



# Lake Prespa

## Transboundary Diagnostic Analysis

July 2009



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## Main abbreviations

AL	Albania
EC	European Commission
EEA	European Environment Agency
EIA	Environmental Impact Assessment
EU	European Union
FYROM	Former Yugoslav Republic of Macedonia
GEF	Global Environment Facility
GR	Greece
IPPC	Integrated Pollution Prevention and Control
IUCN	World Conservation Union
JRC	European Commission Joint Research Centre
N	Nitrogen
NGO	Non Governmental Organisation
P	Phosphorus
PPCC	Prespa Park Co-ordination Committee
REC	Regional Environmental Centre
SAP	Strategic Action Programme
SEA	Strategic Environmental Assessment
SPP	Society for the Protection of Prespa
TDA	Transboundary Diagnostic Analysis
TTT	Technical Task Team
UNECE	United Nations Economic Commission for Europe
UNDP	United Nations Development Programme
WFD	EU Water Framework Directive

## Summary

The Prespa Lakes Basin is a high altitude system (approximately 850 m) with a combined catchment of over 2,500 km<sup>2</sup> covering part of the territory of Albania, the Former Yugoslav Republic of Macedonia and Greece. The basin is home to nearly 30,000 people with the majority residing in Former Yugoslav Republic of Macedonia. The region has little industry (again centred in Former Yugoslav Republic of Macedonia) and the main source of income is agriculture which is estimated to employ about 75% of the workforce, however unemployment is high ranging from about 12% in Greece to over 30% in Former Yugoslav Republic of Macedonia.

The ecosystem and the biodiversity of the region are worth special mention. The geography, soil type and climate coupled with the relatively low human population and impact in the basin has resulted in a wide species diversity with a high proportion of endemic species that are not found elsewhere. The region is an important location for over 90 migratory birds, including the high-profile Dalmatian Pelican. To-date about 20 species are listed on the IUCN threat status list.

Whilst the population and industrial impacts are relatively low, there is a good opportunity to develop an agreed trilateral approach to reduce the existing pressures and impacts and to prevent future economic development in the basin to have an adverse effect on the ecosystem.

As an initial step to developing an agreed Strategic Action Programme (SAP) for the Lake Prespa Basin, this report presents the information of a Transboundary Diagnostic Analysis (TDA) which reviews and analyses data and expert judgement of the state and pressures on the environment of the basin. To date there has been little routine monitoring of water quality in the Prespa Basin apart from Greek side where data from the 1990s indicates little evidence of pollution. The importance of the tri-lateral monitoring programme under development by the Prespa Park Co-ordination Committee (with UNDP-GEF support) can not be over stated and will be essential to validate the expert judgement summarised in this TDA with water quality monitoring data.

The TDA recommends seven priority concerns of transboundary importance that are recommended for further action through implementation of an agreed Strategic Action Programme:

- Nutrient pollution;
- Declining fish stocks
- Loss of water level in Lake Macro Prespa;
- Sediment transport;
- Deforestation and changes in native forests;
- Organic pollution; and,
- Hazardous substance pollution.

These problems and potential problems are, in general, not unique to the Prespa Basin and there are many examples in other regions where there is clear evidence of such pollution problems. The SAP offers an opportunity to introduce measures in this relatively unpolluted region to prevent these problems materialising in the future that enables the ecosystem status to improve together with the livelihoods of the local population.

# 1 Introduction

This report is an integral activity within the UNDP-GEF project 'Integrated Ecosystem Management in the Prespa Lakes Basin of Albania, Former Yugoslav Republic of Macedonia and Greece'

This Transboundary Diagnostic Analysis (TDA) Report is a summary of the detailed national studies and reports prepared by a Technical Task Team (TTT) with representatives from all three countries. These National Analysis Reports have undergone a wide consultation with national stakeholders and present agreed main problems and perceived threats to the ecosystem from each country. This 'summary' TDA report builds on these National Analysis Reports by presenting the main concerns from a transboundary perspective that will be addressed in Strategic Action Programme for the Prespa Lake Basin.

The lack of significant routine environmental monitoring data across the region (an issue that is being currently addressed by the Prespa Park Co-ordination Committee with support from UNDP-GEF) necessitated the gathering of information from a wide range of reports, government sources, NGOs and from regional experts.

## 1.1 Structure of Summary TDA

- Section 2 provides an overview of the methodology agreed for undertaking preparing this TDA, in particular the emphasis placed on the National Analysis Reports prepared by a Technical Task Team on which this 'Summary TDA' is based.
- Section 3 summarises the main features of the Lake Prespa Basin. Including the geo-physical aspects, the ecosystem status, water use, potential climate change impacts, etc.
- Section 4 reviews the main stakeholders and governance in the region and the overall supervision of Lake Prespa Basin.
- Section 5 presents the identified key transboundary threats to the Lake Prespa Basin ecosystem;
- Section 6 summarises the next steps and the priority issues that are recommended to be addressed by the Strategic Action Programme.
- Annexes: The details collected and analysed by the Technical Task Team are presented in three National Analysis Reports. The Technical Task Team also summarised data available from the European Commission's Joint Research Centre (EC JRC) on basin wide monitoring results. The following Annexes are integral to support the conclusions of this Summary TDA report.
  - Maps                      Key maps of the Prespa Basin
  - Annex 1:                Albania – National Analysis Report
  - Annex 2:                Former Yugoslav Republic of Macedonia – National Analysis Report
  - Annex 3:                Greece – National Analysis Report
  - Annex 4:                Monitoring data from basin-wide assessments by JRC and EEA
  - Annex 5:                Bibliography and references

## 2 Methodology

### 2.1 Introduction

This TDA has been compiled by a team led by an international consultant with national expertise provided by a Technical Task Team (TTT). The ToR for the TTT was developed by the international consultant and the UNDP International Transboundary Expert. The TTT were responsible for collecting and analysing all the national issues and prioritising these with respect to trans-boundary concerns. The international consultant summarised three National Analysis Reports into this 'Executive Summary' as a Transboundary Diagnostic Analysis report. The three National Analysis Reports are integral elements to this TDA and are annexed to this report.

The key steps in preparing the TDA were:

1. Agreeing the process in discussion with key members of the PPCC (October 2008);
2. Developing and agreeing with the Prespa Park Coordination Committee (PPCC) the Terms of Reference for the TTT enabling a successful tender to be conducted by the GEF Prespa project (November 2008). The contract to perform the TTT was awarded to the Regional Environment Centre (REC) who provided a tri-national technical team to undertake the data gathering and analysis for the basin;
3. The Technical Task Team undertook the following activities:
  - Preparation of a detailed Inception Report identifying the activities to be undertaken in preparation of the National Analysis Reports for the overall TDA and the future steps for preparing the SAP
  - Collecting and analysing available information on the pressures, impacts and state of the ecosystem in the Prespa Lake Basin;
  - Describing the national governance and stakeholders involved in the Prespa Basin;
  - Identifying the main threats and concerns to the ecosystem from a national perspective;
  - Undertaking three national stakeholder workshops to present the TDA process and to receive active input on environmental concerns;
  - Drafting three National Analysis Reports based on the stakeholder workshops, previous documents including the 2002 SAP prepared for PPCC and a wide range of international and national studies, etc. Full lists of the previous documents reviewed in compiling the National Analysis Reports are given in the annexes to these reports.
  - Developing a series of maps and other baseline assessments utilising information from a wide range of sources, including European Environment Agency, EC Joint Research Centre, etc. This data will be invaluable to assess the subsequent implementation of the SAP.
  - Distribution of the National Analysis Reports and follow-up to elicit national comments from a wide range of stakeholders on the three analysis reports. This has led to the agreement/endorsement of the three National Analysis Reports by key stakeholders.
  - Presenting the 'summary' TDA to national stakeholders and to participate in a tri-lateral stakeholder workshop to review the TDA and the subsequent steps in preparing a revised Strategic Action Programme.
  - Future work includes preparing national action plans to implement the TDA by an agreed trilateral SAP.



4. Drafting this TDA report and distribution for comment prior to a transboundary stakeholder workshop enabling further comment, discussion and agreement on the priorities for the SAP. This report does not repeat all the details provided in the National Analysis Reports but attempts to summarise the key facts and present the main transboundary concerns.

## **2.2 Stakeholder and governance analysis**

The three National Analysis Reports provide details of the key stakeholders and the approach to the governance of the Prespa Basin.

## **2.3 Identification of transboundary environmental stresses**

The Project Document to the GEF-UNDP 'Integrated Ecosystem Management in the Prespa Lakes Basin of Albania, Former Yugoslav Republic of Macedonia and Greece' listed the following stresses that were considered to be of trans-boundary concern in 2004. These included:

- Loss of priority shoreline and wetland habitat
- Degraded aquatic habitat
- Altered aquatic animal and plant community dynamics
- Reduced population of native and endemic fish species
- Inter-specific competition from exotic fish species
- Forest fragmentation / altered forest structure
- Eutrophication

With limited availability of **scientifically validated monitoring data**, a wide stakeholder consultation was conducted through three national workshops to review the above list and to consider the key **perceived risks or threats** to the environment. The agreed conclusions from the three stakeholder workshops are:

- There is a need to reinforce the dialogue, cooperation and information/data exchanges among various stakeholders between the three countries.
- Various studies should be conducted to fill in the data gaps on various indicators for the major environmental impacts over the Prespa park ecosystem
- There is a need to enhance the wellbeing of inhabitants;
- Exploitation of natural resources under common terms should be explored.
- Sustainable management and the EU approximation (Water Framework Directive) are the main driving forces towards the protection of the ecosystem of the Prespa park

These conclusions and the review of reports and further discussions with stakeholders undertaken by the TTT, led to the preparation of three National Analysis Reports. In all cases additional monitoring data is needed from the proposed programmes under development by the PPCC to validate the magnitude and sources of these concerns. On the basis of these National Analysis Reports the following are considered to be the priority concerns of transboundary importance to be addressed by the revised SAP are:

- **Nutrient pollution** (nitrogen and phosphorus) leading to eutrophication and low dissolved oxygen concentrations. The main sources being inadequate wastewater treatment from human settlements and inappropriate use of fertilisers on agricultural land.

- **Fishery management** is under regulated in the region, leading to depletion of native species and lower competition for exotic species. The pressure on fish stocks also come from other pressures such as pollution, loss of water level (depletion of reeds used for spawning).
- **Loss of water level** in Macro Prespa leading to changes in the shoreline habitat. Whilst it is believed that most of the water level change is 'natural' there are clearly steps that be taken to reduce consumptive use of water by agriculture.
- **Sediment transport** resulting from inappropriate land management (agriculture and forestry), periodic flood events and changes in river regimes. In addition to the sedimentation that can occur in the lake the process can also transport nutrients and pesticides.
- **Deforestation and changes in forests** resulting from poor management and enforcement. All countries suffered from a loss of forest area. The loss of forest will impact the economic value of the forest in the future and will detrimentally impact the biodiversity dependent on woodland habitats. In addition, these changes can result in erosion and sediment transport concerns.
- **Organic pollution** leading to low dissolved oxygen concentrations. The main sources being inadequate wastewater treatment from human settlements, animals and the inappropriate disposal of excess fruits.
- **Hazardous substance pollution** leading to accumulations in the water column, sediment and biota from inappropriate use of agrochemicals and industrial processes.

