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CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE AND NATURAL HABITATS

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Hydro power development within the territory of Mavrovo National Park ("The former Yugoslav Republic of Macedonia")

- REPORT BY THE COMPLAINANT -

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BERN CONVENTION - MAVROVO CASE

The conservational value of National Park Mavrovo

National Park Mavrovo is one of the oldest National parks in Europe established in 1949 due to "exceptional natural beauty, historical and scientific importance of forests and forest areas surrounding Mavrovsko Pole (The Mavrovsko Pole field was flooded few years later for the purpose of the existing hydro energy system "Mavrovo"). In 1952 the territory of National Park Mavrovo increased for more than six times to approximately 73,088 ha. In 2011, the foreseen change of the National state border with Kosovo contributed towards expansion of the National Park "Mavrovo" for 212.7 ha.

In terms of biodiversity, the National Park Mavrovo is one of the richest in Macedonia. It is a home of about 50 mammal species, including the wolf, brown bear, fox, wild cat and lynx; 129 bird species, 11 species of amphibians (out of total 15 species found in Macedonia), 24 species of reptiles (out of total 32 species found in Macedonia) and 924 species of invertebrates as well as 1435 plant species. Of these, 14 species of mammals, 45 species of birds, 5 amphibians and 18 species of reptiles are listed in Appendix II of the Bern Convention (for more info see Appendix 1). This indicates the great importance that National Park Mavrovo has in terms of biodiversity conservation. Hence sustaining the quality of the habitats that sustains and host each of the important species is of even greater importance. For a reason, the National Park Mavrovo has been identified as an: Important bird area; Important plant area; Prime butterfly area; it is part of the Macedonian Ecological Network and an EMERALD site (site predefined to be a Natura 2000 upon Macedonia admission to European Union)¹.

¹ Melovski, Lj., Hristovski, S., Brajanoska, R., Velevski, M., Sarov, S., Avukatov, V. (2011). Development of representative protected areas' system in the Republic of Macedonia based on GIS methodology. Proceedings of the conference: Nature protection in XXI century, 95-109. Zhabljak, Montenegro, 20-23.09.2011.

MES (2011). Strengthening the Ecological, Institutional and Financial Sustainability of Macedonia's National Protected Areas System (Project 00058373 - PIMS 3728.). Development of Representative National System of Protected Areas (Project activity Ref. RFP 79/2009). UNDP, Ministry of Environment and Physical Planning of the Republic of Macedonia, Macedonian Ecological Society.

Brajanoska R., Čivić, K., Hristovski, S., Jones-Walters, L., Levkov, Z., Melovski, Lj., Melovski, D. and Velevski, M (2009)

Background document on Ecological Networks - Project : Development of the National Ecological Network in FYR Macedonia (MAK-NEN). MES, Skopje, Republic of Macedonia; ECNC, Tilburg, the Netherlands.

MoEPP (2008). Development of National EMERALD Network in Macedonia, Report. Ministry of Environment and Physical Planning, Skopje.

Melovski, Lj., M. Velevski, V., Matevski, V. Avukatov & A. Sarov (2012). Using important plant areas and important bird areas to identify Key Biodiversity Areas in the Republic of Macedonia. Journal of Threatened Taxa 4(8): 2766–2778.

THE THREATS

Regretfully, many years of inappropriate conservation measures have adversely affected the diversity of National Park Mavrovo². The existing hydro power plant system "Mavrovo" that affects about 946.1km² added additional pressure³. Not once an improper implementation of Article 56 of the National Law on Nature Protection, regarding the biological minimum of watercourses, has been noted (Figure 1). The negative consequences of the disregard of the biological minimum have been scientifically validated and the negative effects are particularly noticeable in the spruce-fir forests (Ass. Abieti-Piceetum scardicum Em, (1958) 1985) along the river Adžina Reka (defined as a strictly protected area). Inadequate management and conservation of river ecosystems significantly affects the structural and functional characteristics of the riparian communities that are directly dependent on the river ecosystem.



Figure 1. The biological minimum of river Adzina Reka (left) and river Crn Kamen (right).

Overlooking the effects of the functioning hydrosystem "Mavrovo" on the naturalness of the Park, the Government of Republic of Macedonia has initiated implementation of two large hydropower projects "Lukovo Pole" and "Boshkov Most" to complement the existing hydrosystem "Mavrovo". Both projects depend on funds from international financial institutions and undermine the very idea of a National Park.

For the purpose of sustaining the water level of the existing Mavrovsko Ezero accumulation as part of the existing hydrosystem "Mavrovo" the waters of the following rivers have been cached: Leunovska Reka, Nikiforovska Reka, Gornokraishka (Mavrovska) Reka and Kakachka Reka that directly inflow in the accumulation, with a total catchment area of 92 km², than the waters of Upper Radika (Crn Kamen, Shtirovica, Brodeshka Reka, Krakornichka Reka, Bogdevska Reka, Vrbenska Reka and Adzhina Reka) with a total catchment area of 321.5 km², than

² As a result of national strategies for promoting and directing the development policies towards economic exploitation of natural resources from 1958 up to today not only that no other protected area of category II has been established but in the areas previously established as National Parks many problems occur. Specifically, in National Park Mavrovo due to the large area occupied by the Park, the low number of rangers employed by the Administration as due to the socio-economic, financial and political pressures and retentions the Park copes with: illegal wood cutting, poaching, unorganized and non-expert collection of forest plants and fruits, non-compliance with the prescribed manner of fishing, unorganized and uncontrolled movements of visitors, uncontrolled entries of people from Albania in search for plants and forest fruits collection, game hunting and surge of initiatives for implementation of large infrastructural projects.

³ For the purpose of sustaining the water level of the existing Mavrovsko Ezero accumulation as part of the existing hydrosystem "Mavrovo" the waters of the following rivers have been cached: Leunovska Reka, Nikiforovska Reka, Gornokraishka (Mavrovska) Reka and Kakachka Reka that directly inflow in the accumulation, with a total catchment area of 92 km², than the waters of Upper Radika (Crn Kamen, Shtirovica, Brodeshka Reka, Krakornichka Reka, Bogdevska Reka, Vrbenska Reka and Adzhina Reka) with a total catchment area of 321.5 km², than Shara waters (Novoselska Reka, Uliverichka Reka, Kamenjarska Reka, Jelovska Reka and Mazhdracha with a total catchment area of 513 km² and Belichica waters with a total catchment area of 19.6 km². The waters of Upper Radika, Shara waters as Belichica waters are transported to the accumulation through system of underground as well as surface channels.

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HPP LUKOVO POLE

This project is planned to be constructed on the territory of Mavrovo National Park on the junction of the Shara and Korab Mountains on the Macedonia, Kosovo and Albania border. The water will be diverted from several tributaries of river Radika (Figure 2).

Dam height	71m
Output	6 MW, estimated at 159 GWh per year with respect to
	additional benefits from existing HPPs
Max daily flush	6 m³/s
Construction/ widening of roads	> 20 km road widening and bitumisation
New supply channels	19.95 km
Directly affected area inside NP Mavrovo	35.46 km^2



Figure 2. HPP Lukovo Pole project

The "Lukovo Pole" reservoir is to be constructed in one of the richest and most beautiful parts of the National Park Mavrovo in terms of plant biodiversity representing a niche for the specialists amongst Europe's plant species. The site hosts 13 threatened habitats, such as alpine and boreal heaths (listed in Annex 1 of the EU Habitats Directive) and Balkano-Pontic fir forests characterized by high endemism. One of the most interesting and unique attributes of the locality Lukovo Pole are the two large (for Macedonia) wetlands Dolno Lukovo Pole and Gorno Lukovo Pole (located in the mere vicinity of the projected Lukovo Pole accumulation). Because of the high altitude and the specific site characteristics this wetlands have characteristics of boreal peat bogs, a type of habitat that is exceptionally rare in South Europe. Lukovo Pole, although still not fully researched, by the scientific community is commonly considered as a site of great ecological value.

Name	Code	Occurrence in
	Palearctic	Macedonia
Transition mires and quaking bogs	54.4	54.48
Alkaline fens	54.2	54.2
Hydrophylous tall herb fringe communities of planins and of the mountane to alpine levels	37.7	37.72
Hydrophylous tall herb fringe communities of planins and of the mountane to alpine levels	37.8	37.872; 37.8724
Alpine and Boreal heaths - Bruckenthalia heaths	31.46	31.4631
Alpine and Boreal heaths - High mountain dwarf heaths	31.4A	31.4A2
Juniperus communis formations on heaths or calcareous grasslands	31.88	31.884
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno – Pandion, Alnion incanae, Salicion albae)	44.13	44.13
		41.191; 41.1911;
		41.1912;
		41.19121;
Beech forests	-	41.19122;
		41.19123;
		41.1913;
		41.192;
		41.1923;

Table 1. RESOLUTION № 4 of the Bern Convention habitats, List of habitats in the affected area "Lukovo Pole"

Severity of impact Nine of the habitats listed in the Resolution $\mathbb{N}_{\mathbb{P}}$ 4 of the Bern Convention can be registered in the area that is to be directly affected by the construction of the "Lukovo pole" HPP. The activities that will be undertaken during the constructional and operational phase of the "Lukovo Pole" HPP as a large infrastructural project to will result with:

- 1. Habitat destruction high, particularly forests and cliffs
- 2. Habitat alteration permanent effects on the habitats
- 3. Habitat fragmentation high
- 4. Land use changes water catchment channels
- 5. Disturbance to breeding birds Alpine species, Crex crex and possibly Golden Eagle

6. Disturbance to birds in feeding/resting/migration areas – scale unknown, formerly important Griffon Vulture roosting site

- 7. Risk of bird mortality unknown, probably not direct mortality
- 8. Reversibility of the impact not reversible
- 9. Success probabilities low to medium
- 10. Cumulative effect with another planned dam and several SHEPP
- 11. Other biodiversity values (subendemic populations of Balkan Lynx, Balkan Chamois)
- 12. Landscape destruction high

Considering the severity of afore listed negative impacts the negative impact on wildlife is imminent. Furthermore it can be expected that the Lukovo Pole accumulation could impact the specific high mountain climate conditions in the area following the expected "mirror effect", and for a reason. It has been noted that the existing Mavrovsko Ezero accumulation has led to significant changes of the climate in the area, mainly influencing the thermal regime of air masses and on the dynamic factors forming the microclimate. It is manifested by the change of the daily and annual fluctuations in air temperature, daily shift of winds and increased relative humidity.

BOSHKOV MOST

The dam project Boskov Most is located in the upper Mala Reka valley in the southernmost part of the National park. The main source of funding for this dam project is the EBRD – the European Bank for Reconstruction and Development. The HPP is designed to produce peak energy.

