DRIN CORDA

Enabling
Transboundary Cooperation
& Integrated Water Resources Management
in the extended DRIN RIVER BASIN

Lake Ohrid Watershed Management Plan

Summary

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The Coordinated Action for the implementation of the Memorandum of Understanding for the management of the Drin basin (Drin CORDA) is supported by the GEF Drin Project. Thus, the latter constitutes an institutional project implemented by the United Nations Development Programme (UNDP) and executed by the Global Water Partnership (GWP) through GWP-Mediterranean (GWP-Med), in cooperation with the United Nations Economic Commission for Europe (UNECE). The Drin Core Group (DCG), being the multilateral body responsible for the implementation of the Memorandum of Understanding serves as the Steering Committee of the Project. GWP-Med serves as the Secretariat of the DCG.

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Lake Ohrid Watershed Management Plan

Towards Strengthening Collaborative Water Resources Management in Lake Ohrid Region

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Controlled by	M. Monetti
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ABBREVIATIONS AND ACRONYMS

AL	Albania
AMBU	Albanian Water Resource Management Agency
AWB	Artificial Water Body
BOD	Biological oxygen demand
CPA	Cumulative Precipitation Anomalies
CPE	Communal Public Enterprise
DCG	Drin Core Group
DPSIR	Driver-Pressure-State-Impact-Response
DRB	Drin River Basin
DW	Department of Waters
EPA	Environment Protection Agency
EQR	Ecological Quality Ratio
EQS	Environmental quality standard
ERC	Energy Regulatory Commission
ES	Ecosystem services
EU	European Union
EWG	Expert Working Group
FGM	Focus Group Meeting
GAP	Good agriculture practices
GEF	Global Environment Facility
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GWP-Med	Global Water Partnership Mediterranean
ha	Hectare
HBI	Hydro-Biological Institute
HMWB	Heavily Modified Water Bodies
IBNET	International Benchmarking Network
IED	Industrial Emission Directive
IPPC	Integrated Pollution Prevention and Control
IRBM	Integrated River Basin Management
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
km	Kilometer
KTM	Key Type Measure
LOW	Lake Ohrid Watershed
LOWMP	Lake Ohrid Watershed Management Plan
LUC	Land use class
MAFWE	Ministry of Agriculture, Forestry and Water Economy (North Macedonia)
masl	Meters above sea level
MARD	Ministry of Agriculture and Rural Development (Albania)
MKD	North Macedonia
MoTE	Ministry of Tourism and Environment (Albania)
MoEPP	Ministry of Environment and Physical Planning
MoU	Memorandum of Understanding
MS	Measuring (gauging) station
NAPA	National Agency for Protected Areas
O&M	Operation and maintenance
PCU	Project Coordination Unit
PE	Population Equivalents

PoM	Programme of Measures
PP	Polluter pays
RBC	River Basin Councils
RBMC	River Basin Management Council
RBMP	River Basin Management Plan
RBSP	River Basin Specific Pollutants
SCI	State Communal Inspectorate
SFI	Shorezone Functionality Index
SHPP	Small Hydro Power Plant
SWB	Surface Water Bodies
SWMI	Significant Water Management Issues
TDA	Transboundary Diagnostic Analysis
TEV	Total Economic Value
ToR	Terms of Reference
TSI	Trophic State Index
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
UWWTD	Urban Waste Water Treatment Directive
WB	Water Body
WFD	Water Framework Directive
WM	Waste management
WRA	Water Regulatory Authority
WUA	Water User Association
WWM	Wastewater management
WWTP	Wastewater Treatment Plant
W&WW	Water supply and wastewater management

1 INTRODUCTION

Rina Consulting, in association with PointPro Consulting, has been appointed by the Global Water Partnership Mediterranean (GWP-Med) to carry out the Watershed Management Plan (WMP) for the Ohrid Lake divided between the southwestern part of the North Macedonia and eastern part of Albania. This document represents the Non-Technical Summary of the Lake Ohrid Watershed Management Plan.

Coordinated action at the Drin Basin level has been absent until the development of the Shared Vision for the sustainable management of the Drin Basin and the signing of a related Memorandum of Understanding (Tirana, 25 November 2011) by the Ministers of the water and environment management competent ministries of the Drin Riparians i.e. Albania, North Macedonia, Greece, Kosovo and Montenegro. This was the outcome of the Drin Dialogue coordinated by the Global Water Partnership Mediterranean (GWP-Med) and United Nations Economic Commission for Europe (UNECE).

The main objective of the Drin Memorandum of Understanding (MoU) is the attainment of the Shared Vision: "Promote joint action for the coordinated integrated management of the shared water resources in the Drin Basin, as a means to safeguard and restore, to the extent possible, the ecosystems and the services they provide, and to promote sustainable development across the Drin Basin".

The ultimate goal of the work in the Drin Basin is to reach a point in the future where the scale of management lifts from single water bodies to the hydrological interconnected system of the Drin Basin, eventually leading from the sharing of waters among Riparians and conflicting uses, to the sharing of benefits among stakeholders.

A process called the "Drin CORDA", Drin Coordinated Action for the implementation of the Drin MoU, was put in place after the signing of the latter. Following the provisions of the MoU an institutional structure was established in 2012. It includes:

- ✓ the Meeting of the Parties;
- ✓ the Drin Core Group (DCG). This body is given the mandate to coordinate actions for the implementation of the MoU; and
- ✓ three Expert Working Groups (EWG) to assist the DCG in its work:
  - Water Framework Directive (WFD) implementation EWG,
  - monitoring and information exchange EWG, and
  - biodiversity and ecosystem EWG.

The DCG Secretariat provides technical and administrative support to the DCG; Global Water Partnership – Mediterranean (GWP-Med) serves by appointment of the Parties through the MoU as the Secretariat.

An Action Plan was prepared to operationalize the Drin CORDA. This has been subject to updates and amendments in accordance with the decisions of the Meeting of the Parties to the Drin MoU and the DCG. The DCG and its Secretariat guides the implementation of the action plan while its implementation is currently being supported by the Global Environment Facility (GEF).

GEF supported Project "Enabling transboundary cooperation and integrated water resources management in the extended Drin River Basin" (GEF Drin Project) is aligned in content, aims and objectives with the Action Plan and the activities under the Drin CORDA.

The objective of the project is to promote joint management of the shared water resources of the transboundary Drin River Basin, including coordination mechanisms among the various sub-basin joint commissions and committees. Albania, North Macedonia and Montenegro are the Project beneficiaries. The GEF Drin project is structured around five components:

- ✓ component 1: consolidating a common knowledge base;
- ✓ component 2: building the foundation for multi-country cooperation;
- ✓ component 3: institutional strengthening for Integrated River Basin Management (IRBM);
- ✓ component 4: demonstration of technologies and practices for the Integrated Water Resources Management (IWRM) and ecosystem management, and
- ✓ component 5: stakeholder involvement, gender mainstreaming and communication strategies.

The Project is implemented by the United Nations Development Programme (UNDP) and executed by the Global Water Partnership (GWP) through GWP-Mediterranean (GWP-Med) in cooperation with the UNECE. GWP-Med is responsible for the realization of the Project. The DCG is the Steering Committee (SC) of the Project. It is managed by a Project Coordination Unit (PCU), based in Tirana, Albania; staff is stationed also in Podgorica, Ohrid, Pristina, and Athens. The duration of the Project is four years.

2 DESCRIPTION OF THE LAKE OHRID WATERSHED

2.1 NATURAL CONDITIONS

2.1.1 Topography and Geology

With a maximum depth of 290 meters and average depth of 155 meters, straddled in the mountainous region between the southwest part of North Macedonia and the eastern part of Albania, Lake Ohrid is one of the oldest and deepest lakes in Europe. The lake is located at an altitude of 693 masl and has an area of 358 km^2. The hydrological regime of the lake is dominated by inflow of water from the nearby Lake Prespa via karstic aquifers, while the outflow occurs through the Black Drin river in the town of Struga.

The Lake Ohrid watershed (LOW) is part of the extended transboundary Drin River Basin (DRB), located in the South-Western part of the Balkan Peninsula and shared between Albania, Kosovo, North Macedonia and Montenegro (Figure below). The DRB comprises seven sub-basins: Lake Prespa, Lake Ohrid, Black Drin River, White Drin River, Drin River, Lake Skadar/Shkodër and Buna/Bojana River.

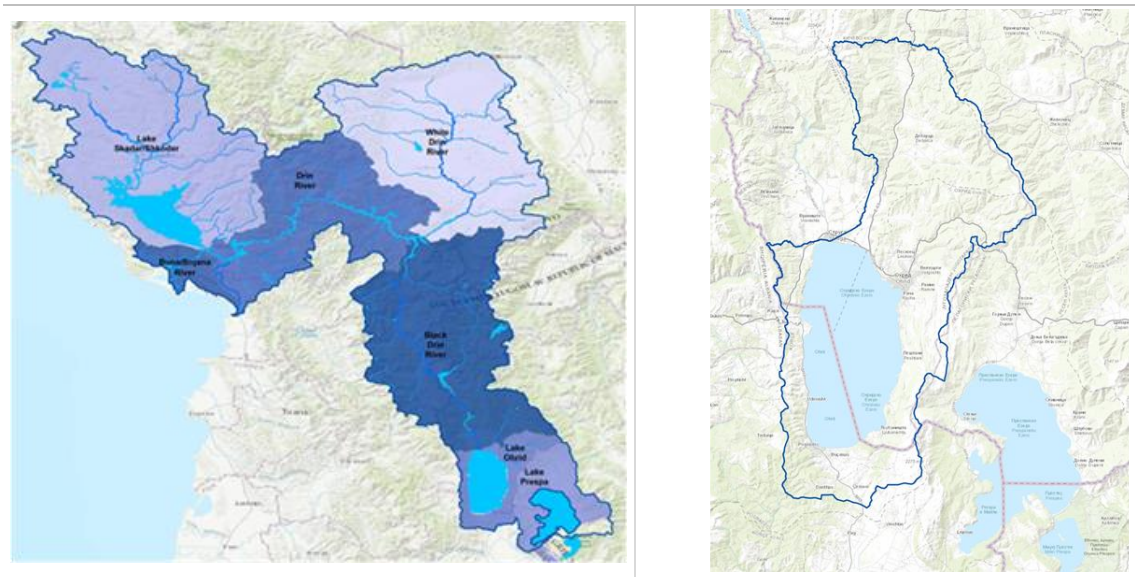

Figure 2.1. The Extended Drin River Basin and Lake Ohrid Watershed

With an estimated age of 2 to 5 million years and maximum water depth of 290m Lake Ohrid is a deep, calcium bicarbonate-dominated, oligotrophic lake that represents a unique aquatic ecosystem. Of the 1,200 registered animal species in the lake, 212 are considered endemic. The importance of the lake is further emphasized with its declaration as a World Heritage Site by UNESCO in 1979 (North Macedonia part) and 2019 (Albania part). With all its amenities and values the lake also represents the most important tourist center in North Macedonia.

2.1.2 Climate, Hydrology and Hydrography

In general, the local climate conditions in the LOW are categorized as Mediterranean with continental influences. According to Watzin et al. (2003) the local climate is influenced by the proximity to the Adriatic Sea, by the surrounding mountains, and by the thermal capacity of Lake Ohrid.

The mean annual temperature recorded in the Ohrid region averages at 11.5 °C; average temperatures range from 21ºC during summer to 1.8ºC during winter. The temperature of Lake Ohrid's pelagic water (below 150 m depth, year-round) ranges from 6ºC to 24–27ºC at the surface during summer.

The morphology of the catchment also affects the wind regime, with Northerly winds prevailing during winter and southerly and southeasterly winds during spring and summer. Average speed of the wind in the Lake Ohrid region is relatively low at 1.8 m/sec.

Precipitation averages around 750 mm annually and is at a minimum during summer.

The hypothesis that the water from Prespa Lake is seeping into the karst massif of the Galichica and Suva Gora mountains and draining into Ohrid Lake (LOW) was first published by Cvijić (1906). The validity of the hypothesis was proven with isotope-based tests (Anovski et al. 1997, 2001; Eftimi and Zoto 1997). Much of the karstic type

of aquifers are found in the triennial limestones of Galichica and Jablanica, which drain through numerous springs into Lake Ohrid. Estimates imply that 49% of the inflow from springs into the lake comes from sublacustrine (under water) springs and 51% from surface springs. The most important are: St. Naum (5-10 m^3/sec), Tushemisht (2.5 m3/sec), Biljanini springs (1-2 m3/sec), Bej Bunar (40-100 l/s), and other unknown number of sublacustrine springs.

Besides the springs, important volume of water drains in Lake Ohrid through a number of tributaries, most of which are small creeks that flow only temporarily during snowmelt and heavy rain periods. The main rivers in the LOW, tributaries to Lake Ohrid (Map 1), include: Sateska, Koselska, Shushica and Grashnica river in North Macedonia, as well as Çeravë and Verdovë rivers in Albania. Details regarding the hydrological parameters of these rivers are given further in the document (Section 2.3: Typology and delineation of water bodies).

Two-thirds of the LOW (Lake Ohrid) water outflow passes into the Black Drin River at the town of Struga, flowing Northwards on the way to the estuary in the Adriatic Sea. The remaining one-third of the lake's water is lost through evaporation (Watzin et al. 2002).[1]

Since 1962 the river's outflow has been controlled with a weir, which regulates the water level. According to an agreement between Yugoslavia and Albania in 1962, the maximum water level in Ohrid Lake is not permitted to exceed the value of 693 masl and the minimum water level to fall below 691.65 masl (Watzin et al. 2002)[2]. However, following later developments, i.e. negotiations and agreements between the two countries, since 1979 the minimum water level in Lake Ohrid is set at 693.10 masl (outflow in Black Drin river in Struga) and the maximum 'operational' level at 693.75 masl, resulting in annual fluctuations of the level in the range of 0.65 m. Further, the agreement between the countries stipulates that in the case of extreme events of water inflow into the lake (with probability up to 1%) the set maximum water level of 693.75 can be exceeded, but not surpassing 694.00 masl.

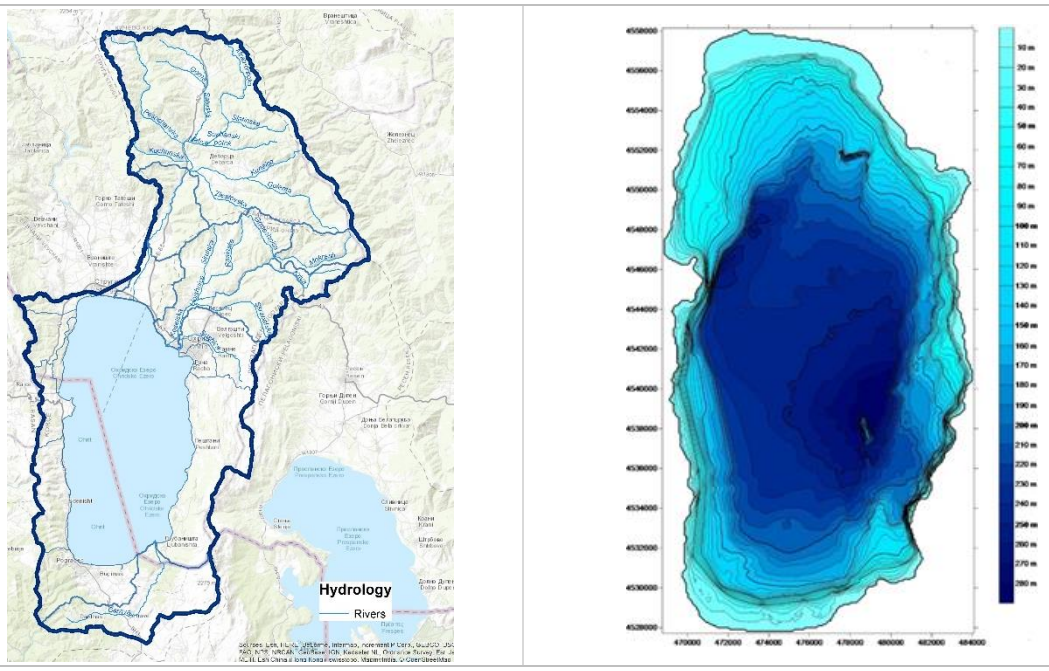

Figure 2.2: LOW: Tributaries and Bathymetric Map of Lake Ohrid

Based on analysis of the recorded water level in Lake Ohrid for the period 1965 – 2016, it is evident that the level of 693.75 masl has been exceeded for a total of 1,970 days, or roughly 10% of the total number of days for the period. Further, the level of 694.00 masl has also been exceeded in 129 days (ratio of 1%). These events, on annual basis, take place during the April – June period. Finally, also the minimum set level of 693.10 masl has not been observed occasionally, that is the actual water level has been lower than the agreed minimum, for a total of 160 days (ratio of 1%) during the drought period 1989 – 1991.

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1 Source: "Shorezone Functionality, Ohrid Lake"; Implementing the EU Water Framework Directive in South-Eastern Europe. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (2017).

2 Source: "Shorezone Functionality, Ohrid Lake"; Implementing the EU Water Framework Directive in South-Eastern Europe. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (2017).

2.1.3 Land Cover

The land cover/land use analysis of the LOW is based on data from the European Environment Agency's CORINE Programme[3] (Map 2; Map 3). A total of 14 land cover classes are analyzed that are included under Programme's Level 2 nomenclature; the area of Lake Ohrid is treated as a separate (one of the 14) land cover category.

The surface area of the LOW is dominated by Forests, Scrub and open spaces, and the surface area of Lake Ohrid, which collectively account for 79% of the total basin area. Other dominating land cover classes are Arable land and Heterogeneous agricultural areas, which make up 15.6% of the area. Of the remaining 5.3% of land, dominant classes are Urban fabric (2%) and Pastures (1.9%).

2.1.4 Protected Areas

A total of 9 protected and sensitive areas located in the LOW are identified, that fall into four of the six IUCN[4] categories (Table below; Map 4). The total area of all protected areas equals 661.6 km^2 (47% of the total basin area), of which 273.2 km^2 in Albania and 393.2 km^2 in North Macedonia.

Table 2.1: LOW: Protected Areas5

ISO3	Site Name	Year	Designation	IUCN CAT	Area (km^2)
MKD	Galichica	1958	National Park	II	145.9
MKD	Ohridsko Ezero	1977	Designated area not yet reviewed	III	247.4
MKD	Duvalo (Kosel)	1979	Designated area not yet reviewed	III	0.0
MKD	Makedonski dab, s.Trpejca, Ohrid	1967	Designated area not yet reviewed	III	0.0
MKD	Platan s.Kalishte, Struga	1961	Designated area not yet reviewed	III	0.0
MKD	Platan-chinar, Ohrid	1967	Designated area not yet reviewed	III	0.0
ALB	Shebenik-Jabllanice	2008	National Park (category II)	II	0.6
MKD	Platanovi Stebla, Ohrid	1967	Designated area not yet reviewed	III	0.0
ALB	Liqeni I Ulzes	2013	Managed Nature Reserve (category IV IUCN)	IV	272.6
				Total	**666.4**

2.2 SOCIO-ECONOMIC CONDITIONS

2.2.1 Administrative Division and Governance

The transboundary LOW is part of the extended DRB and is shared between Albania (313 km^2 or 22% of the total basin territory) and North Macedonia (1,091 km^2; 78% of the territory).

Administratively, the watershed area falls under four municipalities (local government units), of which Pogradec municipality is in Albania, while Ohrid, Struga and Debrca municipalities are in North Macedonia. In reference to the administrative division of the basin territory by municipalities, it should be pointed out that only 34% of Pogradec, 98% and 95% of Ohrid and Debrca respectively, and merely 11% of the total area of Struga municipality falls within the LOW.

Following the territorial division of Albania from 2014/15, the Albanian territory of the LOW falls under five Administrative Units: Buçimas, Çeravë, Dardhas, Pogradec and Hudenisht.

The total number of settlements in the basin equals 94, of which 25 (26.6%) in Albania (Pogradec municipality) and 69 (73.4%) in North Macedonia. 53 of the 94 settlements (or 56%) have population of less than 500, and only 5 have population bigger than 2,000 (Map 5)[6]. 58% of the total population in the LOW lives in the three largest cities (municipal administrative centers): Pogradec, Ohrid and Struga.

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[3] European Environment Agency (EEA), CORINE (Coordination of information on the environment).

[4] IUCN – International Union for Conservation of Nature.

[5] Source: European Environment Agency's (EEA), The European inventory of nationally designated areas holds information about protected areas and the national legislative instruments, which directly or indirectly create protected areas.

[6] Population data for Albania is at a level of Administrative Units. Sources: Albania: Institute of statistics (INSTAT), Republic of Albania; North Macedonia: State Statistical Office, Republic of North Macedonia.

