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

**- OBSERVERS' REPORT FOLLOWING THE
ON-THE-SPOT APPRAISAL -
(24-25 June 2015)**

*Document prepared by
the Observers to the on-the-spot appraisal*

I. REPORT BY MR ROBERT BRUNNER

ON-THE-SPOT APPRAISAL TO MAVROVO NATIONAL PARK, “THE FORMER REPUBLIC OF MACEDONIA”

- 24/25th June 2015 -

Report by Robert Brunner (Austria),
Observer to the visit, representing WCPA (IUCN)
Final version, endorsed by the IUCN World Commission on Protected Areas

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INTRODUCTION

The author Robert BRUNNER is a physical and regional planner by training (Technical University of Vienna). After several years in a planning agency, he was asked to join the Marchfeldkanal Gesellschaft (Marchfeld canal company), which was commissioned to carry out a feasibility study first for the future Austrian National Park Donauauen (Danube floodplains), later for the National Park Thayatal. Both national parks were included in the UN List of Protected Areas as National Parks Category II. He further prepared a study on transborder cooperation of protected areas in Europe on behalf of the IUCN and EUROPARC, and he was member of the WCPA Steering Committee. From 1999 to 2013, he was Director of the National Park Thayatal in Lower Austria, a transborder project with the Czech Republic. Since his retirement in 2014 he has been working as expert for the European Diploma of the Council of Europe, has been proposed as a member of the advisory board of National Parks Austria, and regularly publishes articles in “Nationalpark”, a German magazine.

The observer’s report has been compiled on the basis of presentations and discussions with the parties involved, as well as documents, reports and information provided, inter alia, by the Council of Europe, various ministries of “the former Yugoslav Republic of Macedonia”, the project applicant, various NGOs and experts, guidelines and a site visit. It is an independent statement and does not necessarily reflect any official opinion. Due to the limited time frame, the report had to concentrate on the most important documents. For more information, please see the references in the annex.

The author expresses his gratitude to the representatives of the Ministry of Environment and Physical Planning, of ELEM, of NGOs and scientific institutions, of the EBRD, as well as the representatives of the National Park Mavrovo and the communities Mavrovo-Rostushe and Debar, for the warm welcome and open discussion. He apologizes for any incorrect spelling of names of participants and localities.

ACRONYMS AND ABBREVIATIONS

CBD	Convention on Biological Diversity
CoE	Council of Europe
EBRD	European Bank for Reconstruction and Development
ELEM	Elektrarni na Makedonija
EU	European Union
FY	Former Yugoslav
GW	Gigawatt
h	hour
ha	Hectar
HPP	Hydropower Plant
IUCN	International Union for Conservation of Nature
km	Kilometer
l/s	Liters per second
m	Meter
m ³ /sec	Cubic meters per second
MW	Megawatt
WB	World Bank
WCPA	World Commission on Protected Areas

EXECUTIVE SUMMARY

“The former Republic of Macedonia” intends to build two large hydropower plants within the boundaries of the National Park Mavrovo. At the World Parks Congress in Jeju (Republic of Korea), in 2012, the IUCN called on the Macedonian authorities to abandon all plans to develop hydro-electrical power in the National Park Mavrovo. Complainants argued that such plans would negatively impact the protected site, which is also listed as candidate Emerald site under the Bern Convention (Council of Europe). In December 2014, the Committee of the Bern Convention decided to open a case file. The Secretariat organised an on-the-spot appraisal of the area in June 2015 that included observers from the IUCN and the European Commission.

The larger dam is planned at Lukovo Pole in the northern part of the National Park, and could be financed with a loan from the WB, whereas Boskov Most in the south would be funded through a loan from the EBRD. The observer’s report considers the proposed technical interventions versus the regulations, recommendations and guidelines of the IUCN concerning protected areas, categorisation of protected areas and zoning. It does not include statements on the consequences for biodiversity, wildlife and landscapes. The National Park Mavrovo cannot be seen only as a single protected area, but also has an important function in a network of protected areas in the Balkans.

According to the IUCN, a protected area is a clearly defined geographical space, recognised, dedicated and managed through legal or other effective means to achieve the long-term conservation of nature with associated ecosystem services and cultural values. Therefore it must prevent or eliminate any exploitation or management practice that could be harmful to the objectives of the designation. The regulations in the proposed Mavrovo National Park Law sound similar. It should also be emphasised that protected areas, especially in category II, are not designated in the first place to protect specific species, but to safeguard all elements of a certain area, including natural processes, undisturbed water courses, natural water flows, visual obstacles, etc.

The (not yet adopted) Management Plan 2012-2021 of the National Park Mavrovo and a proposal of the Law for proclaiming the protected area Mavrovo in the category National Park include a revised zoning of the protected area that allocates most of the watercourses inside the National Park Mavrovo into the zone for sustainable use. As the use of hydropower is defined as sustainable, all rivers and brooks could be integrated into the hydropower plant system, and therefore altered and discharged.

“The former Republic of Macedonia” obviously endeavours to increase the proportion of renewable energy in the total energy consumption, and to meet the growing demand for electricity by so-called green power. This follows the EU recommendations for 2020, and contributes to the efforts against global warming. Nevertheless, properly managed protected areas can also provide a contribution to mitigation of climate change.

The construction of the dams and the additionally planned 20 to 30 small HPPs as well as the associated technical infrastructure would not only impact the Radika and the Mala rivers, but also the proposed HPP sites. Additional intakes would discharge water from smaller rivers and brooks, transport would result in numerous lorry trips over a long undefined period, noise and traffic would disturb wildlife and could lead to emigration of species. The aquatic system would be devastated along outstanding river sections. Dry sections can already be seen around previously built technical installations.