## **2.4 Analysis of root causes of environmental stress**

The analysis of the environmental stresses and their root causes was undertaken by the Technical Task Team in discussion at the three national stakeholder workshops, meetings and discussions with national experts / ministry representatives, and through the review of previous reports (most notably the 2002 SAP). With limited availability of monitoring data to scientific validate the ecosystem stresses, expert judgement from national stakeholders was relied on.

### 3 Description Lake Prespa Basin

Detailed descriptions of Macro and Micro Prespa, their basins and all physical, chemical and biological characteristics are provided in the three National Analysis Reports (Annexes 1 to 3)

#### 3.1 Physical and geographic description of the basin

The Prespa Basin and the national borders, main settlements and roads are shown in Map 1.

##### 3.1.1 Lake, river and groundwater systems

Prespa is a high-altitude basin which includes two inter-linked lakes: Micro Prespa (shared by Albania and Greece) with a surface area of 47.35 km<sup>2</sup> and Macro Prespa (shared by all three countries) with a surface area of 259.4 km<sup>2</sup>. The overall basin catchment is quoted as 2,519.1 km<sup>2</sup> (Hollis and Stevenson, 1997). The lake is at an altitude of about 850 m with the surrounding mountains reach an altitude of 2,601 m (Mt. Pelister).

Map 2 provides a representation of the relief of the region.

Micro and Macro Prespa are linked by a short controlled water course which regulates the level of Micro Prespa.

There are four main rivers flowing into Macro Prespa: The Golema Reka, Brajcinska Reka and Kranska Reka (in Former Yugoslav Republic of Macedonia) and Agios Germanos (in Greece). Inflow to Micro Prespa includes the canal diverting the Devoli Rver constructed in 1976 (and responsible for significant sedimentation in the Albanian part of Micro Prespa, although now the pumping system has been largely destroyed) and other small ephemeral water courses.

The outflow from Macro Prespa is believed to be to Lake Ohrid through the karstic geology and indicated through tracer experiments.

The river network and lakes is shown in Map 3 and the hydrogeology of the region is presented in Map 4.

##### 3.1.2 Land Resources

The National Analysis Reports have summarised the main land uses within the Prespa Basin as:

	Total Area	Forests		Pastures		Cultivated land		Non-productive land	
	ha	ha	%	ha	%	ha	%	ha	%
Albania (Region)	36,6024	13,2075		53,732		86,108		94,109	
FYROM – Resen Municipality	55,854	35,165	64	1,628	3	16,137	29	2,924	4
Greece									

Remote sensing data from CORINE (EEA) for the Prespa Basin indicates the following land cover in 2000. This will be an invaluable harmonised reference data set for monitoring the impact of future management actions in the basin. Whilst the

data may differ from national estimations the benefit of a common system that is applied across Europe is of importance.

<b>CORINE Legend</b>	<b>Hectares</b>
Bare rocks	43.39
Beaches, dunes, sands	211.72
Broad-leaved forest	37678.84
Complex cultivation patterns	10497.79
Coniferous forest	547.08
Discontinuous urban fabric	512.16
Fruit trees and berry plantations	376.69
Industrial or commercial units	208.66
Inland marshes	2611.28
Land principally occupied by agriculture, with significant areas of natural vegetation	4406.88
Mixed forest	1702.53
Moors and heathland	1143.35
Natural grasslands	9310.83
Non-irrigated arable land	1825.64
Pastures	1871.52
Permanently irrigated land	1049.19
Sclerophyllous vegetation	3295.70
Sport and leisure facilities	76.96
Transitional woodland-shrub	22841.59
Vineyards	91.73
Water bodies	30500.89

CORINE Land Cover data is presented in Map 5 and a summary map of vegetation in the region is shown in Map 6

### **3.1.3 Mineral resources**

There is limited exploitation of mineral resources in the basin according to the information currently available. The region is characterised by extensive karstic formations (with potentially abundant mineral water resources) but insufficient information from the countries on economic exploitation of minerals. In Former Yugoslav Republic ofOM there is illegal extraction of sand and gravel from the Golema River within the Ezerani Natural Reserve.

### **3.1.4 Climate**

The climate of the Prespa basin is considered to be mild-continental with features from Mediterranean and Central Europe. The mountainous terrain surrounding the lakes results in three different climate types in the region:

- Warm (600 – 900 m) and cold (900 – 1,100 m) sub-Mediterranean zones;
- Sub- mountainous (1,100 – 1,300 m) and mountainous (1,300 – 1,650 m) sub-Mediterranean zones;
- Sub-alpine (1,650 – 2,250 m) and alpine (>2,250 m) zones.

The analysis of the air temperature for the region indicates:

		Absolute Minimum °C	Maximum °C	Annual Mean °C
Ligenas Commune	AL	-15	25	10.6
Resen	FYROM	-26.5	37	9.6
Florina	GR	-15.9	31.30	11.7

Rainfall is predominately in the winter months (October – April) with the driest period being May – September. Most of the recorded data is from low level recording stations and it is clear that at elevation rainfall increases.

		Annual Mean mm
Ligenas Commune	AL	900
Resen	FYROM	705
Florina	GR	650

### 3.2 Ecosystem status

This section provides an overview summary of the ecosystem status based on the agreed National Analysis Reports. This summary includes:

- Water quality status – with information on nutrient, organic and hazardous substance pollution;
- Water level status – for Micro and Macro Prespa
- Biological resource status.

Monitoring of ecosystem parameters is still to be implemented across the whole of Prespa Basin.

Annex 4 summarises available regional monitoring information in a series of maps to describe the area with data from various sources (from EC JRC and EEA). The information assembled by the TTT includes:

- The catchments and river segments of the basin;
- Climatologically data from interpolated datasets;
- CORINE land cover data;
- LANDSAT data giving differences of the vegetation index between 1990 and 2002
- Analysis of climate change scenarios.
- Data providing an indicator of photosynthetic activity (which is correlated to vegetation activity and growth for the area).

Expert stakeholders are invited to comment on the maps, and to provide GIS data where possible, in order to address in more detail the ecosystem properties during the preparation of SAP.

#### 3.2.1 Water Quality Status

There have been a number of studies on the water quality of the Prespa Lakes but, to-date, limited monitoring data is available. Data is available from Greece from the 1990s and it is expected that data from the Greek EU WFD reports will be available soon and the Monitoring and Conservation Working Group of the PPCC is proposing a routine monitoring network in the future. This section provides an overview of the water quality status based on the National Analysis Reports.

### Nutrient Status

In 2007 the Albanian Institute of Hydrometeorology undertook four sampling missions in Prespa lakes. Details of these are presented in the Albanian National Report (Annex 1). A summary of the data is presented below:

Dissolved Oxygen	3.05 – 8.71 mg/l (summer) 9.36 – 11.08 mg/l
Total phosphorus	0.02 – 0.062 mg/l
Ammonia (NH <sub>4</sub> )	0.012 – 0.028 mg/l N
Nitrate	0.015 – 0.045 mg/l N
Transparency (Secchi)	2.5 – 5.3 m

The data presented in the Albanian National Report suggests that the lake is mesotrophic but in the process of eutrophication.

Studies in Former Yugoslav Republic of Macedonia from the early 1990s showed that the Macro Prespa Lake alternated between oligotrophic and mesotrophic (Naumoski et. al., 1997) but since then there is an understanding that the lake is becoming eutrophic. In 2006 (Matzinger et. al.) anoxic conditions were observed in bottom waters and an increase of sediment P found, further indicating a transition to eutrophic conditions.

### Nutrient concentrations and indicators of nutrients (Macro Prespa, FYROM National Report)

(mean unless range indicated)

Date	Secchi depth (m)	Chlorophyll a (µg/l)	Total P (µg/l)	Total N (µg/l)
1992	6.93		8.98 – 65.37	
1997	4.75 - 10		17.79	
2000	4			877.04
2001	3.49	6.28	38.08	815.16
2002	3.17	5.7	32.19	
2003	2.81	6.39	31.04	528.7

The above indicates that the transparency is decreasing over the last 15 years, again an indicator of increasing eutrophication

There is a decreasing ratio of P:N with an expectation that nitrogen could become the limiting nutrient in the future. This could result in a growth of nitrogen fixing blue-green algae with significant detrimental impacts on lake water quality.

### Organic Pollution

There is no status information on organic pollutants. There is limited information on the estimated organic load from untreated domestic wastewater and industrial wastewaters in Resen.

### Hazardous Substances

There is limited status information on hazardous substances, although the National Analysis Reports contain information on the use of herbicides and pesticides. This is a significant gap in the available information. Data available from the 1990s in Greece indicates that hazardous substances were not an issue in either Micro or Macro Prespa. However the potential risks of pollution (from unregulated use of pesticides, for example) and the long-term damage to the ecosystem that could result encourages the use of a precautionary approach to the need to monitor on a tri-

lateral basis and the need to implement measures to reduce the risk of hazardous pollutants entering the environment.

**Groundwater**

There is limited information on the quality or quantity of groundwaters in the region, although there has been considerable research on the links between Lake Prespa and Lake Ohrid.

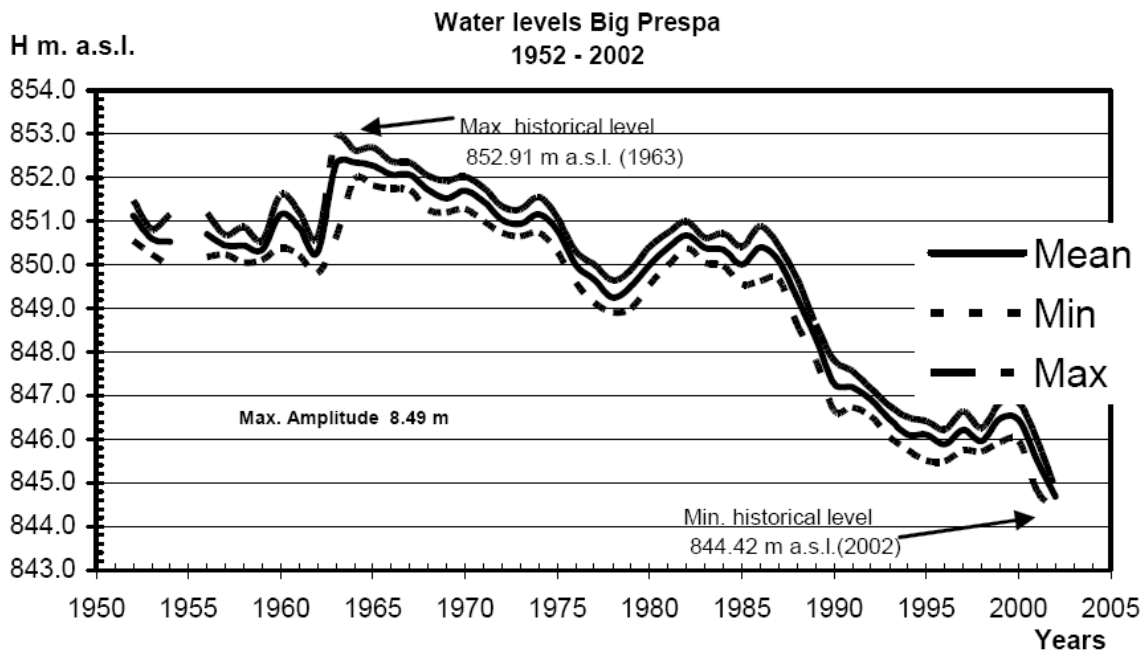
The National Plan for the Protection and Management of Water Resources provides information on aquifers for Greece (ex. classification maps of their nitrate status). Also, a monitoring study of the Integrated Agricultural Management System of Florina collected certain chemical characteristics of water well sampling locations, provided in more detail at the Greek National Analysis Report (Annex 3).

