SOCIO-ECOLOGICAL TRAJECTORY OF THE REPUBLIC OF MACEDONIA: STATUS, TREND AND RECOMMENDATIONS

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Abstract

Despite its small geographical extent, the Republic of Macedonia is one of Europe's most species rich locations with elevated biodiversity emerging from the interplay of its varied geology, climate and topography as well as its geographical position. In recent years, this natural heritage has come under increasing anthropogenic threat with undesired consequences not just for flora and fauna but also for humankind. This article summarises patterns in Macedonia's socio-ecological system, overviewing how economic, social and political factors inter-relate with landscapes, species and ecosystems in the present day. It also makes brief recommendations on how to improve this inter-relationship.

Abbreviations: European Bank for Reconstruction and Development (EBRD), European Commission (EC), European Investment Bank (EIB), International Union for Conservation of Nature (IUCN), Kreditanstalt für Wiederaufbau (KfW), Macedonian Ecological Society (MES), Ministry of Environment and Physical Planning (MoEPP) Protected Area (PA), Strategic Environmental Assessment (SEA).

Keywords: ecosystems, Macedonia, biodiversity, socio-ecological system, protected areas

1.- General characteristics of the natural environment in the Republic of Macedonia.

a) Overview. The Republic of Macedonia occupies 2,543,200 ha of the central part of the Balkan Peninsula. Predominantly mountainous, it is cut by larger

or smaller valleys, gorges, plateaus, and highlands at an altitude ranging from 60 m to 2,764 m a.s.l. (average approx. 800m) with about 15 mountain ranges higher than 2,000 m (only Shar Planina Mountain has more than 20 peaks above 2,500 m). In this relatively small territory, there are three natural tectonic lakes, over 30 glacial lakes, 23 large artificial lakes, more than 100 smaller freshwater accumulations, about 15 valleys, and approximately 35 larger or smaller rivers. The varied topography interacts with diverse climates and geology to deliver a wealth of niche habitats, which not only provide conditions for multifarious biodiversity (Melovski et al, 2013) but also, in several cases, serve as refugia and engines of speciation (Hewitt, 2011). Four phytogeographic regions can be distinguished: Sub-Mediterranean (40% of Macedonian territory), Sub-continental (37%), Sub-humid (22%) and Sub-alpine (1%) (Chemonics International Inc., 2001).

According to data from the Special Plan of Woods Management for Commercial Use (2008), the total forest area in Macedonia is 1,091,857.59 ha, of which 255,444.74 ha are high-trunk forest plants (Makedonski Sumi 2010). Additional 80,000 ha or 7.32% has lesser commercial relevance. Importantly, there are 12 areas with primary forests located on/in the mountains of Nidzhe, Baba, Belasica, Malesevski, Osogovski, Korab and Shar Planina. Averaging 10ha (2-144 ha) in size, these are composed of native tree species; display no clearly visible indications of human activities; and contain ecological processes that are not significantly disturbed. Privately owned forests make up about 15% of the country's stock while management of the remainder is performed by Public Enterprise Macedonian Forests, which was established by the Macedonian government in 1997 as the legal successor of several economic entities which had previously held responsibility (Makedonski Sumi, 2010).

b) Biodiversity. Macedonia´s biological diversity, which has not been completely studied yet, is characterized by richness and outstanding heterogeneity. There are over 17,000 taxa of flora, fungi and fauna (more than 3,000 species of vascular plants, 485 species of vertebrate animals and 6,844 species of invertebrate animals). Despite its small geographical extent, Macedonia holds 42% of all mammal and 68% of all bird species in Europe. There are 950 relict and endemic species, representing as much as 90% of national taxa in some groups. Among vertebrates, the highest percentage of endemism, 34.5%, is observed in the class of fish, while 4 endemic taxa are registered among mammals.

The most significant region for endemism is Ohrid-Prespa, which belongs to the Ecoregion "Southeast Adriatic Drainages", according to the Freshwater Ecoregions of the World (FEOW) categorization developed by the WWF

Conservation Science Program, which provides a global biogeographic regionalization of Earth's freshwater biodiversity (Hales, 2013). This ecoregion is characterized by very high biological uniqueness with more than 50% of its ichthyofauna found nowhere else on the planet. It is also among the global leaders for freshwater fish species per ecoregion area with more than 8 taxa per 10^4 km^2 (Abell et. al., 2008). Ohrid Lake in particular is known as a "museum of living fossils" and it contains at least 200 world-unique taxa—including 7 fish species—many of which have evolved in isolation during millions of years.

c) Protected areas. Macedonia has 86 protected natural areas (PAs) according to the International Union for Nature Conservation (IUCN) classification, which uses management objectives to place PAs in categories (I-VI). These are widely recognized as the global standard and, as such, are increasingly incorporated into government legislation.

