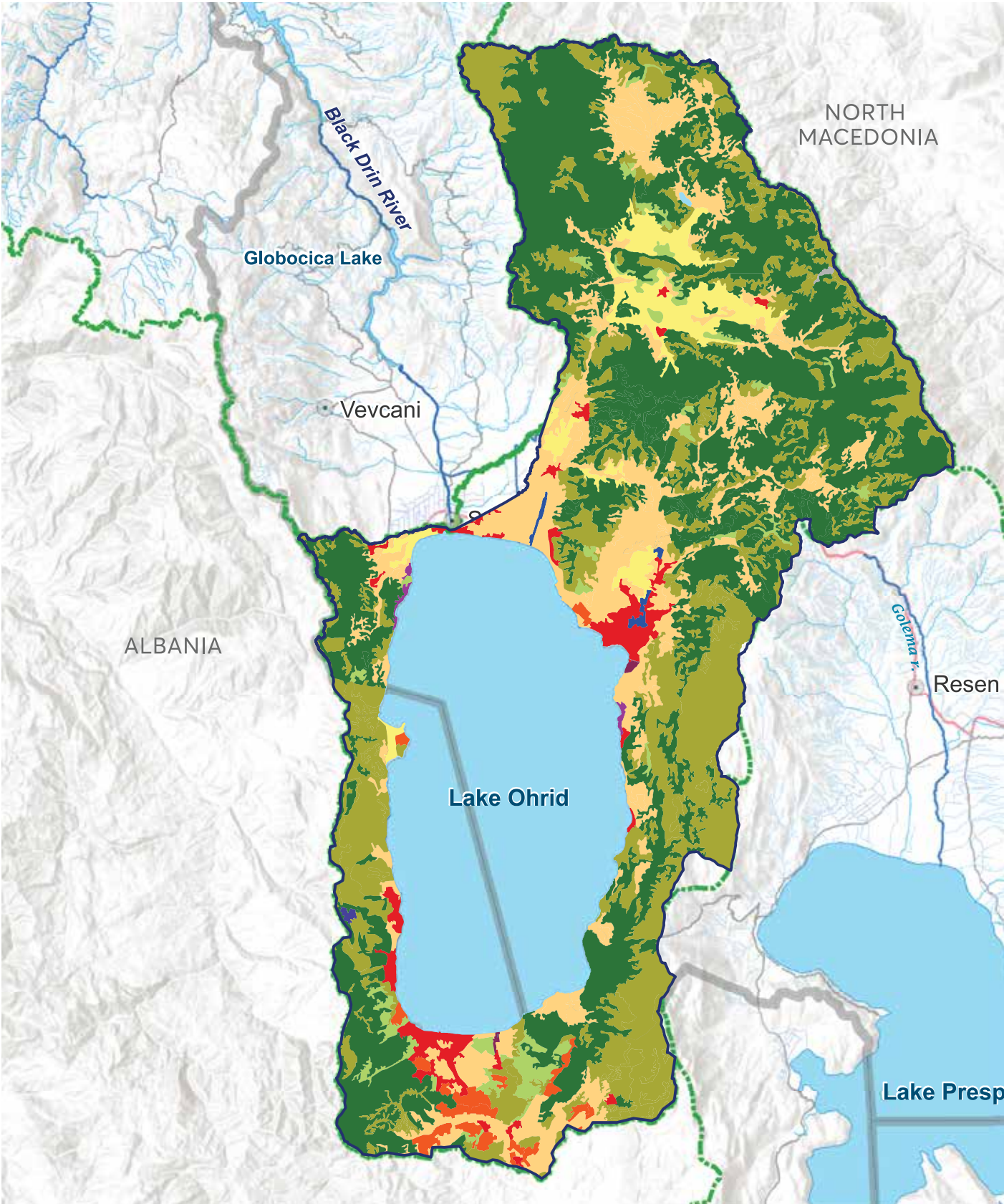


Photo: 2S Studio

## POOR WATER STATUS

Pressures on the water status have been caused by the building of tourist facilities directly at the shore, the destroying of reed belts to gain agricultural land and intense pollution close to the mouth of tributaries. This has caused 75% of the whole perimeter of the lake to have moderate, poor or bad water status.

# LAKE OHRID SUB-BASIN LAND COVER



## LEGEND

Arable land	Inland waters	Permanent crops
Artificial, non-agricultural vegetated areas	Inland wetlands	Scrub and/or herbaceous vegetation
Forests	Mine, dump and construction sites	Urban fabric
Heterogeneous agricultural areas	Open spaces with little or no vegetation	
Industrial, commercial and transport units	Pastures	





## EUTROPHICATION

Given the population growth of the Lake Ohrid region over the past 50 years, a particular concern is the potential eutrophication of the currently *oligotrophic*<sup>3</sup> lake, caused by increased pollution.