More routine data on groundwater quantity and quality is essential.

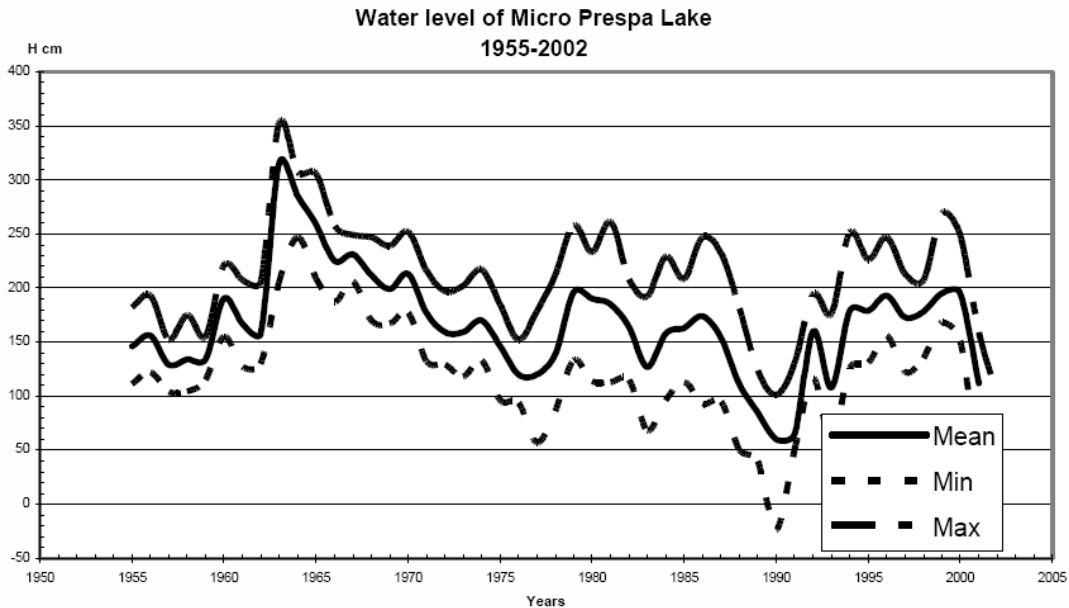
**3.2.2 Water Level Status**

The water level of the lakes is obviously highly dependent on rainfall and the flow from Macro Prespa through the karstic system to Lake Ohrid. In addition, anthropogenic influences are believed to have an impact.

The figures below indicate the height of the lakes over the last 50 years, showing that for the last 40 years Macro Prespa has been declining. The decline in water level has several significant impacts on the ecosystem of the region. In particular, the loss of reed beds and the spawning ground of fish and the conversion of wetlands to agricultural land with potential for additional pollution of the lake.



Source: Report on Mainstreaming ecosystem health priorities into hydrology and water resources management in Prespa lakes – Prespa Project (2007)



Source: Report on Mainstreaming ecosystem health priorities into hydrology and water resources management in Prespa lakes – Prespa Project (2007)

### 3.2.3 Biological resources

Full details of the biological resources are provided in the National Analysis Reports. This is an important region with a wide range of biological assets. There are limited monitoring programmes established for fish abundance or size distribution. SPP undertakes monitoring for biomass including fish on an annual basis (see the Greek National Analysis Report – Annex 3). The main data is from fishermen and this is a very unregulated business. There is some data on periodic fish kills that were attributed to eutrophication problems (Albania) and limited ecotoxicology tests on effluent from agricultural run-off (Former Yugoslav Republic of Macedonia). Additional co-ordinated tri-lateral monitoring is needed.

The following summarises (based on data in the three National Analysis Reports – Annexes 1 -3) the biological resources in the basin:

- 23 species of fish (including 2 hybrids and 9 non-native alien species);
- Presence of eels despite the lack of sea connection
- 11 amphibian species reported
- 21 Reptiles
- 27 types of algae are reported
- 42 species of mammals are reported
- >1300 plant species
- 261 species of birds have been observed in last 50 years including over 90 migratory birds
- Caves of Treni are an important bat colony with 9 species
- There are extensive forests in the basin

### 3.2.4 Nature reserves and protected areas

The management of nature reserves and protected areas is described in Section 4 of this TDA Summary. Key features and values of these areas are described in detail in the National Analysis Reports. All countries in Prespa Basin have designated parks



and / or protected areas, including a trilateral linked region. However the level of protection differs across the region.

Map 7 presents the main protected area locations in the Prespa Basin

The **main nature reserves and protected areas** include:

#### **Albania**

The National Park of Prespa – cross border linked with the National Prespa Park (Greece) and National Park of Galicitsa (Former Yugoslav Republic of Macedonia) 27,750 ha

#### **Former Yugoslav Republic of Macedonia**

There are three nature parks / protected areas

- Ezerani - Strictly Protected Ornithological Reserve (Ramsar site) – 2080 ha
- National Park of Pelister – 10,870 ha
- National Park of Galicitsa (linked with Albania and Greece) – 227 km<sup>2</sup>

#### **Greece**

There are two nature reserves / protected areas:

- Prespa National Forest (linked with Albania and Former Yugoslav Republic of Macedonia) – 4,900 ha with a peripheral zone totalling 14,570 ha
- Micro Prespa has been designated a ‘wetland of international importance’ under Ramsar

A Ministerial Decision, published in February 2009, indicated that Prespa National Forest will be declared as a National Park of Greece.

### **3.3 Socio-economic analysis**

#### **3.3.1 Population:**

The recorded population for the region of tri-lateral Prespa Basin (total area 2,519.1 km<sup>2</sup>) is:

	Population	Date
Albania	10667	2007
FYROM	16825	2004
Greece	1851	2001

The National Analysis Reports provide summaries of the economic, health and education status of the region.

The Prespa Basin is predominately an agricultural rural region with little industrial activity.

#### **3.3.2 Industry**

On the Albanian and Greek part of the basin there is no reported industrial activity. In Former Yugoslav Republic of-Macedonia there is some ‘small industries’ in Resen, including metal processing, textiles and beverage industry which has declined in the last 20 years.

### 3.3.3 Agriculture

In **Albania**, 68% of the labour force is involved in agriculture which generates about 45% of the income for the region. Former state farms have been broken up as ownership titles emerged leading to a significant fragmentation of land. This has resulted in a growing trend for small and medium sized agricultural business. Approximately 23% of the land in Korca Region is cultivated and of this > 90% of this is arable, this compares with only 7% of arable land in the Region of Prespa. In addition it is estimated that there are approximately 14,000 head of livestock (cattle, sheep, goats and pigs) in the region. The low productivity of the agricultural land in Albania is attributed to the current low level of irrigation. The existing system is non-functional.

Cultivated land and pastures cover about 27% of the catchment in **Former Yugoslav Republic of Macedonia**. Apple growing is the main crop with approximately 3,700 ha. In addition to fruit (apples, other fruit and vines) the main crop is wheat (1,200 ha). The extensive apple growing in the region is a significant pressure on the ecosystem with substantial quantities of agrochemicals being used and the disposal of waste apples. In addition there are approximately 5,300 sheep grazed in the region. The current irrigation system is degraded and new well and groundwater abstractions have been introduced by farmers in an unregulated way.

Bean cultivation represents the main crop in **Greece**, providing 75% of the total agricultural income and covering nearly 50% of the agricultural land. It also accounts for nearly 85% of the irrigated land. There are about 8,000 goats and 16,000 sheep grazed in the more mountainous parts of the region.

### 3.3.4 Fishing

Fishing is well established in the region both as a revenue generator and for domestic consumption. Details of the fishing authorities and the threats to the fish stocks are given later in this report.

### 3.3.5 Tourism

Tourism is underdeveloped in Former Yugoslav Republic of Macedonia and Albanian parts of the basin (and has decline in Former Yugoslav Republic of Macedonia since 1991). In Greece tourism and agro-tourism has been developing in the Prespa region with Florina Prefecture having been recently (2007) awarded a prize for one of the 'top 10' agro-tourist locations in the EU (according to recent UNDP reports). Map 8 shows the main cultural and tourist sites in Prespa Basin.

## 3.4 Water use in the basin

Loss of water level from Macro Prespa is considered to be a significant environmental problem. Whilst it is recognised that the major loss factor is natural (changes in rainfall and losses through the karstic geology), reducing consumptive use of water in the basin is important.

All but four of the tributaries of the lakes are ephemeral and there is no information on environmental sustainable flows in the four permanent rivers. There is no data on groundwater quantity or the use of groundwaters.

In **Albania** there has been historic irrigation of agricultural land from Micro Prespa. The most recent data suggests a quantity of 20 Mm<sup>3</sup>/year was extracted in the period 1990 – 2000. There is no significant abstraction from Macro Prespa for irrigation remaining.

In **Former Yugoslav Republic of Macedonia** 10 out of 13 communities in the Golema Reka basin are part of a regional water supply. The system is considered old with significant leakage and an estimated 10% of the domestic water meters are non-operational. Irrigation of the apple trees is the main user of water in the region and many of the sources are unregulated so quantities used are unknown. There has been a gradual shift to drip irrigation which will help to reduce the pressure on the environment.

In **Greece** it is estimated that about 1200ha of land are irrigated with water from Micro Prespa with an increase in the use of drip irrigation in the region to reduce consumptive use (drip irrigation is expected to be used for all irrigation schemes in the future). In addition, private wells are understood to provide water for irrigation in the region

### **3.4.1 Wastewater and Solid waste**

In the whole of the Prespa basin, it is only in parts of the Resen region (**Former Yugoslav Republic of Macedonia**) is a sewerage network present connected to a functional wastewater treatment works. In Resen there are about 11 km of sewerage which delivers wastewater to a treatment works on the banks of Macro Prespa near Ezerani. The WWTW uses an activated sludge with subsequent aerobic sludge treatment. The wastewater is directed to two maturation ponds and the sludge to drying beds. Most of the region is served by a basic solid waste collection system, however the final disposal is not considered to be environmentally sufficient.

In **Albania** all wastewater is discharged untreated to water courses or the ground. Solid waste is currently being addressed by SIDA and the UNDP. However there is still much to be done and 7 non compliant waste sites have been identified in the vicinity of Micro Prespa and 20 by Macro Prespa. In general solid waste disposal is unregulated and uncontrolled in Albania.