2.2.2 Demography and Housing

The total population of the LOW equals 132,059 divided nearly equally between female and male population. Of the total, 39% live in Pogradec municipality, 3% in Debrca, 39% in Ohrid and 19% in Struga.

The overall density of the population for the LOW as a whole is 126 persons per square kilometer. However, there are important differences among population densities per municipalities, ranging from 447 cap/km^2 in Struga, 251 cap/km^2 in Pogradec, 136 cap/km^2 in Ohrid, and only 10 cap/km^2 in Debrca.

Table 2.2: LOW: Population Statistics

Municipality	Female	Male	Total Municipality	Year	% of LOW population	Area (km^2)	Population density (cap/km^2)	% Urban	% Rural
Pogradec	25,341	26,375	51,716	2011	**39%**	206.2	251	14%	86%
Debrca	2,005	1,989	3,994	2015	**3%**	405.0	10	0%	100%
Ohrid	26,183	25,668	51,850	2015	**39%**	381.0	136	75%	25%
Struga	12,285	12,214	24,498	2015	**19%**	54.8	447	71%	29%
TOTAL in LOW	**65,813**	**66,245**	**132,059**		**100%**	**1,047.0**	**126**	**48%**	**52%**

2.2.3 GDP and Employment

According to national statistics, the GDP per capita in 2018 was $5,239 in Albania and $6,100 in North Macedonia. Statistical data for both countries show relatively steady upward growth in these figures over the last several years.

As regards employment, statistics are kept differently in each country but it is clear that unemployment and/or underemployment are high in both countries. In Albania, according to data compiled by the Albanian Institute of Statistics, in 2016 the unemployment rate equaled 15.2%; in North Macedonia, according to the State Statistical Office, the same rate equaled 23.7%. The situation is considered even more difficult if market indicators are segregated by gender. Thus, the inactivity rate (proportion of the population that is not in the labor force) in 2015 in Albania equaled 52.7% for female population and 35.7% for male population, whereas in North Macedonia the same rate for the female population equaled 55% and 30.8% for male population.

2.2.4 Tourism and Local Economic Development

Tourism is one of the most important and fastest growing activities/industries worldwide. The tourism industry has a significant direct and indirect impacts on the economies of a number of countries. In 2016 1.23 billion tourists travelled the world, generating income, supporting job creation and boosting development.

Tourism is the key economic activity in both countries around Lake Ohrid. The climate, geography and physical variety of the territory represented by the lake and mountain ranges accompanied by exceptionally rich biodiversity of flora and fauna, as well as by culture monuments and historical sites, make the entire LOW an attractive and highly-valued tourism site. A number of national parks and nature reserves are also located within the basin, offering possibilities for development of various types of tourism and travel experiences. Finally, Lake Ohrid is declared as a World Heritage Site by UNESCO since 1979.

Table 2.3: LOW: Tourism statistics

Municipality	Administrative Unit	Tourists, domestic and foreign 2011 - 2017							Average
		2011	2012	2013	2014	2015	2016	2017	
Pogradec	Buçimas	51,100	50,000	50,000	50,000	52,500	55,125	57,881	52,372
	Çerravë								
	Dardhas								
	Pogradec								
	Udenisht								
Debrca	N/A								
Ohrid	N/A	178,277	183,335	192,746	197,196	219,944	234,361	275,613	211,639
Struga	N/A	59,079	55,556	59,526	59,171	64,094	74,415	77,238	64,154
TOTAL in LOW		**288,456**	**288,891**	**302,272**	**306,367**	**336,538**	**363,901**	**410,732**	**328,165**

The major tourism and recreation facilities in the basin are located around the three municipal centers of Pogradec, Ohrid and Struga, but as well along the eastern shoreline (Ohrid town to the village of Peshtani), south-east part around the villages of Trpejca, Ljubanishta and St. Naum and north-west section from Struga to Kalishta in North Macedonia, and on the stripe from Tushemisht to Pogradec and the Lin peninsula in Albania (Map 6).

2.2.5 Economic infrastructure

Pogradec is located about 139 km from the capital of Tirana and 40 km from Korça. Pogradec is also the last railway station: Tirana - Durrës - Elbasan - Librazhd - Pogradec and located along SH3 road that passes through Devoll and continues to Greece. The road network connecting Pogradec and the other settlements in the municipality is 140 km. A modern road section Qafe Thane-Lin-Pogradec has been recently reconstructed. Most of the villages in the region can be reached by paved roads, especially along the national highway between Tirana and Korce (south eastern Albania). In the south of the lake there is a paved road connecting Pogradec with the North Macedonia border.

On the North Macedonia side, Ohrid and Struga are roughly 180 km from the capital of Skopje. A new high-way Kichevo-Ohrid is under construction, that will significantly further improve the connection between the region and the capital and other larger cities in the country. A paved road along the entire North Macedonia part of the lake has been constructed since the 1960-ties.

There is also an international airport on the North Macedonia part of the basin – the St. Paul Apostle airport near Ohrid, with capacity of 400,000 passengers and registered average annual number of passengers of over 83,000 for the 2010 – 2016 period. The Ohrid airport is also used for cargo transport.

Overview of the main infrastructure in the LOW is given on Map 7.

2.2.6 Cultural Heritage

Apart from the natural heritage of the Lake Ohrid region, which dates back to the Tertiary period, it has homed humanity for thousands of years as well. Remains of Neolithic settlements have been found around the lake, with further inhabitance by Illyrian and Hellenic tribes confirmed by ancient scripts, the still standing Ancient theatre of Ohrid and the Monumental Tombs of Lower Selca.

As the history of the region developed, so did the appearance and life in the settlements around the lake. The remains of Via Egnatia, the ancient Roman road connecting Rome and Istanbul in near vicinity of the lake are proof of the civilization continuum throughout the era before Christ. Various early roman Basilicas and mosaics, such as the ones in Lin, St. Erasmo and Plaoshnik account for the early adoption of Christianity in the region. The 6-th century paleochristian church of Lin's floor mosaics spreading over 120m^2 are remarkably conserved and have an outstanding artistic value.

As the Slavic tribes began to settle in the region and adopted Christianity, the region became a cradle of Christian theology. Various saints practiced and spread Christianity around the lake, amongst which St. Clement of Ohrid is the most important. Nowadays a newly reconstructed Church sits where St. Clement himself reconstructed an old Church with the purpose of spreading Christianity amongst Slavs. He founded the Ohrid Literacy School, where the Bible was taught in Old Church Slavonic with the use of the Cyrillic script, which he helped develop. His tomb rests in the church to this day.

In the middle ages the region became part of Tsar Samuil's empire, with the city of Ohrid serving as the capital. The fortress built for his needs, with findings of ancient Greek scripts suggesting that it was originally built in the 4-th century B.C., was later used by the Ottoman empire and it sits on the highest point of the city to this day.

On top of a hill in Pogradec there are remains of an Illyrian-Albanian castle in a site that has been populated since the 6-th century B.C. The churches of St. Sophia and Kaneo in the city of Ohrid from the 11th and 13th century respectively, are prime examples of Byzantine architecture that attract plenty of tourists, host cultural events, etc. St John Kaneo's church, sitting on a cliff right above the lake, blends marvelously with the natural setting of the region. The St. Naum monastery from the 16-th century on the other side, too, sits on a plateau right above the lake and has historically welcomed both Christians and Muslims from the region.

Apart from the Byzantine, today's architecture of the area is mostly from the times of the Ottoman Empire. The narrow cobbled streets, numerous mosques and churches, tightly built two to three story buildings throughout the lakeside cities of Ohrid and Pogradec are what gives them such a particular charm.

2.3 TYPOLOGY AND DELINEATION OF WATER BODIES

2.3.1 Surface waters

Lake Ohrid has special physical and biological characteristics compared to other large lakes in Europe. The lake is stratified into two distinct layers, the hydrologically dynamic epilimnion (upper layer) and the more static, voluminous hypolimnion (lower layer).

Typology of Lake Water Bodies

Lake Ohrid was considered as a single type of water body in previous research projects[9]. Some previous typology and delineations were made on political basis, i.e. using the border line between Albania and North Macedonia. However, such an approach is not appropriate and not applicable since the lake as ecosystem cannot be divided on such criterion that is different (opposite) to WFD recommendations. Such political criteria might be used for delineation of the waterbodies, but not for typology of the lake. Past and recent investigations of biota from Lake Ohrid show significant difference in species composition between littoral and sublittoral/profundal regions. Also, significant differences in species composition have been observed on different substrates at same depth. In general it is very hard to establish reference conditions for Lake Ohrid because of two reasons:

- ✓ the presence of high percentage of specific (endemic or relict) species; and
- ✓ limited taxonomical, ecological and biogeographical research of biological quality elements (for instance macroinvertebrates).

WFD Guidance Document No. 2 “Identification of Water Bodies” suggests subdivision of lakes on the basis of significant differences in the biological and hydrogeological characteristics. Based on these criteria and specific geomorphological features of Lake Ohrid, four (4) different types of water bodies have been identified in the lake:

1. the first type is part of the littoral region of 0 to 15 m water depth, characterized by sandy substrate, almost flat bottom and gentle slope where water depth gradually increases;
2. the second type comprises also the littoral region (0 to 15 m water depth), but with rocky bottom and steep slope;
3. the third type is the largest one, comprising the deep part of the lake characterized by clay bottom and more stable physico-chemical conditions (temperature, oxygen, light availability, etc.); and
4. the fourth type includes the spring regions of St. Naum (North Macedonia) and Tushemisht (Albania).

Delineation of Lake Water Bodies

8 Lake Water Bodies belong to MSSM type, 4 to MSRM and 1 MMCD. In total 13 lake water bodies have been identified. Beside water depth, slope, form and shape of bed, substratum composition, also available data for relevant biological elements (diatoms, macrophytes, microinvertebrates and fish) are used for delineation and identification of the water bodies in Lake Ohrid watershed.

Table 2.4: LOW: Typology and Delineation of Lake Water Bodies

No.	Water body type	Water body name	Starting point altitude	Altitude	Surface area of water	Area of WB sub-catchme	Size typology	Geology	Geology code	Depth	Code
1	L	L-Radozhda	693.4	M	3.16	6.2	S	Sand	S	M	MSSM
2	L	L-Kalishta	693.4	M	0.8	22.3	S	Sand	S	M	MSSM
3	L	L-Struga-Black Drin	693.4	M	5.25	14.4	S	Sand	S	M	MSSM
4	L	L-Sateska	693.4	M	4.8	32	S	Sand	S	M	MSSM
5	L	L-Koselska	693.4	M	1.8	157	S	Sand	S	M	MSSM
6	L	L- Ohrid bay	693.4	M	1.6	9.85	S	Rock	R	M	MSRM
7	L	L-Velidab	693.4	M	3.1	116	S	Rock	R	M	MSRM
8	L	L-Bay of St. Naum	693.4	M	1.6	91	S	Sand	S	M	MSSM
9	L	L-Tushemisht	693.4	M	0.81		S	Sand	S	M	MSSM
10	L	L-Pogradec	693.4	M	5.8	56.6	S	Sand	S	M	MSSM
11	L	L-Hudenisht	693.4	M	3.4	40.6	S	Rock	R	M	MSRM
12	L	L-Lin	693.4	M	2.24	22.7	S	Rock	R	M	MSRM
13	L	L-Lake Ohrid-Pelagic	693.4	M	322		M	Clay	C	D	MMCD

Typology and Delineation of River Water Bodies

Based on the WFD requirements, three (3) types of river water bodies have been identified in the LOW:

1. HMC – rivers on High altitude with Medium size Catchment area on carbonate background;
2. MSC – rivers on Medium altitude with Small size Catchment area on carbonate background; and
3. MMC – rivers on Medium altitude with Medium size Catchment area on carbonate background.

According to this typology the following subdivision can be made:

- ✓ one river water body belongs to type 1 HMC (Sateska 1);
- ✓ three river water bodies belong to type 2 MSC (Sateska 2, Koselska 1 and Cerave);
- ✓ two river water bodies belong to type 3 MMC (Koselska 2 and Sushica);
- ✓ one water body is characterized as heavily modified – Sateska 3; and
- ✓ one water body characterized as artificial – Studenchishki kanal.

Table 2.5: LOW: Typology and Delineation of River Water Bodies

No.	Water body Type	Water Body Name	Starting Point Altitude	End Point Altitude	Altitude	Catchment size (km^2)	Size typology	Geology	Combination
1	R	R-Sateska 1	1,273	760	North	345.0	M	C	HMC
2	R	R-Sateska 2	760	709	M	49.0	S	C	MSC
3	HMWB	R-Sateska 3	709	693.4	M	32.0	S	C	MSC
4	R	R-Koselska 1	1,979	877	M	36.0	S	C	MSC
5	R	R-Koselska 2	1,833	693.4	M	157.0	M	C	MMC
6	R	R-Cerave	1,035	695	M	91	S	C	MSC
7	R	R-Sushica	1,220	693.4	M	45	S	C	MMC
8	AWB	Studenchishki kanal	693.5	693.5	M	9.85	S	C	MSC

Typology and Delineation of Heavily Modified and Artificial Water Bodies

According to the WFD, Heavily Modified Water Bodies (HMWB) should be identified and designated where good ecological status is not being achieved because of impacts on the hydromorphological characteristics of a surface water resulting from physical alterations. The identification of HMWB must be based on the designation criteria set out for river water bodies. According to WFD artificial water body represents a body of surface water created by human activity, while HMWB is a body of surface water which as a result of physical alterations by human activity is substantially changed in character. Artificial or heavily modified water bodies are designated if:

- ✓ the changes to the hydromorphological characteristics of that body would have significant adverse effects on the wider environment and water regulation, flood protection, land drainage;
- ✓ the beneficial objectives served by the artificial or modified characteristics of the water body cannot, for reasons of technical feasibility or disproportionate costs, reasonably be achieved by other means, which are a significantly better environmental option; and
- ✓ these conditions are proved in the designation test.

In principle, the boundaries of HMWBs are primarily delineated by the extent of changes to the hydromorphological characteristics that:

- ✓ result from physical alterations by human activity; and
- ✓ prevent the achievement of good ecological status.

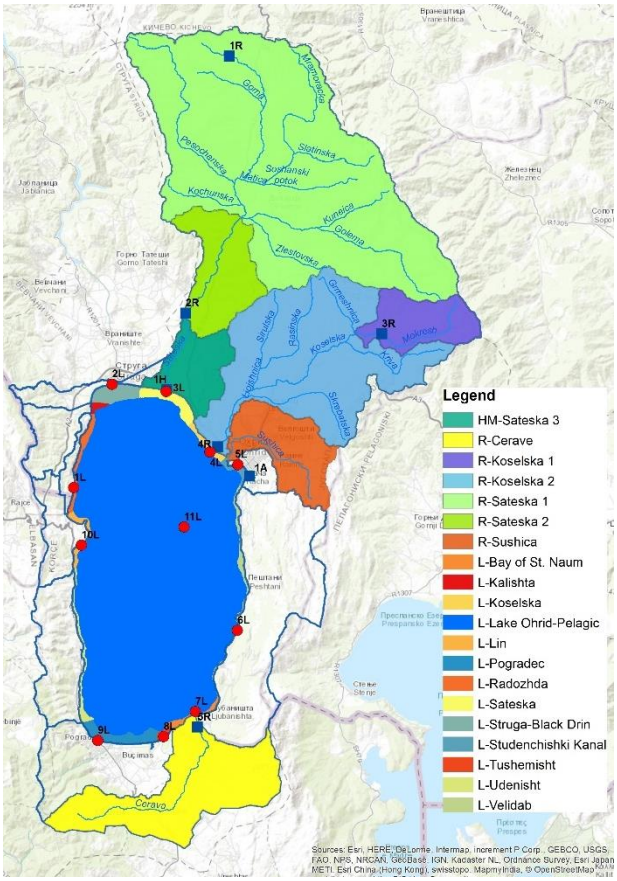

Figure 2.3: LOW: Delineation of Surface Water Bodies

Based on available data one single HMWB has been identified in the LOW – River Sateska 3. In the LOW, also one Artificial Water Body (AWB) was identified – channel Studenchista. The Studencishta wetland is valorized as a natural phenomenon preserved for millennia and hence it's particular significance for the Ohrid Lake.

2.3.2 Groundwater

The groundwater aquifer has been divided into 5 different types of typology as follows[7]:

- ✓ Type 1 - Aquifer zones with intergranular porosity having high to middle transmissivity and permeability;
- ✓ Type 2 - Aquifer zones with intergranular porosity having low transmissivity and permeability;
- ✓ Type 3 - Aquifer zones with karst-fracture porosity having high transmissity and permeability;
- ✓ Type 4 - Zones with local aquifers with limited extent close to the surface and waterproof at deeper levels practically impermeable; and
- ✓ Type 5 – zones that are neither an aquifer nor a groundwater body.

Table 2.6: LOW: Typology and Delineation of Groundwater Bodies

Groundwater body name	Aquifer Type	Horizon	Description
GWB001_Horz1	1	1	Porous highly productive
GWB002_Horz1	1	1	Porous highly productive
GWB021_Horz2	2	1	Fissure highly productive
GWB022_Horz2	2	1	Fissure highly productive

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[7] Source: "Typologies of Groundwater in Macedonia (FYR)", Report"; Proj. Ref. EuropeAid/132108/D/SER/MK : Technical Assistance for Strengthening the Institutional Capacities for Approximation and Implementation of Environmental Legislation in the Area of Water Management; Ramboll (2015).

3 SIGNIFICANT WATER MANAGEMENT ISSUES, DRIVERS AND PRESSURES ON WATER BODIES IN THE LOW

The pressures and impacts assessment is a four-step process making use of the Driver-Pressure-State-Impact-(DPSIR) framework, which is seen as giving a structure within which to present the indicators needed to enable feedback to policy makers on environmental quality and the resulting impact of the political choices made, or to be made in the future.

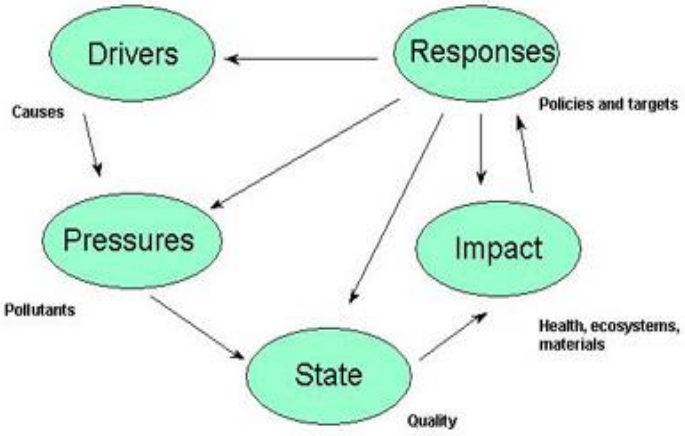

Figure 3.1: The DPSIR Assessment Framework

According to the DPSIR framework there is a chain of causal links starting with 'driving forces' (economic sectors, human activities) through 'pressures' (emissions, waste) to 'states' (physical, chemical and biological) and 'impacts' on ecosystems, human health and functions, eventually leading to political 'responses' (prioritisation, target setting, indicators).

Driving forces are sectors of activities that may produce series of pressures, either as point or non-point sources. The IMPRESS guidance document provides a broad categorization of driving forces, which can be used as a checklist for inventory of the relevant pressures.

The main Driving Forces/Drivers that produce pressure on the water resources of the LOW are the following:

- ✓ urban development;
- ✓ tourism and recreation;
- ✓ fisheries;
- ✓ industry;
- ✓ intensification of agriculture; and
- ✓ hydropower.

Apart from these, Driving Forces in terms of activities as impetuses for change within the DPSIR framework are also:

- ✓ EU accession;
- ✓ the process of EU WFD implementation;
- ✓ promotion of Integrated Water Resources Management;
- ✓ available external funding; and
- ✓ the support of the GWP for transboundary cooperation and institutions establishment for the Extended Drin River basin.

Overall, the DPSIR framework provides the basis upon which to assess the pressures in the LOW. The understanding of the causal relationships between pressure, state and impact, apart from data used from previous studies, was also facilitated by extensive assessments performed within the frame of the GEF Drin Project, which offered sufficient knowledge, background information and data to perform the pressures and impact assessment and select the differential responses to different identified pressures.

The first step for the selection of pressures is based on the identification of the Significant Water Management Issues (SWMI) according to the WFD requirements.

According to Article 14 (1) (b) of the WFD, at least two years before the beginning of each river basin planning period the national Competent Authority for development of the RBMP and related Program of Measures (PoM) has to publish, for each river basin district, a summary of SWMIs which are the most relevant for the given river basin district. The overview must be published for consultation for a period of 6 months and should set out, for the river basin district, the main pressures and impacts, which will need to be addressed in the Plan and the PoM. Thus, the identification of SWMIs is one of the key milestones in designing the plan.