The categorization of Macedonian PAs in accordance with the IUCN was established with the Law on Nature Protection (Official Gazette of RM nº. 67/2004, 14/2006; 84/2007 and 35/10) from 2004. However, the full process has not been concluded yet. Currently, the PA system is in a transitional stage and involves areas both under the old and new categorisation systems. Those from the older legislation (such as the Law on Protection of Natural Rarities from 1973) need to be re-evaluated and designated according to the IUCN classification and new designations need to be incorporated. The target according to the National Spatial Plan is to place 12% of the territory in PAs by 2020.

At present, the greatest PA surface area belongs to the three national parks (NP): Pelister (designated in 1948), Mavrovo (1949) and Galichica (1958). Although mountainous regions and forests prevail in NPs, they still do not cover all the important forests in the country and the area allocated for forest reserves is five times larger than that for PAs. Hence, much of Macedonia's biodiversity is concentrated outside PAs. In this regard, other regions meet the criteria for and would greatly benefit from NP designation, particularly Shar Planina Mountain.

Table: Protected areas in 2014 and their designation according to IUCN

Protected area-according to IUCN	**Category**	**Number of protected áreas**	**Surface (ha)**	**% of the territory of Macedonia**
Strict Nature Reserve	Ia	2	10 023.22	0.39
National Park	II	3	115602.4	4.50
Natural Monument	III	67	71396	2.78
Habitat/Species Management Area	IV	12	2763	0.11
Protected landscape	V	1	102	0.004
Protected area with sustainable use of natural resources	VI	1	26923.03	1.05
Total		86	226 809.65	8.82

Source: Ministry of Environment and Physical Planning (MoEPP). Environmental statistics, 2015.

2.- Threats.

a) Air pollution. Particulate matter, nitrogen dioxide and ground-level ozone are widely recognized as the three pollutants that most significantly affect human health, from impairing the respiratory system to premature death. Air pollution can also impact ecological resources, affecting water and soil quality, instigating bioaccumulation, reducing photosynthesis and even disrupting species compositions (Lovett et. al., 2009). Some areas of Macedonia—particularly the capital Skopje—present significant sources of air pollution. This is especially relevant for the concentration of suspended particles with a size up to 10 micrometres (PM10), which largely exceeds the limit value in winter. During recent years, the number of days overstepping the 24-hour limit value (50 μg/m3) for PM10 in Skopje was more than 120 even reaching >200 in some districts, leading it to become the most polluted city in Europe through the winter 2017/18.

Despite the decline of Macedonian industrial production from the early 1990s, due to which the emission of pollutants has decreased by 50%, industry is, nevertheless, a major air polluter, with significant environmental pressure originating from the metallurgic sector. Overall, total emissions by sector, under the Selected Nomenclature for Air Pollution (SNAP), are due to combustion processes

(58%), transport (20%), production processes (30-35%), and others such as waste disposal and agriculture - (less than 5%) (MoEPP 2015a).

b) Water quality. In Macedonia, water quality is under pressure mainly from anthropogenic activities. Major water consumers are agriculture (42%), industry (29%), households (24%) and energy production (2%). Water supply systems are managed by public enterprises. Connection rates in urban areas are 82%-100%, whereas in some rural areas, the figure drops to 10%. In cities, demand for drinking water is 0.300-0.400 m^3/capita/day, while in rural areas 0.250 m^3/capita/day. The sanitary-hygienic condition of drinking water is within limit values. Of note is the insufficient coverage of wastewater collection and treatment systems. As many as 40.1% of the total number of dwellings are not equipped with installations for discharging wastewater from households into public sewers (MoEPP, 2015a). Moreover, a large part of the constructed sewer network does not lead to modern drainage systems, making the situation particularly worrisome.