Conclusions

- Considering the IUCN guidelines and recommendations and bearing in mind the regulations of the Bern Convention, the observer states that the proposed plans of two larger and over 20 smaller HPPs have been assessed as contradictory to all recommendations and guidelines from not only the IUCN, but also the Bern Convention and the CBD.
- Not every form of use of natural resources, even done in a sustainable manner, can be accepted or tolerated inside protected areas. The negative impacts in the protected area, primarily on the watercourses, but also on ecosystems and wildlife, are unacceptable and cannot be justified by the

reduction of use of fossil energy. The National Park Mavrovo is a valuable area and deserves to be protected without exceptions. The planned changes of water levels and water regimes together with the construction of technical infrastructure are definitively of such an extent that the ecological character of the wider area would be changed, which is contradictory to the IUCN protected area standards.

- The proposed zoning is not compatible with an IUCN cat. II protected area; moreover several of the activities allowed in the "sustainable development" zone are not acceptable. It is recommended to additionally revise the zonation of the protected area under the specifications of the IUCN guidelines with an enlargement of the zone of strict protection, and to redraft the Mavrovo National Park Law in accordance with the IUCN standards.
- It is also recommended that the EBRD and the WB should abstain from both projects and from potential funding of small HPPs in the National Park Mavrovo. Undisturbed rivers and brooks are becoming rare in Europe. Many watercourses in the Balkans are still in natural condition. The construction of these dams would irrecoverably destroy aquatic habitats in a protected area. To jeopardize these rivers cannot be the policy of the EBRD and the WB, and may reflect negatively on both institutions. Enabling the construction within the boundaries of an important and well-established national park could increase the wish for more hydropower plants in the entire Balkan area. Protected areas are designated in the long-term, and are not available for any strategic schemes.

OBJECTIVES¹

The present report aims to evaluate the HPP projects within the boundaries of the National Park Mavrovo taking into consideration the IUCN criteria for protected areas and the management categories, as well as the regulations of the Bern Convention. It does not include a detailed analysis of species and biodiversity, and does not assess the electrical power supply of "the former Yugoslav Republic of Macedonia" in general.

BACKGROUND

The National Park Mavrovo is located in the north-west of "the former Republic of Macedonia", bordering the Republic of Albania and the Republic of Kosovo²³. It is part of the Dinaric Arc and has to be seen also in context with neighbouring protected areas in Albania, Kosovo and Montenegro. The National Park Mavrovo was founded in 1949⁴, with enlargements and changes in 1952. The current size of the protected area is 72,511.2 ha⁵. The National Park Mavrovo is a self-financing organisation. Although the proposal for the National Park Law stipulates that means of financing should be provided, inter alia, by the budget of "the former Republic of Macedonia"⁶ the financing of the regular budget depends in total on own revenues. Revenues can be obtained e.g. from sustainable management of natural resources⁷. As explained by officials during the visit, the annual harvest of forest in the National Park does by far not reach the annual forest growth.

According to the IUCN management criteria, it is categorized as National Park Category II. The recent management plan was designed by OXFAM Italia for the period 2012-2021, and includes a revised zoning of the protected area and new terms for the various zones. This management plan has not yet been adopted. The proposal of the Law for proclaiming the protected area Mavrovo in the category National Park is under discussion.

¹ Citations are printed in Italics; deletions are marked by No corrections made in the orthography.

² All references to Kosovo, whether the territory, institutions or population, in this text shall be understood in full compliance with United Nation's Security Council Resolution 1244 and without prejudice to the status of Kosovo.

³ This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence

⁴ Official Gazette of the People's Republic of Macedonia No. 10, from May 05, 1949

⁵ Management Plan – Zoning within the National Park; Other sources: 73 088 ha

⁶ Ministry of Environment and Physical Planning (2015), Art. 26 (1)

⁷ Ministry of Environment and Physical Planning (2015), Art. 26 (2)

It is the intention of the Macedonian Government to ensure the existence of the National Park Mavrovo on the basis of the proposed proclamation⁸ within IUCN category II, with the possibility to implement various projects including the construction of HPPs in the protected site. Two larger HPP projects depend on loans from the EBRD (Boskov Most) and the WB (Lukovo Pole). An existing micro HPP was financed with a loan from the EBRD, other projects are under discussion. According to the report by the complainant, up to 29 additional small HPP are planned in the park.⁹

In December 2014, the Committee of the Bern Convention decided to open a case file and instructed the Secretariat to seek the agreement of the Party for the organisation of an on-the-spot appraisal to the area in 2015. It included observers from the IUCN and the European Commission, and took place on 24 and 25 June 2015. During the visit, the experts agreed to elaborate a joint report, designed by the Bern Convention expert with the observers' statements as annexes.

FACTS AND FINDINGS

The IUCN criteria for protected areas and the category system

Protected areas are fundamental for national and international conservation strategies. They are important to protect species, ecosystems and landscapes. However, they also have to secure that any type of use of land or natural resources in the area is excluded that is inimical to the purpose of the designation. Definitions are subject to change. The 2008 definition of protected areas is as follows:

Protected area – IUCN Definition

*A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.*¹⁰

The 2008 Guidelines also state, that “the definition should be applied in the context of a series of accompanying principles”,¹¹ of which three are noteworthy in the context of this appraisal:

- *For IUCN, only those areas where the main objective is observing nature can be considered protected areas; this can include many areas with other goals as well at the same level, but in case of conflict, nature conservation will be the priority;*
- *Protected areas must prevent, or eliminate where necessary, any exploitation or management practice that will be harmful to the objectives of the designation;*
- *Protected areas should usually aim to maintain or, ideally, increase the degree of naturalness of the ecosystem being protected.*

The 1994 IUCN guidelines for management categories proposed the exclusion of any exploitation mainly for Category II – National Parks. In the new guidelines of 2008 this exclusion refers to all types of protected areas, the scope of restrictions depending on the primary objective of the respective category.