Dam height	33 m
Output	22 m ³ /s in 5h per day (average discharge of
	Mala Reka:
	5.75 m ³ /s)
Construction/ widening of roads	16.4 km
New supply channels	19.70 km
Directly affected area inside National Park Mavrovo	9.35 km ²

As the water is intended to be released with daily flushes the "Boshkov Most" HPP will have enormous negative impacts on biodiversity and species populations in the river sections below the power-house, especially the trout and the otter⁴ populations in the area. Furthermore, riverine ecology of the entire valley will severely suffer from the diversion of the majority of its natural water supplies (Figure 3). Following the example of negative effects scientifically confirmed in the spruce-fir forests (Ass. Abieti-Piceetum scardicum Em, (1958) 1985) that develops along the river Adžina Reka it is expected that "Boshkov Most" HPP will have severe negative impact on the mesophyll riparian communities (Ass. *Fraxino-Alnetum glutinosae* Micevski; Ass. *Aesculo hippocastani-Ostryetum* Em; Ass. *Tamarici-Myricarietum* Em, 1976) that develop along Mala Reka and Garska Reka.

Furthermore the construction and operation of "Boshkov Most" HPP as the supporting infrastructure will inevitably contribute to the fragmentation of habitats, which threatens the existence of the large carnivores. Machinery, blasting, and long term presence of humans in the area will result not only in direct destruction of forests and other habitats but will also bring nuisance to birds and other mammals.



Figure 3. HPP Boshkov Most project

⁴ According to the report of Andrey Kovatchev, BALKANI Wildlife Society, Bulgaria the country coverage for habitats in rivers for the otter (*Lutra lutra* listed in the European IUCN Red List 2002 as VU-vulnerable and listed in the Appendix II of the Bern Convection) is only 22.1% out of which only 27.57% falls to the habitats in rivers in the alpine region. Bearing in mind the conclusion of the expert that the coverage of the river habitats (completely different niche for the species and together with that important bio-corridor) is completely insufficient and noting that 9.6% (the highest percentage of the total 27.57% of habitats in rivers in the alpine region) of the habitats in rivers in the alpine region fall within the territory of NP Mavrovo it can be noted that the preservation of the structural and functional integrity of the rivers in NP Mavrovo is of a great importance for the population of the otter in the country.

Boskov Most area is a vital part of the corridor for movement and reproduction of the Balkan $lynx^5$

- Lynx lynx balcanicus (See Appendix 2). As an isolated subpopulation of the Eurasian lynx (Lynx lynx - included in the IUCN Red List as near affect (NT)), the Balkan lynx is treated as critically endangered CR (C2a (i, ii) D) (IUCN, 2007). The Balkan lynx (as a subspecies of the Eurasian lynx) is included in the Annex II of the EU Habitat Directive. According to the Directive "For those listed in Annex II of the Habitats Directive, core areas of their habitat must be protected under the Natura 2000 Network and the sites managed in accordance with the ecological requirements of the species".

In contrast to the official conclusion of the "Biodiversity Survey" elaborated under the leadership of the Macedonian Energy Group ELEM (In Appendix 3 see comments provided to the original EIA Study), the "Boskov Most" HPP would result in severe destruction of biodiversity and in population decline of endangered species. Internationally renowned experts analyzed the biodiversity survey and came to the following conclusions:

"The proposed drainage of the streams, detailed in this report, will have an immediate negative impact on the fish habitats and fish populations in these watersheds. In our opinion this biological diversity survey remains superficial, incomplete and misleading with regards to the otter, clearly not taking the risks to this threatened species seriously."

Dr. Nicole Duplaix, Chair of the IUCN-SSC Otter Special Group

"The proposed actions in the National Park will have strong negative effects on the native trout populations which will largely vanish from the reservoir area as well as from the downstream sections of the dam..."

> Dr. Jörg Freyhof, Leibniz, Institute of Freshwater Ecology and Inland Fisheries Berlin and European Chair of IUCN SSC/WI Freshwater Fish Specialist Group

"Overall, there seems to be the view that ..., the negative effects can be easily mitigated. This is not a view that I can... share, and ...I strongly feel that it is in stark confl ict with the primarily management goals of an IUCN Category II National Park."

Dr. Steven Weiss IUCN Salmonid Specialist Group (SSG) & Red List Authority (RLA) forSalmonid Fishes in Eurasia

"Mavrovo hosts [...] the last source of population with reproduction of the Balkan lynx [...]. Putting any additional stress on this source population may lead to the extinction of one of the most threatened mammal populations in Europe."

Dr. Urs Breitenmoser, Co-Chair, IUCN-SSC Cat Specialist Group

20 SMALL HYDROPOWER PLANTS

According to the Public call for concessions published by the Ministry of Environment and Physical Planning, Ministry of Economy another 20 Small hydropower plants are to be built on the

⁵ Trajce et al. (2008).Conservation of the Critically Endangered Balkan Lynx – Achievements and Aspirations. Proceedings of the International Conference on Biological and Environmental Sciences, 26-28 September 2008. Melovski et al. (2008).First camera-trap survey in the National Park Mavrovo, "The former Yugoslav Republic of Macedonia". Proceedings of the International Conference on Biological and Environmental Sciences, 26-28 September 2008, At University of Tirana. Ivanov et al. (2007).Conservation status of the critically endangered Balkan lynx in Albania and Macedonia. Proceedings of the 3rd Congress of Ecologists of the republic of Macedonia with International Participation, 06-09.10.2007.

Breitenmoiser et al. Strategic planning for the conservation of the Balkan lynx. Proceedings of the 3rd Congress of Ecologists of the republic of Macedonia with International Participation, 06-09.10.2007.

Schwaderer et al. (2013).Protected areas in species conservation - the protected area component within the frame of the Balkan Lynx Recovery Programme Proceedings of the III Congress of Ecologists of the Republic of Macedonia with International Participation, At Skopje, Macedonia, Volume: Special issues of Macedonian Ecological Society, Vol. 8.

Breitenmoiser et al. (2000). Action Plan for the conservation of the Eurasian Lynx (Lynx lynx) in Europe. Nature and Environment. 112. pp. 68

territory of National Park Mavrovo. The small hydropower plants (SHPP) as projected will affect the rivers and streams in Bogdevska Reka, Ribnichka Reka, Mavrovska Reka, Tairovska Reka, Galichka Reka and Rosochka Reka watersheds. Two of the planned SHPP are already build and operational (Galichka Reka and Tresonechka Reka), 1 is under construction (Galichka Reka), while 4 have already agreed concessioners and construction work may commence at any time (Figure 4).



Figure 4. Planned Small Hydropower plants in National Park Mavrovo

Even though the SHPP do not include an actual dam the construction of the small dams withdraw many negative effect on the stream integrity: interrupted water flow, barriers to animal movement, water loss from evaporation and loss of biodiversity from the dried portion of the river. Furthermore the constructional activities, that in "The former Yugoslav Republic of Macedonia" last for years can have a devastating effect on the river valley in a broader sense, as in the case of the construction of SHPP on Tresonechka Reka (Figure 5).



Figure 5. Construction of the SHPP Tresonechka Reka.

When all the afore listed projects are overlapped with the alterations made for the purpose of the existing hydrosystem "Mavrovo" the overall cumulative impact of all infrastructural projects in the area is clearly visible (Figure 6). According to the rough circled area about 60% of the territory of the Mavrovo National Park is affected in the tempts of hydroenergy production and about 90% of the affected area is classified as an area under coniferous, broadleaved and mixed forests, pastures, rocks and rocky cliffs. When considering the overall affected area one must wander weather if all planned infrastructural projects are implemented as projected the Park can further sustain and preserve habitat and species diversity (see Appendix 1). Furthermore the fragmentation of habitats could lead to perpetual loss not only to known but also to species still unknown to science.





Figure 6. Cumulative overview of all the planned, projected and build infrastructural projects on the territory of Mavrovo National Park. Please note that the affected areas are roughly circled and coloured in order to increase visibility of the expected impact.

Questionable zoning in the process of revalorisation of Mavrovo National Park

Proposed zoning in the Study for revalorization of Mavrovo National Park does not correspond with the recommendations of the individual experts included in the preparation of the Study (See Appendix 4). Actually both hydroenergy projects were included and considered in the Study for revalorization of Mavrovo National Park clearly reflecting the economic needs for the implementation of the hydroenergy projects "Lukovo Pole" and "Boskov Most" (Figure 7). Therefore, objectiveness of the experts in the zonation process has been compromised. Furthermore the zones as defined in the Low on reproclamation of NP Mavrovo do not correspond to the zones as defined in the final Study for revalorization of NP Mavrovo (See Appendix 4).



Figure 7. Final zoning as presented in the Study for revalorization of Mavrovo National Park with the considered hydroenergy projects overlapped

Following the recommendations given by the experts⁶ (experts on algae, flora and plant communities in wet ecosystems and invertebrates) engaged in the preparation of the Study for valorisation of Mavrovo, the area of Lukovo Pole as a whole is proposed to be included in the zone of strict protection. According to the experts included in the preparation of the Study for valorisation of Mavrovo, the Lukovo Pole area is referred to as an high-mountain pasture and following the Article 62 of the Law on Nature Protection "for the purpose of protection and conservation of the biological and landscape diversity on high-mountain habitats and ecosystems, any anthropogenic activity with exception to those associated with traditional farming as well as eco-tourism in accordance with the principles of sustainable development are prohibited." According to the experts included in the Study of valorisation of NP Mavrovo the source area river Radika i.e. Upper Radika (including river Crn Kamen- about to be cached for the purpose of Lukovo Pole accumulation) is classified as a landscape with exceptional visual values. Additionally, as emphasized in the Study for valorisation of Mavrovo, Lukovo Pole area (comprising the source area of river Radika) is an "high-mountain region with least human influence," and further in the Study it is emphasised that "if any activity in the form of inadequately constructed and functional tourist facilities, ski resorts or artificial reservoirs in the area of Lukovo Pole is allowed, it will lead to irreversible loss of the rich biocenosis of algae (before even they are fully explored) and other aquatic organisms, reducing the total biodiversity and natural value of the region. Lukovo Pole should be declared as a strictly protected nature reserve." Considering afore presented facts and expert recommendations it is questionable why the "Lukovo Pole" area has been included in the zone for sustainable development.

The zoning proposal in the Study for revalorization of the Mavrovo National Park degrades one of the most important and intact parts of the park (the valley of the river Dlaboka Reka) from a zone of strict protection (highest level of protection, as it was prior to this Study) - to a zone for active management/sustainable development, without any information and/or explanations in the document for the reasons of this decision and following the fact initially, the Dlaboka Reka valley was among the affected areas as part of the "Lukovo Pole" project. Just recently, after it was identified as a potential World Heritage site by an international expert delegation the Dlaboka Reka intake was excluded from construction plans, but according to our governmental decision this exclusion is done because of economic reasons not environmental. So following the clarification for the exclusion in the Government decision and considering the concept of the zonation in this part, the Government does not ensure nor guarantees that the valley of Dlaboka Reka will not be affected in the future. Furthermore one of the tributaries of Dlaboka Reka that is Proi I Bukavenit, is still included in the project "Lukovo Pole" and consequently the alteration of Proi I Bikavenit will still affect the hydrology of river Dlaboka Reka threating the intactness of the Dlaboka Reka valley in general.