Within this framework, the broad consultation organised by the GWP-Med for the approval of the Transboundary Diagnostic Analysis (TDA) and the Strategic Action Programme (SAP) for the extended DRB19 is considered as well in the selection of SWMIs for the LOW, as well as for outlining the main challenges ahead, which served as basis for selection of the measures in the PoM of the LOW

More specifically, the investigations carried out under the Drin TDA/SAP analysis identified the following problems/pressures with transboundary effects:

- ✓ deterioration of water quality;
- ✓ variability of hydrological regime;
- ✓ biodiversity degradation; and
- ✓ variability of sediment transport regime.

In addition to the Drin Basin TDA/SAP analysis, based on information from a number of prior investigations related to environmental/water resource pressures in the LOW carried out through the past decades, as well as the detailed analysis carried out for preparation of this plan, the following aspects are regarded as SWMIs for the LOW:

- ✓ point-source and diffuse water pollution caused by urban development, tourism, industry, agriculture and fisheries;
- ✓ water quantity/abstractions from agriculture, urban development and tourism;
- ✓ physical condition of the water environment, i.e. flow alteration and diversion;
- ✓ introduced species and diseases;
- ✓ fisheries; and
- ✓ other anthropogenic activities (boating).

The following Table provides an overview of the key pressures, along with the drivers triggering the pressures, on the surface and ground waters in the LOW according to WFD Reporting Guidance 2016.

Table 3.1: LOW: Summary of Pressures on Water Resources

Pressure	Driver	Indicators	Index	Affected WBs
1.1 - Point – Urban waste water	Urban development	Load of BOD to be reduced (in tonnes/day) to achieve objectives	2.97 (t/day)	[1] [2] [6] [7] [10] [18] [19]
		Load of nitrogen to be reduced (tonnes/day) to achieve objectives	TBD	
		Load of phosphorus to be reduced (tonnes/day) to achieve objectives	TBD	
		Number of water bodies failing EQS for RBSP	12	
1.2 - Point – Storm overflows	Urban development	Number of urban areas with excessive overflows that are causing or contributing to failure of objectives	3 larger cities + 30 other settlements	[1] to [20]
		Number of water bodies failing EQS for PS and/or RBSP	11	
1.3 - Point –Non-IED plants	Industry	Number of permits not compatible with the achievement of objectives	14	
		Number of water bodies failing EQS for RBSP	14	
1.6 - Point – Waste disposal	Urban development	Number of waste disposal sites affecting achievement of objectives	2(+2) official landfills 20 illegal dumps	[1] to [20]
		Number of water bodies failing EQS for PS and/or RBSP	14	
1.8 - Point - Aquaculture	Fisheries and aquaculture	Number of point sources affecting achievement of objectives	2 hatcheries + 3 small fish farms	[6] [19]
2.1 - Diffuse - Urban runoff	Urban development	Length (km)/area (km^2) of water bodies that are not achieving objectives because of diffuse urban run off	320 km^2	[3] [5] [6] [7] [10] [12]
2.2 - Diffuse – Agricultural	Agriculture	Load of nitrogen to be reduced (in tonnes) to achieve objectives	TBD	[3] [4] [6] [7] [10] [11] [12] [14] [15] [18] [19] [20]
		Load of phosphorus to be reduced (in tonnes) to achieve objectives	TBD	
		Number of water bodies failing EQS for pesticides originating from diffuse agricultural sources	12	
		Number of farms not covered by advisory services	TBD	
		Area of agricultural land at risk of soil erosion	TBD	
2.5 - Diffuse – Contaminated or abandoned industrial sites	Industry	Area of land (ha) under pressure that needs to be subject to measures	20 ha	[11]
2.6 - Diffuse – Discharges not connected to sewer network	Urban development	Length (km)/area (km^2) of water bodies not achieving objectives because of this pressure	47.5 km	[1] [7] [11] [12] [19]

Pressure	Driver	Indicators	Index	Affected WBs
2.9 - Diffuse – Aquaculture	Fisheries and Aquaculture	Length (km)/area (km^2) of water bodies not achieving objectives because of this pressure	5 km	[6] [19]
3.1 - Abstraction or flow diversion – Agriculture	Agriculture	Volume of water abstracted/diverted for agriculture (million m^3) to be reduced to achieve objectives	TBD	
3.2 – Abstraction/flow diversion – Water supply	Urban development	Volume of water abstracted for public water supply (million m3) to be reduced to achieve objectives	8.5 mill m^3/year	[1] to [20]
3.3 - Abstraction or flow diversion – Industry	Industry	Volume of water abstracted for industry (million m^3) to be reduced to achieve objectives	TBD	
3.5 – Flow diversion – Hydropower (Sateska river)	Energy – hydropower	Volume of water diverted (million m^3) to be reduced to achieve objectives	187.5 mill m^3/year	[13] [15]
		Volume of sediment to be reduced to achieve objectives	34,150 m^3/year	
3.6 - Abstraction or flow diversion - Fish farms	Fisheries and Aquaculture	Volume of water abstracted for aquaculture (million m^3) to be reduced to achieve objectives	1.75 mill m^3/year	[6] [19]
4.1.1 - Physical alteration of channel – Flood protection	Energy – hydropower Flood protection	Length (km) of water bodies affected by alterations for flood protection not compatible with good ecological status/potential	9.2 km on river WBs 5 km along the Lake	[3] [6] [10]
5.1 - Introduced species and diseases	Fisheries and aquaculture	Number of introduced species preventing the achievement of GES/GEP	6 species	[1] to [12]
5.2 - Exploitation or removal of animals	Fisheries and aquaculture,	Length (km) /area (km^2) of water bodies where the exploitation of animal is preventing the achievement of good ecological status/good ecological potential	356 km^2	
5.3 – Litter or fly tipping	Urban development,	Length (km) of water bodies impacted by litter or fly tipping	All Lake WBs 65 km of RWBs	[1] to [12] [5] [14] [15] [19] [20]
7 – Anthropogenic pressure – Other (boating)	Tourism and recreation	Length (km) /area (km^2) of water bodies where other anthropogenic pressures are causing the non-achievement of objectives	356 km^2	All Lake WBs

[1]	L-Radozhda	[6]	L- Studenchishki kanal	[11]	L-Udenisht	[16]	R-Sateska 3
[2]	L-Kalishta	[7]	L-Velidab	[12]	L-Lin	[17]	R-Koselska 1
[3]	L-Struga-Black Drin	[8]	L-Bay of St. Naum	[13]	L-Lake Ohrid-Pelagic	[18]	R-Koselska 2
[4[	L-Sateska	[9]	L-Tushemisht	[14]	R-Sateska 1	[19]	R-Cerave
[5]	L-Koselska	[10]	L-Pogradec	[15]	R-Sateska 2	[20]	Sushica

4 ECOLOGICAL AND CHEMICAL STATUS/POTENTIAL OF WATER BODIES IN THE LOW

4.1 WFD REQUIREMENTS

The WFD (Annex V) requires classification of surface water bodies through determination of their ecological and chemical status. The ecological status is determined through classification of biological quality element values specified for each surface water category. The estimation should be based on results of direct measurements by an established monitoring system, whereas the system shall utilize particular species or groups of species that are representative of the quality element as a whole. The chemical status for each SWB is determined based on assessed level of compliance with quality standards as defined by Article 16 and Annex IX of the WFD, as well as other EU legislation setting environmental quality standards. The chemical status is also based on results of measurements through the monitoring system. In addition, for heavily modified or artificial water bodies reference to ecological status should be interpreted as ecological potential.

For ensuring comparability of the classification the results of the monitoring are expressed as Ecological Quality Ratios (EQR), which represents a relationship between the values of observed biological parameter value and the reference condition value of the same parameters for each surface water body. The classification based on the EQR is divided in five classes, ranging from High to Bad ecological status. The classification of the chemical status is divided in two classes – Good or Failing to achieve good. The classes of both the ecological and chemical status are also color-coded.

Evidently the EQR, which is based on comparison of measured biological parameters with reference conditions for the same parameters, is the key factor for determination of the ecological status (classes) of water bodies. Further, type-specific biological reference conditions need to be established for every type of water body representing the values of the biological quality elements for that surface water body type at high ecological status. However, Lake Ohrid is a unique ecosystem in the world and trying to find reference conditions in other lakes has no scientific basis. In addition, at present it is practically not possible to establish reference conditions for Lake Ohrid because of two reasons:

- ✓ the presence of high percentage of specific (endemic or relict) species; and
- ✓ limited taxonomical, ecological and biogeographical research of biological quality elements required for proper establishment of reference conditions.

Because of these reasons, the classification of the water bodies of Lake Ohrid is made on the basis of the Carlson's Trophic State Index (TSI), i.e. the US EPA 2000 classification system[8]. The EPA system defines the classification of the trophic status of lake water bodies, thus it differs from the WFD classification. However, the EPA system reflects the primary response (biological activity) of the lake to nutrient overenrichment and therefore represents sound basis for assessing the status of water quality in the lake.

4.2 EXISTING MONITORING NETWORKS

At present regular monitoring based on the requirements of WFD is not performed in the LOW. In general there are some analyses of water quality performed within the framework of various project. Also two institutions in North Macedonia, more or less regularly analyse few selected parameters. The Institute of public health is responsible for monitoring of drinking water and water for recreation. Based on their program the Institute performes analyses of physico-chemical and bacteriological parameters on 30 sampling site in littoral zone of Lake Ohrid. The frequency of this monitoring is twice per month during summer season and once per month in other seasons. The National Hydrometeorological service is responsible for hydrological network in North Macedonia. In Lake Ohrid watershed two automatic stations for monitoring of water level and temperature are installed and functioning. On the Albanian side regular monitoring is performed on two sampling site.

4.3 ECOLOGICAL STATUS/POTENTIAL OF WBs IN THE LOW

For proper determination of the status of water bodies in the LOW a special Surveillance Monitoring Programme was designed and carried out in 2019. The Programme was implemented by a Consortium of specialized research institutions – the Greek Biotope/Wetland Centre (EKBY, part of the Goulandris Natural History Museum, Greece) and the Institute of Marine Biological Resources and Inland Waters (IMBRIW) of Hellenic Centre for Marine Research (HCMR) – and included three monitoring campaigns – February, April and July 2019. The monitoring

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[8] The use of the EPA classification for Lake Ohrid was also suggested by the Surveillance Monitoring Programme Report; details are given further.

was carried out at a total of 20 sampling points: 13 lake WBs, 6 river WBs and 1 AWB – Studenchishki kanal. Details from the monitoring are given in a separate consolidated report[9].

Based on results of the Monitoring Programme, but as well on data from previous monitoring and analysis for water bodies that were not included in the Programme (e.g. Sushica river), 2 river WBs – R-Sateska 1 and R-Koselska 1 – are assessed as having Good ecological status; 3 river WBs – R-Sateska 2, R-Sateska 3 and R-Koselska 2 – as having a Moderate status/potential; 2 rivers/WBs – R-Cerave and R-Sushica – as having Bad status; and the AWB Studenchishki kanal as having Poor status/potential.

Table 4.1: LOW: Ecological Status/Potential of River WBs

Water Body	Ecologocal Status/Potential	WB length (m)	Total river length (m)	WB as % of total river length
R-Sateska 1	GOOD	23,138	40,828	57%
R-Sateska 2	MODERATE	10,727		26%
R-Sateska 3	MODERATE	6,963		17%
R-Koselska 1	GOOD	13,963	33,779	41%
R-Koselska 2	MODERATE	19,816		59%
R-Cerave	BAD	19,940	19,940	100%
R-Sushica	BAD	7,627	7,627	100%
AWB Studenchishki kanal	POOR	625	625	100%

As regards Lake Ohrid, 5 of its WBs are classified as Oligotrophic-Clear water, 6 as Oligotrophic – A, and the remaining 2 lake WBs as Mesotrophic – Water moderately clear status under the EPA system. All water bodies in the basin are assessed as currently having Good chemical status.

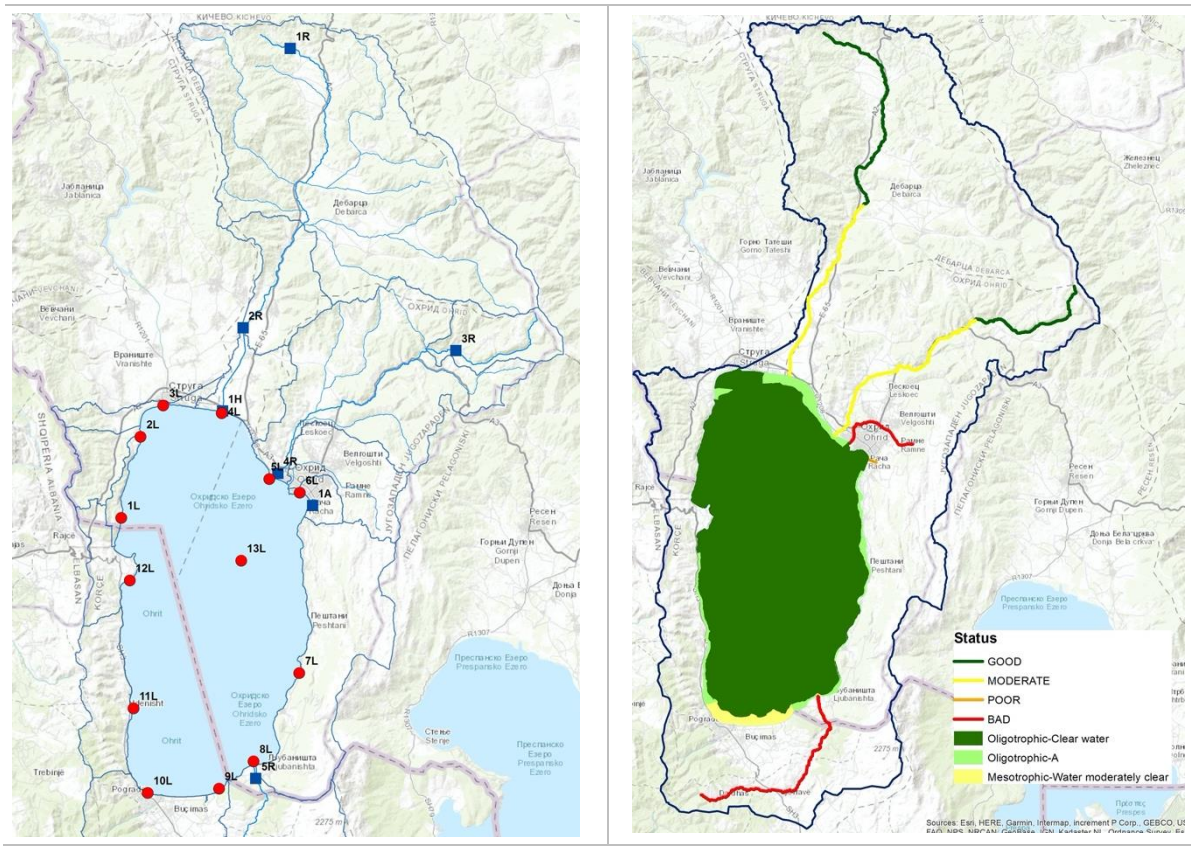

Figure 4.1: LOW: Sampling Sites for the Surveillance Monitoring Programme; Classification of Surface Water Bodies

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[9] "Final report: Surveillance Monitoring Programme for the Lake Ohrid Watershed" (September 2019).

Table 4.2: LOW: Trophic Status of Lake WBs

No.	Type	WB Name	Trophic Status	Mean TSI
1	L	**L-Radozhda**	Oligotrophic-Clear water	**28.60**
2	L	**L-Kalishta**	Oligotrophic-A	**33.43**
3	L	**L-Struga-Black Drin**	Oligotrophic-Clear water	**26.42**
4	L	**L-Sateska**	Oligotrophic-A	**38.21**
5	L	**L-Koselska**	Oligotrophic-A	**33.84**
6	L	**L- Ohrid bay**	Oligotrophic-Clear water	**28.91**
7	L	**L-Velidab**	Oligotrophic-A	**38.67**
8	L	**L-Bay of St. Naum**	Oligotrophic-A	**36.84**
9	L	**L-Tushemisht**	Mesotrophic-Water moderately clear	**43.08**
10	L	**L-Pogradec**	Mesotrophic-Water moderately clear	**46.78**
11	L	**L-Udenisht**	Oligotrophic-A	**30.70**
12	L	**L-Lin**	Oligotrophic-Clear water	**29.72**
13	L	**L-Lake Ohrid-Pelagic**	Oligotrophic-Clear water	**26.81**

Finally, the Final Report of the Surveillance Monitoring Programme also concludes that "…results [of the monitoring] are in complete accordance with other studies, revealing the most water quality degraded waterbodies and that indeed an anthropogenic eutrophication is taking place in Lake Ohrid; …phosphorus concentration has increased four times over the past 100 years because of increased anthropogenic phosphorus loads. The building of a sewerage system and a treatment plant in North Macedonia in the 1980's has definitely had an effect on the P-load. In recent years this decrease seems to be compensated by increasing population. The alternation of decrease and increase in the P-concentration could explain why the increased input of the past decades cannot not be observed in the water quality. The domestic phosphorus input contributes the largest share to the anthropogenic P-load. Thus, it has the largest reduction potential at the moment. Furthermore, morphological alterations in the littoral zone of Lake Ohrid shape biological communities, and it is proposed that they are addressed. Finally, future intensification of agriculture could change the situation dramatically. As a result good agricultural practices should be communicated in following years".

4.4 PLAN FOR FUTURE MONITORING IN THE LOW IN LINE WITH FWD

As elaborated before, performed surveillance monitoring in the course of this project was not sufficient for obtaining the most reliable scientific data and applicable data base for determination of the ecological status of surface and ground waters in the LOW.

As stated in the WFD, Operational monitoring has to be undertaken:

- ✓ a total of six (6) monitoring points on river water bodies should be selected; and
- ✓ a total of eight (8) monitoring points on lake water bodies should be selected.

Investigative monitoring may also be required in specified cases. These are given as:

- ✓ where the reason for any exceedences is unknown;
- ✓ where surveillance monitoring indicates that the objectives set under Article 4 for a body of water are not likely to be achieved and operational monitoring has not already been established, in order to ascertain the causes of a water body or water bodies failing to achieve the environmental objectives; or
- ✓ to ascertain the magnitude and impacts of accidental pollution.

5 ENVIRONMENTAL OBJECTIVES OF THE LOWMP

This section of the plan sets out the objectives that the plan aims to achieve.

5.1 OBJECTIVES AND TIMEFRAME

The WFD establishes demanding environmental objectives for surface waters and ground waters (Article 4). The WFD addresses different areas of legislation related to several separate Directives (Annex VI). The WFD also requires that a RBMP objectives and measures have to comply with requirements of these Directives.

The plan establishes four core environmental objectives to be achieved generally by 2031:

- ✓ Restore good status of surface and ground water bodies;
- ✓ Prevent deterioration of water bodies already having good or high status;
- ✓ Reduce chemical pollution; and
- ✓ Achieve water related objectives for protected areas.

The time period assumed in this Plan for the LOW is the following: (i) Phase I: 2020 – 2025; and (ii) Phase II: 2026 – 2031.

This plan establishes alternative objectives for certain water bodies related mainly to extended deadlines, i.e. deadlines beyond the analyzed 12-year period (2020 – 2031).

Extended deadlines, usually of one additional planning cycle of 6 years, need to be applied to some water bodies due to technical, economic, environmental or cost recovery constraints. Also, in some cases further investigations are required to confirm the extent of impacts or to identify appropriate measures and implement them. The effectiveness of some measures is uncertain and status recovery is expected to take longer than the first planning cycle.

5.2 EXPECTED RESULTS

It is estimated and expected that implementing planned measures (as defined further) will by 2031 achieve an Oligotrophic – Clear water trophic status in 11 of the 13 lake water bodies (i.e. the 6 LWB currently having Oligotrophic – A status will improve to Oligotrophic – Clear water) and the remaining 2 LWB currently having Mesotrophic status (LWB Tushemisht and LWB Pogradec) will, as a minimum, achieve an Oligotrophic – A status. In addition, the 2 river water bodies currently having Moderate status and the AWB Studenchishki kanal with Poor ecological status will achieve Good status, while the 2 RWB currently characterized as having Bad status (RWB Çeravë and RWB Sushica) will achieve, again as a minimum, Moderate status. Further improvements should be expected over the consequent planning cycles. Improvements of groundwater can be defined as data from monitoring activities are available.

6 PROGRAMME OF MEASURES

Section 6 sets out the environmental objectives for the LOWMP. This section describes the measures that need to be implemented to achieve those objectives. The complete Programme of Measures is included in Appendix A.