*Category II - National Parks – IUCN definition*¹²

*Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation of environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.*¹³

⁸ Ministry of Environment and Physical Planning (2015)

⁹ CoE (2013)

¹⁰ DUDLEY (2008), p 8

¹¹ DUDLEY (2008), p. 10

¹² For comparison: National Parks in the IUCN 1994 guidelines: Natural area of land and/or sea, designed to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitors opportunities, all of which must be environmentally and culturally compatible. (IUCN, 1994)

¹³ DUDLEY (2008), p. 16

The primary objective of National Parks is “*to protect natural biodiversity along with underlying ecological structure and supporting environmental processes, and to promote education and recreation.*”¹⁴

The role of national parks

The role of National Parks cat. II is to protect and manage a defined area in its entirety and safeguard its intrinsic values of undisturbed natural processes, regardless of the status of species (e.g. threatened species according to a Red List) or the scope of their contribution to biodiversity. National Parks are declared protected areas neither only for the protection of certain endangered or threatened species and their habitats, nor for the maintenance of certain rare ecosystems. This can be emphasized by additional objectives for national parks defined as supplemental to the primary objective. From the list of additional objectives, the following are relevant:¹⁵

- *To manage the area in order to perpetuate, in as natural a state as possible, representative examples of physiographic regions, biotic communities, genetic resources, and unimpaired natural processes;*
- *To maintain viable and ecologically functional populations and assemblages of native species at densities sufficient to conserve ecosystem integrity and resilience in the long term.*

The proposal for the Law of the National Park Mavrovo¹⁶ points out, that “*Taking into account the specific location, exceptional natural beauty, landscape and aesthetic values and extremely rich flora and fauna, the conclusion is reached that this area meets the criteria to be declared as protected in the category- a national park*”. It also describes the objectives of the Law as:¹⁷

- 1) *Conservation of original and authentic state of nature in NP Mavrovo;*
- 2) *Prevention of activities that may directly or indirectly cause disruption of the natural balance of ecosystems and changes in the basic features and landmarks of NP Mavrovo;*
- 3) *Creation of favourable conditions for protection, conservation and enhancement of biological and landscape diversity in NP Mavrovo; and*
- 4) *Sustainable use of natural resources in a way that does not endanger the survival of the species and their natural balance in NP Mavrovo.*

The wording is in line with the objectives of the IUCN, and can be interpreted as reflecting the intention of the Macedonian Government to establish the National Park Mavrovo as a protected area in IUCN category II, and take into account the IUCN management criteria for category II.

The proposed construction of two large and more than 20 smaller HPPs could cause major changes in the ecological structure through the change of the water regime and the water discharges, and can neither meet the IUCN definition nor the objectives of the drafted law for the National Park Mavrovo.

Zoning

The proposal of the Law for the National Park Mavrovo¹⁸ describes three zones:¹⁹

1. *Zone for strict protection:*

Zone of highest conservation interest, characterised by original, unaltered ecosystems or slightly changed by traditional management practices.

This zone is split into eight separated areas of different size and covers 11.6 % of the park.

¹⁴ DUDLEY (2008), p. 16

¹⁵ DUDLEY (2008), p. 16

¹⁶ Ministry of Environment and Physical Planning (2015), II

¹⁷ Ministry of Environment and Physical Planning (2015), Art. 5

¹⁸ Ministry of Environment and Physical Planning (2015), Art. 9, 11 and 13, shorted and modified by the author

¹⁹ According to the maps provided the Mavrovo Lake is not a designated zone.

2. *Zone for active management:*

This zone is of high conservation interest, but requiring more management interventions aimed to restoration, revitalisation and rehabilitation of habitats, ecosystems and other elements of the landscape.

This zone is split into 16 separated areas of different size and covers 32.2 % of the park.

3. *Zone for sustainable use:*

This zone is most relevant for this appraisal. It covers 56.2 % of the park.

*In the zone for sustainable use, activities shall be allowed, such as intensive agricultural production, sustainable use of forests (sanitary wood cutting), fishing, production of offspring of indigenous trout, hunting of wild species (sanitary shooting), maintenance and improvement of the reproduction centre for adaptation of red deer in Bunec, driving motor vehicles, regulation of unregulated springs, **construction of new facilities for capturing water from springs and watercourses, construction of new buildings for housing, and family weekend houses, new buildings for tourism purposes (hotels, restaurants, motels, campgrounds, mountain lodge, lodge, information centre parking spaces, etc.), construction of new infrastructure (pipelines for water), electricity, construction of earthworks and asphalt roads, construction of water supply and water intake and sewage removal facilities, construction of wastewater treatment plants**, as well as other activities specified in the management plan and annual programs for nature conservation, and urban plans in the municipalities that are situated within the territory of “NP Mavrovo”, where special attention should be paid for carrying out the activities in a way that will not disturb the natural balance in the National Park.²⁰*

Considering the objectives of the appraisal, some comments have to be added with regard to the zoning of the National Park Mavrovo as laid out in the Management Plan and the proposal for the National Park Law.

It should be mentioned that the designation of these three zones does not meet the expectations of the IUCN, as it is laid out in “The 75 % Rule”²¹, which defines that nature protection as the primary management objective (see page 8) should apply to at least three-quarters of the protected area. At the same time, the IUCN recommends that up to 25 % of land or water can be managed for other purposes as long as these are compatible with the primary objective of the protected area.

In the Management Plan of the National Park Mavrovo²² the authors state:

Notwithstanding the IUCN Guidelines for establishing Protected Area Management Categories apply a quantitative criterion to made distinction between protected area categories and stipulates that the primary management objective should to apply to at least three-quarters of the Protected Area, it is not transposed in the Macedonian Law on Nature Protection.

The Vision with its key ideas and concepts, in identifying the management objectives for the National Park Mavrovo was taken into consideration. The vision for the Park emphasizes the nature protection as primary management objective, respecting the basic principles of Category II (National Park), in accordance with both, the National Law on Nature Conservation and the IUCN criteria.

In addition, in accordance with the Vision, the development of eco-tourism and sustainable use of natural resources should be in function of further development and benefit of the local communities in the Park.

²⁰ Ministry of Environment and Physical Planning (2015), Art. 13 (4); Marked in bold and underlined by the author

²¹ DUDLEY (2008), p. 35

²² OXFAM et al. (2011), p. 103

The achievement of this goal, should not adversely affect the conservation of natural, cultural and spiritual heritage, since the nature conservation precedes all other purposes, as implied by the Law on Nature Protection.