In **Greece** the small population is below the limits required by the EU Urban Wastewater Treatment Directive, however there is a plan in progress to install five small treatment plants (e.g. constructed wetlands) in recognition of the important and sensitive ecosystem in the region. Solid waste is collected by the local authorities and transported out of the region.

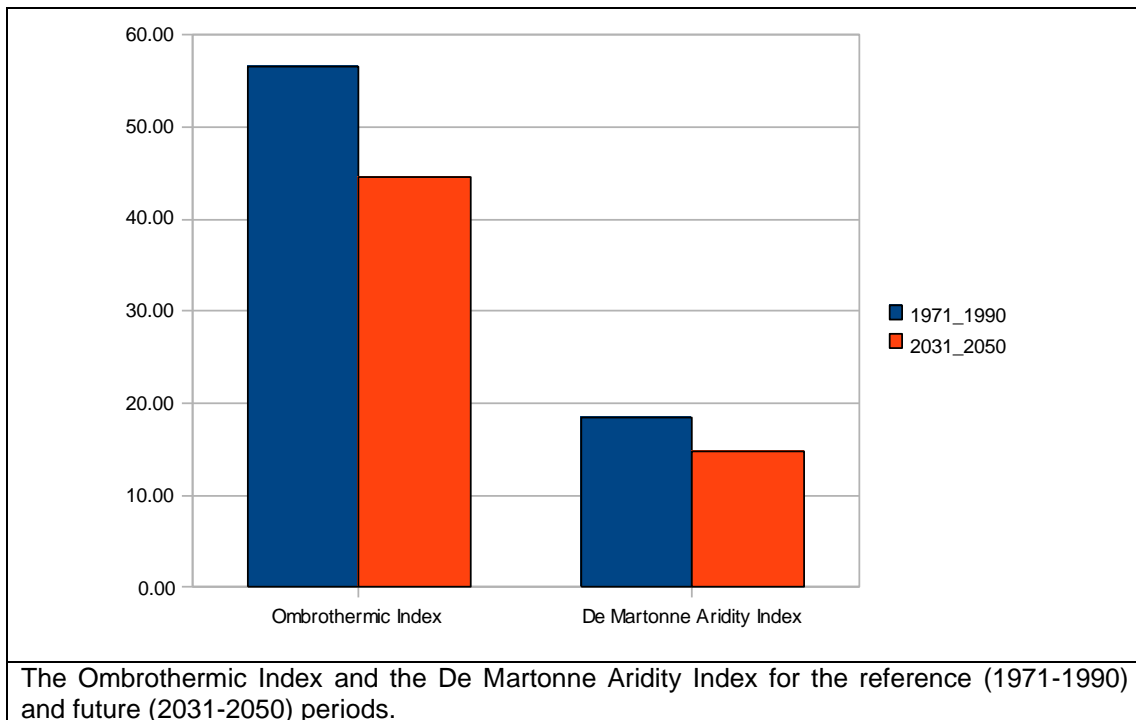
## **3.5 Climate Change Impacts**

In recognition of the problems likely to be caused by climate change a number of studies have been undertaken.

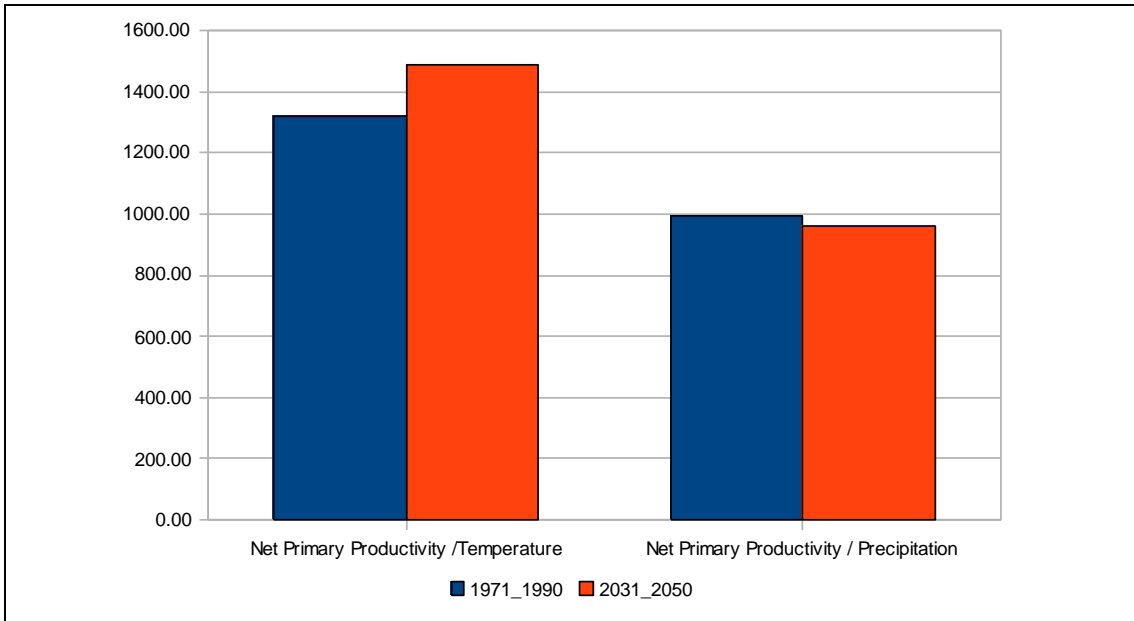
In the Report on Second Communication on Climate and Climate Changes and Adaptation in the Republic of Former Yugoslav Republic of Macedonia, in the section "Vulnerability Assessment and Adaptation for Water Resources Sector", (Donevska K., 2006, Skopje), the author assessed the vulnerability of the water resources of the Republic of Former Yugoslav Republic of Macedonia under conditions of climate change and proposed adaptation measures for the water resources sector, using the results and data from the Initial National Communication and additional updated data and information. Using data from the Administration of Hydrometeorological Works of the Republic of Former Yugoslav Republic of Macedonia, analysis of the minimal, average and maximal annual water levels of the lakes Dojran, Prespa and Ohrid were performed. From the results of the analysis it has been concluded that oscillations of the Ohrid Lake water level are rather small due to the controlled outflow of the river Crni Drim from the lake. Oscillations of the water levels for the other two lakes: Dojran and Prespa are showing significant variations. It is very

important to note that there was an extreme drop-down of the water levels of both lakes that started almost at the same time (in 1986) and had almost the same duration (until 2002). From 2003 onwards, there is an increase of the water levels of the both lakes. Average oscillations of the water level in the period 1961-1986 were recorded for Prespa Lake, from when the water level started drastically to drop-down. Absolute annual minimum of the water level of 445 cm, occurred in 2002

The EC FP6 ENSEMBLES project<sup>1</sup> provides regional downsizing datasets for a number of variables, including precipitation, temperature, etc. The Technical Task Team has used these datasets for the Prespa Basin and has analysed agro-climatic indices for 2031 – 2050 using a reference period of 1971 – 1990. Based on the analyses the number of months for Growing Period (as defined by FAO CLIMPAG) will be reduced on average by 0.5 months for rain-fed crops. Agro-climatic and bio-climatic indices developed for the Prespa Park geographic area include Miami Model Net Primary Productivity (as this is influenced by Temperature and Precipitation), Ombrothermic and De Martonne Aridity Index, plus other variables, such as the Length of Growing Period and annual precipitation sums.

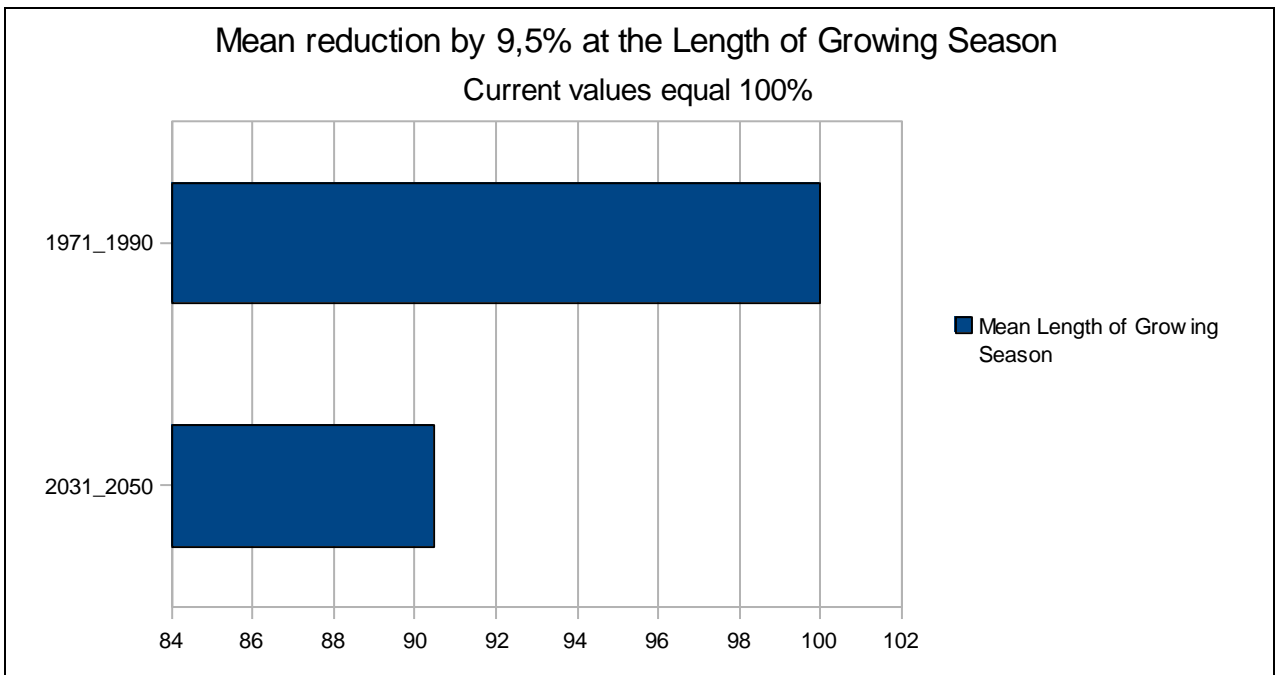


<sup>1</sup> EU FP6 Integrated Project ENSEMBLES (Contract number 505539). 'The data used in this work was funded by the EU FP6 Integrated Project ENSEMBLES whose support is gratefully acknowledged'



The Miami Model Climatic Net Primary Productivity is provided here for the reference (1971-1990) and future (2031-2050) periods. Calculations are made as in the Miami Model on NPP of Temperature and Precipitation accordingly.

A map providing the 25 km grid of the ECHAM5 A1B from the ENSEMBLES Project datasets is provided the 3-country Monitoring report – Annex 4 – derived by the TTT.



Reduction at the mean length of the Growing Period for the period of 2031-2050 in comparison with the climate of the period 1971-1990. In this simulation Length of Growing Period is defined as  $P/ET > 0,49$ , similarly to FAO CLIMPAG website.