6.1 POLICY, REGULATORY AND KNOWLEDGE BASE INCREASE MEASURES

Policy and regulatory measures are considered those measures that either come out as requirements of the legislation or this plan (e.g. establishment and implementation of water monitoring system, adopting new water pricing policies, harmonization of boating legislation, etc.), or aim at strengthening the institutional capacity for ensuring monitoring of LOW MP and its measures implementation, on a local level on IED implementation, including monitoring of performance of existing installations and their compliance with the permit conditions. Further, several measures are proposed which are focused on increasing the knowledge base regarding various aspects of the LOW, thus reducing uncertainties for future planning (e.g. conducting research for determination of reference conditions for Lake Ohrid, development of a type specific surface water classification system, groundwater status monitoring and classification, protected areas designation, climate change impact). Also, an analysis should be done on the necessity of designation of LOW as a nutrient sensitive area under the UWWT Directive and nitrate vulnerable area under the Nitrates Directive in order to mitigate the risk of eutrophication. The same can apply on the elaboration and implementation of specific legislation for using phosphates free detergents.

6.2 CONTROL OF URBAN WASTEWATER DISCHARGES

Inappropriate wastewater management. i.e. wastewater discharge, is certainly one of the most important sources of pollution in the LOW. Based on the analysis presented in Section 4.1 currently the ratio of households connected to public wastewater collection system for the basin equals 72%; the remaining 28% are assumed to use septic tanks for discharge of wastewater. Additional important aspect related to WWM in the LOW is the presence of a large number of tourists in the region, and in particular the distribution of visitors and overnights throughout the year, which creates significant imbalances of pollutant load to water bodies. Further, although there are two central WWM systems (WWTP Vranishta in North Macedonia and Tushemisht in Albania) and several small-scale (decentralized) plants for local tourist facilities around the lake, these are currently facing a number of problems and limitations in their daily operation. Finally, apart from previous studies, the surveillance monitoring programme that was carried out in 2019 also confirmed that anthropogenic eutrophication is taking place in Lake Ohrid, with the domestic phosphorus input contributing the largest share in the total anthropogenic phosphorus load.

Thus, it is expected that during the analyzed 12-year period the WFD requirements regarding WWM should be given highest priority and fully met. Proposed measures for control of urban wastewater discharges take into consideration reconstruction and upgrade of the two central WWM systems, completion of sewer networks in settlements and connecting these networks to the central systems, construction of small-scale WWM systems in villages that will be equipped with WWTPs, and termination of combined sewer systems (i.e. construction of separate surface runoff systems) in urban areas around the lake. Conducted analysis for determination of the size/capacity and required expenditures for the WWM systems are based on input data from the JICA-study mentioned in Section 4.1[10].

6.3 WASTE MANAGEMENT

The sub-group of measures is focused on activities for mitigation of another major pollution sector – solid waste management. It includes improvements in waste collection activities and establishment of regional waste management centers, which in general is an accepted strategy for waste management in both countries, but as well on measures for closure and remediation of the existing non-compliant municipal landfills and village dump sites, introduction of waste recycling, etc. The analyses for both countries are based on unit input data from a study for establishment of regional waste management plan for the South-east region in North Macedonia[11]. In Albania, solid waste of Pogradec Municipality is transferred to Maliq Landfill and a transfer station exists within Pogradec Municipality.

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10 "Data Collection Survey for Ohrid Lake Environmental Improvement", Final Report. Japan International Cooperation Agency (JICA), MoEPP (October 2012).

11 "Preparation of Documents for Establishment of Integrated and Financially Sustainable Systems for Waste Management Centers – Southeast region"; EuropeAid/136347/IH/SER/MK. ENVIROPLAN S.A. and consortium partners: Louis Berger, BiPRO GmbH, EPEM S.A., SLR Consulting Limited (2016).

6.4 CONTROL OF AGRICULTURAL SOURCES OF POLLUTION

Proposed measures within this group refer to control of diffuse (non-point) pollution which is result of agriculture activities. Identified measures are divided in the following sub-groups:

- ✓ Control of fertilizer and pesticide use measures, referring mainly to implementation of good agricultural practices (GAP) in crop cultivation and farm management, with the aim of reducing nutrient (fertilizer) and pesticide pollution; and
- ✓ Agriculture waste and hazardous materials management measures, focused on managing of agriculture waste and waste materials: pesticide and fertilizer packaging (hazardous) waste; PE waste; organic (bio-degradable) waste; and mainly liquid waste from cleaning of agriculture machinery.

6.5 CONTROL OF WATER WITHDRAWALS

This group refers to activities for control of water abstraction (withdrawal) from the basin and increase of water use efficiency. The following sub groups of measures are taken into consideration:

- ✓ control of irrigation water withdrawals, Irrigation is the largest water consumer in the basin. On the other hand current irrigation practices are extremely inefficient. Therefore, a specific focus is given to development and implementation of measures directed at increasing the economy of water use for agriculture purposes. Foreseen measures include:
  - upgrading of existing irrigation schemes, to enable use of modern irrigation techniques (e.g. drip irrigation);
  - promotion and application of advanced irrigation and fertigation technologies on individual farms;
  - promotion of cropping pattern/mix change; and irrigation demand automation measures; and
- ✓ control of municipal and industrial water withdrawals, by reducing physical water losses in drinking and industry water supply networks, mainly in urban areas. Foreseen activities include supply side measures (reparation of water leaks and network upgrade), as well as demand side measures (increased water metering, development and promotion of new water supply codes, etc.).

6.6 FISHERY AND BIODIVERSITY MANAGEMENT MEASURES

As pointed out in Section 4.4, even though fishery master plans are in place in both countries and major efforts for restocking are continuously being implemented for several decades, as a result of inadequate protection and unsustainable fishing practices the two endemic Salmonid species of the lake (Ohrid Trout and Belvica) are at threat of possible irreversible loss of their populations. Further, additional pressure is the presence of introduced (alien) fish species in the lake.

Therefore, particular measures are proposed which by and large refer to harmonization of the fishery regulations in both countries and adoption of a joint Fishery Master Plan, as a main prerequisite for further continuous implementation of activities for controlling of listed adverse impacts. In addition, measures such as upgrading the capacity of the restocking hatcheries, as well as for strengthening of fishing inspection units are also planned.

6.7 OTHER MEASURES

The group of other projected measures includes:

- ✓ protected areas measures, focused mainly on restoration and improved management of protected areas (e.g. drinking water supply sources) within the LOW;
- ✓ remediation of contaminated industrial sites. As mentioned in Section 4.2, in addition to eutrophication Lake Ohrid is also under pressure of pollution resulting from abandoned old chromium, iron and nickel mines outside Pogradec in Albania. Therefore, the plan includes implementation of measures and activities focused on mitigation of this pressure in the form of:
  - detailed site investigations for precise determination of the contamination extent and selection of preferred clean-up technologies, and
  - implementation of remediation works;
- ✓ flow diversion – hydropower, the measure refers to reducing the highly negative impact from Sateska river on Lake Ohrid (see Section 4.7), through implementation of design and civil works for re-routing the main flow of the river in its original riverbed with discharge directly into the Black Drin river and additional erosion-control activities. The concept that is observed here is based on analysis carried out in 1998 by the Directorate for Water Economy in North Macedonia12 and includes four phases:
  - reconstruction of the section of Sateska river from the Volino village to Black Drin (8 km length) to enable a flow-capacity of 100 m3/sec and construction of a special flow-diversion structure with the same capacity,
  - regulation of the upper section of the Sateska riverbed (channel) from Volino to Klimeshtica (20 km length),
  - construction of check dams (sediment settling basins) along the upper section of Sateska, and
  - implementation of reforestation and other erosion-control measures on the upper section. These works will enable full control of up to Q50-year flow in Sateska of 180 m^3/sec, whereas in the case of such an event Q100 m^3/sec will surge directly to Black Drim and the remaining 80 m^3/sec to Lake Ohrid. Thus, the solution will prevent practically all current discharge of sediment and nutrients (phosphorus and nitrogen) in the lake, without affecting the annual hydropower generation on the cascade reservoirs/HPPs along the Drin river; and
- ✓ other anthropogenic pressure management measures, focused on activities for mitigation of the remaining major anthropogenic pressure – boating. Besides harmonization of boating legislation with the EU standards and strengthening the capacity of boating administrations, this sub group also includes construction of modern docking (boat) marinas on both sides of the lake.

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[12] Zavod za Vodostopanstvo, 1998.

7 ECONOMIC ANALYSIS

Albania and North Macedonia have developed economic instruments related to water resource management. Applied economic instruments are divided in four categories:

- ✓ water service tariffs (fees);
- ✓ water use charges;
- ✓ emission charges; and
- ✓ product charges.

7.1 TARIFFS FOR WATER SUPPLY AND WASTEWATER MANAGEMENT

In both countries sharing the LOW water service tariffs are regulated by special national agencies – the Albanian Regulatory Authority of the Water Supply and Waste Water Disposal and Treatment Sector[13], and the Energy and Water Services Regulatory Commission of the Republic of North Macedonia[14].

Table below provides an outline of average water supply and wastewater service tariffs (prices) in 2018 in LOW municipalities; average water service tariffs for both countries are also provided.

Table 7.1: Water service tariffs for households and industry in LOW municipalities[15]

Water tariff (Euro/m3)	2018					
	Podradec	Ohrid	Struga	Debrca	AL average	NMK average
Households						
Total water tariff	0.67	0.70	0.97	0.42	0.80	0.61
Water supply	0.37	0.56	0.57	0.36	0.61	0.43
WWM	0.30	0.14	0.40	0.06	0.19	0.18
Industry and public sector						
Total water tariff	0.91	0.70	0.97	0.42		0.61
Water supply	0.61	0.56	0.57	0.36		0.43
WWM	0.30	0.14	0.40	0.06		0.18

When discussing W&WW affordability a thresholds value expressed as a percentage is applied on household income that determines the point at which the cost of water and wastewater services becomes unaffordable. Table below represents such threshold values used by various international organizations and the value established in North Macedonia.

Table 7.2: Water Service affordability Threshold Values

Organization	Threshold value*
World bank (2002)	3% – 5%
UK Government	3%
US Government (USEPA)	2.50%
Asian Development Bank (ADB)	5%
UNDP	3%
North Macedonia (regulator)	3%

% of average household income that can be spent on water and wastewater services

The share of current water service expenditures in the total household expenditures for several categories of household income is shown in the Table below.

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[13] http://www.erru.al/index.php?lang=2

[14] https://www.erc.org.mk/Default_en.aspx

[15] Sources: Albanian Regulatory Authority of the Water Supply and Waste Water Disposal and Treatment Sector (2018); Energy and Water Services Regulatory Commission of the Republic of North Macedonia (2018). International Benchmarking Network for Water and Sanitation Utilities (IBNET), 2015/18.

Table 7.3: Share of Water Service Expenditures by Categories of Household income in the LOW

HH income categories (Euro/month)	WS+WWM expenses as % of HH monthly income			
	Podradec	Ohrid	Struga	Debrca
250	1.7%	4.0%	3.0%	2.7%
400	1.1%	2.5%	1.9%	1.7%
600	0.7%	1.7%	1.2%	1.1%
800	0.5%	1.3%	0.9%	0.8%
1,000	0.4%	1.0%	0.7%	0.7%

It is concluded that at present the average prices charged by CPEs for W&WW in LOW municipalities are affordable for the local population, except for households of the group with lowest income. Evidently, the recent increase of water service tariffs vs. affordability aspects is reflected in the water consumption patterns.

7.2 COST-BENEFIT ANALYSIS

The implementation of the LOWMP has four distinct objectives related to:

- ✓ restoration of good status/quality of surface and ground waters;
- ✓ preventing deterioration of water resources already having a good status;
- ✓ reduction of chemical pollution of water resources; and
- ✓ achieving objectives related to protected areas. Accomplishment of these objectives, on the other hand, will bring about a number of benefits for the local population in the basin, but as well for the wider community.

A total of twelve Ecosystem Services (ES) provided by the Lake Ohrid watershed were valued using various economic techniques such as direct and indirect market price and avoided cost (direct market valuation approach), benefit transfer and travel cost (revealed preference approach), and contingent valuation (stated preference approach) methods. The range of valued ES is divided in ES of Lake Ohrid; ES of forests, protected and agricultural areas; and ES related to the entire watershed.

Table 7.4: Total Economic Value of LOW Ecosystem Services

Watershed part	Ecosystem Services	Service Type	Service value type (TEV approach)	Valuation method	Estimated ES value ($)	Period	% of Total
Lake Ohrid	Drinking water - households, industry	Provisioning	Use value - direct	Market price	$ 5,780,135	2016/17	2.0%
	Hydropower generation	Provisioning	Use value - direct	Market price	$ 55,525,470		18.8%
	Commercial fishery	Provisioning	Use value - direct	Market price	$ 1,016,506		0.3%
	Commercial boating	Provisioning	Use value - direct (NC)	Market price	$ 708,606		0.2%
Forests, Protected and Agriculture Areas	Raw materials -- timber, fuelwood	Provisioning	Use value - direct	Market price	$ 3,735,613	2016-2018	1.3%
	Food - game, fungi	Provisioning	Use value - direct	Market price	$ 5,774,725		2.0%
	Medicinal resources -- herbs	Provisioning	Use value - direct	Market price	$ 5,761,573		2.0%
	Agriculture production (crops)	Provisioning	Use value - direct	Market price	$ 17,480,000		5.9%
	Erosion prevention/soil protection	Regulating	Use value - indirect	Avoided cost	$ 346,531		0.1%
	CO2 sequestration	Regulating	Use value - indirect	Market price	$ 2,423,878		0.8%
Entire Watershed	Tourism and recreation	Cultural	Use value - direct (NC)	Travel cost	$ 191,438,339	2017/18	64.9%
	Existence/bequest/altruist value	Cultural	Non-use value	Contingent valuation	$ 5,114,937		1.7%
NC - non consumptive				**Total Value**	**$ 295,106,314**		100%
				Unit Value ($/ha)	**$ 2,102**		

In summary, three of the twelve analyzed ES – Tourism and recreation, Hydropower and Agriculture – account for nearly 90% (89.6%) of the total estimated value. Of the remaining services, Drinking water, Food, Medicinal herbs and Existence/bequest, account for 2% of the total each.

The simplified cost-benefit analysis shows that the benefits that implementation of the plan would bring over the next 15 years are 8.4 to 8.7 times higher than the costs when different discount rates are used.

Table 7.5: Summary Results of the Cost-Benefit Analysis

Cost or benefits	3% Discount rate	5% Discount rate
PV of costs	€ 268,046,819	€240,794,500
PV of benefits	€2,336,887,820	€2,022,248,415
B/C ratio	8.7	8.4

8 PUBLIC PARTICIPATION

Following the devised plan, the following public participation and consultation activities took place:

- ✓ Inception Workshop, organized in Ohrid on May 15, 2018, which brough together over 30 participants from responsible ministries, local government units, public enterprises, development agencies, research organizations, and NGOs from both countries.;
- ✓ over 20 direct meetings (semi-structured interviews) with local government units, public enterprises, executive authorities and other responsible organizations on local level were conducted during the succeeding period (May – December 2018) dedicated to characterization of the LOW;
- ✓ a specific and particularly important public participation event related to the LOWMP development represents the survey that was conducted in the LOW region in August/September of 2018. The goal of the survey was to collect data necessary for valuation of the LOW ecosystem services. Two questionnaires were developed for the purpose, focused on gathering an insight into the end-users' (stakeholders') perception of the values and benefits arising from the natural characteristics of the LOW, the awareness of the pressures impacting the status and quality of basin's water resources;
- ✓ two Focus Group Meetings (FGM) were organized in Ohrid (May 14, 2019) and one in Struga (May 15, 2019). The FGMs gathered over 30 stakeholders representing tourism service providers (hotel and restaurant owners), tourism agencies, local government representatives, Port Authority representatives from Ohrid, and NGOs;
- ✓ on January 28, 2020 the Draft LOWMP was presented to the Drin CORDA Expert Working Group and on January 30 to the Drin Core Group at an event organized by the GWP-Med in Tirana;
- ✓ in March 2020 the Draft LOWMP was published on the MoEPP web page. Representatives of North Macedonia ministries and other stakeholders were invited to review the plan and submit their comments;
- ✓ on June 23, 2020 the Albanian Water Resource Management Agency (AMBU) has distributed the Draft LOWMP to representatives of country's Transboundary Water Administration Commission. Commission members have been asked to provide their opinion on the plan on behalf of the institution they lead; and
- ✓ on 28th of September 2020, the draft Lake Ohrid Watershed Management Plan was presented at a national on-line consultation meeting organized by the Ministry of Environment and Physical Planning of North Macedonia, involving approximately 30 representatives from the competent Ministries, public institutions, local government, civil and scientific society in North Macedonia.
- ✓ on 27th of November 2020, the draft Lake Ohrid Watershed Management Plan was presented at an on-line consultation meeting of the Lake Ohrid Bilateral Committee, organized by the Mayor of Ohrid and involving approximately 15 participants — Mayors of Pogradec and Ohrid, other local government representatives, representatives from the competent Ministries, and civil society organizations in Albania and North Macedonia.

The consultative process organized along the production of the LOWMP reveal the stakeholders' appreciation for transparency in carrying out the public participation activities, their expectations on the WFD positive impact on management of the water resources, the knowledge on the pressures and state on Ohrid lake region that were substantially improved and the fact that there is a great ambitious in terms of sustainable water management of the Lake Ohrid region due to the implementation of the most cost-effective measures aiming to reach WFD objectives.

9 CONCLUSION

We, the Project Team would like to express our gratitude to all experts and stakeholders contributing to the development of the LOWMP, which will secure a good status for the freshwater ecosystems in the Lake Ohrid region, through the implementation of proposed programmes of measures and monitoring.

Finally, we have witnessed, to our great appreciation, the excellent cooperation between countries that share the Lake Ohrid region, providing an example of international cooperation to control the significant water management issues in the region, aiming to ensure that all stakeholders can access the findings of our investigations and analysis in order to facilitate better informed and more evidence-based policy decisions.