In simple terms, the lake which is naturally very low in nutrients, is highly vulnerable to increased nutrient input (e.g. phosphorus and nitrogen) from agricultural, household and industry waste. This increased input of nutrients can disrupt the oxygen levels of the water, harming the species that live in the lake.

It may take more than a decade to see the effects of today's pollution level in the lake, because of the lake's long water residence time<sup>4</sup> of 70 years!

Moreover, it has been shown that the negative effects from eutrophication would be significantly amplified by global warming, with computer simulations indicating that a 50% reduction in phosphorous input must be reached to keep the deep water oxygenated for the next 50 years.

<sup>3</sup> Low in nutrients, high in oxygen

<sup>4</sup> The average length of time water remains within the boundaries of the lake.



## DECLINING FISH STOCKS

Commercially important fish species in Lake Ohrid, including the famous Ohrid trout and the belvica have been harvested at unsustainable levels in recent years. Populations of trout are in immediate danger of collapse and the belvica is classified as "vulnerable" according to the IUCN Red List.

Human activities along the shoreline threaten the spawning and wintering grounds of the Ohrid trout and other endemic fishes. Efforts are being made to replenish stocks through aquaculture, including trout hatcheries which enable the fingerlings to grow and be released into the lake, helping to replenish fish stocks.

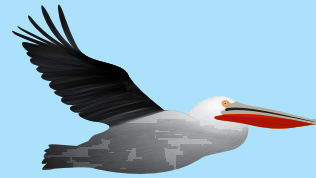




# Lake Ohrid: A unique ecosystem and a UNESCO World Heritage Site

- 2-5 million years old
- Contains 55.4km<sup>3</sup> of water
- 300+ endemic\* species
- 9 Protected and Sensitive Areas

- 131,000 people living on the lake shore
- 170,000 living in the catchment area
- 69 settlements within North Macedonia, 25 within Albania
- 58% of population live in Pogradec, Ohrid and Struga



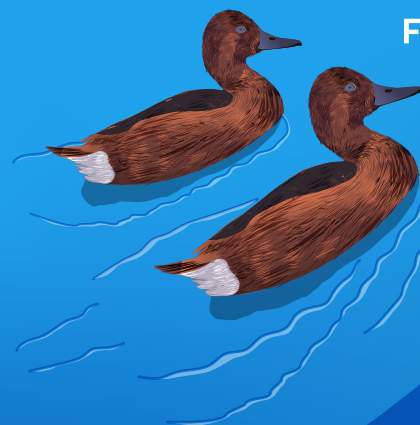
DALMATIAN PELICAN



EASTERN IMPERIAL EAGLE



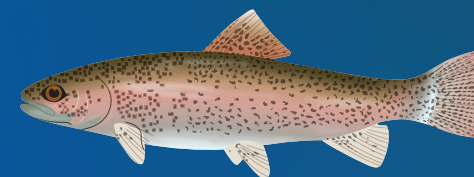
HABITAT DESTRUCTION



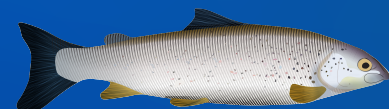
FERRUGINOUS DUCK



7 OUT OF 21  
FISH SPECIES  
ARE ENDEMIC



OHRID TROUT



BELVICA FISH



EUROPEAN EEL



WORMS AND SPONGES

68 SPECIES  
OF FRESHWATER  
SNAILS



DALMATIAN PELICAN

Nearly  
**300**  
meters  
deep

\* Endemic species are plants and animals that exist only in one geographical region.



# Creating a sustainable future for Lake Ohrid

Lin, Albania

In order to sustainably manage these challenges and protect the unique ecosystems in the Lake Ohrid sub-basin, coordinated and integrated action is required at a transboundary level.

Under the Global Environment Facility supported Drin Project, the **Global Water Partnership – Mediterranean**, in close cooperation with competent institutions in Albania and North Macedonia, is developing a River Basin Management Plan for the Lake Ohrid sub-basin, following the principles of the European Union (EU) Water Framework Directive (WFD).

Known formally as the '**Lake Ohrid Watershed Management Plan**' (LOWMP), it will act as a 'Master Plan' for Albania and North Macedonia to enhance coordination between competent institutions and enable the sustainable management of Lake Ohrid sub-basin's natural resources.