## 4 Stakeholder and Governance Analysis

### 4.1 Overview of institutional, legal and policy in Prespa Lake basin

In 2000, the Prime Ministers of Albania, Former Yugoslav Republic of-Macedonia, and Greece issued a joint declaration declaring that “the Prespa Lakes and their surrounding catchment are unique for their geomorphology, their ecological wealth and their biodiversity, which gives the area significant international importance.... The conservation and protection of an ecosystem of such importance not only renders a service to Nature, but it also creates opportunities for the economic development of the adjacent areas that belong to the three countries.” The Declaration declares the Prespa Lakes and their surround catchment as “‘Prespa Park’ ... the first trans-boundary protected area in South Eastern Europe...”

The Declaration also promises “enhanced cooperation among competent authorities in our countries with regard to environmental matters. In this context, joint actions would be considered in order to:

- Maintain and protect the unique ecological values of the “Prespa Park”,
- prevent and or reverse the causes of its habitat degradation;
- Explore appropriate management methods for the sustainable use of the Prespa Lakes water; and,
- To spare no efforts so that the “Prespa Park” becomes a model of its kind as well as an additional reference to the peaceful collaboration among our countries”.

The first action following the Declaration was the establishment of the Prespa Park Co-ordination Committee (PPCC) by the three Ministers of Environment. Each country provides representatives from ministries of environment, an NGO and local government. In addition MedWet is present as an observer. However there is no national financial contribution to the operation of the PPCC nor is there a legal commitment to support the PPCC. To-date the secretariat (SPP) has been supported by WWF-Greece with occasional ad-hoc funding to the PPCC from the Greek Government and from the UNDP-GEF Prespa Project which has largely supported the meetings of the PPCC working groups.

The PPCC has, with the co-operation of experts from the three countries, successfully prepared a *Strategic Action Plan for the Sustainable Development of the Prespa Park* funded by the Greek Government. This document provided a common vision for the future conservation and sustainable development of the Prespa Basin and was adopted by the PPCC in 2004. However, despite the detailed activities and budgets identified there has been no formal commitment by the countries (or donors) to fund the > 30 M euro Plan.

Whilst the absence of a formal agreement that would establish the PPCC as legal entity under international law is a significant issue there is clearly a need to agree the priority environmental problems of the region and then to develop a pragmatic and financially acceptable SAP to address these problems.

The EU Water Framework Directive (WFD) may provide a means to further the co-operation between the Prespa Basin countries. EU countries are obliged to co-ordinate their river basin management actions with non-EU countries where ever

possible. In addition, the new water legislation in Former Yugoslav Republic of Macedonia is fully compatible with the expectations of the WFD and recent changes to the water law in Albania have also brought this in-line with the Directive.

## **4.2 National environmental management and strategies**

The national institutions and their policies with respect to environmental protection are provided in the National Analysis Reports (Annexes 1 to 3).

### **4.2.1 Albania**

Full details of the key ministerial stakeholders and their responsibilities are described in the National Report for Albania and this is presented in Annex 1.

The primary responsibility for conservation and resource management is with the Ministry of Environment, Forestry and Water Administration (MoEFWA) and the Ministry of Agriculture, Food and Consumer Protection (MoAFCP). At the local level the Regional Environmental Agencies (under the MoEFWA) are responsible for implementing environmental legislation at the local level, supporting local and regional governments. In addition, the key environment sectors have the following authorities and organisations involved. The MoEFWA has limited capacity at the local / regional level.

#### **Water Management**

Water resources are under the Ministry for Environment, Forestry and Water Administration through the Directorate of Nature Protection and Water, and the Directorate of Pollution Prevention Policies. Albanian territory is divided into six water basin authorities with responsibility for the implementation of national legislation. The Albanian law on water resources has recently been amended (December 2007) to accommodate the requirements of the EU Water Framework Directive

The Ministry of Public Works, Transport and Telecommunications is responsible for water supply and sanitation, with the Ministry of Health having responsibility for potable water monitoring. The Ministry of Agriculture, Food and Consumer Protection regulates water use and irrigation.

#### **Land Use**

Land use and planning is organised at national, regional and local levels under the Ministry of Public Works, Transport and Telecommunications.

#### **Fishing and Forestry**

The responsibility for managing and controlling fish resources within Albania is with the MoEFWA through its Directorates on Fishing Policy and Fishing Inspectorate. A new private body, the Fisheries Management Organisation, is expected to play an important role in the future management of the fishing sector in Albania.

The management of forests is under the MoEFWA through the Forestry and Pasture Policy Directorate.

#### **Protected Areas and Biodiversity**

The MoEFWA through the Directorate of Environmental Protection Policies has responsibility for protected area management, and through the Directorate for Nature Protection Policies for nature protection. MoEFWA co-operates with a wide range of ministries with regards nature protection, including: The Ministry of Agriculture, Food and Consumer Protection (agricultural biodiversity), the Ministry of Public Works,

Transport and Telecommunication (land use), Ministry of Tourism, Culture, Youth and Sports (tourism) and the Ministry of Interior (control of the management of natural resources).

### **Solid Waste Management**

Solid waste is managed by a large number of ministries and other organisations (including the MoEFWA, Ministry of Public Works, Transport and Telecommunications, Ministry of Health, Ministry of Agriculture, Food and Consumer Protection).

### **Regional / Local Environmental Action Plans**

A regional development strategy has recently been prepared by the Regional Council of Korca. This strategy provides a vision where inhabitants 'live without poverty' by 2015 and that poverty is seen as the 'main cause of environmental degradation'. The strategy expects that sustainable development of the environment with the protection of natural resources (particularly forests and protected zones) will enhance the livelihoods of the people. Based on this strategy, the communes are required to develop local development plans and local environmental actions plans. This process has been completed in the communes within the Prespa Basin.

## **4.2.2 Former Yugoslav Republic of Macedonia**

Full details of the key ministerial stakeholders and their responsibilities are described in the National Report for Former Yugoslav Republic of Macedonia and this is presented in Annex 2.

### **Water Management**

Water management is split between a number of ministries and other authorities. The Assembly of Former Yugoslav Republic of-Macedonia has defined the boundaries of river basin districts (in accordance with the WFD), and intends to adopt the National Strategy for Waters and the Water Master Plan, as well as River Basin Management Plans (RBMPs). The Swiss Development Co-operation is assisting with the establishment of a River Management Board for the Bregalnica catchment and UNDP has initiated the development of a RBMP for the Prespa catchment in the Former Yugoslav Republic of Macedonia. The Government (MoEPP) grants concessions for economic use of surface and ground water, adopts the expected river basin management plans (in accordance with the WFD), adopts the proposed programme of measures, establishes water quality standards and protection zones.

Until the recent water legislation consistent with the EU WFD, the Ministry of Agriculture, Forestry and Water Economics (MAFEW) had been responsible for the overall water management in the country, including all aspects of water quality and pollution prevention and control (permitting). However, with the new Law on Water Management the responsibility and staff are to be transferred to the Ministry of Environment and Physical Planning (MEPP), with irrigation and drainage only remaining with the MAFEW.

Water quantity and quality monitoring of both surface and ground waters is within the Hydro-Meteorological Directorate (to be transferred to the MEPP), the Ministry of Health and the Institute for Hydro Biology (under the Ministry of Education)

### **Agriculture, Fisheries, Hunting and Forestry**

The Ministry of Agriculture, Forestry and Water Economy (MAFWE) is responsible for agriculture, forest management and protection, and regulates hunting, fishing and plant protection. New laws consistent with the EU Acquis are in preparation and



debate is still in progress on forestry to ensure the new legislation is consistent with an ecosystem approach to management.

The fishing industry is managed through five year concessions granted to fishing companies, who must restock the lake according to plans and pay a levy of 10% of the wholesale catch to the government to assist with improving fishing conditions in the lake. Enforcement of the catch figures is considered to be weak and currently fishing is moratorium until a fishing master plan is developed.

A long-term management plan for hunting in Former Yugoslav Republic of Macedonia has been adopted by MAFWE and specific areas are leased to hunting associations to manage. Within Prespa Park there are two managed hunting sites.

### **Protected Areas and Biodiversity**

Both the MAFWE and MEPP have responsibilities with respect to protected area management and protection of biodiversity and in some cases both ministries have direct responsibility (for example, wild bird protection where the EU Wild Birds Directive has been transposed in two laws under these ministries). The Laws on the protection of the National Parks Galicica, Mavrovo and Pelister have been established.

### **Solid Waste Management**

The MEPP has responsibility for the transposition and implementation of the waste management directives. In some cases this responsibility is joint with other relevant ministries (such as Ministry of Transport - transport of hazardous waste, Ministry of Health – handling of health care waste, Ministry of Economy – packaging waste) and municipalities – management of municipal waste.

### **Local Environmental Action Plans**

There is a Local Environment Action Plan for the Municipality of Resen dating from 2003 which predates the current Law on Environment. It defines the establishment of protection zones around water supply sources, the replacement of asbestos pipes in water supply systems, connection of settlements to the existing WWTW, upgrading the current WWTW to include tertiary treatment, pre-treatment of industrial wastewater, participation in a future regional municipal waste management system, introduction of more sustainable agricultural practices, etc. This plan is in need of revised it in-line with new environmental legislation and to be consistent with relevant EU Directives.

## **4.2.3 Greece**

Full details of the key ministerial stakeholders and their responsibilities are described in the National Report for Greece and this is presented in Annex 3.

The GR-MoEPP, the Ministry of Rural Development and Food (through the General Secretariat of Development and Protection of Forests and Natural Environment), and the Ministry of Development, Spatial Planning and Public Works, are the main national level institutions with responsibilities related to the Prespa Lakes Ecosystem. Prefecture and Regional Water Authorities, Forestry Directorates, Forestry Services, Departments of Land Rehabilitation/Reclamation, Prespes Local Municipality Government (and its Technical Services Department), are all involved in various aspects of land use management at the regional, prefecture, and the Municipality Level. Authorities on Land Use, Water management, Hunting and Fisheries and Biodiversity protection, exhibit a spectrum of competences which are shared and coordinated at national, regional and local level.

### **Water Management**

As an EU country, water management in Greece is focused on the requirements of the EU Water Framework Directive. This Directive specifies the obligation to characterise the pressures and impacts the water basins and then to prepare a River Basin Management Plan (2009) with the detailed measures required to achieve the Directive's objective of 'good water status' by 2015. Key to this process was the reporting of a monitoring network and data for the water basin. Unfortunately this data is not yet available. The MoEPP, through the National Water Resource Directorate, the Regional Water Resource Directorate and the National Monitoring Networks of Water Resources, is responsible for the implementation of the WFD.

### **Land use authorities**

The Ministry of Rural Development and Food is the ministry dealing with agriculture, forestry and fisheries. Under its jurisdiction is also the National Forest of Prespa and the Wildlife refuges of the area. The General Secretariat of Development and Protection of Forests and Natural Environment, at the Ministry of Rural Development and Food is responsible for forest management and natural resources protection related matters. Planning and monitoring / approval of the plans (including Environmental Impact Assessment – EIA for structures and Strategic Environmental Assessment – SEA for plans / programmes) which have any impacts over the protection of the Prespa Park ecosystems are approved by the General Secretariat of Development and Protection of Forests and Natural Environment. The Directorate of Fisheries addresses farming and management issues of fish.