According to the report of the Commission⁷, the Valley of Dlaboka Reka river has been identified and proposed for World Heritage. The report stated that the complex of "virgin forest" in Dlaboka Reka includes the valley of the river itself. By definition, "virgin forest" is stable a forest that has attained great age without significant disturbance. The structural and functional characteristics of the "virgin forest" in Dlaboka Reka valley are closely connected with the river ecosystem- Dlaboka Reka. Hence, given that the functionality of the two ecosystems is mutually determined by several environmental aspects, the obligation to grant the same degree of protection of the river and the valley is imposed. Given that any human intervention and taken measure of active management in the valley can disrupt the natural balance ("virginity") of this ecosystem, it is questionable why part of Dlaboka Reka valley is still considered to be in the zone for active management/sustainable development.

⁶ Based on the data presented in the final Study for valorisation of Mavrovo. The general faults of the Study for valorisation of Mavrovo in terms of incompliance with the individual expert reports are generally elaborated in Appendix 4 but will not be subjected to detail comment here.

⁷ Kanpp et al. (2013) Report of the Excursion to Ancient Beech Forests in Albania and Macedonia. EuroNatur Spezial 01/2014.

Boshkov Most area is a vital part of the corridor for movement and reproduction of the Balkan lynx (*Lynx lynx balcanicus*). The Eurasian lynx (*Lynx lynx*) is included in the IUCN Red List as near affect (NT). As an isolated subeuropean population of the Eurasian lynx, the Balkan lynx is treated as critically endangered CR (C2a (i, ii) D) (IUCN, 2007). The Balkan lynx (as a subspecies of the Eurasian lynx) is included in the Annex II of the EU Habitat Directive. According to the Directive "For those listed in Annex II of the Habitats Directive, core areas of their habitat must be protected under the Natura 2000 Network and the sites managed in accordance with the ecological requirements of the species". Based on the above presented facts it is questionable why the area Boškov Most, as the valleys of the Mala Reka and Garska Reka river are not included in the zone of active management.

COSTS BENEFITS AND ALTERNATIVES

Investing in national energy capacities is of course needed, but it should be planned with consideration of all National strategies that define the potentials, conservation values and valorisation of the natural values as to be based on current hydrological potential (reassessment of the hydrological potential in Macedonia is needed in order to project cost-effective hvdro energy projects that could be fully operational). Environmental organizations support the initiative of rational and strategic production of energy from renewable sources, but not in protected areas. For example: the HPP "Boshkov Most" is designed to produce peak energy only, while according to our estimates the HPP Lukovo Pole will contribute to the total amount of 25% of electricity produced by hydropower plants with only (105 GWh) 9%, and the contribution within the total electricity generated in Macedonia is only 2%. Note that the percentages apply only to electricity produced in the country and if the contribution is calculated in regard of the total amount of electricity demand in Macedonia, the percentage is negligible. The funds can be invested in the construction of HPP "Chebren and Galiste" that will have a far more significant participation 840,30 GWh (73% contribution to electricity produced by hydro or even 18% of the total electricity generated in Macedonia). Additionally other sources of renewable energy (wind, solar energy) should be considered.

Appendix 1

National Park Mavrovo is situated in the western part of Macedonia, covering the southern parts of Shar Planina Mt., western and central parts of Bistra Mt., the entire Macedonian part of Korab Mt. and Deshat Mt. and larger part of Krchin Mt. Significant section (83%) of the Radika River catchment area runs within the Park borders.

Exceptionally rich flora and vegetation diversity exists on the area of the NP Mavrovo. Within its boundaries, classical finds (locus classicus) of high number of species are situated (Achillea corabensis, Crepis macedonica, Dianthus macedonicus, Erysimum korabense, Solenanthus scardicus, Viola gostivarensis, Viola ivonis and others). This abundancy can be further supplemented by several other species described on the Albanian side of the Mountain of Korab, also recorded on the Macedonian side of this mountain massif (Draba korabensis, Festuca korabensis, Sesleria korabensis, Ranunculus degenii and others). The following species are enrolled on the IUCN Global Red List (1997): Achillea corabensis, Alkanna noneiformis, Coeloglossum viride, Colchicum pieperianum, Eryngium serbicum, Fritillaria macedonica, Gentiana lutea subsp. symphyandra, Narthecium scardicum, Oxytropis purpurea, Ramonda serbica, Ranunculus degenii, Sempervivum kosaninii, Silene schmuckeri, Vicia montenegrina, Viola elegantula, Solenanthus scardicus.

The area of the NP Mavrovo hosts unique finds of the following species on the territory of "The former Republic of Macedonia": Draba korabensis, Festuca korabensis, Sesleria korabensis, Dianthus barbatus, Potentilla palustris, Cerinthe glabra, Saxifraga moschata, Matricaria caucassica, Senecio transsilvanicus, Ranunculus wettsteini, Valeriana bertiscea, Tragopogon orientalis, Trifolium spadiceum, etc.

The fauna characteristic of Balkan-Middle-European Broadleaved Woodlands dominates on this site, with significant portion of Taiga Type Coniferous Forests on higher altitudes. At the same time, along the Radika River flow, Mediterranean faunal elements are present. A large number of endemic species, mainly from the invertebrate groups: Gastropods (Gastropoda), Oligochaetes (Oligochaeta), Isopods (Isopoda), Millipedes (Diplopoda), Grasshoppers (Orthoptera), Beetles (Coleoptera) is registered on this site. The importance of the site could be presented through a single case with the Fairy shrimp *Branchipus intermedius* that was firstly described on the Carpathian Mountains in Romania. The species is extinct from the type site, because of degradation of natural habitats, and currently, the only location where it still exists is the site "Tri Bari", within this ASCI site. Therefore, the species is included in the European Red List within the category "Critically Endangered". The only close relative of this species, the Fairy shrimp *Branchipus blanchardi*, inhabits exclusively certain temporary pools on the French Alps. Within this area, stable populations of 25 vertebrate species with European threatened status, exist.

In addition to the birds species listed on Resolution No 6 (1998) and regularly occurring migratory birds not listed on Resolution No 6 (included in tables 3.2.a. and 3.2.b), three bird species: *Picus viridis, Carduelis cannabina, Miliaria calandra* (Table 3.3) breeding in the site are considered to be concentrated in Europe and with an Unfavourable conservation status in Europe (SPEC Cat 2, BirdLife International 2004). The Corncrake (*Crex crex*) is most likely present with population sufficient to meet A1 criterion for declaration of another Important Bird Area in Europe (Heath & Evans, 2000) within the borders of this site.

OVERVIEW OF SPECIES FOUND IN MAVROVO NATIONAL PARK, INCLUDED IN THE APPENDICES OF THE BERN CONVENTION

PLANTAE

Ramonda serbica, Appendix I Campanula abietina, Appendix I

INSECTA

Austropotamobius torrentium Appendix II Lindenia tetraphylla, Appendix II Lucanus cervus Appendix II Parnassius apollo, Appendix II Parnassius mnemosyne, Appendix II Zerynthia polyxena, Appendix II Euphydryas maturna, Appendix II (listed under Hypodryas maturna) Euphydryas aurinia, Appendix II (listed under Euphydryas (Eurodryas) aurinia) Phengaris arion, Appendix II (listed under Maculinea arion) Rosalia alpina, Appendix II

AMPHIBIA

Triturus macedonicus (befere considered as a subspecies of Triturus cristatus listed under Appendix II) Bombina variegata scabra listed as Bombina variegata Appendix II Pseudepidalea viridis listed as Bufo viridis Appendix II Hyla arborea, Appendix II Rana dalmatina, Appendix II

PISCES

Pachychilon macedonicum, Appendix III (listed under Rutilus macedonicus) Rutilus rubilio, Appendix III Barbus meridionalis, Appendix III Cobitis taenia, Appendix III

REPTILIA

Eurotestudo hermanni boettgeri Appendix II Emys orbicularis, Appendix II Ablepharus kitaibelii, Appendix II Mediodactylus kotschyi Appendix II Algyroides nigropunctatus, Appendix II Lacerta viridis, Appendix II Eurotestudo hermanni boettgeri Appendix II Emys orbicularis, Appendix II Ablepharus kitaibelii, Appendix II Mediodactylus kotschyi Appendix II Algyroides nigropunctatus, Appendix II

MAMMALIA

Hypsugo savii, Appendix II Pipistrellus kuhlii, Appendix II Eptesicus serotinus, Appendix II Miniopterus schreibersii, Appendix II Myotis mystacinus, Appendix II Myotis blythii, Appendix II Lacerta trilineata, Appendix II Lacerta agilis, Appendix II Podarcis muralis, Appendix II Podarcis tauricus, Appendix II Podarcis erhardii, Appendix II Dolichophis caspius Appendix II Platyceps najadum dahlii Appendix II Zamenis longissimus Appendix II Natrix tessellate, Appendix II Coronella austriaca, Appendix II Vipera ammodytes, Appendix II Vipera ursinii macrops, Appendix II

Crocidura suaveolens, Appendix II Canis lupus, Appendix II Lutra lutra, Appendix II Ursus arctos, Appendix II Felis silvestris, Appendix II Lynx lynx, Appendix II

FUNGI

Phylloporus pelletieri (Short-listed for inclusion in the Bern Convention)

AVES

Acanthis canabina, Appendix II Alauda arvensis, Appendix III Alcedo atthis, Appendix II Alectoris graeca, Appendix III Anas querquedula, Appendix III Aquila chrysaetos, Appendix II Aythya ferina, Appendix III Aythya nyroca, Appendix III Bubo bubo, Appendix II Caprimulgus europaeus, Appendix II Carduelis chloris, Appendix II Carduelis spinus, Appendix II Certhia brachydactyla, Appendix II Cicaetus gallicus, Appendix II Columba oenas, Appendix III Coturnix coturnix, Appendix III Crex crex, Appendix II Dendrocopos medius, Appendix II Emberiza calandra, Appendix III Emberiza cia, Appendix II Emberiza cirlus, Appendix II Emberiza citronella, Appendix II Emberiza hortulana, Appendix III Erithacus rubecula, Appendix II Falco peregrinus, Appendix II Falco tinnunculus, Appendix II Ficedula albicolis, Appendix II Ficedula hypoleuca, Appendix II Fringilla coelebs, Appendix III Gyps fulvus, Appendix II Hirundo rustica, Appendix II Jynx torquilla, Appendix II Lanius collurio, Appendix II

Birds listed on Res. 6

Gavia arctica Casmerodius albus (Egretta alba) Egretta garzetta Aquila chrysaetos Circaetus gallicus Circus aeruginosus Gyps fulvus Pernis apivorus Lyrurus tetrix, Appendix III Lullula arborea, Appendix III Luscinia megarhynchos, Appendix II Monticola saxatilis, Appendix II Monticola solitarius, Appendix II Muscicapa striata, Appendix II Otus scops, Appendix II Parus caeruleus, Appendix II Parus lugubris, Appendix II Perdix perdix, Appendix III Pernis apivorus, Appendix II Phoenicurus phoenicurus, Appendix II Phylloscopus sibilatrix, Appendix II Picus canus, Appendix II Picus viridis, Appendix II Prunella modularis, Appendix II Regulus ignicapillus, Appendix II Regulus regulus, Appendix II Saxicola rubetra, Appendix II Saxicola torquata, Appendix II Scolopax rusticola, Appendix III Serinus serinus, Appendix II Streptopelia turtur, Appendix III Strix aluco, Appendix II Sylvia atricapilla, Appendix II Sylvia communis, Appendix II Sylvia nisoria, Appendix II Turdus merula, Appendix III Turdus philomelos, Appendix III Turdus pilaris, Appendix III Turdus viscivorus, Appendix III Tetrao tetrix Appendix III