Taking into account the zoning map (proposal) it is obvious that the zone for strict protection and the zone for active management are split into several areas of different size, which limits the effectiveness of nature protection measures. More than 56 % belong to the zone for sustainable use, but most of the rivers and brooks fall into this zone. This means that most permanent watercourses in the park and all larger ones are not strictly protected, and therefore can be used for energy production and other economic purposes. The Radika River, the longest and most important river in the park, stretching from north to south, lies as some others in its total length inside the National Park Mavrovo in the zone for sustainable use. It is therefore available for various forms of (sustainable) use. As interventions in the river with a significant change of the hydrological regime cannot be considered sustainable, the plans for the HPPs are in strong opposition to both the IUCN definitions and the objectives of the National Park Mavrovo Law.

The zoning also does not consider specific interests of villages and settlements within the park boundaries. The designation of a specific zone for urban development in the National Park Mavrovo Management Plan could be helpful to control urban development, set limits, and prevent uncontrolled and undesirable effects.

Sustainability and renewable energy

The availability of fossil energy is obviously limited. In the long-term only renewable energy sources will be available (biomass, solar energy, wind, water, etc.). The energy-turn-around towards renewable energy will be indispensable. Long before fossil energy sources will be depleted prices will rise. Climate change and the 2⁰-goal create additional time pressure. This is evident in the set EU-targets to reduce green-house-gas emissions by 20 % against 1990, and to increase the portion of renewable energy and energy efficiency by 20 % until 2020. Together this leads to an intensification in the production of renewable energy sources. Nevertheless, all these provisions provide new grounds for conflict. Renewable energy is by no way a synonym for environmental friendliness and nature protection, in fact serious conflicts can occur.²³

Hydropower plants in the National Park Mavrovo

Existing hydropower plants

To get an overview of the recent hydropower system in the National Park Mavrovo, the following description can be found in the Mavrovo National Park management plan:

One of the most complex hydropower systems (HPS Mavrovo) is located in the Municipality of Mavrovo-Rostushe. The Mavrovo Hydropower System with its three hydropower plants: HPP Vrutok, HPP Raven and HPP Vrben, and with a total capacity of the reservoirs of 277 million m³ is one of the largest and most complex system in the Macedonian Hydropower systems. It accounts for 42% of the total installed hydropower capacity in “the former Yugoslav Republic of Macedonia”.

*The Mavrovo Hydropower system is the largest and the most complex system of hydropower plants in “the former Republic of Macedonia” comprising three hydropower plants with 9 turbines in total, the Reservoir Mavrovsko Ezero Lake, 133.3 km of intake tunnels, pipelines and channels, 91 km of which being closed headrace channels, 36 km of tunnels and 6.4 km of high pressure steel siphons and pipelines, as well as 167 km of access roads for maintenance and facility surveillance.*²⁴

Proposed hydropower plants

The management plan describes the two sites for large hydropower plants.²⁵

The construction of the Hydropower Plant Boshkov Most is an important hydropower project for “the former Republic of Macedonia”. With its 68 MW installed power and 120 GWh annual

²³ Nationalparks Austria (2014), shortened and translated by the author

²⁴ OXFAM et al. (2011), p. 85

²⁵ OXFAM et al. (2011), p. 85

production of ecologically most acceptable electrical energy, this hydropower plant is not only going to increase the power capacity of the country but also will be an important economical driver in the next four years for Western Macedonia, i.e. for the region along the course of the Radika River and its tributaries in particular, but also for the municipalities of Mavrovo-Rostushe, Center Zhupa and Debar.

The concept for harnessing the power of water from the two largest mountain massifs in “the former Republic of Macedonia”, the Shar Planina Mountain Massif and the Korab Mountain Massif, which has started back in 1947 with the construction of the Mavrovo Hydropower Plants System, cannot be considered complete without realization of the project for construction of a dam and reservoir Lukovo Pole and intake of waters from the Korab Mountain.

Thus, considerable efforts were put hitherto into the realization of these two projects. In this respect, two major problems, related to this issues, which the Government of “the former Republic of Macedonia” has solved recently should be emphasized: delineation of the common border with Kosovo²⁶, so that all of the water surface of the future reservoir Lukovo Pole will be located on the territory of “the former Republic of Macedonia”, and the provision of financial support for the realization of the project.

The implementation of the project will obtain additional quantities of water from the Shar Planina and Korab Mountains watersheds and harnessing the power of water for production of additional 130 GWh electrical energy through the existing Hydropower Plants of the Mavrovo Hydropower System.²⁷

The Lukovo Pole project is less advanced than the Boskov Most HPP. Lukovo Pole does not only include the 71 m dam and the lake at the northern edge of the National Park Mavrovo close to the border with the Republic of Kosovo. It also comprises the complementary inflow to the lake coming from at least six intakes through a channel and tunnels. It should be noted that according to the project layout²⁸ four or five intakes are situated in the zone of active management. No detailed information could be obtained regarding mass calculation or quantity computation for the construction of the dam as well as for related construction work or about the origin of the material.



Figure 1: The crown of the dam would be located between the lower and the second pole (⇔) of the electric line on the right-hand slope, with the crown stretching across a length of 335 m. © R. Brunner

²⁶ All references to Kosovo, whether the territory, institutions or population, in this text shall be understood in full compliance with United Nation's Security Council Resolution 1244 and without prejudice to the status of Kosovo.

²⁷ More and detailed information can be obtained from various papers provided by ELEM (see list of references)

²⁸ Map: Project Layout (by BRL Ingenierie)

If the construction material is taken from excavations within the park boundaries, it will definitely have serious impacts and is in discrepancy to an IUCN recommendation of the World Conservation Congress 2000 which suggests that exploration and extraction of mineral resources in protected areas should be prohibited.²⁹ But even if the material is excavated outside the park and transported to the Lukovo Pole site, the negative impacts will be significant. Negative impacts are mainly caused by excavation, crushing plants, compacting material and transport. A potential excavation site close to Crn Kamen was not confirmed by the project executing organisation. The existing access road to Lukovo Pole along the Radika river is probably not suitable for heavy lorries. Material from the more than 3.000 m newly built tunnels between the Korab massif and the Lukovo Pole storage, if suitable, would only represent a small contribution to the mass calculation of the dam. No information was available about how erosion material deposited behind the planned Lukovo Pole dam would be removed after completion. The number of lorry trips needed for the transport of construction material was not available.