## EU WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive provides a legal framework for the integrated management of water bodies. It aims to:

- Prevent further deterioration of ecosystems
- Promote sustainable water use
- Improve ecosystems
- Contribute to mitigating flood and drought impacts

The EU WFD has been transposed into the legislative framework in Albania and North Macedonia and guides Basin Management Planning.

## THE KEY PRINCIPLES OF A RIVER BASIN MANAGEMENT PLAN ARE:

- Adopt integrated water resources planning, accounting for environmental, economic and social needs.
- Focus within Basin boundaries – this is the key geographical unit.
- Follow clear, transparent and accessible processes for analysis and decision making.
- Follow a 6-year planning cycle.
- Work in partnership with public bodies (e.g. local water management authorities).
- Active and early involvement of a broad range of stakeholders.
- Use cost-benefit analysis to understand impacts of any interventions.



# Developing the Lake Ohrid Watershed Management Plan

Development of the LOWMP follows these steps:

## 1 DATA COLLECTION AND ANALYSIS OF CURRENT STATUS

- Collect and analyse hydrological, socio-economic and biodiversity data;
- Water balance and climate change analysis;
- Understand water utilisation and demand under current and projected water balance;
- Understand water pressures and human impact (e.g. point source pollution, diffuse source pollution, abstraction pressures);
- Map water bodies, water infrastructure and protected areas;
- Legal and institutional analysis;
- Economic analysis of water use;
- Identify data gaps.

## 2 WATER QUALITY MONITORING

- Comprehensive and systematic water monitoring over 1 year period;
- Establish baseline understanding of lake's ecosystem and pollution levels;
- Assess the physical, biological and chemical properties of water;
- Parameters include temperature, salinity, oxygen content, fish and aquatic plant indicators, pH, nutrients, heavy metals and pesticides.

## 3 LAKE CHARACTERIZATION

- Project potential future impacts on water resources;
- Classify surface water (rivers and lakes) and groundwater bodies, based on EU Water Framework Directive (WFD) standards;
- Develop long-term water quality monitoring programme based on WFD standards;
- Identify and establish environmental goals for surface water, groundwater and protected areas.

## 4 PROGRAMME OF MEASURES

- Propose measures to meet EU WFD Standards;
- Basic measures and supplementary measures;
- Cost-benefit analysis of measures;
- Consideration for climate change scenarios.

## A Strategic Planning document

developed in accordance with the legislation of the two littoral<sup>5</sup> countries. A 'Master Plan' taking into consideration all other plans developed to date, to enhance coordination between competent institutions and enable the sustainable management of Lake Ohrid sub-basin natural resources.

## Includes measures to:

- Prevent further deterioration of water resources and ecosystems;
- Promote sustainable water use;
- Improve water resource/ ecosystems quality;
- Contribute to mitigating flood and drought impacts.

## STAKEHOLDER ENGAGEMENT

- Communicate the vision for Lake Ohrid sub-basin;
- Consult national and local institutions and authorities;
- In depth interviews;
- Equal participation of women and men.

<sup>5</sup> Littoral: situated on the shore of the lake.



# Lake Ohrid Watershed Management Plan

## Development of the LOWMP considers:

### LAWS AND AGREEMENTS

- EU regulations, especially the EU Water Framework Directive, and national laws;
- International agreements between Albania and North Macedonia.

### MODELS

- Consumptive and non-consumptive water needs e.g. hydropower;
- Hydrological and land use models to identify appropriate measures for environmental conservation and socio-economic development.

### PLANS

- Development plans of the national governments and local authorities;
- Management plans of protected areas, forest and fisheries.

### COORDINATION MECHANISMS FOR DEVELOPING AND IMPLEMENTING THE LOWMP

- Steering Committee comprising of representatives of relevant institutions, local authorities and stakeholders;
- Ultimately the Lake Ohrid Watershed Bilateral Committee will be coordinating the implementation of the Plan at the transboundary level, while the national authorities are responsible for the implementation of the Plan in the littoral countries.

### BEYOND LAKE OHRID

The LOWMP will help inform a River Basin Management Plan to cover the entire Drin Basin.



For more information visit:

[www.drincorda.org](http://www.drincorda.org)

 [@Drin.Basin.Corda](https://www.facebook.com/Drin.Basin.Corda)

[www.gwpmed.org](http://www.gwpmed.org)

**The Lake Ohrid Watershed Management Plan** is one of six Pilot Activities taking place under the Drin Project.

The Drin Project is financed by the **Global Environment Facility (GEF)**, implemented by the **United Nations Development Programme (UNDP)** and executed by the **Global Water Partnership – Mediterranean (GWP-Med)**, in partnership with **United Nations Economic Commission for Europe (UNECE)**.