c) Waste disposal. In 2008, 74% of collected municipal solid waste was landfilled. This rose to 99.74% in 2012 due to increased coverage of the nationwide collection system. However, of Macedonia's 47 official landfills only one, "Drisla", fulfills EU Directive criteria. Many are water permeable, so waste is able to infiltrate ground aquifers (MoEPP 2014a), and the estimated 1,000 additional uncontrolled landfills in rural areas remain a challenge. Recycling ratios of household waste are still very low. In 2012, the share of recycled packaging was just 12% of the total packaging placed on the market. The recycled rate per material is glass (0.31%), plastic (19%), paper and cardboard (18%) and metal packaging (4%) (MoEPP, 2015a). Littering and dumping are widespread.

d) Overfishing and hunting. The yield has increased during the last several years because various companies, business entities and concessionaires have been given licences for fishing or hunting activities in certain areas. According to the State Statistical Office, in 2014, the number of hunted game was 9,685, showing a rising trend in regard to previous years (MoEPP, 2015a). Poaching, the use of poison baits and trapping are ongoing problems (MoEPP 2014a). Commercial fishing is managed through five-year concessions granted by the government and the concessionaire must provide protection; take measures to prevent illnesses in the fish stock; and maintain the breeding areas. It is also obliged to restock relevant fisheries through an approved plan and must pay 10% of the wholesale value of the catch to the government for the purpose of improving fishing

conditions. Nevertheless, populations of commercially valuable species, including local endemics Ohrid trout and belvica, appear to be declining due in major part to overfishing (Kostoski et al 2010).

e) Deforestation. It is alarming that large areas suffer deforestation. The reasons are multiple: firewood production is a serious issue, although, in recent years, major destruction has been due to infrastructure expansion (particularly roads) too. The situation in NPs is notably worrisome. Exploitation of forest resources is not only allowed but the main source of revenue and may be inappropriate for sustained PA management. Forest fires, frequently non-natural, are also a threat. In 2000 alone, fires destroyed 5% of the forest cover. In part, the inability to attend them is the result of limited management personnel and technical resources.

f) Mining and Quarries. Mining is the third largest export sector in Macedonia with a significant contribution to the economy, representing around 15% of industrial production and contributing around 1.5% to GDP. In recent years, there have been increased business activities and investments in the mining sector, boosted by 2012 legislation (revised in 2014) which introduced a simpler and faster procedure for granting permits and concessions. While past investments were solely in acquisitions and expansions of existing mines, with the new legal framework in place, the Government of Macedonia announced a public call for granting concessions at over 80 new locations (Lawyer Issue, 2015). To date, Macedonian invertebrate and plant taxa, including several endemic species, have been disproportionately threatened by this industry, notably in the Prilep area (MoEPP, 2014a).

g) Energy production. In recent years, renewable energy sources represent 16-24% of the total electricity generated in Macedonia (MoEPP, 2015a). However, only 7% is produced using wind or solar power, while 93% is hydrological. Instead of promoting wind and solar-generated energy, various new hydroelectric power plants have been built and more announced. The same situation is present in neighbouring counties. Hydropower constructions have rocketed by 300% across the western Balkans in the last two years, sparking fears of disappearing mountain rivers and biodiversity loss in refugial areas with high prevalence of relict species (MoEPP, 2014a). About 2,800 new dams are now in the pipeline, 37% of which are set to be built in PAs such as national parks or Natura 2000 sites (The Guardian, 2017).

h) Urbanization. Poorly planned and discontinuous urbanization engender habitat loss and interplay with existing threats such as waste disposal and sewerage deficiencies. Lowland habitats and wetlands are particularly endangered as are the shores of water bodies such as Lakes Ohrid, Prespa and Dojran, yet also the Vardar River basin (MoEPP, 2014a).

i) Agriculture. Abandonment of agricultural and pastoral land is causing habitat succession, while agricultural intensification in other locations has led to habitat loss and the pollution of ground aquifers (MoEPP, 2014a). Water quality at Lakes Dojran and Prespa has declined due to irrigation (MoEPP, 2014a).