Figure 2: The Lukovo Pole Lake would stretch across three km to the north east (left) and flood the valley (right) next to the border with the Republic of Kosovo. © R. Brunner

According to the technical parameters of the project³⁰ the height difference between the normal water level in the water storage and the minimum water level will be 47 m (1.587 m vs. 1.540 m above sea level).



Figure 3: An existing steel siphon would be integrated into the HPP system. The picture also shows the present state of the access road to the Lukovo Pole site. The Radika riverbed on the right is dry. © R. Brunner

²⁹ IUCN World Conservation Congress 2000, recommendation 2.82; see also DUDLEY (2008), p. 12

³⁰ ELEM (2015), p. 6 (table 1)

Boskov Most is the farthest developed project, and in case of realisation, it will be co-financed through a loan from the EBRD. It consists of a 33 m high dam in the upper Mala river valley with additional inflow coming through six intakes, five of them outside the National Park Mavrovo. The Boskov Most system³¹ includes a power tunnel, which runs parallel to the Mala river and the hydropower plant next to the mouth of the Mala river into the Radika river. The access to the construction site is easier as it is located closer to the main road (approx. 15 km). However, improvements and relocation of the road will be necessary. The ecological flow in the Mala river (minimum water flow) is envisaged through a small HPP placed at the bottom of the outlet gate chamber in the planned Tresonce dam. The nominal discharge will be 211 l/s compared to the average annual discharge of 5.7 m³/sec.³² This would change the ecological character of the water courses significantly, contradictory to the primary objective for IUCN cat. II National Parks.³³



Figure 4: Left: The meadow would disappear under the Tresonce Lake. The small chapel (right) would be transferred to another location © R. Brunner

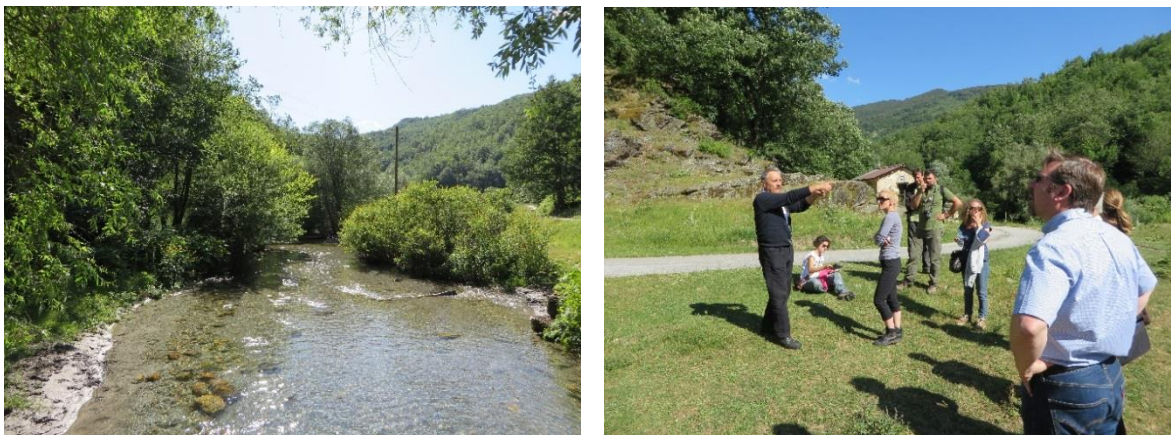


Figure 5: Left: the Mala river today. Right: Explaining the situation during the appraisal. © R. Brunner

It could not be verified whether the intakes outside the National Park Mavrovo and other related measures will have a negative impact on the water supply of the various villages located in the area where the intakes are to be built. However strong concerns were expressed by representatives of villages located outside the park.

A remarkable number of small HPP are planned within the boundaries of the National Park Mavrovo, a few of them already exist. As could be seen from an example close to the proposed Tresonce HPP Lake, even small HPPs cause negative impacts. This specific small HPP is supplied via a two km penstock. On two km of river length, the water discharge is significantly reduced.

³¹ ELEM (no year)

³² CoE (2014) and ELEM (no year)

³³ DUDLEY (2008), p. 16

Various research studies confirm that small HPPs influence significantly longer river stretches to produce the same amount of electric energy as large HPPs. This is not an argument for building larger power plants within a protected area, but it confirms the fear that many small HPPs may have large impacts in the National Park Mavrovo.

Furthermore, the IUCN principles to prevent or eliminate any exploitation harmful to the environment apply to all types of HPP regardless of their size.



Figure 6: Left: Small HPP near Tresonce. The pressure pipe runs under the sandy slope. Right: The outlet of the small HPP (left) and the river with a reduced discharge (right). This HPP is located inside the National Park Mavrovo. © R. Brunner

ASSESSMENT

Protected area National Park Mavrovo

Although the National Park Mavrovo meets in general the requirements of a protected area, some comments must be made.

The IUCN points out clearly that protected areas must prevent or eliminate any exploitation harmful to the objectives of the designation. Any technical infrastructure, which has a negative impact on various habitats, such as aquatic ecosystems, is harmful in various ways. This can be seen in different places where water is discharged from rivers and brooks. The dryfall downstream causes a heavy impact. Even a minimal water flow (10 % to 12 % of the average water flow) cannot secure the habitat for aquatic species.

The IUCN also states that protected areas should aim to maintain or increase the degree of naturalness of ecosystems within protected areas. In the present case, the construction plans for the dams would have unacceptable impacts due to their interference in the aquatic ecosystems in more or less the total area, regardless of their size.