Migratory birds not listed on Res. 6

Otus scops Phoenicurus phoenicurus Parus cristatus Phylloscopus sibilatrix

Rupicapra rupicapra balcanica, Appendix III

Falco naumanni Falco peregrinus Bonasa bonasia Crex crex Aegolius funereus Bubo bubo Caprimulgus europaeus Alcedo atthis Dendrocopos leucotos Dendrocopos medius Dryocopus martius Picus canus Lullula arborea Lanius collurio Ficedula albicollis *Pyrrhocorax pyrrhocorax*

HABITAT TYPES (Resolution No 4/1996):

4	1	•	1			Beech forests
4	1		2			Oak-hornbeam forests
4	1		4			Mixed ravine and slope forests
4	1		7			Thermophilous and supra-Mediterannean oak woods
4	1		8			Mixed thermophilous forests
4	2		1	7		Balkano-Pontic fir forests
4	2		2	4	4	Pelagonide spruce forests
4	4		1			Riparian willow formations

NUMBER OF OTHER IMPORTANT SPECIES OF FLORA AND FAUNA AND OTHER IMPORTANT HABITAT TYPES

FLORA:

FAUNA:

Achillea corabensis Alkanna noneiformis Coeloglossum viride Colchicum pieperianum Eryngium serbicum Fritillaria macedonica Gentiana lutea subsp. symphyandra Narthecium scardicum Oxytropis purpurea Ranunculus degenii Sempervivum kosaninii Silene schmuckeri Vicia montenegrina Viola elegantula Solenanthus scardicus Crepis macedonica Dianthus macedonicus Erysimum korabense Viola gostivarensis Draba korabensis Festuca korabensis Sesleria korabensis Dianthus barbatus Potentilla palustris Cerinthe glabra Saxifraga moschata Matricaria caucassica Senecio transsilvanicus Ranunculus wettsteini

Dendrobaena alpina mavrovensis Gammarus halilicae Ochridaphe albanica Acanthopelatum albanicum Macedoilus storkani Microiulus storkani a Leptomastigoiulus hamuligerus Protonemura miacense Duvalius gogalai Paradeltomerus paradoxus

> Salamandra salamandra Bufo bufo Rana temporaria Rana ridibunda Rana graeca

Anguis fragilis Coronella austriaca Elaphe longissima Natrix narix Natrix tessellata Vipera ammodytes Vipera berus

Martes foina Clethrionomys glareolus Nannospalax leucodon Sciurus vulgaris Achillea corabensis Alkanna noneiformis Coeloglossum viride Colchicum pieperianum Eryngium serbicum Fritillaria macedonica Gentiana lutea subsp. symphyandra Narthecium scardicum Oxytropis purpurea Ranunculus degenii Sempervivum kosaninii Silene schmuckeri Vicia montenegrina Viola elegantula Solenanthus scardicus Crepis macedonica Dianthus macedonicus Erysimum korabense Viola gostivarensis Draba korabensis Festuca korabensis Sesleria korabensis Dianthus barbatus Potentilla palustris *Cerinthe glabra* Saxifraga moschata Matricaria caucassica Senecio transsilvanicus Ranunculus wettsteini Valeriana bertiscea Tragopogon orientalis Trifolium spadiceum

Dendrobaena alpina mavrovensis Gammarus halilicae Ochridaphe albanica Acanthopelatum albanicum Macedoilus storkani Microiulus storkani Leptomastigoiulus hamuligerus Protonemura miacense Duvalius gogalai Paradeltomerus paradoxus korabe Salamandra salamandra Bufo bufo Rana temporaria Rana ridibunda Rana graeca Anguis fragilis Coronella austriaca Elaphe longissima Natrix narix Natrix tessellata Vipera ammodytes Vipera berus Martes foina Clethrionomys glareolus macedonic Nannospalax leucodon Sciurus vulgaris Chionomys nivalis

3	1	4	4				High mountain Empetrum-Vaccinium heaths
3	6	1	1	1			Alpic acid snow-patch communities
3	6	3	9	1			Oro-Moesian Festuca paniculata grasslands
3	6	3	9	3			Oro-Moesian Poa violacea grasslands
3	6	3	9	4	1		Oro-Moesian crooked sedge grasslands
3	6	4	1	7	2	3	Pelagonide closed calcicolous sesleria grasslands
3	6	4	1	7	2	4	Pelagonide closed calcicolous fescue grasslands
3	6	4	2	8			Pelagonide naked-rush swards
3	6	4	3	8	2	1	Pelagonide calcicole stripped grasslands
3	7	6	1				Helleno-Moesian riverine and humid clover meadows
3	7	8	7	2			Moesian tall herb communities
3	7	8	7	2	4		Moesian scarlet avens tall herb communities
4	1	9	1				Chesnut woods
5	4	4	8				Balkan bog-asphodel fens
6	1	5	1				Illyrian montane screes
6	2	1	А	1	1		Pelagonide calcareous cliffs

OTHER IMPORTANT HABITAT TYPES:

Appendix 2

Balkan lynx – Lynx lynx balkanicus

In the south-west of the Balkan Peninsula, in the mountains forming the border between Albania and "The former Yugoslav Republic of Macedonia" and spreading north into Kosovo and Montenegro, a small and long-term isolated autochthonous population of Eurasian lynx *Lynx lynx* has survived to the present. After suffering a severe bottleneck in the 1930's the Balkan lynx (*Lynx lynx balcanicus*) was officially protected by the authorities of Yugoslavia in 1949. Its population size gradually started to increase and reached its peak of 280 individuals leaving mainly in south-west Balkans. After the fall of Yugoslavia in 1991, the civil war in Albania in 1997 and the conflicts in "The former Yugoslav Republic of Macedonia" and Kosovo⁸ in the early 2001, the negative impact on wildlife in general increased. Overhunting of the lynx' main prey, destruction of the forests (especially relevant in Albania) and poaching, very much affected the habitat and specific-prey-dependent lynx. In relatively short period of time, this small population started to decline and almost reached its all-time minimum of about 40 mature individuals. According to the IUCN Red List criteria, the Balkan lynx population is Critically Endangered CR(C2a(i, ii) D).

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The critical conservation status of this population was repeatedly recognised in the past, but the political situation in the range countries was not in favour of a conservation project. Only recently, a group of scientists and conservationists launched the Balkan Lynx Recovery Programme. This ongoing project started in 2006 as a partnership between NGOs from the range countries that are believed to share most of the Balkan lynx population – "The former Yugoslav Republic of Macedonia" and Albania and expanded its activities to Kosovo (¹) and Montenegro, while the expert guidance came from Switzerland, Germany and Norway.

The 8-year monitoring programme conducted in the project has shown that the only viable and reproductive core of the Balkan lynx population is the Mavrovo National Park. In this referenced area only, we have completed a total of 3 intensive camera-trapping sessions indicating that inside and in the close vicinity of the park there are around 10-12 mature individuals, occupying a space of around 700 km². What is even of a greater importance is that in every completed session in the park, we were able to photograph a mother with juvenile/s, indicating a successful reproduction of the population. Our further research in other areas outside Mavrovo, not only that didn't reveal any juveniles, but also did not allow any statistical assumption of the size of the population, pointing out that all the individuals could have derive from one source. This makes Mavrovo the most important and the only core area of the Balkan lynx population.

⁸ All reference to Kosovo, whether to the territory, institutions or population, in this text shall be understood in full compliance with United Nations Security Council Resolution 1244 and without prejudice to the status of Kosovo.



The construction activities of Boshkov Most and its associate hydro-power plants will affect the capacities of the site to sustain a viable population of the lynx and on a broader scale affect the conservation potential prospective of National park in general. According to the Balkan lynx project findings, the southern part of the park is the most important area for the Balkan lynx' survival. It has well preserved forests, abandon ungulate populations and insignificant disturbance level, all relevant factors for the survival of the lynx. The only one male individual that we followed with the means of radio-telemetry showed that most of his time was spent exactly in the Boshkov Most area. A resident female, photographed in 2008, 2010, 2012 and 2013 also lives in the heart of the construction area where in the spring of 2013 she was photographed with a last-year kitten.

The cumulative effects of the long-term construction activities of Boshkov Most and its associate hydro-power plants will undoubtfully cause intense disturbance and emigration of the ungulate population which eventually will be followed by the lynx. Outside the protected areas, the fate of the wildlife is in the hands of the hardly existing and badly implemented Law on Hunting in "The former Yugoslav Republic of Macedonia" and probably the worst hunting federation on the European scale. Driving the resident animals (lynx) outside their home-ranges will affect their reproductive success and will cause negative turn-over rate of the population size. Moreover, accessible roads which will be built along the hydro-power plants will make the entrance to the so-far inaccessible areas open and assessable to poachers.

These hydro-power plants, along with other infrastructural plans of "The former Yugoslav Republic of Macedonia" (ex. the highway Kichevo- Ohrid) and the already recognized threats to the Balkan lynx (poaching, prey depletion and loss of habitats) will have a negative cumulative effect on the lynx population and will eventually cause it to go extinct. A strictly specialized predator such as the Eurasian lynx, with high demands for pristine nature, stands little chance in an ever changing world. The high pressure that the modern society has brought in terms of energy demands, trade and luxury will have a high price on the natural values. Balkan countries are blessed of still being in the natural hotspots of Europe, but cursed with bad leadership and national politics.

Dime Melovski Balkan Lynx Recovery Programme, Macedonian Ecological Society Macedonian representative of IUCN's Large Carnivore Initiative for Europe

Appendix 3

TO AD ELEM and EBRD copy to Ministry of Environment

Skopje, 04.11.2013

Subject: Comments on the final biodiversity monitoring report for the pre- construction phase of the project "Boskov Most"

Dear Sir/Madam,

We would like to thank you for sending the final biodiversity report to us, and for allowing time for us to comment; likewise we thank you for sending previously submitted seasonal reports. We would also like to thank you for inviting our representatives to the public hearing held on 25.10.2013; unfortunately we were not able to attend due to the short notice of the meeting. We would be grateful if you would consider our comments on this report below, they are related to the environmental issues and to some of the studied groups.

Before elaborating our comments in more detail, we would like to draw your attention again to the on-going process for the re-proclamation of Mavrovo as National Park and the preparation and adoption of the Management plan for Mavrovo National Park. This complex process should result in decision on the level of acceptable development and the level of protection of the environment within the National park (80% of the HPP Boskov Most project is located in the Park).