### **Protected Areas and Biodiversity**

The General Directorate of Aesthetic Forests, National Forests and Hunting of the Ministry of Rural Development and Food) is responsible for protected areas and hunting. The MoEPP has responsibility for the Ramsar sites of Greece, NATURA 2000 sites and other protected sites.

### **Solid Waste**

The Regional and Prefecture Directorates of the Spatial Planning and the Environment are the bodies dealing with solid waste.

## **4.3 Role of Civil Society in Prespa Basin**

All three countries are Parties to the Aarhus Convention (UNECE Convention on access to information, public participation and access to justice in environmental matters) and have implemented its provisions in national legislation. In addition, Greece as an EU country is also implementing the relevant Aarhus Convention related EC directives.<sup>2</sup>

Although Albania and Former Yugoslav Republic of Macedonia have made efforts to bring in line their environmental legislation with the Aarhus Convention and the relevant related EU directives, there is still much to be done, especially in the field of practical implementation. While implementation of the access to information pillar is less problematic, regarding the public participation pillar and especially the access to justice pillar, there are still numerous gaps in the implementation. The national

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<sup>2</sup> Directive 2003/4/EC on public access to environmental information, Directive 2003/35/EC providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC and Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment

legislation on EIA and SEA in these countries is in place usually with proper public participation requirements, but detailed legal provisions, especially procedures, guidance documents and the implementation practices are still missing. Albania is still in the process of developing and adopting legislation on Integrated Pollution Prevention and Control (IPPC), while Former Yugoslav Republic of Macedonia has already adopted implementing legislation and started to implement the IPPC directive.

As the national Implementation reports of Greece for the Aarhus Convention available at the UNECE website mentions, there are detailed resources at the National level for NGO involvement and for the budget available towards environmental and awareness raising programs. Funding from the Operational Programme for the Environment (EPPER) for the periods of 2000-2006 and 2007-2013 is reported to be several million Euros. Obligations of the country to provide public access to environmental information and public participation in decision making including consultations, and the tools deployed to achieve that, are also described in the National Implementation Report, along with other important issues.

The civil society is represented in the Prespa Park Co-ordination Committee (PPCC) where in addition to representatives from ministries of environment an NGO representative is also invited from each country, along with a representative of a local government. In addition MedWet is present as an observer.

Trilateral activities in the area initiated and carried out by NGOs are numerous, and the most significant ones are the proposals for the creation of the trilateral park and later on the development of the Strategic Action Plan till 2002. The participating NGOs are the Society for the Protection of Prespa (SPP), based in Aghios Germanos, Greece, the Protection and Preservation of the Natural Environment in Albania (PPNEA), based in Tirana, Albania, and the Society for the Investigation and Conservation of Biodiversity and the Sustainable Development of Natural Ecosystems (BIOECO), based in Skopje, Former Yugoslav Republic of Macedonia.

### **Albania**

In Albania, 68 civil society organisations participated in the latest survey on civil society carried out in 2006<sup>3</sup>, declaring themselves as environmental civil society groups with a membership of approximately 11,420 and a total budget of EUR 837,250. Nature protection, forestry, biodiversity and sustainable development were among the top 5 priority activities mentioned by them. The vast majority of the surveyed groups were formed after 2000 (60 percent).

The development of civil society organisations in Prespa Region is still at early stage. Only a few local, some regional and national level NGOs are active in the Prespa Park area organising limited activities on environmental issues, eco-tourism, nature resource management and sustainable use. Only a few local and national NGOs are active in the Prespa Park area including the following groups: Albania, Macedonia People Empowerment Programme (AMPEP), Environmental Association Morava, Korce (EAM, SHMM), Transborder Wildlife (TWA – NN) from Korce, the Sun of Liqenas from Liqenas and *the* Association of Forest and Pasture Users (Prespa) which works in Korce, Gorice, Liqenas as well as nationally. These groups are involved in projects or activities on agriculture, organic or traditional farming, animal protection/wildlife, biodiversity, forestry, sustainable management of communal forest

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<sup>3</sup> NGO Directory of South Eastern Europe: [A Directory and Survey Findings of West Balkan Environmental Civil Society Organisations, Fifth Edition, 2006, REC, p. 28-29.](#)

and pastures, nature protection, rural development and waste issues. The impact of the activities is mainly focused on promoting the local natural, cultural and historical values. In few cases, in partnership with local authorities, NGOs have taken concrete action for waste management, reforestation, etc. Some foreign / international organisations such as GTZ, SNV, REC did support the local groups on their activities.

#### **Former Yugoslav Republic of Macedonia**

In Former Yugoslav Republic of Macedonia, 50 civil society organisations with approximately 7466 members and a total budget of EUR 713,750 participated in the above mentioned survey as environmental civil society groups with almost an equal split shown between groups formed in the 1996-2000 period and after the year 2000. Among the top priority topics nature protection was included as the 3rd, for environmental CSOs along with environmental education/education for sustainable development, sustainable eco-tourism and waste issues

Civil society in the Prespa Park in Former Yugoslav Republic of Macedonia is not well developed. Some active NGOs deal with rural tourism development projects (e.g. NGO, Coalition of Perspective Prespa, Resen) however, their activities are concentrated in a limited area. On the other hand, associations of farmers and fishermen, although being registered as civil organisations, aim at the economic benefits from using natural resources and not at managing the ecosystem in a sustainable way.

#### **Greece**

For the Prespa area in Greece, the Society for the Protection of Prespa, consisting of WWF, Friends of Prespa and other organisations, and the Cultural Triangle of Prespa (CTP) are the two NGOs locally active. SPP has a long record in national, bilateral, trilateral and international environmental cooperation and project development in the area. Also, the cooperation of SPP with the Prespa National Forest Management Body (PNFMB) and other local stakeholders, the development of information centers (3 from PNFMB and 1 from SPP) in the area, the increasing collaboration and involvement of local stakeholders in the decision making and conservation management research efforts, are some of the characteristics of the work undertaken, with the goals both for the well being of the local inhabitants and the protection and preservation of the natural and cultural resources of the area. CTP is focusing in cultural and other public activities and more can be found at its website ([www.ctp.gr](http://www.ctp.gr)).

Scientific, dissemination and project report publications are numerous and thus provide a good level of access to environmental information in the area. The PNFMB, The University of Thessaloniki, the University of Athens, the Institute for Geological and Mineral Exploration, the Local government of the Municipality of Prespes, the Prefecture of Florina are actively collaborating in local projects and participate in the decision making processes.

## 5 Priority transboundary threats to the ecosystem of Lake Prespa Basin

In all counties additional data from monitoring programmes is needed to confirm these concerns and it is expected that the UNDP-GEF supported monitoring programme will assist with this further data collection. This assessment is highly dependent on expert judgement and perception of risk following a precautionary approach to protect the environment.

### 5.1 Introduction

The Prespa Basin ecosystem, as clearly indicated in the three National Analysis Reports and the Strategic Action Plan (2004), is of significant international importance offering wide biodiversity and ecological wealth. The aquatic ecosystem provides a habitat for a number of species unique to the system and the area is important to over 90 species of migratory birds. Both the terrestrial and aquatic environments are under multiple threats deriving from a range of human activities in the region.

Whilst the ecosystem is under threat from the pressures in the basin this does not imply that this is a heavily impacted environment necessitating significant remediation, but this TDA and the subsequent SAP, offer a means to agree actions to prevent further deterioration and to mitigate past damages.

The purpose of this section is to present the priority threats to the transboundary ecosystem as agreed by the main regional stakeholders. Whilst not all the threats originate in all the countries it is accepted that a regional approach through an agreed SAP is the most effective means to address these threats.

Although there have been a number of studies in the region over the past decade there is still little monitoring data (water quality, biodiversity information, etc.) to enable trends to be determined or for the threats to the ecosystem to be quantified. However, there is significant local expert judgement and experience to identify the main concerns and threats to the ecosystem in the basin.

Like all ecosystems the pressures and impacts are interlinked with a range of causes. The main threats to the ecosystem, and in particular the biodiversity of the region, include:

- **Nutrient pollution** (nitrogen and phosphorus) leading to eutrophication and low dissolved oxygen concentrations. The main sources being inadequate wastewater treatment from human settlements and inappropriate use of fertilisers on agricultural land. Data is available indicating that this is a significant problem.
- **Fishery management** is under regulated in the region, leading to depletion of native species and lower competition for exotic species. The pressure on fish stocks also come from other pressures such as pollution, loss of water level (depletion of reeds used for spawning). Some data and information exists on this issue.
- **Loss of water level** in Macro Prespa leading to changes in the shoreline habitat. Whilst it is believed that most of the water level change is 'natural' there are clearly steps that be taken to reduce consumptive use of water by agriculture. Some data on water use is available.

- **Sediment transport** resulting from inappropriate land management (agriculture and forestry), periodic flood events and changes in river regimes. In addition to the sedimentation that can occur in the lake the process can also transport nutrients and pesticides. Some data and information exists on this issue.
- **Deforestation and changes in forests** resulting from poor management and enforcement. In the past all countries suffered from a loss of forest area. The loss of forest will impact the economic value of the forest in the future and will detrimentally impact the biodiversity dependent on woodland habitats. In addition, these changes can result in erosion and sediment transport concerns. Information exists in all countries on the pressures on forests but the main concern is with the continuing threat to the forest ecosystem in Albania.
- **Organic pollution** leading to low dissolved oxygen concentrations. The main sources being inadequate wastewater treatment from human settlements, animals and the inappropriate disposal of excess fruits. Some data and information exists on this issue.
- **Hazardous substance pollution** leading to accumulations in the water column, sediment and biota from inappropriate use of agrochemicals and industrial processes. Very limited data and information exists on this issue.

Whilst data on these issues is in some cases very limited, a precautionary approach based on the concerns expressed by the stakeholder workshops is being adopted. It is important that one of the first steps of the SAP will be to validate these concerns and to prioritise the actions to mitigate the problems.

These concerns are presented together with summarised information indicating the sources and magnitude of the problem where available. This will enable a SAP to be developed addressing these concerns and specifying a management objective to address each concern.

## **5.2 Key Transboundary Concern 1: Nutrient enrichment**

### **5.2.1 Introduction**

The most relevant impact of high nutrient loads is *eutrophication*. This has been defined by the EC 'as *the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned*<sup>4</sup>'. This accelerated growth of algae can cause depletion of the dissolved oxygen concentration with consequential impact on other biological species.

### **5.2.2 Sources of nutrients**

The main sources of nutrients in the Prespa Basin are from wastewater (human settlements and animals) and from fertilisers used by agriculture. In addition erosion can be a considerable source of nutrients and this can be exasperated by poor land management (e.g. agriculture and forestry).

The population of the basin is approximately 29,000 with about 40,000 – 50,000 and farmed livestock, with an estimated YYY kg of fertiliser applied to agricultural land each year. Despite these relatively low loads the potential impacts and risks of an

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<sup>4</sup> EU Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment (UWWT-Directive).

increase of eutrophic conditions dictate that the problems of nutrient enrichment are important and of transboundary concern.