3.- Political and social context.

a) Post-Socialist Transition. In 1991, Macedonia transitioned from being the poorest of Yugoslavia's 6 republics to one of the poorest independent countries in Europe (EBRD, 2013). Unlike in other East European nations, environmental movements did not feature strongly in Macedonia's path to independence (Fagan and Sircar, 2013). In the 26 years since, factors such as sanctions on Serbia, a Greek trade embargo, regional and internal conflicts, and political crises have contributed to existing economic weakness (European Commission, 2005; World Bank, 2017). Unemployment has fluctuated between 22% and 39% of the labour force (World Bank, 2015); and GDP per capita is less than half the EU28 average (Eurostat, 2016). These conditions have pushed ecological beneath economic issues in the national agenda (Saleem and Watzin, 2011).

b) Cross-border conservation. Successful internationally-backed conservation exercises have emerged from the need to build greater cooperation with neighbouring countries, but these have also introduced a complex political dimension to nature protection in shared ecosystems (Avramoski, 2004). Meanwhile, Albania's recent history as a closed country slowed joint management of natural resources, and fractious relationships with both Albania and Greece have inhibited the free movement of environmental data (Saleem and Watzin, 2011; Bonacci, 2014). Initiatives at Ohrid-Prespa, Drim Basin, Balkan Green Belt, Shar Planina Mountain and Jablanica Mountain appear to be making progress on these issues (Vasilijević and Pezold, 2011; MoEPP, 2014a).

c) Legislation. Macedonia's constitution establishes ecological protection as a fundamental value and outlines not just the right of every citizen to a healthy

environment but also the responsibility to protect it. Beyond the constitution, central legislation is the Law on Nature Protection and the Law on Environment (MoEPP 2014a). The latter provides the instruments and principles for environmental policy, and, under Articles 45 and 46, complies the Macedonian Environmental Information Centre within the Ministry of Environment and Physical Planning to compile reports and data for public dissemination, including the yearly Quality of Environment report, biennial environmental indicators and statistics, and a four-yearly Standard Operating Environment (SOE) report. Alignment with ecologically related EU acquis such as the Habitat and Birds Directives is ongoing and several relevant international conventions (Aarhus, Ramsar, CBD, AEWA, CITES, Paris Agreement etc.) have been ratified.

While a firm legal base for the maintenance of ecological integrity may therefore seem to exist, implementation is severely deficient; regulation in areas from pollution to water quality still lacks preparedness by EU standards (EC, 2016); and other laws conflict with environmental objectives. PAs are a case in point: Whatever the theoretical robustness of legal measures to safeguard them, designation is time-consuming to achieve and subject to whole or partial reversal for economic exploitation (MoEPP, 2014a), while legal provisions for Tourism Development Zones within their boundaries risk irreversible damage to habitats (Citrus Partners, 2015).

4.- Political/institutional milieu.

Functional capacity of institutions tasked with maintaining Macedonia's ecological integrity is low (EC, 2016). Biodiversity strategies are in a large part non-implemented and national bodies established for nature protection are either insufficiently active or disbanded (MoEPP, 2014a).

Political interference with detrimental implications for the environment is evident (KfW, 2011) and decision-makers display sub-optimum environmental literacy (IUCN, 2014; PrespaNet,2017). Hiring procedures are not always merit-based; dismissals have been used as tools of coercion; and the judiciary has been politicized (EC, 2016). There is a human-resource shortfall in numbers and expertise (MoEPP, 2014a; Taylor, 2015; IUCN, 2017), not least because of a university system that could not offer a range of specialist ecology-linked subjects (United Nations, 2011).

Simultaneously, sectoral strategies and practical policy for tourism, forestry and energy in particular are poorly coordinated with nature protection and agreements for public tenders precede impact assessments, disempowering

environmental executive authorities (MoEPP, 2014a). Tension arising from the demands of international agreements is apparent between national bodies, international bodies and government ministries. In addition, the decentralization that followed internal ethnic conflict in 2001 as part of the EU-backed peace process created new municipalities whose ability to oversee technical environmental policy is insufficient (Taylor, 2015).

a) Environmental funding Financial provisions for ecological purposes are lacking (MoEPP, 2014; IUCN, 2017) and the majority of Macedonia's conservation activity is funded either by other European countries or international sources such as the GEF. National parks generate income through over-extensive timber extraction (UNESCO/ICOMOS/IUCN, 2017); the fund for reforestation has been abolished (Kolevska, 2017); resources for public awareness activities are deficient (MoEPP, 2015b); and species monitoring is intermittent (MoEPP, 2014a).

b) Human Migration. Characterized by intense intellectual emigration, approximately 200,000 citizens have departed Macedonia in just 20 years (Bornarova, 2012). Such outmigration hollows the collective store of expertise and may weaken civil society's agency to change environmental behaviour (Rootes, 1997). Emigration has also been fuelled by rural populations (Bornarova, 2012), whose abandonment of traditional agricultural landscapes impacts the biodiversity reliant upon them and leads to increased wildfire frequency (MoEPP, 2014a; IUCN, 2017).

c) Attitudes and values. Environmental awareness and willingness to engage in ecologically beneficial behaviour is reported as low in Macedonia (MoEPP, 2014a). Interviews with national park visitors have revealed them to lack both knowledge of their impact on natural environments and readiness to engage in nature protection (Petrova, 2009), while an ethnographic survey of livestock breeders found that a majority were in favour of a complete eradication of wolves, an outlook emerging from economic and social flux rather than knowledge of the ecosystemic role of apex predators (Lescureux, 2013).