The preparation of an urban planning document for non-inhabited areas with the area assigned for the HPP Boskov Most project is also ongoing. This document is subject to a Strategic Environmental Assessment according article 3, point 15 of the Ordinance on strategies, plans and programmes; and changes are subject to environmental impact, human livelihood and health assessment (Official gazette of "The former Yugoslav Republic of Macedonia"No. 153/07 from 20.12.2007).

The above mentioned documents and procedures are important for the overall assessment of the impacts of Boskov Most HPP project on the environment.

Summary

Our comments on the Biodiversity Monitoring Report refer to the species groups as well as to the absence of important technical data. In order to carefully analyze and judge this report, we have consulted several international renowned species experts.

Conclusions:

- This biological diversity survey is in large parts superficial, incomplete and misleading.
- It is not in line with international monitoring standards.
- In contrast to what the survey concludes, Boskov Most HPP would result in severe destruction of biodiversity and to population decline of endangered species.

We demand:

• Additional research: In order to fill the knowledge gaps and to present a scientifically accurate picture of the impacts of the HPP, we strongly demand the survey to be complemented. The monitoring procedure for species groups, such as for macrozoobenthos, mammals, and birds should be started next spring.

• Complete technical data: Add technical data about the operation of the project (e.g. outflow/discharge during different times of the year, km affected by drainage and flush, effects on water levels of Mala Reka and Radika during operation etc.)

General Comments on the Report:

The greatest concern of the national and international organisations represented here comes from the character of the proposed hydropower plant "Boskov Most". Boskov Most would drain large parts of the river network and would be flushing other parts of the river network. It would be operated as a peaking HPP; it will only operate in times of greatest energy demand, during which it will discharge large quantities of water up to the maximum capacity of the outflow pipes 22 m³/sec.

The daily fluctuating water level downstream of the outflow is one of the most devastating effects of the HPP on the river ecosystem. In general, the practice of hydropeaking inevitably produces permanent negative ecological effects on the downstream systems for 10s of kilometres, even showing effects up to 100 kilometres away from the release point. There is normally a strong reduction in the primary food base (i.e. a decrease in macrozoobenthic productivity and biomass) and a disruption of spawning and rearing of young fishes. The effects of hydropeaking are often so pervasive that large reaches of river landscapes in Europe have been declared as "Heavily-modified" under the EU Water Framework Directive (WFD) for this impact alone, and thus are largely exempt from the overall goal of reaching good ecological status.

Thus, in contradiction to the statements presented in the Report, (and with reference to the Environmental Impact Survey), it is not possible for us to envisage an HPP at Boskov Most, without envisaging significant reductions in the ecological status of the affected water bodies, including river reaches downstream, which have not been considered in this monitoring study. Maintaining the combined catchments of all waters in the watershed of Mala Reka at a biological minimum (most of the water being forced into pipes), along with the modifications of the riverbed downstream of the HPP and the daily flushes, will lead to inevitable loss of the majority of the biodiversity in the river ecosystem. This will not only apply to the Mala Reka, but also downstream in the river Radika, and indirectly upstream of the point where the Mala Reka joins the Radika.

Overall, the Report appears to offer the view that although Boskov Most project undoubtedly affects ecological process and numerous plants and animals, the negative effects can be easily mitigated. This is not a view that we, as a professional scientists can share, especially as this project is largely to be carried out within an IUCN Category II National Park, whose primary goal is: "…protecting large scale ecological processes with characteristic species and ecosystems…" The management objective(s) should apply to at least three-quarters of the protected area – the 75 per cent rule. (Dudley, 2008 Guidelines for applying Protected Area Management categories).

These goals appear to be in stark contrast to those of the HPP Boskov Most.

Specific comments:

In order to analyse and to judge the report correctly, we sent the assessment to the following internationally renowned experts:

- Dragonflies and other macrozoobenthos: Geert de Knijf Research Institute for Nature and Forest, Brussels. Dr. Jürgen Ott - Member of the IUCN Invertebrate Specialist Group and European Focal Point
- Fish: Dr. Jörg Freyhof Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin and European Regional Chair of the IUCN_SSC/WI Freshwater Fish Special Group. Dr. Steven Weiss – Karl-Franzen-University Graz and chair of IUCN Salmonid Specialist Group & Red List Authority for Salmonid Fishes in Eurasia.
- Birds: MSC Willem Van den Bossche and MSC Boris Barov Science department of BirdLife Europe
- Mammals: Eurasian Otter: Dr. Nicole Duplaix, Chair of the IUCN- SSC Otter Special Group Balkan Lynx: Dr. Urs Breitenmoser - Co- Chair, IUCN- SSC Cat Specialist Group

River ecosystem: Ulrich Eichelmann – CEO of Riverwatch, Society for the protection of Rivers.

Dr. Kai Frobel - Scientific advisor for Friends of the Earth Germany

Please find their individual statements attached.

1. Ambient noise and ambient air quality

The measurements of ambient noise in the final report have been completed during the summer of 2012 (August). At the last meeting held in ELEM (18.03.2013) it was agreed by all parties that an additional measurement should take place during the winter season. The final report needs to be updated with results from an additional measurement of the noise in a new season. The measurements of ambient air quality in the final report have been completed during the period August-September 2012. At the last meeting held in ELEM (18.03.2013) it was agreed by all parties that an additional measurement of ambient air should take place during the winter season. The final report should be updated with results from an additional measurement of ambient air should take place during the winter season. The final report should be updated with results from an additional measurement of ambient air quality in one new season.

2. Lack of detailed information on macro invertebrates

The biological survey report <u>seems</u> impressive in that many different groups of organisms have been surveyed, and as expected, a great deal of biodiversity is found in the Mavrovo National Park and surrounding areas. However, to underline the difficulty in gaining a rough estimate of the levels of biodiversity that will be affected by this project, we note that "no" species of the large order Trichoptera (caddis flies) are reported, rather only "empty houses". Trichoptera (wrongly listed as "Trohoptera" in your Report) are one of the most diverse and functionally important groups of macroinvertebrates in these systems. Macroinvertebrates are highly sensitive to HPP development and there is no doubt that significant negative impacts in biodiversity, productivity and biomass of these creatures will occur, and these reductions can have "knock on" effects for many aquatic, semi-aquatic and riparian species that depend on this fauna as a food base. Several species are not determined exactly, but are named sp. (ie species name unknown). This, combined with the very limited description of the macro invertebrate fauna descriptions indicates that a specialist was not involved in the study – contrary to what we would have expected.

3. Lack of data on Odonata (dragonflies) and other macro zoobenthos

Odonata (dragonflies) are characteristic, easily visible, and an important group for conservation, they are totally dependent aquatic ecosystems, including rivers and have not been well covered within the study. The report does not present the applied methodology for the surveys conducted on the macrozoobenthos; it does not give evidence of sampling intensity, state how many days observations were conducted or how much time was spent at each water body. Furthermore, the report does not specify how the species were identified. Most probably, only imagines/adults were detected. The larval stages were determined in the framework of the MZB-survey only (see below), however although adult dragonflies are seen flying in the air, their larval stages, which can take up to 5 years for Cordulegaster species, are dependent on water. Therefore these species are not terrestrial invertebrates <u>– as listed in the Report</u> - but freshwater insects. The survey itself did not focus on larval stages and exuviae were obviously not mapped – if they had been this would have proved the close affiliation (philopatry) of certain species to the study region.

Only eight dragonfly species were detected in the whole study area, that is far less than expected. For example we would have expected that *Cordulegaster heros* would have been present, is a species protected by the European Habitats Directive and has been found in the lower part of the river catchment of Mala Reka, records have been published for Debar region in the Crni Drim River. A survey would certainly yield many more localities in the area. Except *Cordulegaster bidentata* (classified as Near Threatened on the European Red List) all dragonflies recorded are more or less generalist (euryoecious) species. Another two species are mentioned in the context of the MZB-survey. The number of detected dragonfly species is surprisingly low, given the amount of aquatic habitats present in the study area. The dragonflies of Macedonia have not been studied intensively in the past, Boudot et al. (2009) but 59 species are known to occur in the country, with reference to Boudot's work, a comprehensive dragonfly survey for the project area would be expected to reveal

higher dragonfly biodiversity. Some species which occur frequently along the Mediterranean basin and the Balkan Peninsula respectively are not represented in the report are *Calopteryx splendens*, *Coenagrion puella*, *Anax imperator* or *Anax parthenope*, *Crocothemis erythraea* among others). For some families no species have been detected at all (Lestidae, Gomphidae, Corduliidae among others).

We believe the surveys conducted were not comprehensive as other available studies have detected the species or families mentioned above (for example De Knijf et al. 2013). This lack of comprehensiveness is also evident in the low number of species detected in the framework of the MZB-survey. The presence of *Aeschna cyanea* is surprising, as the species is rather uncommon in the study region.

It is obvious that internationally respected dragonfly experts from "The former Yugoslav Republic of Macedonia" and the Balkan Peninsula in general have not been consulted.

We noticed that some species are listed in the Report as only being present for a short time of the year. This is true for the adults but not for the larvae that stay into the water for at least 1 year, but can be as long as 5 year, depending on the species. Therefore table 1-12 must be seen as an attempt to show the flight period of the adults. This table is not correct; *Calopteryx virgo* is included on the wing from May till late August, probably even till September, this is not the case it flies only in May.

Generally, hydro peaking significantly impacts the downstream dragonfly community. These impacts are frequently devastating for the species during the hatching period as all individuals are killed at the same time. In the aftermath of a hydro peaking event drought conditions prevail and important habitats for the larvae fall dry. This leads to even more fatal losses in the population through desiccation of sensitive larvae and elevated predation on larvae by birds. Even if hydro peaking does not occur during the hatching period, extreme discharges will lead to the dislodging of many individuals and ultimately elevated mortality rates. This is in direct contrast to the information given on page 54 of the report. The most likely outcome of hydro peaking is that nearly all dragonfly species, not only the *Cordulegaster* species, will be completely disseminated.

The construction of the HPP, the drainage of streams and the resulting flush waves will also severely damage the riparian vegetation (river edge plants). This will also have a negative impact on the emergences substrates used by dragonflies during the transition phase from larvae living in the water to flying adults. The Coleoptera species *Cerambyx cerdo* is threatened in Europe and listed on in the annexes of the EU Habitats Directive (in Annexes II and IV). However, the species is not identified as such in the list of the Report (See page 53).

4. Unique fish species affected

Two salmonid species have been reported as the only fish species in the affected river systems: Salmo farioides and Salmo montenegrinnis. Neither of these species has gone through any kind of IUCN threat assessment. This is typical for the genus in this region as there is considerable controversy about their taxonomy and little reliable data or research aimed at resolving the situation. To underscore the complexity, another species, Salmo macedonicus has been entered into the IUCN Global Red List as Data Deficient. Either way, there is little doubt that the region affected by this project contains unique populations/species of salmonid fishes, for which we lack sufficient data for proper taxonomic assignment, let alone an assessment of their threatened status. From section 1.2.3.3 (additional measures to mitigate impacts) it is assumed that barriers to migration will be the most important impact of the HPP. It should be emphasized that habitat degradation due to major hydrological impacts (water abstraction, flooding by the reservoir, and hydropeaking) will be the most direct and damaging impact to the aquatic systems. Stocking cannot compensate for habitat degradation and is seldom considered a viable measure or even compatible with the primary goals of Category II National Parks, which are primarily constructed to preserve biodiversity and ecosystem function. Stocking of salmonid fishes is notoriously ineffective and often results in a suite of additional problems for the native fauna.