Appendix A

Programme of Measures

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Programme of Measures

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators 2020-2025	KTM Indicators 2026-2031	Expenditure (EUR) 2020-2025	Expenditure (EUR) 2026-2031
1.1 - Point – Urban waste water	Urban development Tourism and recreation	CHEM/ MICR/ NUTR/ ORGA	**2, 3, 5, 6, 7, 17, 18**	9, 10 (MKD)	B	• Setting up of advanced WWM tariff policy for households, commercial needs (tourism) and SMEs in Municipalities of Struga and Ohrid based on the national ERC methodology	[*See indicators specified under pressure 3.2 below*]			
		CHEM/ MICR/ NUTR/ ORGA	**2, 3, 5, 6, 7, 17, 18**	1 (MKD)	B	• Preparation/update of Feasibility Study and engineering design documents • Reconstruction and upgrading of the existing WWM system Vranishta	PE required to be treated by upgrade of WWM 80,000 curr. + 40,000 (120,000 max)		€23,240,000	
		CHEM/ MICR/ NUTR/ ORGA	**9, 10, 11, 12, 19**	9, 10 (AL)	B	• Setting up of advanced water WWM tariff policy for households, commercial needs (tourism) and SMEs in Municipality of Pogradec	[*See indicators specified under pressure 3.2 below*]			
		CHEM/ MICR/ NUTR/ ORGA	**9, 10**	1	B	• Preparation of Feasibility Study and engineering design documents • Reconstruction and upgrading of the existing WWM system Tushemisht	PE required to be treated by upgrade of WWM 40,000 (max)		€14,300,000	
		MICR/ NUTR/ ORGA	**1**	1 (MKD)	B	• Extension of the existing WWM system Vranishta, to connect all settlements and tourist facilities in the WB (L-Radozhda) • Construction of secondary sewers in Radozhda village and tourist facilities in WB	Number of WWT works to be constructed/upgraded 1 PE to be treated by extension/upgrade of WWM 1,700		€1,090,000	
		MICR/ NUTR/ ORGA	**2**	1 (MKD)	B	• Completion of secondary sewer systems in Kalishta, Frangovo and Mali Vlaj villages and tourist facilities in WB	Number of WWT works to be constructed/upgraded 3		€6,080,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
						• Connecting secondary sewer systems to the central WWM system Vranishta	PE to be treated by extension/upgrade of WWM			
							3,000			
		MICR/ NUTR/ ORGA	**5, 17, 18, 20**	1 (MKD)	B	• Completion of secondary sewer systems in settlements and tourist facilities in WBs • Connecting secondary sewer systems to the central WWM system Vranishta, or construction of distributed small-scale WWM systems for individual settlements	PE required to be treated by upgrade/extension of WWM		€2,380,000	
							3,700			
		MICR/ NUTR/ ORGA	**6**	1 (MKD)	B	• Completion of secondary sewer systems in Ohrid, Istok and Racha settlements and tourist facilities in WB • Connecting secondary sewers to the central WWM system Vranishta	Number of WWT works to be constructed/upgraded		€2,570,000	
							3			
							PE required to be treated by upgrade/extension of WWM			
							4,000			
		MICR/ NUTR/ ORGA	**7**	1 (MKD)	B	• Completion of secondary sewer systems in settlements (Eleshec, Elshani, Sv. Stefan) and tourist facilities in WB (sewer systems connected to WWM Vranishta)	Number of WWT works to be constructed/upgraded		€2,700,000	
							2			
							PE required to be treated by upgrade/extension of WWM			
							4,200			
		MICR/ NUTR/ ORGA	**7**	1 (MKD)	B		PE required to be treated by upgrade of WWM		€4,420,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
						• Construction of small-scale WWTM systems for Trpejca, Ljubanishta, Velestovo villages and tourist facilities	4,300 Number of WWT works to be constructed 3			
		MICR/ NUTR/ ORGA	**8**	1 (MKD)	B	• Reconstruction/upgrading of small-scale WWM system in St. Naum	Number of WWT works to be constructed/upgraded 1		€250,000	
		MICR/ NUTR/ ORGA	**9, 19**	1 (AL)	B	• Construction/completion of secondary sewer systems in settlements and tourist facilities in WB (Çerravë and Dardhas Admin Units) • Connecting secondary sewer systems to the central WWM system Tushemisht, or construction of distributed small-scale WWM systems for settlements	PE required to be treated by upgrade of WWM 10,000		€6,420,000	
		MICR/ NUTR/ ORGA	**10**	1 (AL)	B	• Completion of secondary sewer systems in settlements and tourist facilities in WB Pogradec (Buçimas and Pogradec Admin Units) • Connecting secondary sewer systems to the central WWM system Tushemisht	PE required to be treated by upgrade of WWM 7,100		€4,600,000	
		MICR/ NUTR/ ORGA	**11**	1 (AL)	B	• Construction of small-scale WWTM systems for settlements and tourist facilities in WB Hudenisht (Hudenisht Admin Unit)	PE required to be treated by upgrade of WWM 3,000		€3,000,000	
		MICR/ NUTR/ ORGA	**12**	1 (AL)	B	• Construction of small-scale WWTM systems for settlements and tourist facilities in WB Lin (Hudenisht Admin Unit)	PE required to be treated by upgrade of WWM 3,500		€3,500,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
1.2 - Point – Storm overflows	Urban development Tourism and recreation	CHEM/ OTHE	**3**	1, 21 (MKD)	B	• Termination of combined sewer, by construction (or completion) of separate storm/surface runoff collection system in Struga and disconnecting existing storm runoff connections from the WWM system Vranishta	Number of sustainable drainage systems 1 (0%)	(100%)		€5,000,000
		CHEM/ OTHE	**6**	1, 21 (MKD)	B	• Termination of combined sewer, by construction (or completion) of separate storm/surface runoff collection system in Ohrid and disconnecting existing storm runoff connections from the WWM system Vranishta	Number of sustainable drainage systems 1 (0%)	(100%)		€4,000,000
		CHEM/ OTHE	**10**	1, 21 (AL)	B	• Termination of combined sewer, by construction (or completion) of separate storm/surface runoff collection system in Pogradec and disconnecting existing storm runoff connections from the WWM system Tushemisht	Number of sustainable drainage systems 1 (0%)	(100%)		€2,000,000
		CHEM/ OTHE	**2, 5, 6, 7, 17, 18**	1, 21 (MKD)	B	• Disconnection of existing housing and tourist facilities' storm runoff connections from the WWM system Vranishta (all WB settlements in Struga and Ohrid municipalities with sewers connected to WWM Vranishta)	Number of upgraded storm overflows 	TBC		€9,000,000
		CHEM/ OTHE	**9, 10**	1, 21 (AL)	B	• Disconnection of existing housing and tourist facilities' storm runoff connections from the WWM system Tushemisht (all WB settlements in Buçimas, Çerravë, Dardhas and Pogradec Admin Units with sewers connected to WWM Tushemisht)	Number of upgraded storm overflows 	TBC (100%)		€2,000,000
1.3 - Point –- IED plants	Industry	CHEM/ ECOS/ ORGA/ OTHE	**1, 2, 3, 5, 6, 7, 8, 17, 18, 20**	10, 16 (MKD)	S	• Development and implementation of capacity building program for local government employees in Municipalities of Struga and Ohrid on environmental permitting procedure and enforcement of	Number of trained municipal employees 4		€250,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
						IED/SEVESO/IPPC legislation for industry (IPPC Type B)				
					B	• Revisiting and continuous monitoring of compliance with environmental requirements for existing IED/IPPC Type B permits (industrial units)	Number of revised permits		€750,000	
							14			
		CHEM/ ECOS/ ORGA/ OTHE	**9, 10, 11, 12**	10, 16 (AL)	S	• Development and implementation of capacity building program for local government employees in Municipality of Pogradec on environmental permitting procedure and enforcement of IED/SEVESO/IPPC legislation for industry (IPPC Type B and C)	Number of trained municipal employees		€200,000	
							3			
					B	• Revisiting and continuous monitoring of compliance with environmental requirements for existing IED/IPPC Type B/C permits (industrial units)	Number of revised permits		€600,000	
							11			
1.6 - Point – Waste disposal	Urban development	CHEM/ ECOS/ LITT/ MICR/ NUTR	**1, 2, 3, 5, 6, 7, 8, 17, 18, 20**	21 (MKD)	B	• Site identification and selection; preparation of design documents for development of regional waste management facility for Ohrid and Struga Municipalities (Southwest Region in MKD) • Construction of regional waste management facility for Ohrid and Struga Municipalities (Southwest Region in MKD)	Population from LOW to be covered by the regional WM facility		€8,880,000	€5,920,000
							85,000			
							Waste disposal capacity (t/y) at regional WM facility for LOW			
							32,000 t/y			
			9, 10, 11, 12	21 (AL)	B	• Site identification and selection; preparation of Feasibility Study and engineering design documents for development of regional waste management facility (landfill) for Pogradec Municipality (Buçimas,	Population from LOW to be covered by the regional WM facility		€5,400,000	€3,600,000
							55,000			
							Waste disposal capacity (t/y) at			

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators 2020-2025	KTM Indicators 2026-2031	Expenditure (EUR) 2020-2025	Expenditure (EUR) 2026-2031
						Çerravë, Dardhas, Pogradec and Hudenisht Admin Units)	regional WM facility for LOW			
						• Construction of regional waste management facility for Pogradec Municipality	20,000 t/y			
			1, 2, 3, 5, 6, 7, 8, 17, 18, 20	21 (MKD)	B	• Closure of existing municipal landfills in Municipalities of Ohrid (Bukovo) and Struga, including remediation of the landfill sites	No. of remediated waste disposal sites		€4,200,000	€260,000
							4			
			9, 10, 11, 12	21 (AL)	B	• Closure of existing municipal landfill in Municipality of Pogradec (Çerravë Admin Unit) and remediation of the landfill site	Number of remediated waste disposal sites		€2,700,00	€175,000
							1			
			1, 2, 3, 5, 6, 7, 8, 17, 18, 20	21 (MKD)	B	• Closure of illegal (village) dumps in Municipalities of Ohrid and Struga, including remediation of the landfill sites	Number of remediated illegal dumps		€175,000	
							19			
			9, 10, 11, 12	21 (AL)	B	• Closure of illegal dumps (villages within the LOW) in Municipality of Pogradec, including remediation of the landfill sites	Number of remediated illegal dumps		€100,000	
							TBD			
1.8 - Point - Aquaculture	Fisheries and aquaculture	CHEM/ ORGA	**13**	18 (AL)	S	• Closure of the fish farms with rainbow trout, or upgrading to farming of Ohrid trout (required intervention on the outlet water)	Number of closed aquaculture facilities		€50,000	
							TBD			
				1 (MKD)	S	• Construction of small-scale WWM systems for on outlet water at HBI Ohrid	Number of WWT works to be constructed		€100,000	
							1			
2.1 - Diffuse - Urban runoff	Urban development Tourism and recreation	CHEM/ OTHE	**1 to 20**	21	B	[*See measures, indicators and investments specified under pressure 1.2 above*]				
2.2 - Diffuse – Agricultural	Agriculture	CHEM/ ECOS/ NUTR	**2, 3, 4, 5, 6, 7, 17, 18**	2, 12 (MKD)	S	• Reduce nutrient pollution from agriculture through optimization of	Area of agricultural land required to be covered		€850,000	€550,000

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
						mineral fertilizers use efficiency by laboratory soil testing, fertilization plans on areas with intensive agricultural systems	4,000 ha (60% of tot)	2,680 ha (40% of tot)		
			9, 10, 11 12, 19	2, 12 (AL)	S	• Reduce nutrient pollution from agriculture through optimization of mineral fertilizers use efficiency by laboratory soil testing, fertilization plans on areas with intensive agricultural systems	Area of agricultural land required to be covered		€400,000	€250,000
							1,970 ha (60% of tot)	1,300 ha (40% of tot)		
			2, 3, 4, 5, 6, 7, 17, 18	2, 12 (MKD)	S	• Advisory services for agriculture: Development of facilities and procedures for proper on farm management and storage of organic (manure) fertilizer	Number of farms that need to be covered by advisory services		€1,500,000	€2,000,000
							40%	30%		
			9, 10, 11 12, 19	2, 12 (AL)	S	• Advisory services for agriculture: Development of facilities and procedures for proper on farm management and storage of organic (manure) fertilizer	Number of farms that need to be covered by advisory services		€700,000	€500,000
							40%	30%		
			2, 3, 4, 5, 6, 7, 17, 18	2, 12 (MKD)	S	• Advisory services for agriculture: Implementing procedures and enforcing capacities for application of manure in line with Nitrate directive provisions	Number of farms that need to be covered by advisory services		€1,800,000	€1,100,000
							30%	20%		
			9, 10, 11 12, 19	2, 12 (AL)	S	• Advisory services for agriculture: Implementing procedures and enforcing capacities for application of manure in line with Nitrate directive provisions	Number of farms that need to be covered by advisory services		€600,000	€350,000
							30%	20%		
			2, 3, 4, 5, 6, 7, 17, 18	2, 12 (MKD)	B	• Reduce nutrient pollution from agriculture: Delineation of vulnerable areas in a line with Nitrate directive	Area of buffer zones required to be covered		€1,200,000	€550,000
							70%	30%		
			9, 10, 11 12, 19	2, 12 (AL)	B	• Reduce nutrient pollution from agriculture: Delineation of vulnerable areas in a line with Nitrate directive	Area of buffer zones required to be covered		€300,000	€100,000
							70%	30%		
			2, 3, 4, 5, 6, 7, 17, 18	2, 12 (MKD)	S	• Reduce nutrient pollution from agriculture: Introduction of on farm agro-	Area of agricultural land required to be covered		€1,900,000	€1,400,000

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
						ecological measures for sustainable agricultural production	2,670 ha	2,000 ha		
			9, 10, 11 12, 19	2, 12 (AL)	S	• Reduce nutrient pollution from agriculture: Introduction of on farm agro-ecological measures for sustainable agricultural production	Area of agricultural land required to be covered		€900,000	€700,000
							1,300 ha	980 ha		
			2, 3, 4, 5, 6, 7, 17, 18	3, 12 (MKD)	S	• Reduce pesticides pollution from agriculture: Implementation of plant protection programs for optimization of pesticide use and effective pest control	Area of agricultural land required to be covered		€900,000	€600,000
							3,000 ha	2,350 ha		
							Number of farms that need to be covered by advisory services			
							45%	35%		
			9, 10, 11 12, 19	3, 12 (AL)	S	• Reduce pesticides pollution from agriculture: Implementation of plant protection programs for optimization of pesticide use and effective pest control	Area of agricultural land required to be covered		€300,000	€200,000
							1,300 ha	980 ha		
							Number of farms that need to be covered by advisory services			
							45%	35%		
			2, 3, 4, 5, 6, 7, 17, 18	3, 12 (MKD)	S	• Reduce pesticides pollution from agriculture: Development of facilities and procedures for proper on farm management of pesticides and storage	Number of farms that need to be covered by advisory services		€900,000	€600,000
							(45%)	(35%)		
			9, 10, 11 12, 19	3, 12 (AL)	S	• Reduce pesticides pollution from agriculture: Development of facilities and procedures for proper on farm management of pesticides and storage	Number of farms that need to be covered by advisory services		€300,000	€200,000
							(45%)	(35%)		
			2, 3, 4, 5, 6, 7, 17, 18	15 (MKD)	S	• Development of facilities for collection and processing of agricultural organic by-products	Number of farms that need to be covered by advisory services		€1,000,000	€800,000
							(30%)	(40%)		

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
			9, 10, 11 12, 19	15 (AL)	S	• Development of facilities for collection and processing of agricultural organic by-products	Number of farms that need to be covered by advisory services (30%)	(40%)	€400,000	€250,000
2.5 - Diffuse – Contaminated or abandoned industrial sites	Industry	CHEM/ OTHE	**9, 10, 11, 12**	4 (AL)	B	• Remedial Investigation /Feasibility Study, for determination of nature and extent of contamination. Assess the treatability of site contamination and evaluates the potential performance and cost of treatment technologies • Implementation of remediation (clean-up) activities	Area of land covered by the measures (ha) required to achieve objectives: 5	15	€1,500,000	€4,500,000
2.6 - Diffuse – Discharges not connected to sewer network	Urban development Tourism and recreation	MICR/ NUTR/ ORGA	**1 to 20**	21	B	[*See measures, indicators and investments specified under pressure 1.1 above*]				
2.9 - Diffuse – Aquaculture	Fisheries and Aquaculture		**13**	18, 1	S	[*See measures, indicators and investments specified under pressure 1.8 above*]				
3.1 - Abstraction or flow diversion – Agriculture	Agriculture	LOWT	**2, 3, 4, 5, 6, 7, 17, 18**	8 (MKD)	S	• Restoration of existing irrigation channel scheme	Area of irrigated land required to be covered: 400 ha	300 ha	€2,000,000	€1,500,000
			9, 10, 11 12, 19	8 (AL)	S	• Restoration of existing irrigation channel scheme	Area of irrigated land required to be covered: 300 ha	200 ha	€1,500,000	€1,000,000
			2, 3, 4, 5, 6, 7, 17, 18	8 (MKD)	S	• Introduction/application of modern irrigation systems (drip and sprinkle irrigation)	Area of irrigated land required to be covered: 800 ha	400 ha	€1,600,000	€800,000
			9, 10, 11 12, 19	8 (AL)	S	• Introduction/application of modern irrigation systems (drip and sprinkle irrigation)	400 ha	250 ha	€800,000	€500,000
			2, 3, 4, 5, 6, 7, 17, 18	8 (MKD)	S	• Introduction of advanced approaches in soil moisture controlling systems and irrigation scheduling	Area of irrigated land required to be covered: 800 ha	400 ha	€1,200,000	€600,000

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
			9, 10, 11 12, 19	8 (AL)	S	• Introduction of advanced approaches in soil moisture controlling systems and irrigation scheduling	Area of irrigated land required to be covered 400 ha	 250 ha	€600,000	€375,000
			2, 3, 4, 5, 6, 7, 17, 18	8 (MKD)	S	• Introduction of fertigation in high productive agricultural systems	Area of irrigated land required to be covered 800 ha	 400 ha	€1,200,000	€600,000
			9, 10, 11 12, 19	8 (AL)	S	• Introduction of fertigation in high productive agricultural systems	Area of irrigated land required to be covered 400 ha	 400 ha	€600,000	€375,000
			2, 3, 4, 5, 6, 7, 17, 18	24 (MKD)	S	• Mitigation of negative impact of climate change with implementing of adaptive measures for more effective water savings	Number of farms that need to be covered by advisory services 55%	 25%	€2,700,000	€2,000,000
			9, 10, 11 12, 19	24 (AL)	S	• Mitigation of negative impact of climate change with implementing of adaptive measures for more effective water savings	Number of farms that need to be covered by advisory services 45%	 30%	€1,200,000	€950,000
			2, 3, 4, 5, 6, 7, 17, 18	11 (MKD)	B	• Improve water pricing policy and implementation of cost recovery measures for water services from agriculture	Agricultural area (ha) where water pricing policy measures are required 2,000 ha		€100,000	
			9, 10, 11 12, 19	11 (AL)	B	• Improve water pricing policy and implementation of cost recovery measures for water services from agriculture	Agricultural area (ha) where water pricing policy measures are required 5,000 ha		€100,000	
3.2 – Abstraction/ flow diversion – Water supply	Urban development Tourism and recreation	LOWT	**1, 2, 3, 6, 7, 8, 17, 18, 20**	9 (MKD)	B	• Reevaluating existing water supply tariff policy of CPE covering Municipalities of Struga and Ohrid, following cost recovery and PP principles; Setting up of advanced water supply tariff policy for households, commercial needs (tourism) and SMEs based on the national ERC methodology	Population for which water pricing policy measures are required 76,000		€100,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
			1, 2, 3, 6, 7, 8, 17, 18, 20	8 (MKD)	S	• Development and implementation of a water supply efficiency increase program, to reduce non-revenue water in Municipalities of Struga and Ohrid (all settlements and tourism sites) to a sustainable level	Reduction (%) in non-revenue water required 35%	35%	€4,200,000	€4,200,000
			1, 2, 3, 6, 7, 8, 17, 18, 20	13 (MKD)	B	• Reassessment of compliance with EU directives and standards, or establishment of appropriate safeguard (buffer) zones for drinking water abstraction sources (wells, springs) in Municipalities of Struga and Ohrid	Number of drinking water protection zones required TBD		€1,000,000	
		LOWT	**9, 10, 11, 12, 19**	9 (AL)	B	• Reevaluating existing water supply tariff policy of CPE covering Municipality of Pogradec, following cost recovery and PP principles; Setting up of advanced water supply tariff policy for households, commercial needs (tourism) and SMEs	Population for which water pricing policy measures are required 30,000		€100,000	
			9, 10, 11, 12, 19	8 (AL)	S	• Development and implementation of a water supply efficiency increase program, to reduce non-revenue water in Municipality of Pogradec (all settlements and tourism sites) to a sustainable level	Reduction (%) in non-revenue water required 35%	35%	€1,900,000	€1,900,000
			9, 10, 11, 12, 19	13 (AL)	B	• Reassessment of compliance with EU directives and standards, or establishment of appropriate safeguard (buffer) zones for drinking water abstraction sources (wells, springs) in Municipality of Pogradec	Number of drinking water protection zones required TBD		€500,000	
3.3 - Abstraction or flow diversion – Industry	Industry			S		[*See measures, indicators and investments specified under pressure 3.2 above*]				
3.5 – Flow diversion –	Energy – hydropower	HHYC/ HMOC/	**13, 14, 15, 16**	5, 6, 7, 17	B	• Preparation of Feasibility Study and engineering design documents	Length of rivers (km) affected by the measure		€14,220,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
Hydropower (Sateska river)		NUTR/ ORGA		(MKD)		• Implementation of construction activities and measures for rediverting of Sateska river in its original flow (riverbed) with discharge into Black Drin river	8 km			
							Number of water bodies affected by the measures			
							4			
3.6 - Abstraction or flow diversion - Fish farms	Fisheries and Aquaculture	NOSI	**13**	S		[*See measures, indicators and investments specified under pressure 1.8 above*]				
4.1.1 - Physical alteration of channel – Flood protection	Energy – hydropower Flood protection	NOSI		S		[*Minor pressure, no measures*]				
5.1 - Introduced species and diseases	Fisheries and aquaculture	OTHE	**13**	18	B	• Implementation of measures to control adverse impacts of invasive alien species: ♦ Permanent fish stock and fisheries monitoring ♦ Establishment of Eel Management Units according to EU eel Regulation ♦ Introduction of measures for eradication of invasive fish species (L. gib.)	Number of species for which codes of practice to reduce spread of invasive alien species are required		€1,250,000	
							6			
5.2 - Exploitation or removal of animals	Fisheries and aquaculture	OTHE	**13**	20	S	• Harmonization (coordination) of fishery regulations between AL and MKD, including (1) detailed fish stock assessment and (2) preparation of joint Fishery Management Plan. • Implementation of measures to control adverse impacts of fishing and other removal of animals:	Number of water bodies affected by the measures		€4,000,000	
							1			
							Area of water bodies (km2) affected by the measure			
							356 km2			