	Population	Livestock	Fertiliser use
Albania	10,667	13,993 <sup>1</sup>	24.3 t/yr <sup>2</sup>
FYROM	16,825	5,300 <sup>3</sup>	2,600 t/yr
Greece	1,851	24,000 <sup>4</sup>	<sup>5</sup>
TOTAL	29,343		

1 Cattle, sheep, horses, goats and pigs

2 Estimated on the basis of 25kg/ha and 971.5 ha under cultivation

3 Sheep

4 Estimated 8000 Goats and 16,000 Sheep

5 >300 ha under 'Local Agricultural Management System'

### Domestic Wastewater

The Former Yugoslav Republic of-Macedonia having the largest population and intensive agriculture (apples) is the most significant contributor of nutrient pollution to the basin. Resen municipality has a basic infrastructure for wastewater collection and treatment with 11 km of sewerage and wastewater treatment plant close to the lake providing secondary treatment. No data is available on the effluent quality.

Only the city of Resen and parts of Jankovec and Ezerani villages are covered with wastewater collection sewers. Unfortunately, due to lack of resources and incentives, a number of communities in close vicinity to the main sewer are not connected to central wastewater management system; these villages are: Gorna Bela Crkva, Dolna Bela Crkva, Kozjak, Podmocani and Grncari. The existing WWTP covered 6710 people or 40% of the Former Yugoslav Republic of Macedonia population in the Prespa Basin. Other villages covering 60% of the population have no sewerage collection networks or treatment plants. UNDP is supporting the development of a constructed wetland for the village of Nakolec: construction activities are pending. The decision to treat wastewater from this village was based on its location with problems of connection to the existing sewerage system

Quantities of untreated sewerage and pollutant loads in Former Yugoslav Republic of Macedonia

Untreated WW discharged (m <sup>3</sup> /day)	BOD 5 kg/day	P kg P/day	N kg N/day
300	605	26.61	35.31

Source - Restoration and Protection of Golema Reka 2006

In Albania there are no wastewater treatment facilities and wastewater is discharged via septic tanks or direct to ground.

	Discharge m <sup>3</sup> /day	COD kg/day	NH <sub>4</sub> -N kg/day	P <sub>tot</sub> kg/day
Liqenas Commune (Macro Prespa)	460	230	48	1.2
Proger (Micro Prespa)	50	25	4.8	0.1

These estimates of wastewater discharge (which do not include livestock estimates) are not considered to be significant sources of nutrients. Although the discharge of untreated wastewater is considered to be a potential problem with respect to abstraction of drinking water due to microbiological contamination.

Domestic wastewater in Greece is under the obligations of the EU Urban Wastewater Treatment Directive (91/271/EEC as amended by 98/15/EC). This directive requires treatment to prescribed standards based on the sensitivity of the receiving water and the size of the population. Below 2000 pe there is no obligation under the Directive to provide treatments if there is no sewerage collection infrastructure – which corresponds to the Prespes Municipality. However, due to the importance of the natural environment the local government is planning to install wastewater treatment for all 13 villages in the area using constructed wetlands. Five schemes are planned: two schemes are under construction, two have approved EIAs and the fifth is currently under planning for a remote settlement.

### Industrial Wastewater

The only industrial activity is located in Resin and wastewater generated is directly discharged into the Golema Reka. Most of these industrial plants do not have pre-treatment or treatment facilities. This uncontrolled discharge of wastewater represents one of the most critical issues associated with pollution of Golema Reka.

### Industrial wastewater discharge

Waste water discharge from industrial plants	m <sup>3</sup> /day	m <sup>3</sup> /year	%
Agroplod	15	5.48	8
Prespateks	125	45.62	66
All other industrial facilities and services	50	18.25	26
Total	190	69.35	100

Source: Restoration and Protection of Golema Reka 2006

### Wastewater composition discharged into Golema River from Prespateks

Wastewater flow	m <sup>3</sup> /day	125	
Parameter	Unit	Range (from- to)	
pH value		6.49	6.5
Temperature	°C	28.8	32.85
Conductivity	µs/cm	8.03	10.6
NH <sub>4</sub> -N	mg/l	3.54	4.62
NO <sub>3</sub> -N	mg/l	3.67	3.5
Ortho PO <sub>4</sub> -P	mg/l	0.84	0.87
Total PO <sub>4</sub> -P	mg/l	0.81	0.64
BOD <sub>5</sub>	mg/l	327	443
COD	mg/l	608	869

Source: Restoration and Protection of Golema Reka 2006

## 5.2.3 Impacts of nutrient enrichment

In the Prespa Basin there are conflicting reports on the trophic state of the lakes, with Micro Prespa classified as mesotrophic and Macro Prespa as oligotrophic (Hollis 1997). But there is clear evidence of eutrophic conditions at the Albania and Former Yugoslav Republic of-Macedonia coasts at times. This eutrophic condition has manifest itself by increased levels of algae which in the worst case (2007, Albania) resulted in significant fish kill, although the source of the nutrients was not believed to have been from Albania.

The lack of routine monitoring data of lake and tributary rivers is significant and needs to be addressed as a priority. Further information is needed on the use of fertilisers.



## 5.3 Key Concern 2: Native Fish Stock Decline

### 5.3.1 Introduction

Native fish stocks are believed to be declining with potential loss of revenue for fishermen and loss of biodiversity. Over fishing with poor regulation and enforcement, pollution, water level decline (loss of spawning grounds) coupled with competition from exotic species are considered to be significant factors of the decline.

There are limited statistics on fish numbers and catches in the Prespa Basin.

### 5.3.2 Available information

#### Management of Fishing

All countries have a no-fishing season between April and June during the spawning period, although reports from the Former Yugoslav Republic of Macedonia suggest that this ban is not respected. All countries have experimented with restocking native species and fish farming. 9 non-native species of fish have been introduced to the Lake Prespa Basin.

In Albania there are estimated to be 80 licensed fishermen (on Micro and Macro Prespa) but there are an unknown number of unlicensed fishermen. There is no effective regulation and much fishing is, in general, illegal, unregulated and unreported with reports of small mesh nets being used (leading to juveniles being caught). Estimates suggest that 80% of the catch is carp with less than 10% bleak.

In Former Yugoslav Republic of Macedonia, responsibility for the management and control of fishing was devolved to a concessionaire – Ribomak (until 2004). Since then there has been no concessionaire and this is now expected to be re-tendered. The number<sup>5</sup> of fishermen range from about 50 in summer to 15 in winter. There were no limits on catch placed on Ribomak by the MAFWE. There were reports of both a decline in abundance and size of native fish. With the limited data available an increase in the total quantities of fish catch can be seen but a strong reduction in the percentage of carp (historically 50% of total catch was carp now 10 -20%). The former methodology of calculating the fees to be paid by the concessionaire was based on fish catch and therefore there may be some doubt over these figures. It is expected that the new concessionaire (anticipated by the end of 2009) will have a different fee structure which will improve the information quality on fish catch.

#### Total fish catch – Former Yugoslav Republic of Macedonia (2004):

Type of fish	Total Production (kg)
1. Bleak	61.172,40
2. Carp	10.088,10
3. Nase	7.083,12
4. Roach	28.976,40
<b>TOTAL:</b>	<b>107,320</b>

Source –Ribomak (private concessionaire)

SPP (LIFE2002) reports that according to collected data the total number of fishermen are 130 with 65 fishing boats. At Micro Prespa, 50 fishermen and 40 boats are active, while at Macro Prespa 40 fishermen with 25 boats are practicing the fishing profession. They are members of the local Fishing Cooperative, and most of them are also active in other fields (e.g. tourism). The SAP (2002) reports as a mean

<sup>5</sup> Fish data quoted for Former Yugoslav Republic of Macedonia in the National Report came from the previous concessionaire – Ribomak.

harvest per year 136 tonnes for all the area of Greece, for the time period of 1964-1990, while less data exists for the period after this date.

### Threats to Fish Stocks

- Use of illegal nets
- Poor enforcement of regulations
- Pollution from excess nutrients and organic substances causing depletion in dissolved oxygen levels.
- Potential toxic impact from the use of agrochemicals. A report from Former Yugoslav Republic of Macedonia indicates that there is not enough data available for a detailed analysis of hazardous substance pollution in the Macro Prespa Lake. Ecotoxicology studies of runoff from fruit orchards point to significant sub-lethal impacts of insecticides on fish larvae, which show higher mortality rates, slower growth, and signs of disrupted cellular homeostasis even after a three-month recovery period in clean water. Studies show that fish may not be able to recover quickly from the toxic effects of insecticides, and that exposure to pesticide runoff may cause increased mortality and a decrease in fish populations. Other studies show the potential for certain herbicides to have sub-lethal effect on endocrine function in wildlife and humans, affecting sex determination, growth rates, and fecundity.
- Competition from alien species. A report from Albania indicates that the introduction of *L. gibbosus* about 15 years is significant. This species is competitive (food and habitat) with native species and although edible is avoided by fishermen as it entangles in the nets – hence numbers of this species is stable and may distort the biodiversity of the lakes (in addition it is believed that this species may be endangering some of the native invertebrates)

## 5.4 Key Concern 3: Reduction in the water level in Macro Prespa

### 5.4.1 Introduction

There is a reduction in the water level in Macro Prespa resulting in the loss of priority shoreline and wetland habitat. Whilst much of the reduction in water level is attributed to changes in rainfall and the karstic nature of the region, overuse of water for irrigation is a contributing factor and should be a priority action to minimise additional losses of water level.

The reduction of water level has resulted in the loss of reed beds with consequential impacts on fish spawning grounds. In addition the decrease in water level has led to the exploitation of former wetlands as agricultural land leading to a greater potential for pollution from agrochemicals or waste from grazing animals. A reversal of this increase in 'agricultural' land by farmers (for example if water levels were encouraged to rise) is likely to be met by opposition from some farmers who would see this as a 'loss' of land.

### 5.4.2 Available information

- The water level variation in Micro Prespa is considered to be natural and water balance (rainfall and consumptive use) is monitored by SPP. The outflow to Macro Prespa is controlled through a sluice.
- SPP has estimated that the optimal height (854.60 m asl) for ecosystem maintenance and local water demand of Macro Prespa.

- During the last century the Macro Prespa Lake experienced a significant water level fluctuation. After its last peak in June 1963, the level dropped by approximately 8 m until 2002. This signifies a loss in water volume, yet, the loss of water surface maybe even more significant. A comparison between Landsat images of 1988 and 2000 shows that the decline in water level caused a loss in the lake surface area of 8.6 km<sup>2</sup>. This was most pronounced in the shallow parts of the shoreline, namely in the north, at the Ezerani Reserve and along the eastern beaches. At several locations, the water retreated by more than 50 m (e.g. Pretor, Nakolec).
- Diversion of the Devolli River in 1976 has resulted in silting of Micro Prespa and the formation of a marshland.
- Since the 1950s, the demand for irrigation from apple growers in Former Yugoslav Republic of Macedonia has been significant. Historically water was drawn from the lake and pumped to the orchards, however the high operation costs and poor maintenance has made this system obsolete. Current demand for irrigation is estimated at  $1.2 \times 10^7$  m<sup>3</sup>/year despite the significant reduction of the apple orchards. Much of the water is drawn from wells close to the lake and is unregulated. Estimates of between 8000 – 10000 wells are reported. Farmers are gradually moving to drip irrigation systems which will reduce demand, at present about half of all irrigation uses this method.