The IUCN recommendations and guidelines define a framework for the conditions under which a protected area should be implemented, further developed and maintained. The guidelines are just recommendations for countries to use, however no binding mechanism could be applied. But they make protected areas internationally comparable and when followed, guarantee a quality standard for the protection. Exceptions may happen, but they should be limited to minimal interventions, which can be argued with local specifics and characteristics, and have to be in line with the protected areas'

objectives. The need for hydropower energy can by far not justify the proposed interventions. Some rivers in the National Park Mavrovo are already altered and negatively affected by human interventions. To meet the IUCN principles action has to be taken to diminish the negative impact caused by various existing installations discharging water for hydropower usage, and to prohibit further constructions threatening nature and biodiversity in the protected area.

Other types of human interventions and use of natural resources might also have negative impacts on habitats, but they were not the aim of the appraisal.

Zoning

The zoning, as drafted in the Management Plan 2012-2021, must be rated as insufficient. Compared with the 75 % rule of non-intervention areas, the drafted management plan only secures 11.6 % as strict protection zone, and another 36.2 % are listed as active management zone. For the latter, it cannot be guaranteed that the active management will not be inimical to the primary objective of the protected area. The largest part of the National Park Mavrovo is located in the zone for sustainable use. More or less all watercourses of relevant size, with only a few exceptions, are designated in the zone for sustainable use and therefore open for any technical intervention. Some watercourses are already discharged for existing hydropower plants. As can be seen on the Radika river at Crn Kamen, no water remained in the Radika riverbed at the time of the appraisal.



Figure 7: Radika river upstream Crn Kamen, the water discharge at Crn Kamen intake and the Radika river downstream (left to right). The Radika river is designated as zone for sustainable use in its total length inside the National Park Mavrovo. © R. Brunner

Special attention should be paid to the fact that most intakes to the Lukovo Pole Lake are situated in the active management zone. According to the proposal of the National Park Law,³⁴ activities like the construction of new facilities for capturing water from springs and watercourses and of pipelines for water and water intakes are, inter alia, restricted to the zone for sustainable use. Assuming that the mapping of the zonation is correct, the construction of at least four intakes would be contradictory to the proposed National Park Law, beside the negative impact on the brooks caused by the water discharge through these intakes.

The impacts of both HPPs on biodiversity are not evaluated in this observer's report and will be documented separately.

The current zoning is not appropriate to secure the protection of species, landscapes and biodiversity. The size of the zone for sustainable use is large, and any development within the zone, even those in line with the proposed National Park Law, could cause negative impacts on the small and scattered zones for strict protection and active management. Regarding the activities in the zone for sustainable use, it is recommended to revise the potential usage of natural resources and constructions in line with the IUCN guidelines for management categories. It would also be advisable to draft a different zoning for the area of the National Park Mavrovo that considers the urban development of the settlements as a distinct zone, as well as specific zones for the construction of visitor facilities to provide more legal certainty for communities and citizens. The urban development zone should have a clear border to all three zones as determined in the management plan.

³⁴ Ministry of Environment and Physical Planning (2015), Art. 11

Renewable energy and energy consumption in “the former Republic of Macedonia”

All efforts made to strengthen the promotion of renewable energy and to meet the 2020 climate targets of the EU are appreciated. But they should be weighed against the needs of nature protection. Protected areas are designated to protect species, habitats and natural processes, and provide recreation, if the latter is not against the primary management objective of protection of natural ecosystems. They play an important role locally, but they should also be part of a system of protected landscapes, and are increasingly important in strategies against climate change. The construction of two large and several small HPPs would definitely alter rivers and aquatic habitats in the park. This would be in contradiction with the objectives of protected areas.

It would be worth checking the renewable energy strategy of “the former Republic of Macedonia” against the requirements of protected areas, primarily the National Park Mavrovo.

Hydropower plants and the National Park

As described above, both the large power plants and the numerous smaller HPPs cause enormous impacts. The Radika and the Mala rivers will dry out more often and for longer periods than under natural conditions. The remaining water in the riverbeds is not sufficient to provide natural conditions for aquatic habitats. In addition, water from several rivers and brooks in- and outside the National Park is diverted via intakes to the water storages at Lukovo Pole and Boskov Most with possible negative impacts on local water supplies.

Lukovo Pole is the larger of both dams and located on the northern side of the National Park, more than 1.500 m above sea level. Long-distance transportation of material, noise and pollution will definitely have serious impacts on the protected area. Technical interventions, the impacts on watercourses caused by flushes, the altering of (aquatic) habitats and the disturbance of wildlife will be significant and do not meet the IUCN recommendations.

Regarding the IUCN criteria and principles, both larger HPPs and the cumulative impact from more than 20 small HPPs are contradictory to the designation of protected areas, regardless of the species endangered by the construction of these dams. The construction of the HPPs undermines all efforts to protect the area as strictly as possible or even as strictly as necessary, and does not achieve the proposed objectives of the National Park Mavrovo Law.³⁵

Various aspects have been discussed and described in the chapter Facts and Findings. In summary, it can be said that the dams will negatively affect most of the area in the long run, both during the construction period and through the management of water resources.