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
						♦ Permanent fish stock and fisheries monitoring (also in 5.1) ♦ Introduction of new fishing techniques for bleak exploitation from the lake ♦ Establishment of a common minimal catchable size (fishing gears) and fishing quotas for both countries ♦ Reassessment of efficiency of fish-management practices (concession) ♦ Upgrading of volume (capacity) and standards of trout hatcheries Ohrid and Shum (MKD), Lin (AL) ♦ Strengthening of fishing inspection (Law Enforcement) units in MKD, AL				
5.3 – Litter or fly tipping	Urban development	CHEM/ LITT/ MICR/ NUTR	**1, 2, 3, 5, 6, 7, 8, 17, 18, 20**	21 (MKD)	S	• Improved/upgraded waste collection in urban areas (settlements) and tourist facilities • Introduction of waste recycling practices	[*Indicators and investments specified under pressure 1.6*]			
			9, 10, 11, 12	21 (AL)	S	• Improved/upgraded waste collection in urban areas (settlements) and tourist facilities • Introduction of waste recycling practices	[*Indicators and investments specified under pressure 1.6*]			
7 – Anthropogenic pressure – Other (boating, tourism, recreation)	Tourism and recreation Fisheries and aquaculture Transport/ Navigation	CHEM/ OTHE	**13**	19, 21 (MKD, AL)	S	• Harmonization of boating legislation and regulations (bylaws) with the pertinent EU Directives and standards	Area of water bodies (km2) affected by the measure 356 km2		€100,000	
				19, 21 (MKD	S	• Strengthening the capacity of the Port Authority in Ohrid	Area of water bodies (km2) affected by the measure 356 km2		€200,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
				19, 21 (AL)	S	• Analysis of requirements and possibilities for establishment of independent port authority in Pogradec	Area of water bodies (km2) affected by the measure 356 km2		€100,000	
				19, 21 (MKD)	S	• Site identification and selection; preparation of Feasibility Study and engineering design documents for development of joint boat marina for Ohrid and Struga municipalities. Estimated capacity 1,000 boats. • Construction of a modern boat marina for Ohrid and Struga.	Area of water bodies (km2) affected by the measure 356 km2		€15,000,000	
				19, 21 (AL)	S	• Site identification and selection; preparation of Feasibility Study and engineering design documents for development of boat marina in Pogradec. Estimated capacity 250 boats. • Construction of a modern boat marina in Pogradec.	Area of water bodies (km2) affected by the measure 356 km2		€3,750,000	
			8	21 (MKD)	S	• Development and implementation of plan for protection and management of the wider area around the surface springs at St. Naum	Area of water bodies (km2) affected by the measure		€1,000,000	
			9	21 (AL)	S	• Development and implementation of plan for protection and management of the wider area around the surface springs at Tushemisht	Area of water bodies (km2) affected by the measure		€1,000,000	
Policy measures, research, knowledge base	N/A	N/A	**1 - 20**	14	S	• Preparation and development of monitoring programme for transboundary water resource management in the LOW, in accordance with WFD: ♦ Preparation of a study to assess: (1) existing monitoring programmes and	Assessment study identifying need for monitoring Agreement on transboundary monitoring stations		€250,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
						capacities on national level and (2) required needs and procedures to perform monitoring in the LOW at the transboundary level, in accordance with EU Directives ♦ Agreement on LOW transboundary monitoring programme: (1) agreement on transboundary monitoring program locations; (2) agreement on transboundary monitoring program requirements and procedures; (3) preparation of joint monitoring guidelines based on international guidance and standards for implementing monitoring protocols ♦ Designation of appropriate authorities responsible for the implementation of the transboundary monitoring programme	Agreed list of monitoring parameters and protocols			
					S	• Updating and increasing precision of water balance for the entire Prespa-Ohrid Lakes Watershed, including analysis of potential climate chenge impact on both lakes	Assessment study reporting (detailing) water balance (hydrology) aspects of the Prespa-Ohrid basin		€500,000	
					S	• Conducting research and establishment of reference conditions for future determination of ecological status of Lake Ohrid water bodies	Study establishing reference conditions for assessment of biological quality status of Lake Ohrid water bodies		€250,000	
					S	• Conducting analysis for improved water resource management (outflow from Lake Ohrid), to balance the needs of all stakeholders	Study with recom-mendations for improved management of outflow regimes from Lake Ohrid		€100,000	

Pressure	Driver	Impact Type[1]	WB[2]	KTM[3]	B/S[4]	Specific Measure	KTM Indicators		Expenditure (EUR)	
							2020-2025	2026-2031	2020-2025	2026-2031
					S	• Preparation and development of programme for reed management	Study with recommendations for long-term reed management in the LOW		€100,000	

1: Impact types

CHEM - Chemical pollution	HMOC - Altered habitats due to morphological changes	NOSI - No significant impact
ECOS - Damage to groundwater-dependent terrestrial ecosystems	LOWT - Abstraction exceeds available groundwater resource	NUTR - Nutrient pollution
HHYC - Altered habitats due to hydrological changes	MICR - Microbiological pollution	ORGA - Organic pollution

2: Water Bodies

[1]	L-Radozhda	[6]	L- Studenchishki kanal	[11]	L-Udenisht	[16]	R-Sateska 3
[2]	L-Kalishta	[7]	L-Velidab	[12]	L-Lin	[17]	R-Koselska 1
[3]	L-Struga-Black Drin	[8]	L-Bay of St. Naum	[13]	L-Lake Ohrid-Pelagic	[18]	R-Koselska 2
[4[	L-Sateska	[9]	L-Tushemisht	[14]	R-Sateska 1	[19]	R-Cerave
[5]	L-Koselska	[10]	L-Pogradec	[15]	R-Sateska 2	[20]	Sushica

3: Key Type Measures: Appendix D.

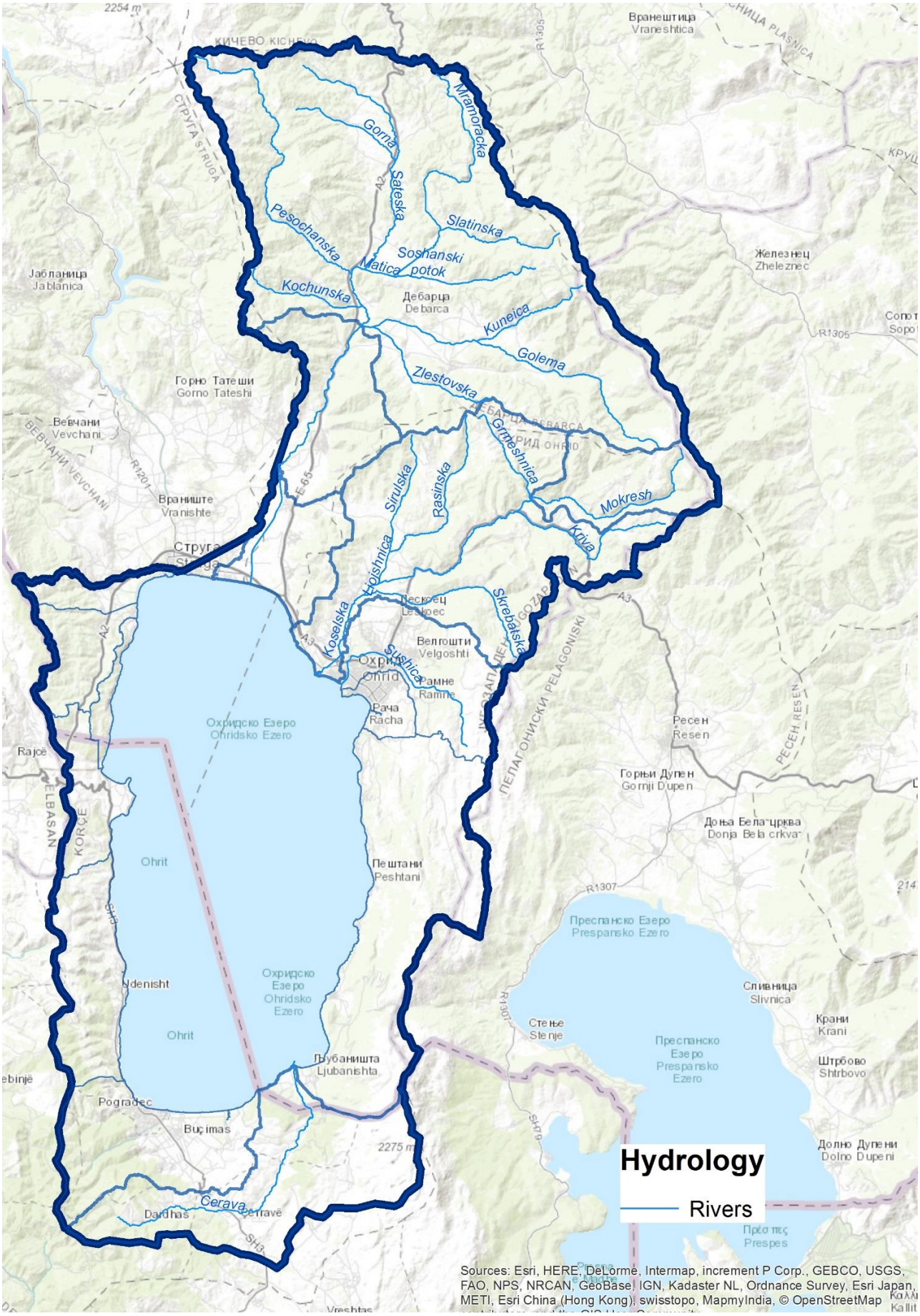
4: Basic or Supplementary Measure.