The Report states that minimum flow requirements (MFR) will be applied and that this will result in no reduction in the ecological status of the affected water bodies. This statement is not compatible with facts or the existing EU legal framework. The affected rivers are in pristine or nearly pristine condition, and we know of no MFR legislation (e.g. in Europe), which would not lead to a

significant ecological degradation as defined under the Water Framework Directive (WFD) of the European Union. MFR are compromises aimed at maintaining "some" functional or socio- economic components of a river within our cultural landscapes. They are not measures of conservation or nature protection that were designed or envisioned to be applied to nature reserves or National Parks where the maintenance of natural ecological processes and biodiversity are primary management goals. Even if State-of-the-art minimum flows associated with hydropower development in Europe are applied, they will severely impact ecological function, productivity and biomass of the fish and aquatic invertebrate populations of the affected rivers.

5. Poor section on birds

Regarding the section on birds, we note that the methods section lacks considerable detail. It is not clear how many visits were made to each site; there are no quantitative estimates of the present populations, and it is therefore not clear how the conclusions are drawn regarding the degree of impact. Threat categories are out of date, and some of the species names are incorrect all pointing to low quality research. Some species with potentially high conservation concern listed in the seasonal reports (e.g, *Ficedula semitorquata*, NT) are not listed in the final report. Most importantly, it is not obvious what the basis for the conclusion was. There is no information on the percentage of population affected, and no qualitative estimate e.g. a stratification of the area by habitat type and some sort of assessment which habitats will be most/least affected, their area of distribution in the National park and hence a proxy of the animal populations affected.

6. Mammals

a) Methodology

The methodology of mammal survey should have presented details on the locations of the camera- traps and lynxes prey, as this is what the conclusion that the lynx does not hunt in the region are based on (page 72). We feel more photographic evidence was needed.

b) Otters

More specifically, few pristine river ecosystems remain in south eastern Europe where otters can flourish, so each one is precious. Mala Reka and Radika are two such Rivers. The proposed drainage of the streams detailed in this report, will have an immediate negative impact on the fish habitats and fish populations in these watersheds, as well as the amphibian populations. Fish and amphibians are both favoured prey for otters and as a result, the otter's food supply will be affected year around. Although no details are provided concerning the effects of the proposed daily flushing regimen of the main rivers Mala Reka and Radika. Such repeated and drastic water level changes can only have a severe detrimental effect on both otters and their prey. The construction of the HPP will also severely damage the riparian vegetation along the river, cover which otters require for their dens and in particular, for raising their cubs. The otters will also abandon construction areas due to the human disturbance and noise levels. It is stated in the report that "the reduction of the quantity of water in the affected watercourses, i.e. the reduced flow, will ease the access to food" (page 73 of the report) which underlines the absence of the authors' basic understanding of otter ecology and behaviour as well as the how river ecosystems function. Boskov Most will have direct and severe impact on the resident otter population which is unlikely to survive. In our opinion this biological diversity survey remains superficial, incomplete and misleading with regards to the otter, clearly not taking the risks to this threatened species seriously.

c) Lynx

The risk of HPP Boskov Most to the Critically Endangered Balkan lynx *Lynx lynx balcanicus* (Kryštufek 2012) population remains one of the key controversial aspects, which the study has failed to answer. The Report argues that the HPP construction would not pose a big problem to the lynx. We think this is a wrong conclusion and that any additional loss of habitat or increased disturbance will negatively affect the lynx or its prey (see below). However, this is a matter of interpretation. We strongly argue, that, as long as the Balkan lynx is "Critically Endangered# (Melovski 2012), no further risk must be put on this species.

We believe that the construction will have a negative impact on the lynx, and a serious study on this important issue has not been made. To undertake construction without addressing this issue in a scientific manner is not acceptable. Comprehensive scientific ecological studies on lynx populations in "The former Yugoslav Republic of Macedonia" by KORA, the Macedonian Ecological Society and NP Mavrovo over the last seven years (2006 - 2013) are not properly reflected in the report. Facts have been omitted, even though all the relevant documents were provided to the experts involved in the preparation of the study for the biodiversity monitoring, as agreed during earlier consultation meetings.

The recent population estimates (Melovski, 2012) yield an alarming 22 to 40 individuals in the potential distribution range of the Balkan lynx and not "around 100" as stated in the report. Furthermore, the comprehensive surveys in Macedonia and neighbouring countries have revealed that Mavrovo hosts the only remaining population nucleus of lynx, thus holds the last source population with reproduction of the Balkan lynx. We strongly caution against putting any additional stress on this source population as it may lead to the extinction of one of the most threatened mammal populations in Europe.

Recent camera-trapping study (Stojanov *et al.*, 2013) conducted in within the boundary of NP Mavrovo showed that the resident female in the southern territory of the park had offspring last year (the female was photographed near the village of Gari in 2008, Mal Brzovec in 2012, 2013 and Jadovska Reka - near village Selce in 2010, 2013). A radio-telemetry study in 2010 and 2011 showed that, for most of the period he was followed, the territory of the resident male covered exactly the same area of the planned construction for Boskov Most.

It terms of the habitat preferences of the Balkan lynx, the facts in the report are misleading and imply that conflict between the lynx population and the construction site will be avoided. Eurasian lynx and thus the Balkan lynx much prefer forested habitats and transitional woodland- shrub (Avukatov in prep.; Ivanov in prep.); these are the habitats that will be destroyed by HPP Boskov Most construction. The Report states "...lynx move and feed mostly in the upper parts of Jadovska and Tresonechka river watersheds..." Our field research does not support such an assumption. Actually, the main prey item in the Balkan lynx' diet is the roe deer (57% of the radio-tagged lynx's prey in Mavrovo were roe deer and only 28% were chamois, Melovski et. al. 2010, 2011) and NOT the chamois as stated in the Report.

We concur that the main chamois habitat in the construction area won't be threatened. However, the roe deer habitat will be affected by the HPP construction. The short-term disturbance might lead to temporal dislocation of the populations of the chamois and the roe deer, but also of the lynx. The short-term disturbance, although temporary, may have a decisive negative impact on the lynx, which is at the brink of extinction. If both, prey and predator are temporarily depressed, prey might recover, but the predator may not because any additional stress to a critically endangered taxon could push it to extinction.

d) General comments on mammals with regard to infrastructure and water levels

We are of the opinion that the reservoir and the adjoining objects and infrastructure (especially pipelines and siphons) will pose barriers to unhampered movements of the mammals (which will mostly affect the wild boar, chamois, the brown bear, the grey wolf and the lynx), and the dam itself will present a barrier to the semi-aquatic species (the otter and the water vole). The change in the underground water-table (increased levels in the proximity of the dam) can negatively affect the populations of the Lesser Mole Rat *Spalax leucodon*, which are characterized with high caryotype diversity and represent potentially significant conservation units. In addition all populations of mobile species will be reduced by increased disturbance and noise levels. The infrastructure for the dam and the HPP (access roads, powerlines, water pipelines, water reservoirs, tyrolian catchments, material extraction sites, workers' camps, depots etc.) will take much more area than the reservoir itself, and will cause long-reaching consequences, habitat fragmentation, and cross- cutting of wildlife tracks and paths, especially in the canyon parts of Mala Reka catchment. The contamination with light during the construction and operational periods will also contribute to increased disturbance.

To conclude, although the conflicts stated here are characteristic for all HPP/dam constructions, we believe that because the majority of this project is situated in a National Park, the risks it poses to biodiversity are unacceptably high. We fear that if all planned infrastructure activities in Mavrovo NP continue, due to the cumulative impact, the Park will never meet the "75% rule" (the total coverage of the zone of strict protection and the zone of active management) for formal acceptance of the Park as Category II protected area under IUCN guidelines (Dudley, 2008). In view of the facts and professional opinions highlighted in these comments; IUCN's resolution for conservation of Mavrovo NP adopted at the last IUCN World Conservation Congress Jeju, Korea 2012; the attention of the remaining energy-production projects planned for this National Park; we would expect that ELEM and EBRD will undertake a more detailed and objective assessment of the impact of HPP Boskov Most. Such a study should fill the gaps in the study highlighted and identify proper mitigation measures. Alternatively they could abandon the plans for the implementation of this project. In our opinion, the final biodiversity monitoring report remains incomplete, inaccurate, and at times deliberately misleading.

We remain open for future consultations, Sincerely,

Ulrich Eichelmann	CEO, RiverWatch		
Ana Colovic-Lesoska	Eco- Svest, Skopje		
Dr. Jürgen Ott	Member of the IUCN Invertebrate Specialist Group and European Focal Point of the group		
Dr. Kai Frobel	Scientific advisor for Friends of the Earth Germany		
Dr. Geert De Knijf	Research Institute of Nature and Forest, Brussels		
-	Karl-Franzens-Universität Graz and IUCN Salmonid		
Dr. Steven Weiss	Specialist Group (SSG) & Red List Authority (RLA) for Salmonid Fishes in Eurasia		
Dr. Jörg Freyhof	Leibniz - Institute of Freshwater Ecology and Inland Fisheries, Berlin		
MSc Boris Barov	Conservation Action and Science Department of BirdLife Europe		
MSc Willem Van den Bossche	Conservation Action and Science Department of BirdLife Europe		
Dr. Metodija Velevski	Macedonian Ecological Society		
Dr.Nicole Duplaix	Chair, IUCN-SSC Otter Specialist Group		
Dr.Urs Breitenmoser	Co-Chair, IUCN-SSC Cat Specialist Group Front 21/42,		
	Skopje		
MSc Aleksandra Bujaroska			
MSc. Elizabeth Radford	Plantlife International and IUCN SSC Plant Conservation Committee member		

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Odontological comments on the annual report

"Survey in the Pre-Construction Phase (Pre-construction Survey) – Annual Report"

Authors: Dr. Jürgen Ott (<u>www.lupogmbh.de</u>)

- Former President of the German Society of Odonatologists (GdO e.V.)
- Coordinating Author of the latest and the previous German Red List of dragonfly species
- Co-author of the European IUCN Red List of dragonfly species
- Member of the IUCN Invertebrate Specialist Group and European Focal Point of the group
- Head of the federal state association of nature conservation of Friends the Earth Germany e.V.
- Consultant in the fields of Zoology and Fauna for the Southern district government Germany

Dr. Kai Frobel (kai.frobel@bund- naturschutz.de)

- Biodiversity Consultant for
- Scientific advisor for Friends of the Earth Germany
- Biodiversity Consultant for Friends of the Earth Bavaria
- Bavarian representative at the German Society of Odonatologists (GdO)

General aspects:

Dragonflies only play a minor role in the project report. There is no specific chapter dealing with the occurrence of dragonfly species in the study area, which indicates that the order has not been investigated in particular.