Materialist values are far more prevalent than post-materialist (EC, 2008), which has been linked to lesser environmental concern and therefore reduced green influence in democracies (Franzen and Meyer, 2010) and social trust is poor, especially towards institutions (EC, 2017), which has been shown to restrict ecologically accented behaviour (Fairbrother, 2016). Uneven access to information and monitoring blanks for species and ecosystems deplete opportunities for public

education, which is also held back by inadequate interdisciplinary learning at school and university level (United Nations, 2011). Awareness campaigns may also be undermined by outmigration from their target groups (PrespaNet, 2017).

d) Civil society. Even compared to other Yugoslav republics such as Croatia, civil society was weak in Macedonia at the time of independence (Taylor, 2015). Although the quantity of environmental NGOs mushroomed to 150 for a population of just 2,000,000 at one stage (United Nations, 2003), the non-government sector continues to display network immaturity to the present day and shows greater external than domestic interconnection (Taylor, 2015). Again, issues with access to information, inadequate public participation processes and monitoring deficiencies are inhibitors to full functioning (EC, 2016). There has been an aggressive campaign by politicians and certain media to discredit NGOs in recent years (EC, 2016).

e) International influence. The interaction of domestic and international forces has extensive consequences for Macedonian ecology. Noteworthy is the pursuit of foreign direct investment, which has prompted the government to offer free national park land to resort developers (Horwath HTL, 2013) and renewed interest in mining.

Of the several transport infrastructure projects activating threats to Macedonian Important Bird Areas, Important Plant Areas, Emerald Sites and a World Heritage Site, two emanate from the Pan European Transport Conference of Crete 1994/Helsinki 1997 and reflect immediate post-Cold War socioeconomic and geopolitical aims (Miltiadou, 2012). Linking Durres, Varna, Salzburg and Thessaloniki, these are part-financed by the European Investment Bank (EIB) and the European Bank of Reconstruction and Development (EBRD), yet Strategic Environmental Assessments (SEAs) are still believed to contain deficiencies, particularly with regard to ecological connectivity and cumulative impacts (MoEPP 2014a; UNESCO/ICOMOS/IUCN 2017). Decision-makers in Macedonia claim to have little influence over their pathways (UNESCO/ICOMOS/IUCN, 2017). The Ministry of Environment also identifies flaws in environmental assessments for other highway projects financed by both the EBRD and EXIM Bank of China.

The EBRD is engaged in many other projects with ecological consequences, including several small hydropower plants (EBRD, 2013), despite evidence of mismanagement and habitat damage at existing dams (MoEPP, 2014b; IUCN, 2017; Vejnovic, 2017). So far, the most serious of these projects has occurred at Mavrovo NP, where the bank was forced to abandon finance for the

Boskov Most Dam due to Recommendation 184 of the Standing Committee of the Bern Convention. In request for immediate suspension of the dam project, the Committee cited the high biodiversity value of the park, its status as a core reproductive area for the critically endangered Balkan lynx and the need for full cumulative impact assessments. The EBRD is now considering finance for an express road that would require rezoning of the Ohrid-Prespa region's NP Galichica (Citrus Partners, 2015).

f) Strategic Environmental Assessments (SEAs). SEAs are intended to avoid or reduce significant environmental impacts from the implementation of plans or projects but suffer deficiencies in Macedonia due to poor estimation of cumulative impacts and lack of recognition for habitats that are not categorized at European level (MoEPP, 2014a). Suggested mitigation measures have been poorly implemented (MoEPP, 2014a; Vejnovic, 2017) and economic justifications within SEAs are not supported by comprehensive, transparent figures. Ecosystem services are not considered.

5.- Environmental and Ecological Trajectory.

a) Landscape changes. Landscapes can be categorized as natural, semi-natural (or mixed natural) and "some natural". It is evident that most European countries suffer transformation of "core natural" landscapes into 'mixed' and/or "some natural" mosaic patterns due to major anthropogenic-driven fragmentation including expansion of agricultural areas, transport infrastructure, human settlements and non-natural fires.