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MAPS

Cumulative impact on rivers (National Park Mavrovo)

Project Layout for the Lukovo Pole area

Scheme of Boskov Most system (Hydropower project) – Final design

Zoning within the National Park Mavrovo (draft version)

Zoning of the Mavrovo National Park. Spatial plan of the National Park Mavrovo (1988)

FIGURES

Figure 1: The crown of the dam would be located between the lower and the second pole (\Leftarrow) of the electric line on the right-hand slope, with the crown stretching across a length of 335 m. © R. Brunner

Figure 2: The Lukovo Pole Lake would stretch across three km to the north east (left) and flood the valley (right) next to the border with the Republic of Kosovo. © R. Brunner

Figure 3: An existing steel siphon would be integrated into the HPP system. The picture also shows the present state of the access road to the Lukovo Pole site. The Radika riverbed on the right is dry. © R. Brunner

Figure 4: Left: The meadow would disappear under the Tresonce Lake. The small chapel (right) would be transferred to another location. © R. Brunner

Figure 5: Left: the Mala river today. Right: Explaining the situation during the appraisal. © R. Brunner

Figure 6: Left: Small HPP near Tresonce. The pressure pipe runs under the sandy slope. Right: The outlet of the small HPP (left) and the river with a reduced discharge (right). This HPP is located inside the National Park Mavrovo. © R. Brunner

Figure 7: Radika river upstream Crn Kamen, the water discharge at Crn Kamen intake and the Radika river downstream (left to right). The Radika river is designated as zone for sustainable use in its total length inside the National Park Mavrovo. © R. Brunner

II. REPORT BY MR ANDRÁS DEMETER

THE BALKAN LYNX: THE SPECIAL RESPONSIBILITY OF THE MAVROVO NATIONAL PARK IN THE CONSERVATION OF A FLAGSHIP SPECIES

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Background

According to the latest comprehensive review of the statuses of large carnivore species in Europe, the Balkan lynx is the smallest and most threatened native Eurasian lynx population (Kaczensky *et al.* (2012^{37, 38}) Chapron *et al.* 2014³⁹, IUCN Red List 2015⁴⁰). The newest global Red List assessment of 2015 for the Eurasian lynx states: “The European population with the greatest conservation concern is the Critically Endangered Balkan Lynx subpopulation”.

It has been shown to be morphologically and genetically very distinct from the other Eurasian lynx populations in Europe (von Arx, 2015⁴¹, Buresh 1941, Miric 1978⁴²), and is considered by several authorities on lynx biology to be a separate subspecies, *Lynx lynx balcanicus* (such as in the taxonomic notes at the beginning of the new assessment, IUCN Red List 2015⁴³). It is listed as a subspecies (under the name *ssp. martinovi*) in the national catalogue of species in Mavrovo⁴⁴. One of the lead experts of the government and the EBRD, Prof. Svetozar Svetovski questioned the taxonomic status of the Balkan lynx during discussions of the appraisal visit. However, irrespective of its status in nomenclatural terms, it is a distinct phylogenetic lineage of the Eurasian lynx (Breitenmoser, 2011⁴⁵) and should be regarded a conservation unit, and as such it requires special attention.

After a dramatic decline in the 19th- 20th centuries, the present total size of the population is estimated to be only about 27-54 independent (adult plus subadult) individuals, corresponding to about 20–39 mature individuals (maximum number, probably an optimistic estimate based on the lynx density in the core area of the population (Mavrovo NP). It is divided into two distinct distribution nuclei: a) in northern Albania and the bordering areas in Montenegro and Kosovo and b) and the western, north-western part of "the former Yugoslav Republic of Macedonia".

³⁶ The contents and views included in this report are the opinion of the author as a nature conservation expert and do not necessarily reflect the official position of the European Commission.

³⁷ http://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/task_1_part1_statusofcineurope.pdf

³⁸ http://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/task_1_part2_species_country_reports.pdf

³⁹ Chapron *et al.* 2014. Recovery of large carnivores in Europe's modern human-dominated landscapes. *Science* 346, 1517-1519.

⁴⁰ <http://www.iucnredlist.org/details/12519/0>

⁴¹ http://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/10_Arx_Cross-border_lynx_conservation_in_the_Balkans.pdf

⁴² http://www.catsg.org/balkanlynx/02_status/2_3_taxonomy/taxonomy.htm

⁴³ <http://www.iucnredlist.org/details/12519/0>

⁴⁴ http://www.undp.org/content/dam/the_former_yugoslav_republic_of_macedonia/docs/Biodiversity.pdf

⁴⁵ Breitenmoser U. 2011. Genetic status and conservation management of reintroduced and small autochthonous Eurasian lynx *Lynx lynx* populations in Europe. Report on an international workshop to the Swiss National Scientific Foundation, 9 pp.

Knowledge about the Balkan lynx had been very scarce before the Balkan Lynx Recovery Programme, implemented by Albanian, "the former Yugoslav Republic of Macedonia" NGOs in collaboration with Swiss, German and Norwegian partners, was launched in 2005 and now is in its third phase⁴⁶.

In central-north Albania a few lynx occur in the Munella Mt. and in its surroundings where no reproduction has been confirmed, and in the Shebenik-Jabllanica NP on the eastern border with "the former Yugoslav Republic of Macedonia"⁴⁷. The northern part of Albania potentially hosts a few individuals. In Kosovo^{*48} a lynx was camera-trapped in the Prokletije Mt. in March 2015, apart from which there are only 30-40 years old records from the southern border with "the former Yugoslav Republic of Macedonia" and from the western part bordering with Albania and Montenegro. In Montenegro, two individuals killed in 2002 were confirmed at the southern border with Albania and Kosovo^{*} but the current presence of lynx is uncertain. In Greece its presence is questionable.

In "the former Yugoslav Republic of Macedonia", lynxes occur in the western part of the country, mainly in the areas in and between the national parks Mavrovo, Galichica and Pelister (Karaorman, Ilinska-Plakenska Mts.), but most probably also in the Shar Planina Mts. bordering with Kosovo^{*}. In December 2010, a camera-trapping survey revealed individuals in the central-north part of Macedonia (Jasen PA) (Melovski et al., 2013⁴⁹), however, they could not be confirmed in 2014. The latest estimate published by the Statistical Office of "the former Yugoslav Republic of Macedonia" in 2010 put the population size at 39 individuals.

More robust estimates of Balkan lynx densities come from three intensive camera-trapping surveys in the core area of the Mavrovo NP. In 2008, 2010 and 2013 (study area ~ 400 km²) revealed a minimum number of 7 to 9 independent individuals, and a population density of 0.83±0.25 individuals per 100 km² (Melovski et al. 2008⁵⁰). Preliminary results of camera-trapping in 2015 resulted in 8-9 lynx being pictured, indicating a stable population size in the park and its vicinity.