Methodology

The report does not present the applied methodology. It does not give evidence of the intensity of the conducted surveys (On how many days observations were conducted? How much time was spent on each water body?). Furthermore, the report does not specify how the species were identified. Most probably, only imagines/adults were detected. Obviously, the larval stages were determined in the framework of the MZB-survey only (see below). The survey itself did not focus on larval stages and exuviae were obviously not mapped. However, these would have proved the philopatry of certain species.

A comprehensive description of the applied methodology is not provided in the report and the results presented are insufficiently reliable.

Results

Merely 8 dragonfly species were detected in the whole study area. Except *Cordulegaster bidentata* all of these are more or less euryoecious species. Another two species are mentioned in the context of the MZB-survey.

The number of detected dragonfly species is surprisingly low. Regarding the aquatic habitats present in the study area, one would expect significantly higher dragonfly biodiversity. Even if the dragonflies of Macedonia have not been studied intensively in the past, according to Boudot et al. (2009) 59 species are known to occur in the country. With regards to this reference, a comprehensive dragonfly survey for the project area should generally reveal higher dragonfly biodiversity.

Many species which occur frequently along the Mediterranean basin and the Balkan Peninsula respectively are not represented in the report (*C. splendens, C. puella, A. imperator* or *A. parthenope, C. erythraea* among others). For some families no species have been detected at all (Lestidae,

Gomphidae, Corduliidae among others). There is indication that the conducted surveys were little intense since other available studies have detected the species or families mentioned above (compare De Knijf et al. 2013).

Evidence of this lack of intensity is also given regarding the low number of species detected in the framework of the MZB-survey. However, the presence of *A. cyanea* is surprising, as the species is rather uncommon for the study region.

Obviously, internationally respected dragonfly experts from Macedonia and the Balkan Peninsula in general have not been consulted.

Potential impacts of hydro peaking

Generally, hydro peaking significantly impacts the downstream dragonfly coenosis. These impacts are frequently devastating for the species.

Especially during the hatching period hydro peaking events have disastrous aftermaths as all individuals are killed at the same time. After the hydro peaking events drought conditions prevail and important habitats for the larvae fall dry. This leads to even more fatal losses in the population in many ways (e.g. desiccation of sensitive larvae, elevated predation on larvae by birds etc.)

Even if hydro peaking does not occur during the hatching period, extreme discharges will lead towards the dislocation of many individuals and towards elevated mortality rates in the end.

References

The only reference listed in the dragonfly section was the book written by K.D. Dijkstra.

Not only sophisticated literature for the determination of dragonfly species is missing (exuviae, larvae), but also earlier published references from "The former Yugoslav Republic of Macedonia" and the Balkan Peninsula in general are not taken into account (e.g. by Adamovic, Karaman, Buchholz, Herbert).

Other important sources of information – which are also not cited – are:

Boudot, J.P. et al. (2009): Atlas of the Odonata of the Mediterranean and North Africa. Libellula Supplement 9: 1-256.

Jovic, M. & B. Mihajlova (2009): Catalogue of the Odonata collection in the Macedonian museum of natural history. Acta entomologica serbica 14 (2): 133-146

Jovic, M. (2009): Report on Macedonia 2008 project-Odonata. IDF-Report 21: 1-23.

For a comparison of the possible dragonfly fauna see:

Knijf, G. De, C. Vannappelghem, C. & H. Demolder (2013): Odonata from Montenegro, with notes on taxonomy, regional diversity and conservation. Odonatologica 41 (1): 1-29

Comments on other sections:

Macrozoobenthos:

Several species are not exactly determined, but are named sp. This fact indicated that a real specialist was not involved regarding also the fact that the fauna in general is described only to a limited extend and intensity.

Cerambyx cerdo:

This Coleoptera species is subject to the EU Habitats Directive and listed in Annexes II and IV. However, the species is not identified as such in the list of the annual report.

Compare page 53

Muscardinus avellanarius:

The species is listed in Annex IV of the Habitats Directive as well, but not classified as such in report. Compare page 569/70



To ELEM and the EBRD

Comments on surveys concerning HPP Boshkov Most/MK

Vienna, 22.10.2013

Dear Sir or Madam,

Riverwatch is an NGO advocating globally for the protection of rivers. Thankfully, we received the two studies "Biodiversity survey over the area of HPP Boshkov Most" and the "Environmental Monitoring over the Area of HPP Boshkov Most" for the purpose of scrutiny.

I would like to inform you that we view the assessment of the biodiversity as exceedingly inadequate and the conclusion for the respective species groups as utterly incomprehensible and simply incorrect.

It seems as if the authors have failed to comprehend the ecological repercussions that will follow from the construction of the power plant, or were not provided with adequate data. Thus, they not only arrive at a wrong conclusion in regards to species groups, but also at an inaccurate overall result.

While the impacts on species groups have been gravely understated, the consequences of the practice of hydro-peaking on the Mala Reka and downstream have been left out entirely from the study.

Furthermore, I would like to point out that the projected power plant is inconsistent with EU guidelines, as it contradicts the principle of non-deterioration of status in the Water Framework Directive. Moreover, it is inconsistent with Natura2000 guidelines, particularly the Habitat Directive (Council Directive 92/43/EEC of 21 May 1992). The construction of this power plant would not be possible within the EU. In the light of Macedonia's accession aspirations, the government of "The former Yugoslav Republic of Macedonia" and involved companies are advised to closely adhere to European standards.

Finally, I would like to remark, that, on top of all, the project contradicts National Park Regulations, and thus construction at the proposed spot must be avoided at any cost.

Riverwatch will help to bring the case of Boshkov Most to the attention of the European Union and other international bodies.

I hope my comments were of help to you!

Sincerely,

Ulrich Eichelmann CEO Riverwatch



IUCN SSC/WI Freshwater Fish Specialist Group cfo Chester Zoo, Cedar House, Caughall Road, Upton, Chester, CHZ 1LH

> Tel: +44 (0)1244 389758 E-mail: info@iucnffsg.org www.iucnffsg.org

Dr. Jorg Freyhof Leibniz-Institute of Freshwater Ecology and Inland Fisheries Muggelseedamm 310 12587 Berlin

Tel. +49 30 64181707 freyhof@igb-berlin.de

Berlin, 23 October 2012

Statement Concerning the Establishment of the Hydro Power Plant Boshkov Most

The Biodiversity survey reports HPP Boshkov Most have been assessed by me as the European chair of the IUCN-SSC Freshwater Fish Specialist Group. The authors of the reports seem to be unfamiliar with habitat requirements of freshwater fishes especially the trout species (Sa/mo spp.) native to the National park. The proposed actions in the National Park will have strongly negative effects on the native trout populations which will largely vanish from the reservoir area as well as from the downstream section of the dams.

Especially the proposed daily flushing regimen of the rivers will have strong negative effects on freshwater fishes and all other freshwater and riparian biodiversity. Daily flushing is the end of all "normal" freshwater biodiversity downstream of the reservoir and this effect will continue to affect biodiversity for several km. Park area.

I as the European chair of the IUCN-SSC Freshwater Fish Specialist Group can hardly understand how such low quality assessments can be accepted and how such detrimental hydropower project can be taken into consideration within a National Park area.

KARL-FRANZENS-UNIVERSITÄT GRAZ Institut für Zoologie

Univ.-Ass. Dr. Steven Weiss

8010 Graz, Universitätsplatz 2 Tel.Nr.++43 0316/380/5599 FaxNr.++43 0316/380/9875 E-mail: steven.weiss@uni-graz.at

IUCN Salmonid Specialist Group (SSG) & Red List Authority (RLA) for Salmonid Fishes in Eurasia



24.10.2013

Statement Concerning the Establishment of the Hydro Power Plant Boshkov Most

To whom it may concern,

I have briefly reviewed the biological survey for the HPP Boshkov Most project, and would like to make a few brief yet critical statements. Overall, there seems to be the view that although such a project undoubtedly affects ecological process and numerous plants and animals, the negative effects can be easily mitigated. This is not a view that I can, as a professional scientist share, and especially due to the fact that this project is largely to be carried out in a National Park, I strongly feel that it is in stark conflict with the primarly management goals of a IUCN Category II National Park.

Salmonid species

Two salmonid species have been reported as the only fish species in the affected river systems; *Salmo faroides* and *Salmo montenegrinnis*. Neither of these species is officially recognized by the IUCN or has gone through any kind of assessment. This is typical for the genus in this region as there is much controversy on their taxonomy and little reliable data or research aimed at resolving the situation. To underscore the complexity, *Salmo macedonicus* has been entered into the IUCN data bank with no assessment due to deficient data. The species is reported to occur in the Mala Reka, yet the species has not been reported in the Boshkov Most biological survey? It is not clear whether *S. macedonicus* has been overlooked or misidentified. Either way, there is little doubt that the region affected by this project contains unique populations/species of salmonid fishes, for which we lack sufficient data for proper taxonomic assignment, let alone assessment of their vulnerability.

Reduced-flow effects, barrier effects, stocking, hydropeaking

From section 1.2.3.3 (additional measures to mitigate impacts) it is assumed that barriers to migration will be the most important impact of the HPP. It should be emphasized that habitat degradation due to major hydrological impacts (water abstraction, flooding by the reservoir, and hydropeaking) will be the most direct and damaging impact to the aquatic systems. **Stocking cannot compensate for habitat degradation** and is seldom considered a viable measure or even compatible with the primary goals of Category II National Parks, which are primarily constructed to preserve

biodiversity and ecosystem function. Stocking of salmonid fishes is notoriously ineffective and often results in a suite of additional problems for the native fauna.

The report states that **minimum flow requirements** (**MFR**) will be applied and that this will result in no reduction in the ecological status of the affected water bodies. This statement is not compatible with facts or the existing EU legal framework. The affected rivers are in pristine or nearly pristine condition, and I know of no MFR legislation (e.g. in Europe), which would not lead to a significant ecological degradation as defined under the Water Frame Directive (WFD) of the European Union. MFR are compromises aimed at maintaining "some" functional or socio-economic components of a river within our cultural landscapes. They are not measures of conservation or nature protection that were designed or envisioned to be applied to nature reserves or National Parks where the maintenance of natural ecological processes and biodiversity are primary management goals. Even if **State-of-the-art minimum flows associated with hydropower development in Europe are applied, they will severely impact ecological function, productivity and biomass of the fish and aquatic invertebrate populations of the affected rivers.**

Hydropeaking

The survey does not explicitly address the impacts of hydropeaking on the Mala Reka or downstream water bodies. Fluctuating water levels due to hydropeaking (the project is planning peak flows) are among the most large-scale and pernicious ecological impacts of particular HPP constructions. Hydropeaking can produce permanent ecological effects for 10s, or even up to 100 km or more on the downstream systems. Most often, there is a strong reduction in the primary food base (i.e. macrozoobenthic productivity and biomass) and disruption of spawning and rearing of young fishes. The effects of hydropeaking are often so pervasive that large reaches of river landscapes in Europe have been declared as "Heavily- modified" under the EU WFD for this impact alone, and thus largely exempt from the overall goal of reaching good ecological status. **Thus, in contrast to the statements in the biological survey (and reference to the EIS), it is not possible to envision such a project without significant reductions in the ecological status of the affected water bodies, including river reaches downstream, which have not even been considered.**

Aquatic invertebrates

The biological survey report is in part impressive in that many different organismal groups have been surveyed, and as expected, a great deal of biodiversity is found in the Mavrovo National Park and surrounding areas. However, to underscore the difficulty in gaining a rough estimate of the levels of biodiversity that will be affected by this project, I note that the large order Trichoptera (caddis flies), one of the most diverse and functionally important groups of macroinvertebrates in these systems is listed as "Trohoptera", and for this group "NO" species are reported, rather only "empty houses". Macroinvertebrates are highly sensitive to HPP development and there is no doubt that significant negative impacts in biodiversity, productivity and biomass will occur, and these reductions can affect many aquatic, semi-aquatic and riparian species that depend on this fauna as a food base.