In 2006, Macedonia's national forest pattern profile appeared to rank relatively favorably: 7th of 38 European countries with some 75% of the territory considered "natural core" compared to 65% in the EU (except Greece) and less than 50% in highly developed countries such as Germany, France, Belgium and the Netherlands (EEA, 2015). However, "National profile of forest connectivity change in landscapes with a net forest area gain" in the period 2000-2006 also by the EEA reveals a different picture. This indicator places Macedonia 34th of 38 countries, showing massive destruction of natural landscapes with large-scale forest loss, and very little forest gain with virtually no increases in connectivity. Taking into account the situation in the last decade, these numbers are probably much worse now.

b) Biodiversity Loss. Although the complete national Red List of threatened species has not been released yet, the IUCN Global Red List categorizes 17 of Macedonia's 27 endemic fish species as globally threatened and 21 of its self-growing fungi as critically endangered. Among mammals, the Balkan lynx is assessed as critically endangered too with less than 50 mature individuals remaining in existence (Melovski, 2015), and apex predators such as brown bear and grey wolf are undergoing decline. Populations of many other species are either decreasing or nationally extinct including ecosystemically important taxa such as the lammergeyer and black vultures, and prey species like Balkan chamois and roe deer (MoEPP, 2014a). Evidence of significant shifts in species composition are evident at both the globally significant ecosystems of Lakes Ohrid and Prespa as well (GiZ, 2015). At the former, wetlands have largely lost significance for nesting birds and breeding fish (Spirovska et. al.- 2012); evidence of a pollution gradient is emerging; native fish exhibit signs of liver damage (Jordanova et. al., 2016); and extinction of world-unique taxa is suspected (Albrecht et. al., 2010).

6.- Socio-ecological and economic consequences.

In South-East Macedonia, Lake Dojran endured massive loss to tourism and fishing industries caused by lowering water levels and accelerated eutrophication (Popovska 2005). It is still considered a "dangerous ecosystem" as a result of toxin release (Krstic and Aleskovski 2016). In the south west, algal blooms are expected at Lake Prespa also due to eutrophication (GiZ 2015) and the fishing industry at Lake Ohrid was forced to abandon capture of Ohrid trout, its most commercially significant species, for several years because of a population crisis (MoEPP, 2014a). Such emergency measures may be repeated soon. Elsewhere in Macedonia, industries surrounding the collection of plants and fungi have experienced restrictions also due to overexploitation and extensive picking is responsible for large declines in *Sideritis raeseri* and *Sideritis scardica* (MoEPP, 2014a), two plant species with economic, cultural and potential medicinal applications.

As a suspected factor in a 2015 flash flood affecting 5,000 citizens, 6 fatally in Tetovo, deforestation (legal and illegal) has led to societal disruption in other ways (Dotzeva et. al., 2015). Alongside road-building, it also contributes indirectly to Radika Valley landslides (Jovanovski 2013). Meanwhile, between 2002 and 2013, wildfires ravaged 92,223 hectares of Macedonian forest (MoEPP, 2014a), costing 21,000,000 Euros for suppression in July 2007 alone (Goldamer and Nikolov, 2008).

Regarding mining and air pollution, effects register in soil values for lead and zinc of 1.5 and 1.6 times higher than target levels in the Bitola region (Dimovska et. al., 2014) and arsenic presence in Macedonian mosses of 1.8 times higher than the median recorded in the period 2005-2010 for Albania, Bulgaria, Serbia and Europe generally (Dimovska et. al., 2013). The situation for these and/or other pollutants is likely to be more severe around Skopje and Tetovo. Moving to North East Macedonia, fish in mining-impacted rivers display heightened biological alterations (Barisic et. al., 2015).

7.- Environmental activities.

Macedonia has seen several environmental citizens' initiatives and coalitions emerge in recent years. Pressure groups such as Ohrid SOS, which has demanded a revision of tourism development policy in the Ohrid-Prespa region; the Save movements in Gevgelija and Valandovo ("Спас за Валандово/Гевгелија"), whose activities have focused on preventing mines; and the O2 Coalition, which campaigns for better air quality, have each secured national attention and tentative success. Plans to drain Studenchishte Marsh, a nationally rare and important wetland, are currently on hold after pressure from Ohrid SOS; the prime minister has announced the intention to reduce mining expansion in East Macedonia; and six of eight mayoral candidates for the capital Skopje signed the O2 Coalition's Platform for Clean Air prior to local elections in 2017.