Appendix B

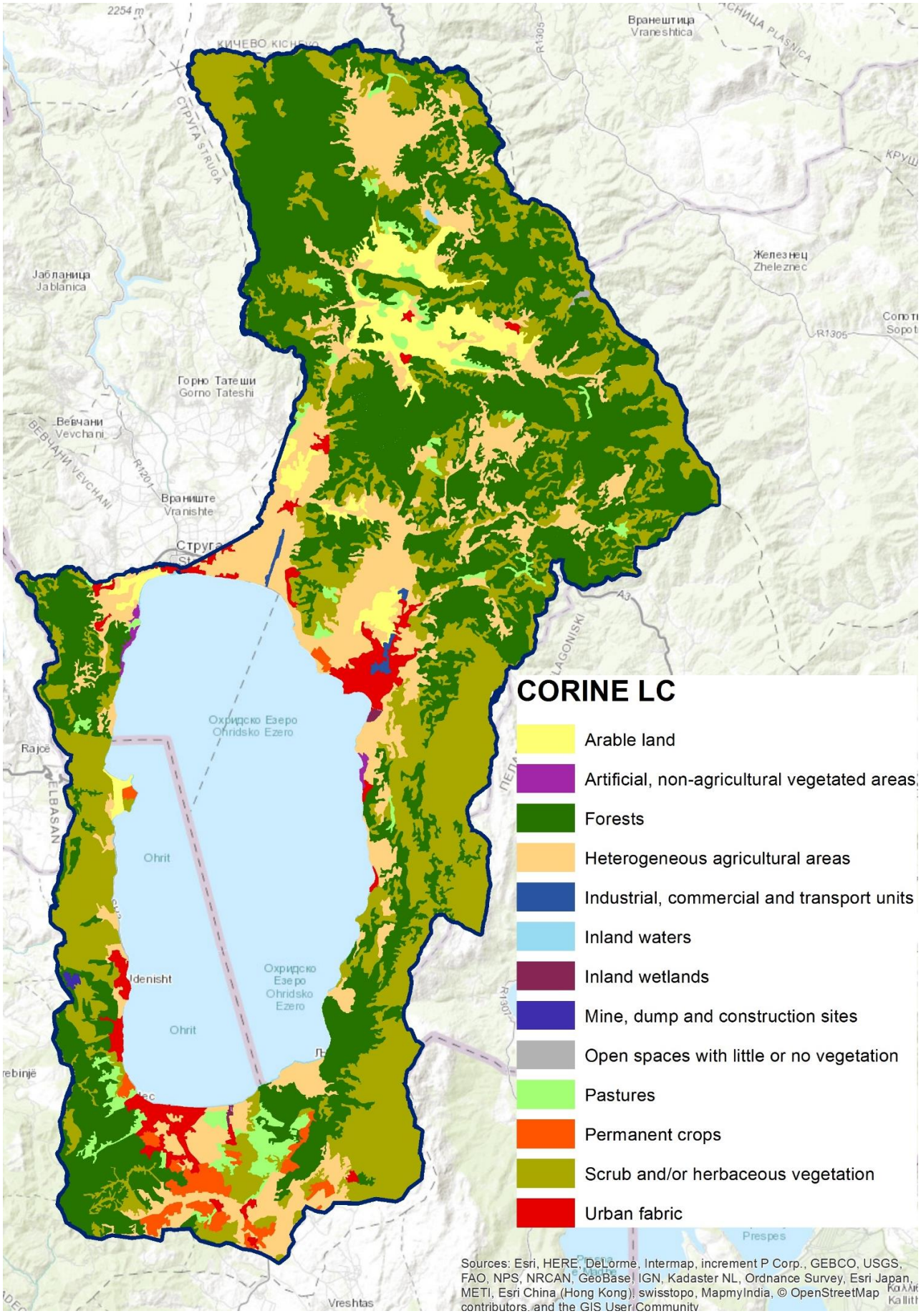
Maps

Doc. No. P0006769-1-H7 Rev. 0 - November 2020

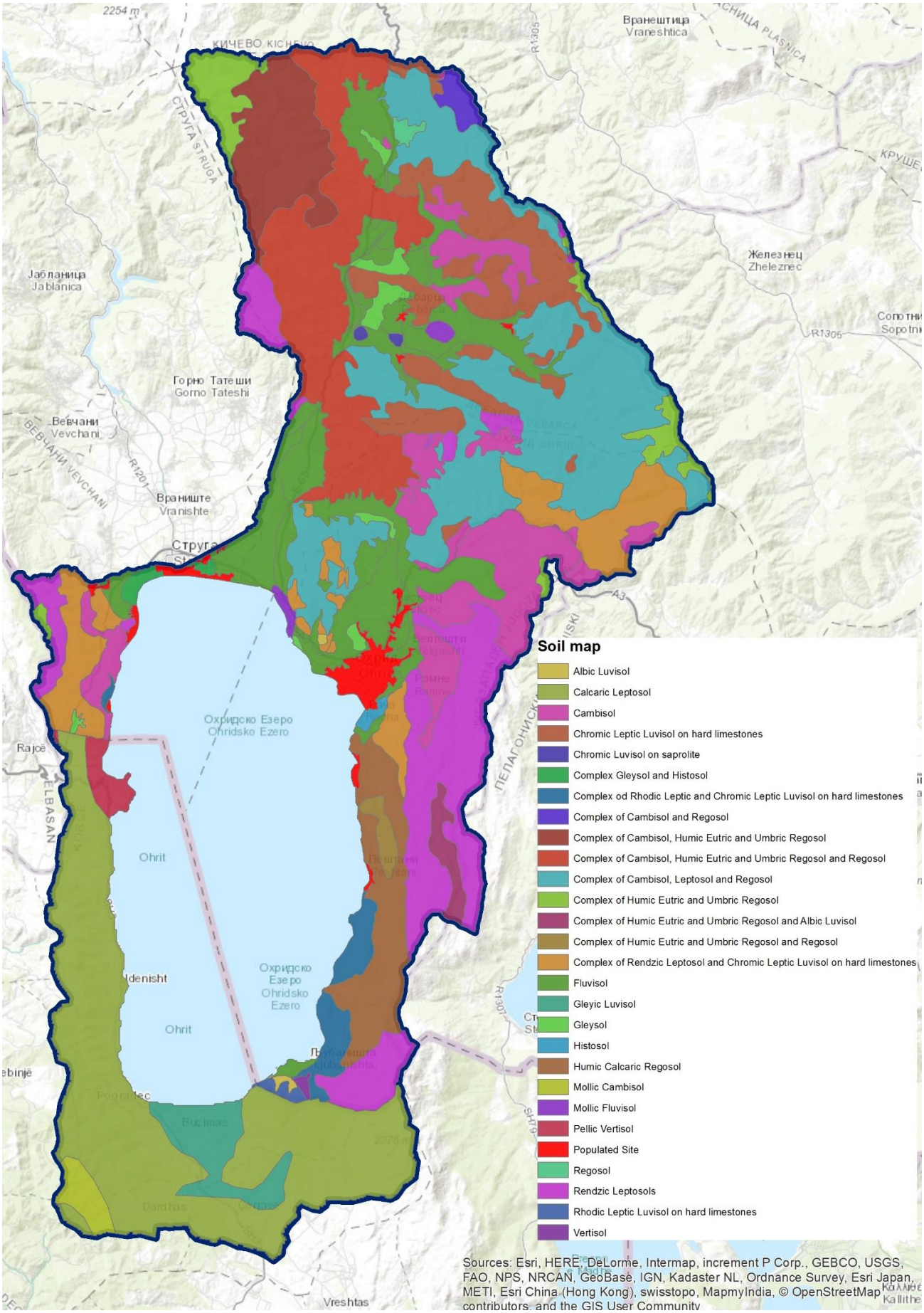
Map 1: Hydrology of LOW



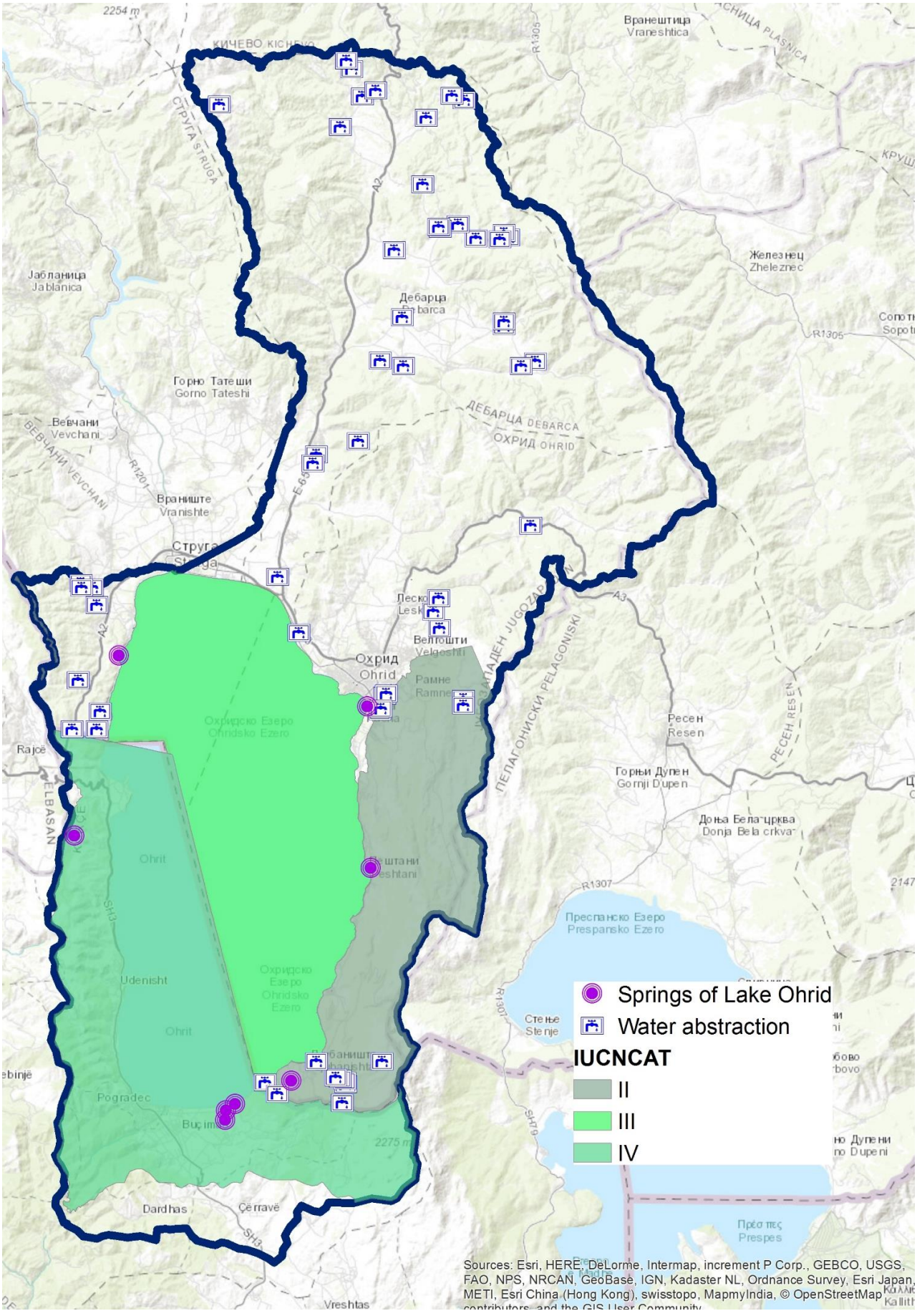
Map 2: LOW – Land Cover



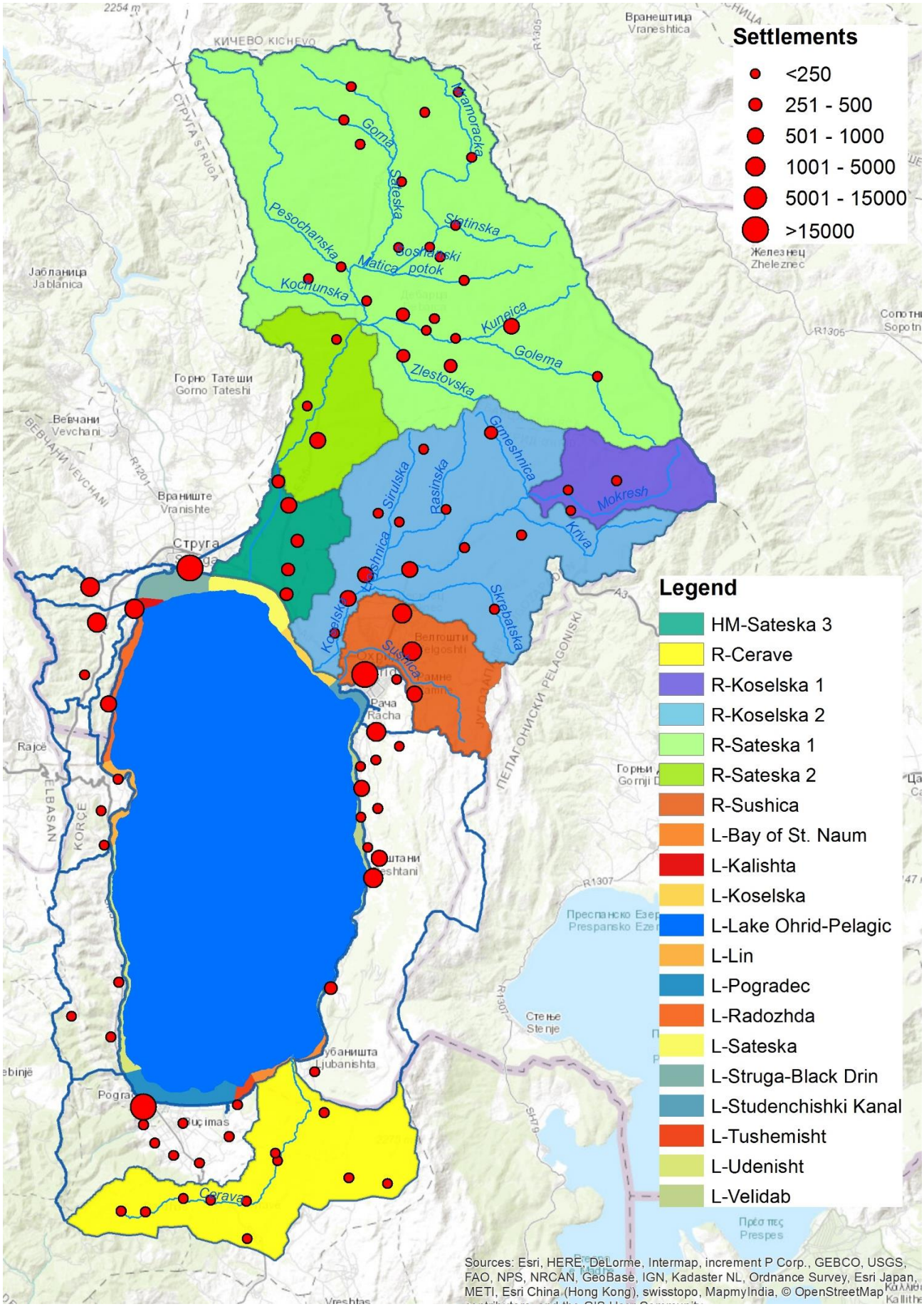
Map 3: LOW – Soil Map



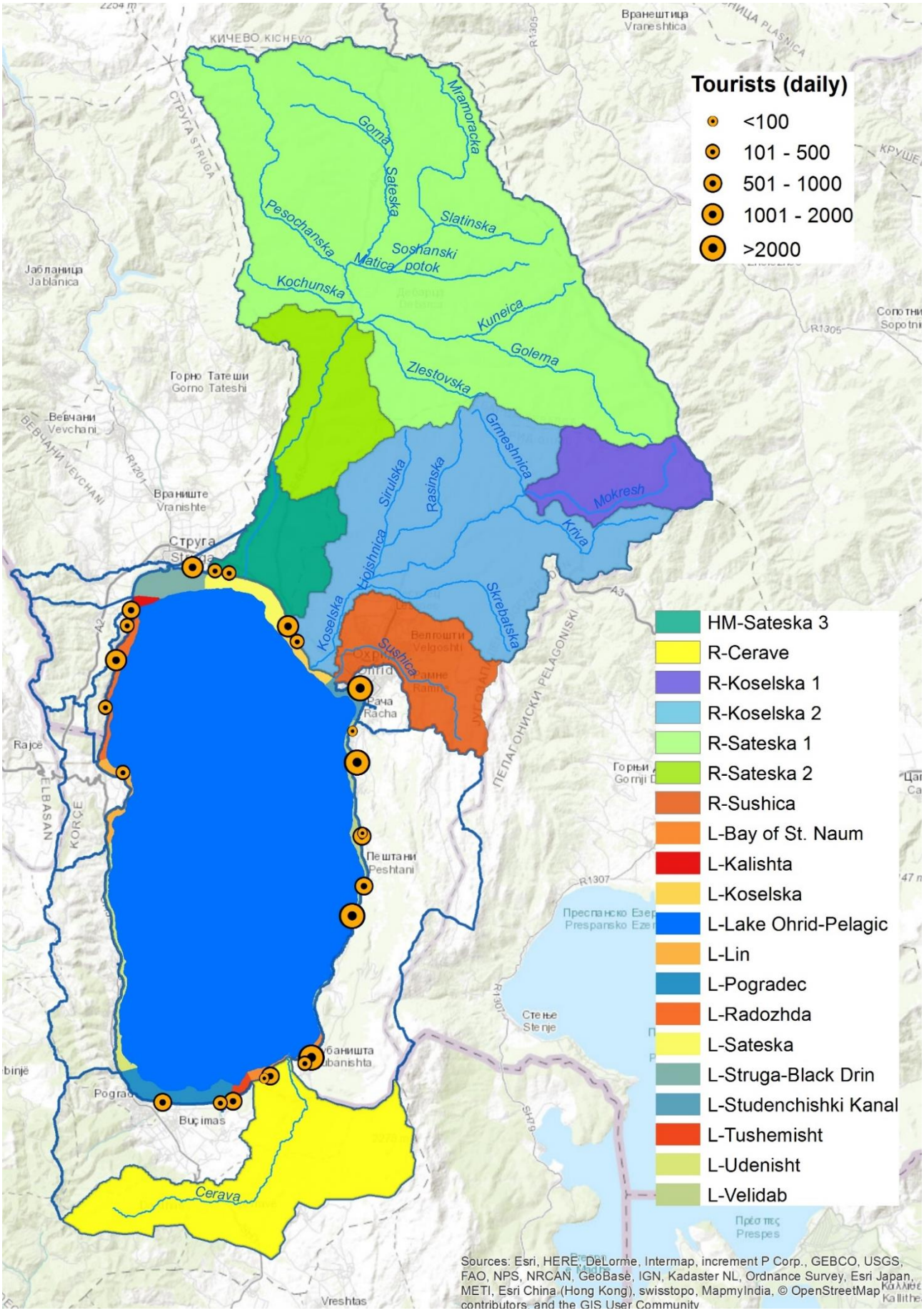
Map 4: LOW – Protected Areas



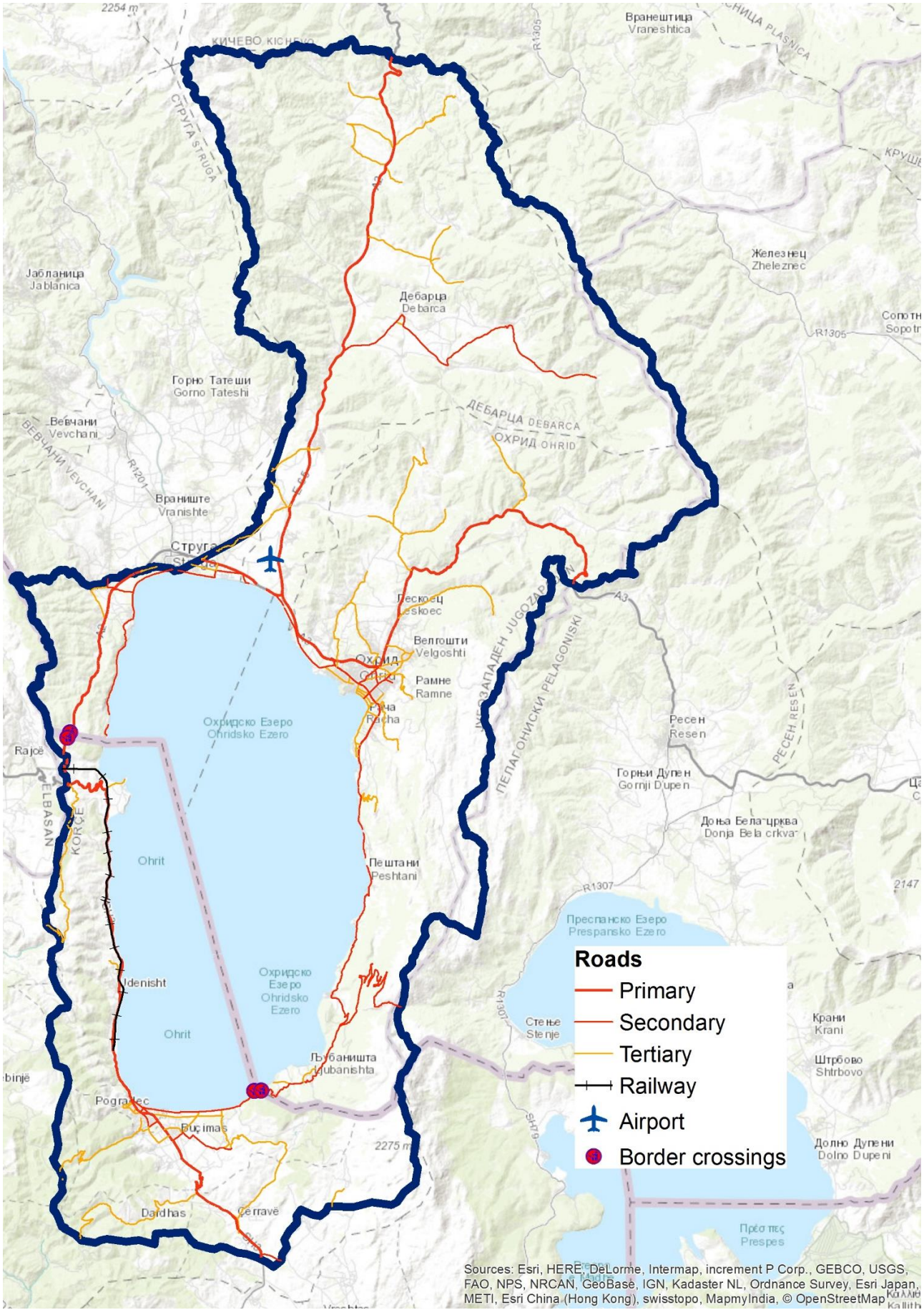
Map 5: LOW – Settlements



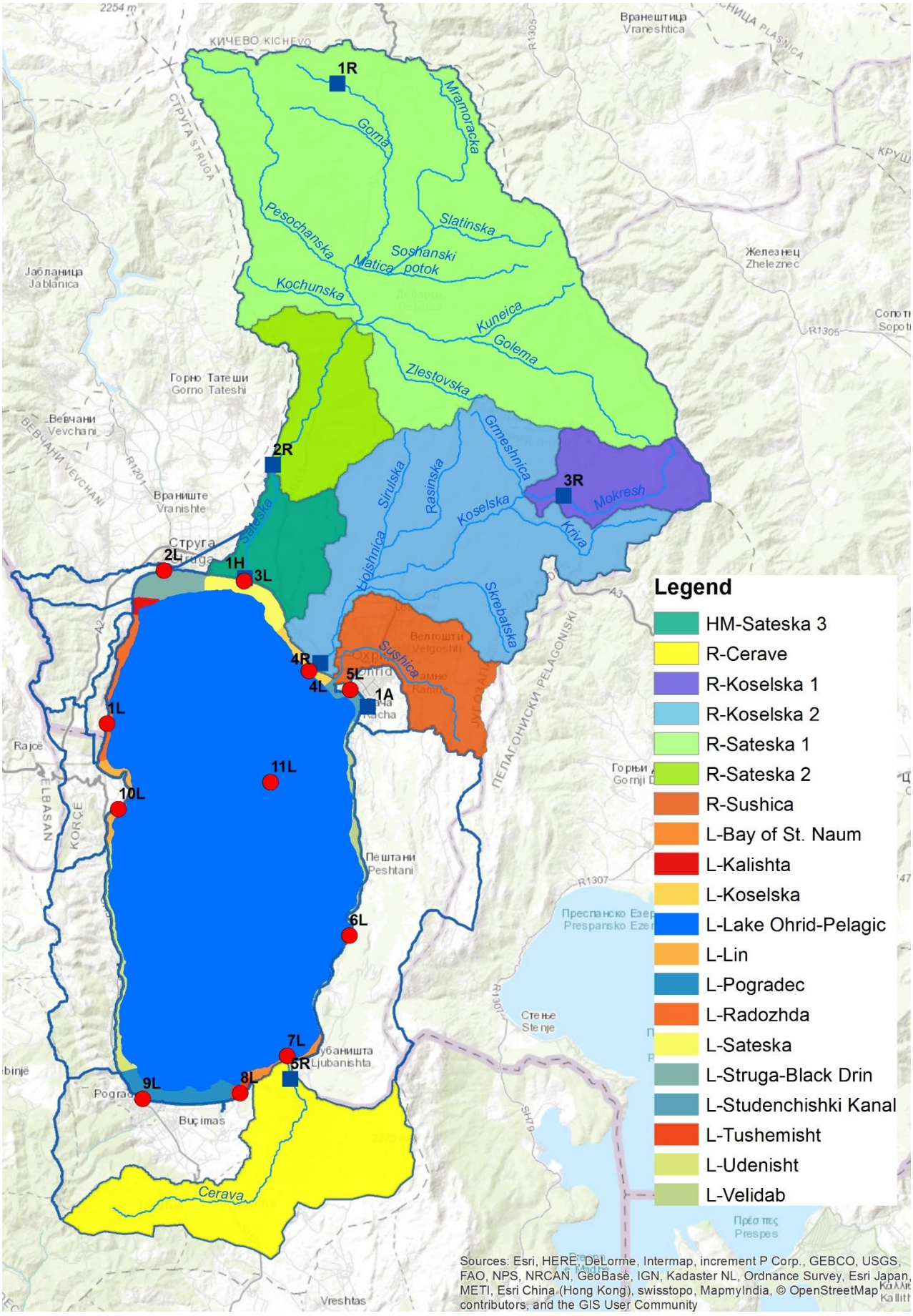
Map 6: LOW – Tourism sites



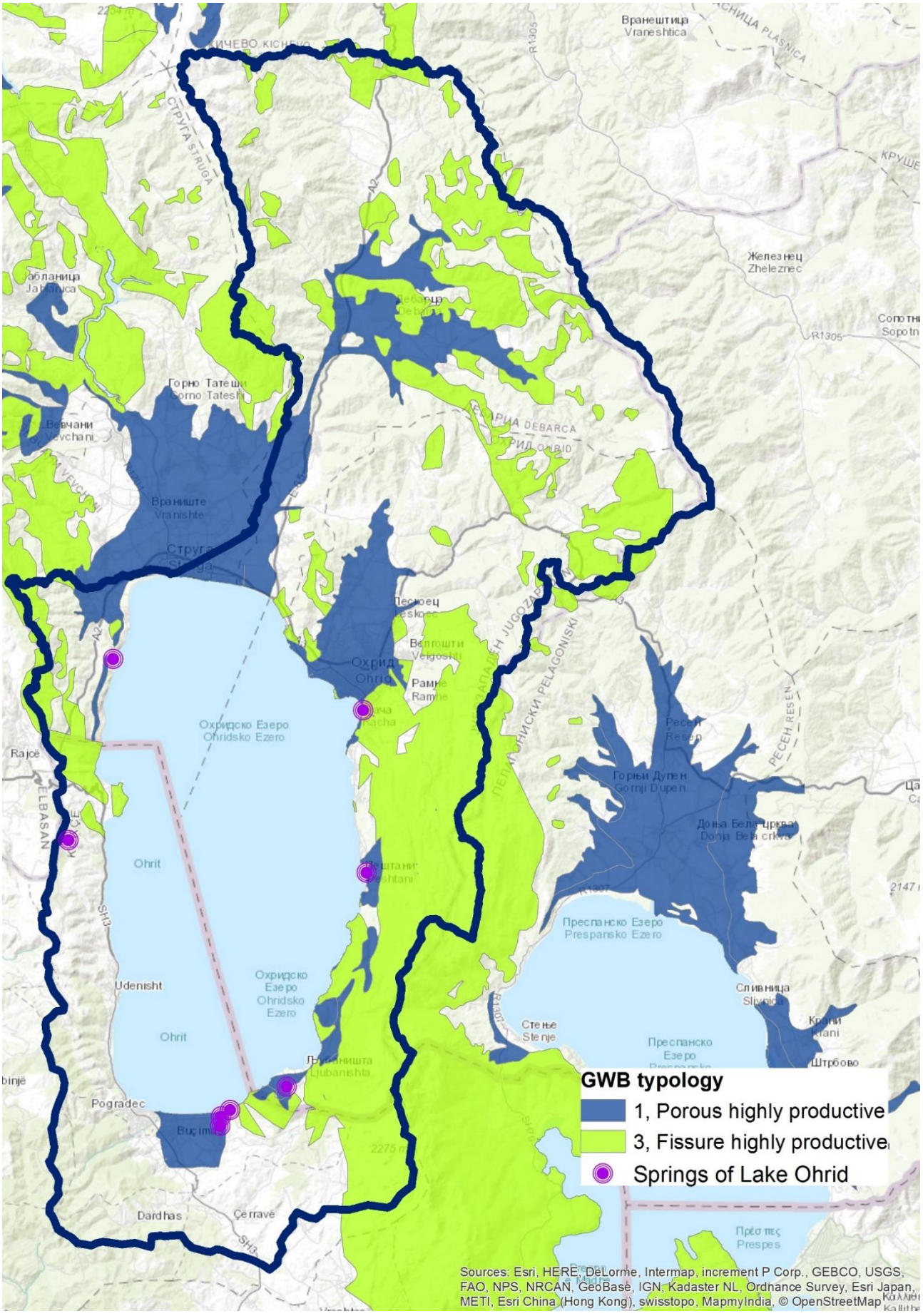
Map 7: LOW – Infrastructure