Sincerely,

Steven Weiss, Assoc. Prof. Dr.



To : ELEM (Elektrani na Makedonija) European Bank for Reconstruction and Development (EBRD)

Brussels, 30th October 2013

Ref: WV 13/122

Subject: Comments on the final report for monitoring of the biodiversity in the phase before construction of the project "Boskov Most"

Dear Sir,

We would like to thank you for the opportunity to give some general comments on the final report of the project "Boskov Most" (AD Elektrani na Makedonija, 2013; Biodiversity Survey in the Pre- construction Phase over the area of HPP Boshkov Most – annual Report; Empiria EMS, Skopje; Tehnolab, Skopje; Society for Study and Protection of Birds of Macedonia, Skopje).

Overall, we are concerned about the impacts that this project, largely to be carried out in a National Park, undoubtedly will have on the ecological process and numerous plant and animal species. We are worried of the conflict of this project with the primary management goals of this IUCN Category II National Park.

The observations we want to share are:

- the section on methods used for the monitoring is not very detailed. It is for instance not clear how many visits were made;
- there are no quantitative estimates of the present bird populations in the report. Therefore it is not clear how the conclusions are drawn for the degree of impact to these species populations;
- the threat categories are out of date and some names are mistaken (this gives the impression of general low quality);
- and most importantly: what is the basis for the conclusion? As there is no information on the proportion of the population that will be affected, there is no qualitative assessment of the potential impact. It would have been helpful to have at least a crude quantitative estimate e.g. a stratification of the area by habitat type and some sort of assessment which habitats will be most/least affected, their area of distribution in the National Park and hence a proxy of the animal populations affected.

We remain open for future consultations and advices,

Yours sincerely,

MSc Boris Barov

MSc Willem Van den Bossche

Conservation Action and Science Department of BirdLife Europe Stichting Birdlife Europe - 38 -

IUCN/SSC Otter Specialist Group

... leading global otter conservation







October 22, 2013

OTTER SPECIALIST GROUP

Statement Concerning the Establishment of the Hydro Power Plant Boshkov Most

Two reports, the "Biodiversity survey over the area of HPP Boshkov Most" and the "Environmental Monitoring over the Area of HPP Boshkov Most" have been brought to the attention of the IUCN-SSC Otter Specialist Group. As the chair of this group of international otter experts I would like to comment and express my concerns on the chapter concerning the threatened Eurasian otter (*Lutra lutra*). Few pristine river ecosystems remain in southeastern Europe, like the Mavrovo National park, where otters can flourish and so each one is precious.

The authors of the study appear to be unfamiliar with the habitat requirements and the ecology of the otters in this region and the effects that the HPP Boshkov Most may have on the resident otter population. The proposed drainage of the streams, detailed in this report, will have an immediate negative impact on the fish habitats and fish populations in these watersheds. The same will be true for the amphibian populations, both favored prey categories for otters. As a result, the otter's food supply will be affected year around.

Further, no details are provided concerning the effects of the proposed daily flushing regimen of the main rivers Mala Reka and Radika. Such repeated and drastic water level changes can only have a severe detrimental effect on both otters and their prey.

The construction of the HPP will also severely damage the riparian vegetation along the river. This will also have a negative impact on the otter that requires riparian cover for its dens and, in particular, for raising its cubs. The otters will also abandon these construction areas due to the human disturbance and noise levels.

You state in the report that "the reduction of the quantity of water in the affected watercourses, i.e. the reduced flow, will ease the access to food" (page 73 of the report) which underlines the absence of the authors' basic understanding of otter ecology and behavior as well as the functioning of river ecosystems.

In our opinion this biological diversity survey remains superficial, incomplete and misleading with regards to the otter, clearly not taking the risks to this threatened species seriously.

Boshkov Most will have direct and severe impact on the resident otter population which is unlikely to survive.

The IUCN-SSC Otter Specialist Group therefore requests that the EBRD conducts more detailed assessments to determine how the local otter populations will be impacted by the HPP Boshkov Most and what palliative measures need to be taken.

We remain at your disposal to further assist and advise you for this important project.

Sincerely

Dr Nicole Duplaix, Chair





To Elektrani na Makedonija (ELEM), and European Bank for Reconstructiona and Development

Muri/Bern, Switzerland, 1 November 2013

Comments to the biomnitoring study for HPP Boskov Most, regarding the Balkan lynx *Lynx lynx balcanicus*

The risk of HPP Boshkov Most to the Critically Endangered Balkan lynx *Lynx lynx balcanicus* (Kryštufek 2012) population remains one of the key controversial aspects, which the study for biomonitoring of the biological diversity in the region of Boskov Most HPP failed to answer.

The Report argues that the HPP construction would not pose a big problem to the lynx. We think this is a wrong conclusion and that any additional loss of habitat or increased disturbance will negatively affect the lynx or its prey (see below). However, this is a matter of interpretation. We strongly argue that, as long as the Balkan lynx is "Critically Endangered" (Melovski 2012), no further risk must be put on this species.

We believe that the construction will have a negative impact on the lynx, and a serious study on this important issue has not been made. To undertake construction without addressing this issue in a scientific manner is not acceptable. Comprehensive scientific ecological studies on lynx populations in "The former Republic of Macedonia" by KORA, the Macedonian Ecological Society and NP Mavrovo over the last seven years (2006 - 2013) are not properly reflected in the report. Facts have been omitted, even though all the relevant documents were provided to the experts involved in the preparation of the study for the biodiversity monitoring, as agreed during earlier consultation meetings.

The recent population estimates (Melovski, 2012) yield an alarming 22 to 40 individuals in the potential distribution range of the Balkan lynx and not "around 100" as stated in the report. Furthermore, the comprehensive surveys in Macedonia and neighbouring countries have revealed that Mavrovo hosts the only remaining population nucleus of lynx, thus holds the last source population with reproduction of the Balkan lynx. We strongly caution against putting any additional stress on this source population as it may lead to the extinction of one of the most threatened mammal populations in Europe.

Recent camera-trapping study (Stojanov *et al.*, 2013) conducted in within the boundary of NP Mavrovo showed that the resident female in the southern territory of the park had offspring last year (the female was photographed near the village of Gari in 2008, Mal Brzovec in 2012, 2013 and Jadovska Reka - near village Selce in 2010, 2013). A radio-telemetry study in 2010 and 2011 showed that, for most of the period he was followed, the territory of the resident male covered exactly the same area of the planned construction for Boskov Most.

It terms of the habitat preferences of the Balkan lynx, the facts in the report are misleading and imply that conflict between the lynx population and the construction site will be avoided. Eurasian lynx and thus the Balkan lynx much prefer forested habitats and transitional woodland-shrub (Avukatov in prep.; Ivanov in prep.), these are the habitats that will be destroyed by HPP Boshkov Mostsconstruction. The Report states "...lynx move and feed mostly in the upper parts of Jadovska and Tresonechka river watersheds..." Our field research does not support such an assumption.

Actually, the main prey item in the Balkan lynx' diet is the roe deer (57% of the radio-tagged lynx's prey in Mavrovo were roe deer and only 28% were chamois, Melovski et. al. 2010, 2011) and NOT the chamois as stated in the Report.

We concur that the main chamois habitat in the construction area won't be threatened. However, the roe deer habitat will be affected by the HPP construction. The short-term disturbance might lead to temporal dislocation of the populations of the chamois and the roe deer, but also of the lynx. The short-term disturbance, although temporary, may have a decisive negative impact on the lynx, which is at the brink of extinction. If both, prey and predator are temporarily depressed, prey might recover, but the predator may not because any additional stress to a critically endangered taxon could push it to extinction.

Dr. Urs Breitenmoser Co - chair, IUCN/SSC Cat Specialist Group

SEPARATE OVERVIEW OF THE ZONING RECOMMENDATIONS INDIVIDUALLY GIVEN BY THE EXPERTS INCLUDED IN THE PREPARATION OF THE STUDY OF REVALORIZATION OF MAVROVO NATIONAL PARK

According to Article 92 paragraph (5) of the Law on Nature Protection, a Study for valorisation/revalorisation is obligatory in order to determine the contemporary state and to provide an adept basis for development of the Act for declaration of an area as a protected area. The validity and importance of the Study for valorisation is confirmed in Article 94 paragraph (3) which states that the proposal for proclamation of protected area among other includes: the primary for submitting the proposal, cartographic display, as well as technical expert study for evaluation or re-evaluation of the area. We would like to inform that as a concerned party we have, by submitting comments in regard, contributed in the final processing of the Study for valorisation of Mavrovo.

Regrettably, against the provisions of the Law on Nature Protection, the Study of revalorization of Mavrovo NP, includes information regarding the two planned hydropower projects (HPPs Boškov Most, SHPP Crn kamen and accumulation Lukovo Pole) and maps on which it is clearly visible that the two hydroenergetic projects are considered in the process of drafting the zones of protection in the park. According to Section 51 of the definitions of the Law on Nature valorisation/revalorisation is professional and scientific evaluation of the values of the natural heritage in order to confirm, expand, strengthen or reduce the scope and effect of protection, including the exclusion or termination of protection. The inclusion of the two large HPP projects in the Study for valorisation of Mavrovo NP (A total 20 new hydropower projects are planned in Mavrovo NP and the study considered only the two large HPP) directs and thus affects the objectivity and independence of the expert assessment (see Figure 1, Figure 2, Figure 3 and Figure 4) in concerning the process of valorisation of the natural heritage.



Figure 1. Zoning as proposed by the expert of avifauna



Figure 2. Zoning as proposed by the expert for invertebrates



Figure 3. Zoning as proposed by the expert for plants



Figure 4. Zoning as proposed by the experts (all zones overlapped)

In addition to the afore listed and taking regard to the provisions of Article 92 (paragraph 5) and Article 94 (paragraph 3) of the Low on Nature Protection we must observe that the map "Zoning of National Park Mavrovo" according to which the Low on Reproclamation of Mavrovo as a Protected Area in the Category of National Park defines and describes the zones of protection does not correspond to the map attached in the Final study for valorization of Mavrovo (Figure 5).