As key agents in the successful appeal to the Bern Convention to prevent dam construction in NP Mavrovo, eco-NGOs Ekosvest and Front 21/42 also supply evidence of improving capacity in the non-government sector. Transposition of the EU's complicated environmental legislation is expected to result in greater complexity of domestic civil sector networks (Taylor, 2015) too, while the recently activated GEF project *Achieving Biodiversity Conservation through Creation and Effective Management of Protected Areas and Mainstreaming Biodiversity into Land Use Planning* aims at integrating biodiversity knowledge into a wide-range of decision-making processes and developing a more comprehensive National Red List to catalyse ecological conservation. The gradual proliferation of studies on ecosystem services (MoEPP 2014a) may also inform more effective policy from both an economic and ecological perspective. Several other activities demonstrate the potential for positive change. The Macedonian Ecological Society (MES) has delivered key data on several individual species, and communities at Prespa, Dojran and Pelister are moving towards more sustainable uses of natural resources

following targeted projects (MoEPP, 2014a; PrespaNet 2017). Much of this work is reliant on international finance.

Nonetheless, the environmental history of post-1991 Macedonia warns of numerous conservation actions that have either failed to achieve sustainable objectives or existed more tangibly as PDFs than actualized safeguards against ecological loss. Populations of endemic Ohrid trout are not believed to have been secured by decades of restocking (Jordanova et. al., 2016); the fifteen-year movement to establish Mount Jablanica as a national park has yet succeeded only so far as a mistimed valorisation (MoEPP, 2014a); Shar Planina Mountain has waited 20 years for NP status; and the discontinued Tree Days, in which members of the public were encouraged annually to replant forests on a national scale, have led to inappropriate species selection, poor planting practices and substandard survival rates (Kolevska et. al., 2017). Overall, reforestation is realized at only 45% of planned quantity (Kolevska et. al., 2017) and even the large number of environmental NGOs over the years has not achieved sufficient success in awareness terms.

Slow or frustrated progress characterizes certain international investments too: Initial improvements in water quality at UNESCO Lake Ohrid from upgrades to the sewerage system are being undone by local mismanagement, institutional ignorance and foregone maintenance (KfW, 2011; JICA, 2012). Meanwhile, tasked with putting in place a "comprehensive, representative and effectively managed national protected area system", a US$5,161,000 GEF-UNDP project from 2008-2011 entitled *Strengthening the Ecological, Institutional and Financial Sustainability of Macedonia's Protected Area System* is yet to gain the desired traction: Within three years of project completion, the National Biodiversity Information System developed under its auspices had fallen into non-activity. Within four years, NP Galichica had become the target of multiple urbanization and tourism expansion plans. Now, six years later, the IUCN (2017) still identifies low PA capacity, regards financing practices as unsustainable and reviews the World Heritage Management Plan for the Ohrid region as more like a development than a conservation document.

Revealingly, MAK-NEN, a comprehensive network of PAs designed by MES and funded from Netherlands sources, was completed at the same time as the GEF project. However, despite its incorporation of Key Biodiversity Areas, provision for ecological corridors based on the movements of the brown bear and intention to resolve conservation imbalance between Macedonia's east and west, PA territory has increased just 0.2% since and the current expansion of transport

infrastructure already threatens the integrity of areas it has identified (MoEPP 2014a).

8.- Conclusions.

Biodiversity in Macedonia is threatened in a similar way as elsewhere in Europe yet without functional legislative, institutional or non-governmental systems to adequately ameliorate or reduce anthropogenic impact. Air and soil pollution represent a major threat for the stability of ecosystems. This together with unregulated and illegal hunting, overfishing, habitat loss and uncontrolled collection of plants and fungi has led to a decrease in the population of many species, in some cases even below the biological minimum.

Degradation of natural resources has also resulted in increasingly obvious effects on Macedonia's socio-ecology evidenced by eutrophication events, erosion, air pollution, bioaccumulation and declining fish stocks etc., many of which have already exerted significant economic damage. If Inglehart (1995) is accepted, severe objective environmental problems can catalyse support for environmental protection in certain circumstances. Macedonia may soon reach the point at which such an effect takes hold. Indeed, it may have done so already in local areas such as Prespa and Dojran, where habitat degradation has been followed by more ecological decision-making, indicating a move towards a sustainable development model. Gradually incrementing knowledge on ecosystem services and ecological functioning both filtering through to Macedonia and emerging from domestic study has the potential to strengthen this shift.