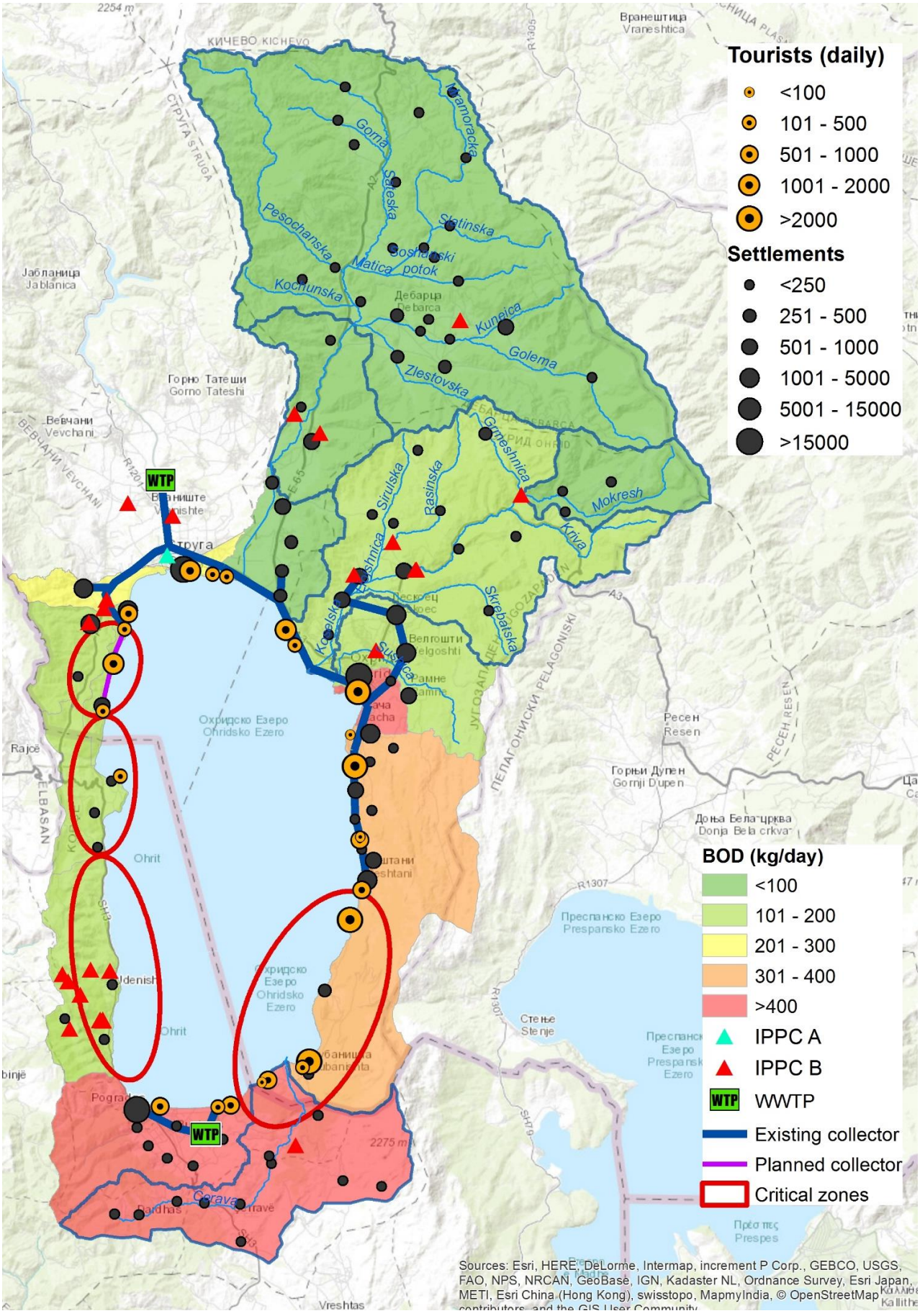
Map 8: LOW – Surface Water Bodies



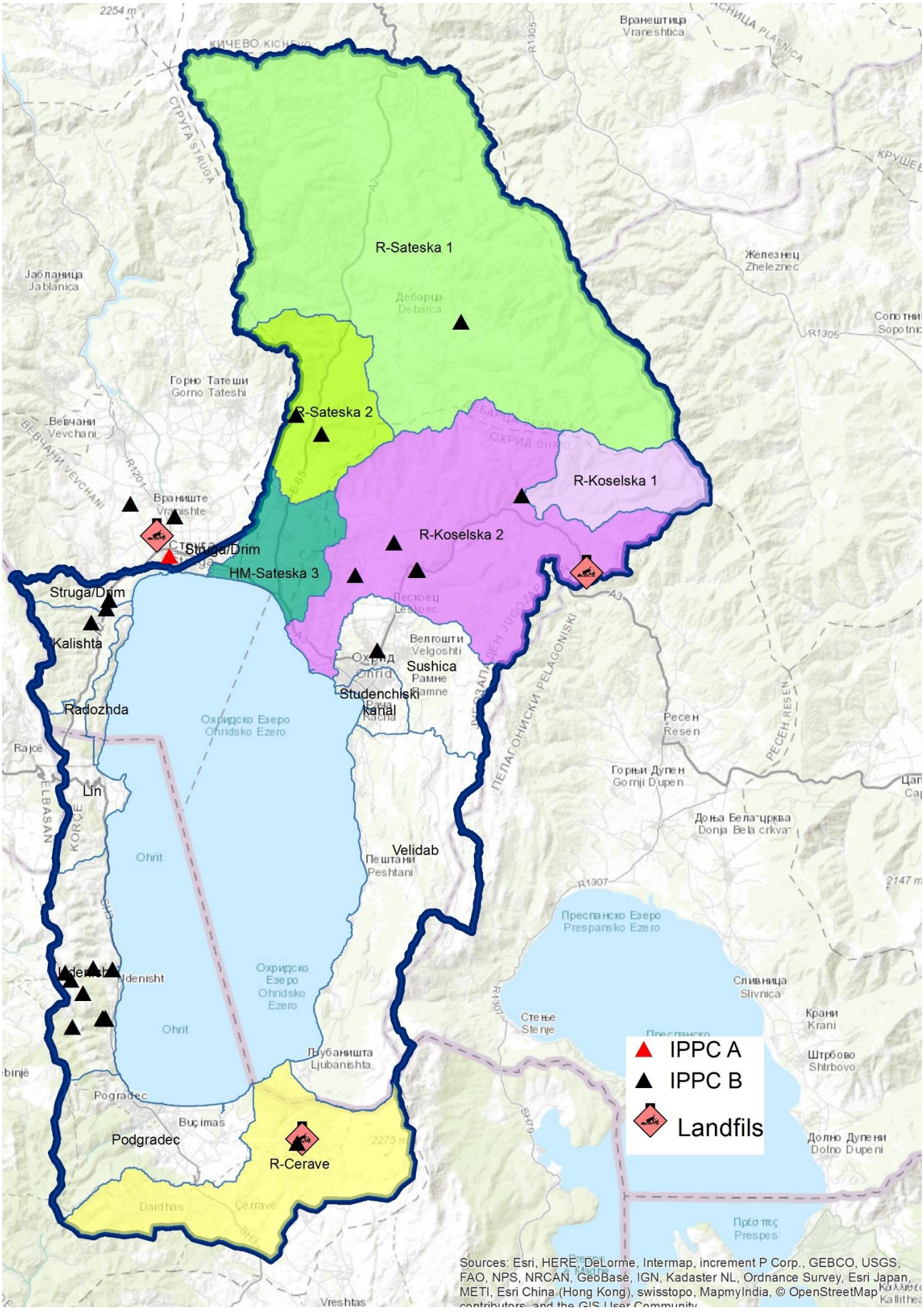
Map 9: LOW – Groundwater Bodies



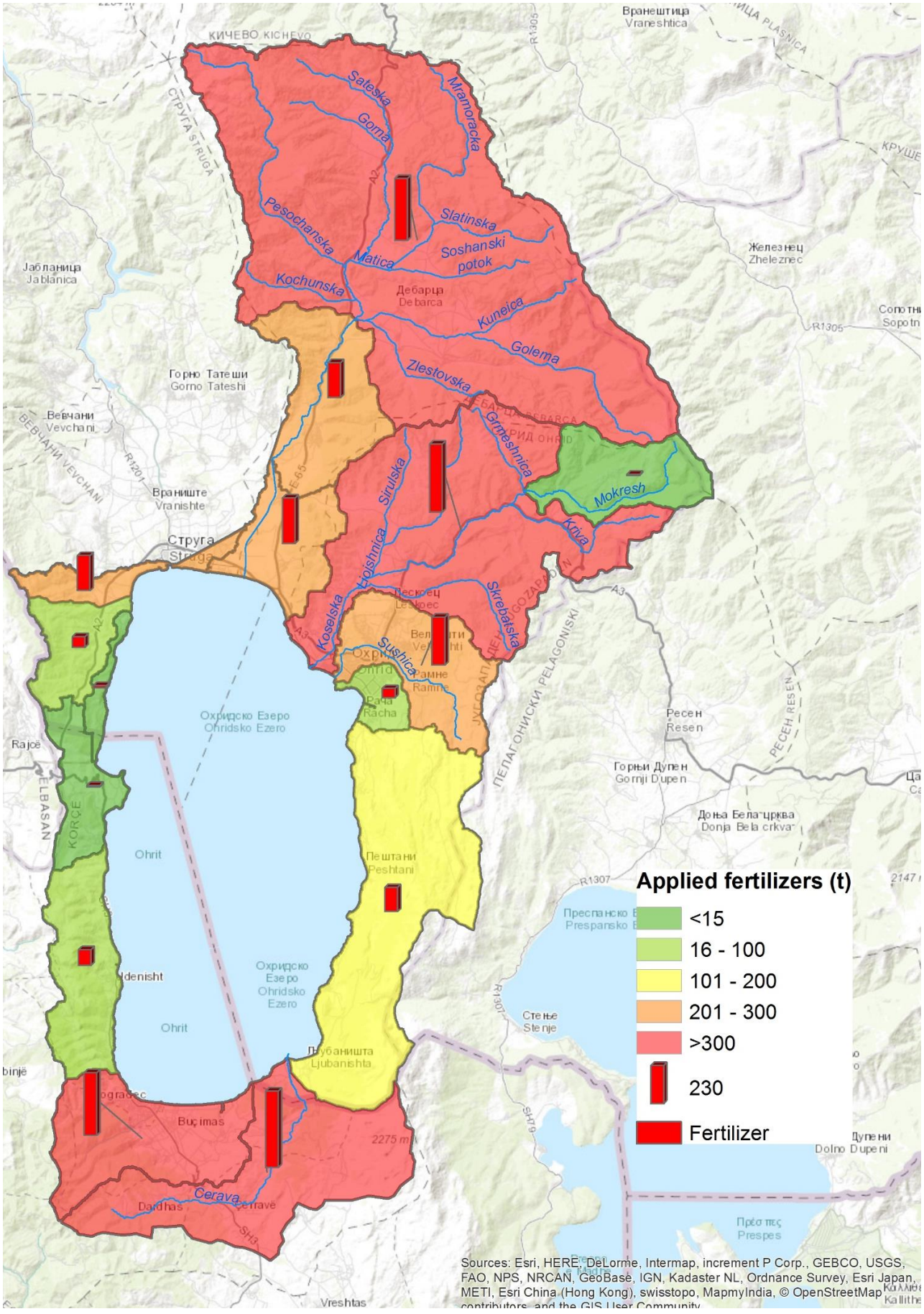
Map 10: LOW – WWM and BOD Load



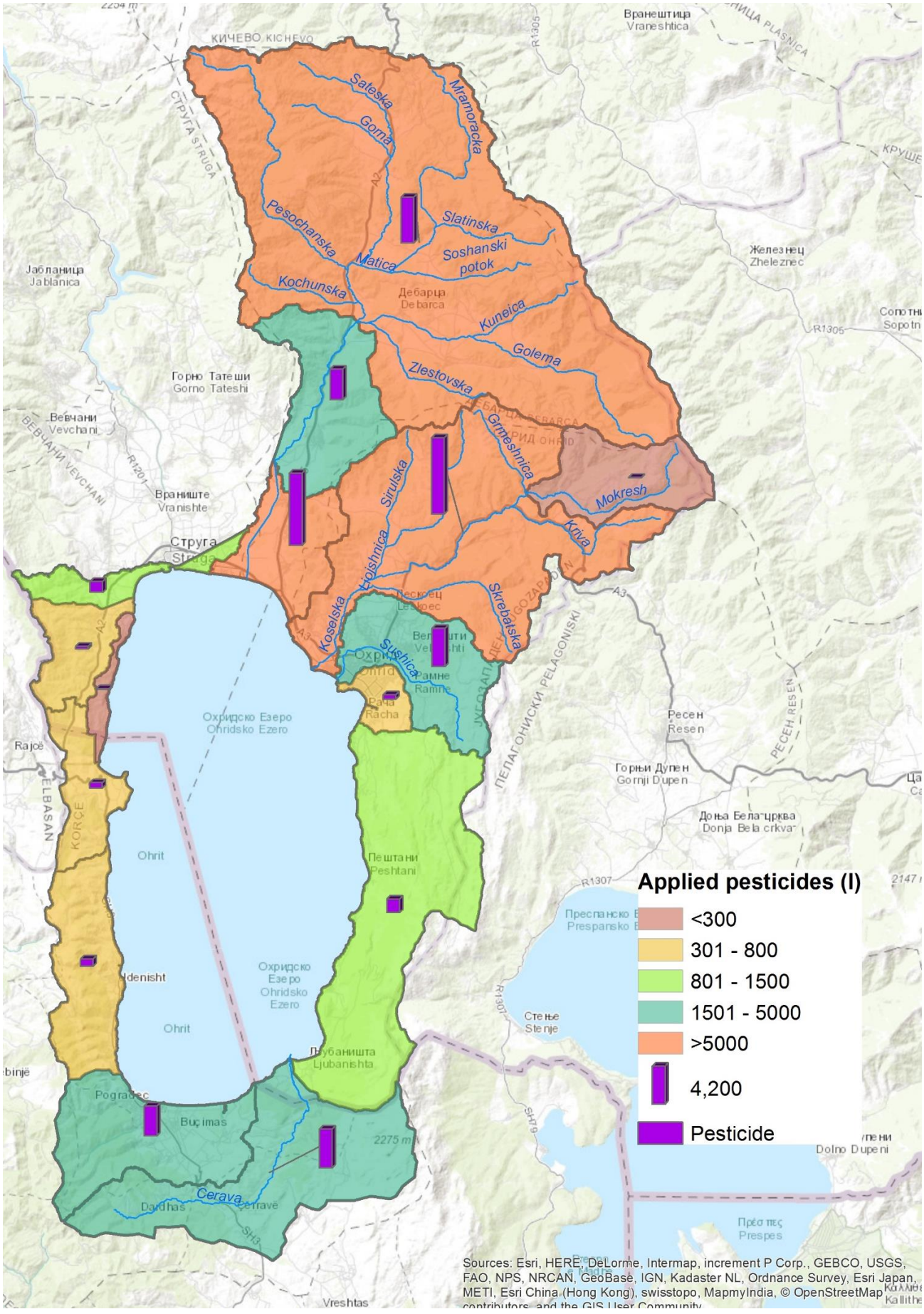
Map 11: LOW – Industry/IPPC and Landfills



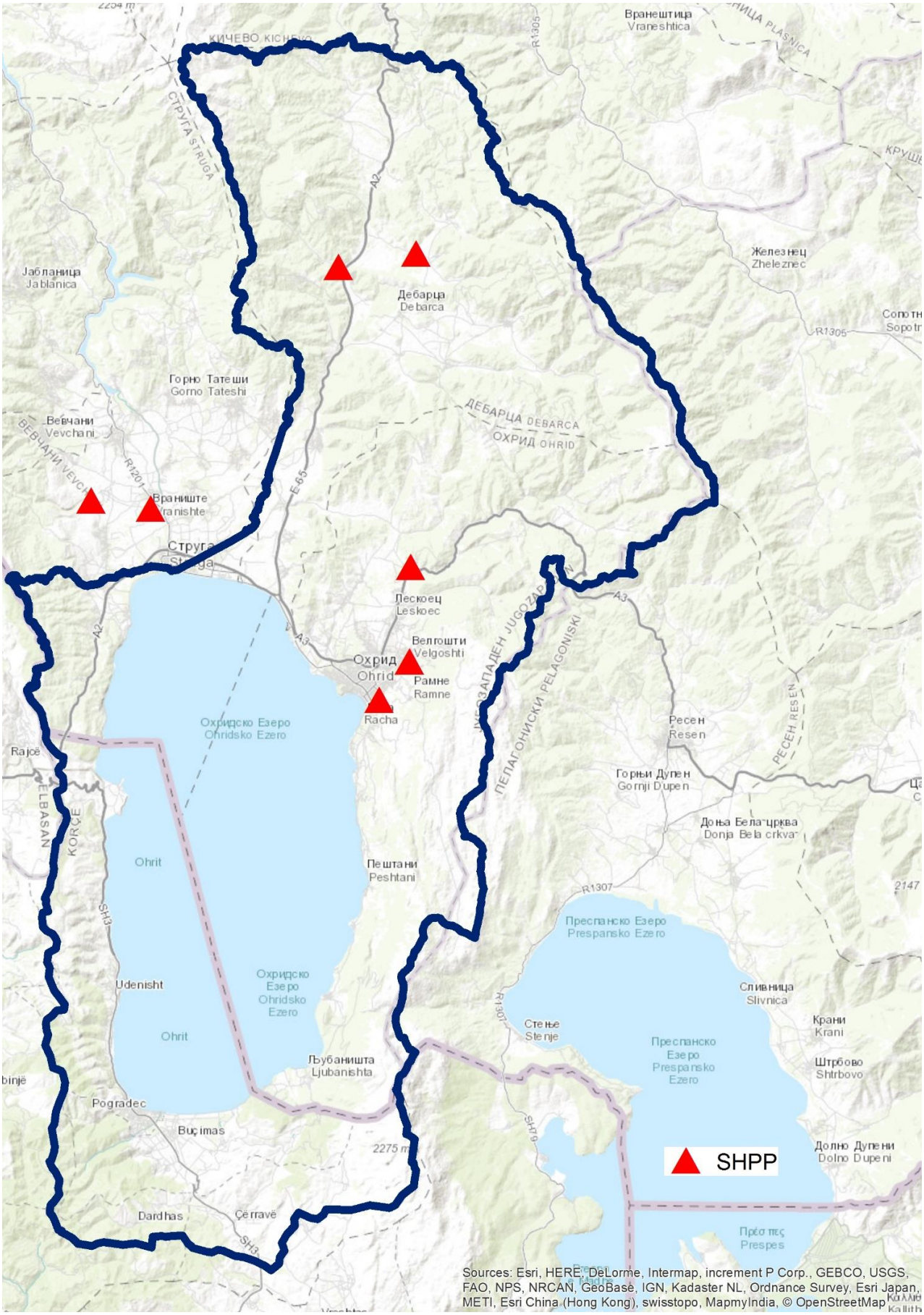
Map 12: LOW – Fertilizer use



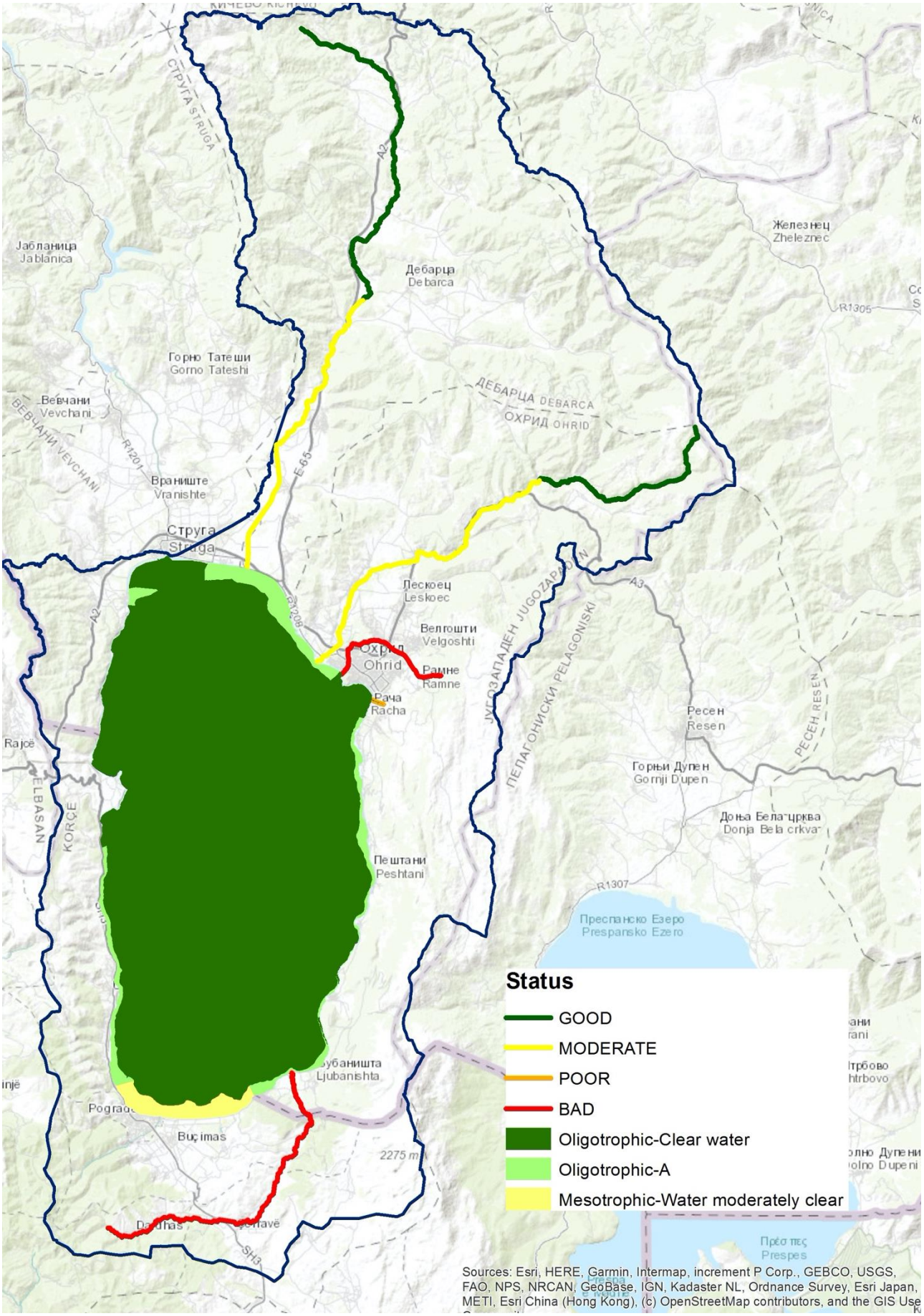
Map 13: LOW – Pesticide use



Map 14: LOW – Small Hydro Power Plants



Map 15: LOW – Ecologocal Status/Potential of Surface Water Bodies



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