## **5.5 Key Concern 4: Sediment Transport**

### **5.5.1 Introduction**

Sediment from eroded agricultural land and poor forest management can transport nutrients and micro-pollutants to the lake. In addition silting of the lake (as in the case of the diversion of the Devolli River that has resulted in a marsh area in Micro Prespa) can change the characteristics of the ecosystem.

### **5.5.2 Available information**

- Drainage channels cover about 50% of the irrigated agricultural land in Former Yugoslav Republic of Macedonia and combined with the rivers (both permanent and ephemeral) transport an estimated 163,000 m<sup>3</sup>/year.
- In Greece it is estimated 8,000 t/year of solid material and 37,000 t/year of organic material from arable land based in a study in 1988 (reported in the 2002 SAP);
- The diversion of Devoli River towards the Micro Prespa resulted in transportation of erosion sediments. The huge quantities of sediments changed completely the littoral zone and created a wetland. Run-off and sediments may contribute to the further eutrophication of the Micro Prespa Lake. The aquatic habitat altered which caused additional changes in the Prespa Lakes ecosystem.

## **5.6 Key Concern 5: Deforestation and changes in forests**

### **5.6.1 Introduction**

Deforestation and changes in forestry resulting from inappropriate management practices and illegal activities have impacted all countries. The loss of forests impacts the economic value of the timber available, the biodiversity of the region dependent on woodland habitats and results in additional erosion that can lead to additional eutrophication pressures.

Whilst this is not a problem with direct ‘transboundary’ impacts it does affect the overall regional ecosystem and as such would benefit from a regional strategy through the SAP. Forests have been managed with a view to resource production (timber and firewood) only with limited attention to ecosystem management.

The region has significant forested areas and these are important for the biodiversity and economy of the region. The most heavily degraded forests are found in Albania which has suffered from unregulated exploitation of this natural resource.

### 5.6.2 Available information

- In Albania, prior to 1990, forests were heavily exploited producing > 20,000 m<sup>3</sup>/year of wood for timber or firewood. Since 1992 significant further exploitation has occurred. It is estimated that about 50% of forests are significantly degraded and at least 10% of these can only be restored by extensive reforestation. Communes have prepared forest management plans but despite some remediation significant further work is required. Throughout the Albanian part of the Prespa Basin, considerable illegal wood cutting is practiced, with material being used as fodder for livestock, grazing by animals and for firewood.
- From an ecosystem management perspective, forest management in Former Yugoslav Republic of Macedonia is lacking in several respects. Firstly, forest management is focused primarily upon producing a sustainable supply of timber and firewood for the region; habitat values, catchment management values, and biodiversity enhancement values are not management objectives. There is an emerging awareness of ecosystem oriented forest management and the importance of adopting related practices, but there is limited institutional capacity to develop and apply ecosystem-oriented forest management.

## 5.7 Key Concern 6: Organic Pollution

### 5.7.1 Introduction

Organic pollution from human and animal waste leads to depleted dissolved oxygen concentrations with impacts on aquatic life. The main source of organic pollution is believed to be the population centre of Resen and the industry in this region that at present discharges untreated waste to the Golema Reka.

### 5.7.2 Available information

The main information on organic material is presented above and is common with nutrient pollution.

In addition a significant contribution derives from the inappropriate disposal of waste apples and other waste from apple trees (e.g. pruned branches), which are often deposited directly into the water courses.

#### Waste apples quantities estimate in the Prespa region

Orchard Area (ha)	Average Yield (t/ha)	Total Annual Production (t/year)	Waste Percentage (%)	Total Annual Apple Waste (t/year)
3.200	25	80.000	10	8.000
3.200	25	80.000	15	12.000
4.000	25	100.000	10	10.000
4.000	25	100.000	15	15.000

Source: Restoration and Protection of Golema Reka 2006

## 5.8 Key Concern 6: Hazardous Substance Pollution

### 5.8.1 Introduction

At present there is virtually no information on the aquatic (water column, sediment or biota) concentrations of hazardous substances. It is evident that a range of pesticides and herbicides are in use by farmers in Former Yugoslav Republic of Macedonia and Greece (economic conditions are currently preventing the use of these substances in Albania). The concern about hazardous substances was raised at each of the stakeholder consultation, together with the concern about the illegal trade of EU banned chemicals between Albania and Former Yugoslav Republic of Macedonia with Greece (reported during stakeholder workshops in February 2009).

There are reports from Former Yugoslav Republic of Macedonia of farmers cleaning spraying equipment in water courses. There are no exact data available regarding the amount of pesticides used in the Prespa region. As in the case with fertilizers, individual producers either purchase pesticides from private agriculture stores or import them from the neighbouring countries – Albania, Greece and Bulgaria. The branch office of MAFWE in Former Yugoslav Republic of Macedonia, which is the institution responsible for control of agricultural stores, does not have information on quantities of pesticides sold by the stores. The table below presents estimated data on the use of pesticides in the Former Yugoslav Republic of Macedonia Prespa region, calculated based on average quantities of pesticides used for one hectare of apple orchards and wheat production fields.

#### Use of pesticides in the Former Yugoslav Republic of Macedonia Prespa Region

Pesticide Type	Quantity (tons)
Fungicides	38.5
Herbicides	3.2
Insecticides and Acaricides	22.5
<b>Total</b>	<b>64.2</b>

Source: Agricultural Extension Agency – Resen

## **6 Conclusions / Next Steps**

This TDA is an intermediate activity in the process of addressing the pressures (and the potential pressures) on the Lake Prespa Basin. The analysis is based on limited scientific data due to the scarcity of monitoring programmes and the availability of data, and is, therefore, heavily reliant on national expert judgement.

With the approval of the 'priority transboundary threats' the Technical Task Team will develop a Strategic Action Programme to address these threats to the Prespa ecosystem.

### **6.1 Summary of threats to the ecosystem**

Despite the low population density and lack of significant industrial pollution the basin is at risk from further degradation from a number of pollution sources and other pressures. The basin has suffered from minimal ecosystem management in the past when agriculture, fisheries and forests were managed to give high yields with little attention paid to the environment. Water level decline in Macro Prespa is a further risk to both the terrestrial and aquatic ecosystems.

The key sectors and immediate causes impacting the environment are:

- Agriculture – water use, nutrient losses, erosion, hazardous substance waste, organic waste;
- Fishing – unregulated fishing activities and introduction of alien species;
- Municipal wastewater – limited treatment of wastewater

The limited availability of routine monitoring data has necessitated the extensive use and dependence on national expert judgement /risk assessment to confirm the key concerns and threats to the ecosystem. The following summarises the main sources of these threats.

#### **6.1.1 Pollution**

- Point sources (domestic and industrial wastewaters)
- Diffuse sources (agriculture, solid waste sites, untreated domestic wastewater, etc.)
- Waste apples
- Waste agro-chemicals, cleaning of spraying equipment and waste containers for chemicals

#### **6.1.2 Other threats**

- More on the threats to ecosystem for mammals, fish, birds due to.....
- Land use changes (inc. intensive agriculture)
- Sediment erosion
- Urbanisation and the lack of integrated land use planning
- Tourism - increased numbers with inadequate infrastructure
- Water level decrease
- Deforestation by grazing and collection for firewood
- Climate change

## **6.2 Priority Actions for the Strategic Action Programme**

### **6.2.1 General actions required**

- Strengthening the tri-lateral management through legal recognition and national financial support to the co-ordinating body (currently the PPCC).
- Implementation of national funded and co-ordinated tri-lateral monitoring programme consistent with the recommendations of the Monitoring and Conservation Working Group of the PPCC
- Strengthening of institutions responsible for management of the environment and especially of protected areas;
- Improved regulation and enforcement to maintain the ecosystem
- Development and implementation of incentives towards more ecosystem friendly economic activities and improvement of the wellbeing of the local population.
- Improved land-use planning (especially in Albania)

### **6.2.2 Priority Actions 1: Reduction of nutrient pollution**

- Implementation of routine monitoring of wastewater and receiving waters. This will lead to a better understanding of sources and quantities that can assist with prioritising the management actions.
- Installation of tertiary (nutrient removal) wastewater treatment in Resen and increased connection of domestic polluters and to sewerage.
- Installation of pre-treatment for industrial wastewater according to the EU Integrated Pollution Prevention and Control Directive (2008/1/EC) in Resen
- Improved use of fertilisers through the introduction of BAPs in particular in Former Yugoslav Republic of Macedonia.
- Completion (these are currently underway or planned) of five constructed wetlands for domestic wastewater treatment in Greece and Former Yugoslav Republic of Macedonia.
- Development of appropriate means (e.g. constructed wetlands) to treat wastewater from Albanian villages.

### **6.2.3 Priority Actions 2: Improvement of fish stocks**

- Implementation of a fish monitoring programme and means to ensure that accurate statistics on fish catches are maintained.
- Reduction of pollutants (nutrient, organic and hazardous substances)
- Improved regulation and enforcement of the fishing industry
- Research to determine the need for fishing quotas to maintain stocks
- Measures to reduce the chances of non-native fish introduction

### **6.2.4 Priority Actions 3: Minimising water level decline in Macro Prespa**

- Improved monitoring of water use and demand in the region.
- Improved regulation and enforcement of water abstraction.
- Improved irrigation methods
- Control of agriculture on land 'reclaimed' from the lake.

#### **6.2.5 Priority Actions 4: Reduction of sediment transport**

- Evaluating the magnitude of problems caused to the Prespa ecosystem from eroded sediments.
- Implementation of BAPs to reduce erosion.
- Chemical analysis of eroded sediments to quantify potential pollutant sources

#### **6.2.6 Priority Actions 5: Protection of natural forests**

- Data needs to be collected on the extent of forest degradation in the region – especially in Albania.
- Improved management and enforcement of forests with an emphasis on ecosystem management in addition to resource management needs to be encouraged.
- Further development and implementation of integrated land-use planning measures (linking to the work and results of the PPCC Working Group on Spatial Planning).

#### **6.2.7 Priority Actions 6: Reduction of organic pollution**

- Implementation of a wastewater and river/lake monitoring programme for BOD and COD as appropriate.
- Prioritisation of wastewater construction to reduce organic loads from both domestic and industrial sources;
- Ensuring that waste crops are not disposed of inappropriately.

#### **6.2.8 Priority Actions 7: Reduction of hazardous substance pollution**

- An inventory of hazardous chemicals used and stored in the Prespa Basin should be established;
- Farmers should be encouraged to adopt BAPs with respect to pesticide / herbicide use;
- Prohibited hazardous substances should be removed from farms and appropriately disposed.
- Monitoring for hazardous substances should be introduced across the Lake Prespa Basin.