Reminiscent of the environmental movements that became a focal point for opposition to Communism in other East Europe countries in the 1980s, issues such as the overdevelopment of the UNESCO Ohrid region, declining air quality and mining have been a feature of recent criticism of the Macedonian state too. Provided a similar pattern to elsewhere (Waller and Millard, 1992), this may foreshadow a move into mainstream politics and thereby influence over economic policy for figures who are environmentally informed, although sustaining momentum is far from guaranteed (Botcheva, 1996) and the impact from large investors such as the EBRD whose development models still display ecological deficiency is continuing.

In parallel, transposition of EU environment acquis is likely to instigate more intricate socio-ecological networks as the demands of technically complex European policy necessitates a larger role for the NGO sector within a more interconnected system of environmental governance to ensure acquis

implementation (Taylor, 2015). Together with the more stringent nature protection regulations from EU legislation itself and its requirements for both environmental monitoring and freedom of information, this increasing capacity should result in greater effectiveness and oversight of environmental and economic policy as well as application of law. However, as has been seen recently in Poland, this does not of itself guarantee ecologically sensitive policy if decision-makers are otherwise minded (The Guardian, 2018).

9.- Recommendations.

Given the reliance of the environmental sector on overseas investment and the power of international frameworks to influence regional ecological outcomes (PrespaNet, 2017), support from the international community is essential to reversing ecological decline. However, successful outcomes will remain elusive unless greater emphasis is placed on long-term results quantified by biodiversity-based and public awareness indicators rather than the simple production of reports, valorizations, and action plans that have little meaning unless integrated action is taken on the ground. Additional financial support, not only for environmental projects but development infrastructure in other sectors, should be conditional on such indicators.

Policy synchronization is required. Domestically, this means harmonizing the legal framework so the Law on Environment and Law on Nature Protection are not emasculated by other legislation. It also requires unity between planning documents for nature protection and those for economic and infrastructural development. Biodiversity-focused cross-sectoral cooperation is urgently needed at the international level too. Currently, funding from European states for ecological projects is contradicted by support for transport and energy infrastructure from EIB and EBRD, financial institutions in which the same states are often donors. Other policies, such as those aimed at economic or social transition, need to be more mindful of whether functional systems are in place to control their indirect impacts.

In addition, ecological integrity would be more effectively maintained if international and domestic stakeholders in future large-scale infrastructure, industrial or tourism development projects awaited completion of the national IUCN Red List of Threatened Species before entering the planning stage. This would speed up the compilation process and lead to better informed decision-making. Impacts would reduce further if the Macedonian government, international financial institutions and private sector entities such as resort planners stringently adhered to Motion 26 from the 2016 IUCN World Conservation Congress, which

establishes protected areas as no-go zones for environmentally destructive developments even when biodiversity offsets are proposed. If extended to areas known to hold the ecological value of PAs despite a lack of formal designation, such as Shar Planina Mountain and Mount Jablanica, prospects for Macedonia's biodiversity would improve.

Motion 26 emphasizes the role of SEAs. Here, better reliability would result from incorporating the environmental outcomes of previous projects within SEAs for future ones; quantifying overall domestic environmental performance by a standardized measure; reviewing mitigation history; as well as estimating both political will and social awareness as factors influencing likely long-term ecological consequences. Previous environmental protection and conservation history could then be taken as an indicator of future reliability much like a credit system. Poor previous ecological performance would automatically trigger an unfavourable SEA conclusion and a declined application for finance from international institutions with appropriate Social and Environmental Policies.

The ecological wellbeing of Macedonia rests on many other factors besides: the building of cohesion and capacity among NGOs and institutions; the nurture and retention of expertise; securement of sustainable revenue streams; actualized protection measures; as well as respect and enforcement of related laws. Improved ecological awareness at all levels of society would be a driving force for achieving these goals. Alongside customized inclusion of ecology within all economic, engineering and business-related studies at university level, greater attention needs to be paid to why awareness is low, addressing issues such as social trust and developing localized, culturally-specific mechanisms of inspiring ecological behaviour.

Recent improvements in locations such as Prespa demonstrate that positive steps are not unachievable.

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