The above data indicate that "the former Yugoslav Republic of Macedonia" bears a special responsibility for the survival of the Balkan lynx, as it hosts the last reproducing nucleus.

Conservation status of the Balkan Lynx

Main threats to Balkan lynx are small population size, poaching, reduction in prey base and degradation of habitats. Limited range, disturbance and collision with vehicles complement this list⁵¹.

⁴⁶ http://www.catsg.org/balkanlynx/01_recovery-programme/1_9_newsletter/BLRP_Newsletter_01-2013.pdf

⁴⁷ Trajçe, A., Hoxha, B., Trezhnjeva, B. & Mersini, K. 2014. Munella Mountain. Summary of findings from the Balkan Lynx Recovery Programme. Protection and Preservation of Natural Environment in Albania, Tiranë. <http://www.ppnea.org/Summary-findings-Balkan-Lynx-Report-PPNEA.pdf> and summary as first article in the Newsletter 01/2014 http://www.catsg.org/balkanlynx/01_recovery-programme/1_9_newsletter/BLRP_Newsletter_01-2014.pdf

⁴⁸ *This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence. *This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

⁴⁹ Melovski D., Ivanov, Gj., Stojanov, A., Trajce, A., Hoxha, B., von Arx, M., Breitenmoser-Wursten, Ch., Hristovski, S., Shumka, S. & Breitenmoser, U. 2013. Distribution and conservation status of the Balkan lynx (*Lynx lynx balcanicus* Bureš, 1941). IV Congress of Ecologists of the Republic of Macedonia with international participation Special Issue. Ohrid, Republic of Macedonia.

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⁵⁰ Melovski, D., Ivanov, Gj., Stojanov, A., Trajce, A., Zimmermann, F., von Arx, M. 2008. First camera-trap survey in the National Park Mavrovo, Macedonia. I International Conference on Biological and Environmental Sciences, Republic of Albania: 312-315. http://www.catsg.org/balkanlynx/01_recovery-programme/1_7_conferences/tirana-sept-08/tirana-sept-08.htm

⁵¹

http://ec.europa.eu/environment/nature/conservation/species/carnivores/pdf/task_1_part2_species_country_reports.pdf

The 1990-1995 as well as 1996-2001 Pan-European assessments, made by experts from the regional countries, indicated a decrease for both population size and trend of the Balkan Lynx. The latest assessment carried out within the framework of the Balkan Lynx Recovery Programme⁵² in "the former Yugoslav Republic of Macedonia", Albania, Kosovo and Montenegro, taking into account the local ecological knowledge, concluded that at present the population size and area of occupancy have stabilised. However, the Balkan lynx population still falls in the IUCN Red List category "Critically Endangered - CR" under criterion (D) - the number of mature individuals is estimated to be less than 50. The IUCN Red List of Threatened Species⁵³ will be officially updated in November 2015 to include an assessment of the Balkan lynx (Manuela von Arx, Dime Melovski, pers.com.)

Legal protection

In "the former Yugoslav Republic of Macedonia", the species *Lynx lynx* is a strictly protected by the Law on Hunting (Official Gazette of RM 26/09) and the List of Strictly Protected Species (Official Gazette of RM 139/11) according to the Law on Nature Protection (Official Gazette of RM 67/04).

The species *Lynx lynx* is listed in Appendix III of the Bern Convention on the Conservation of European Wildlife and Natural Habitats, which requires, under Article 7.1, that "Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the protection of the wild fauna species specified in Appendix III"⁵⁴.

In light of "the former Yugoslav Republic of Macedonia"'s status as a candidate country to the EU, the Habitats Directive (**Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora**⁵⁵) is also relevant. *Lynx lynx* is listed in Annex II, **requiring designating the most appropriate sites hosting this species as Special Areas of Conservation under Article 2.1 of the directive. In addition, it is also listed in Annex IV, for which species a system of strict species protection under Article 12 is required.**

A recovery strategy and two ("The former Yugoslav Republic of Macedonia" and Albania) National Action Plans for the Balkan lynx (Conservation Strategy and National Actions Plans for the conservation of the critically endangered Balkan Lynx (T-PVS/Inf (2011)33 and T-PVS/Inf (2011)34)⁵⁶ have been presented to the Bern Convention as results of several planning workshops.

The 31st meeting of the Standing Committee in Strasbourg in 2011 took note of the results of the strategic planning workshops and encouraged both states to implement them without delay, as well as to collaborate as appropriate to achieve the successful recovery of the lynx populations in the region⁵⁷. However, follow-up actions by the relevant national ministries are still pending.

⁵² http://www.catsg.org/balkanlynx/20_blx-compendium/index.htm

⁵³

http://www.iucn.org/about/work/programmes/species/our_work/the_iucn_red_list/iucn_red_list_news/?21561/Conservation-successes-overshadowed-by-more-species-declines--IUCN-Red-List-update

⁵⁴

<https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=0900001680078af6>

⁵⁵ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043>

⁵⁶

<https://wcd.coe.int/com.instranet.InstraServlet?command=com.instranet.CmdBlobGet&InstranetImage=1979317&SecMode=1&DocId=1826416&Usage=2>

⁵⁷

<https://wcd.coe.int/com.instranet.InstraServlet?command=com.instranet.CmdBlobGet&InstranetImage=2263468&SecMode=1&DocId=1865310&Usage=2>

The significance of Mavrovo National Park for the Balkan Lynx

According to recent scientific information, the Mavrovo National Park and its immediate surroundings is the only area in the entire distribution range of the Balkan lynx where reproduction has been documented by camera-trapping young individuals since the Balkan Lynx Recovery Programme has started⁵⁸. It is hence the last remaining functional population nucleus. All lynx discovered in other areas within "the former Yugoslav Republic of Macedonia" or in the neighbouring countries are likely to be dispersing individuals from this core area. Only in the Munella Mts in Albania, another small group of resident lynx has been detected, but so far, no reproduction has been confirmed there.

As regards the two planned hydropower project in Mavrovo National Park, Lukovo Pole possibly poses less threat for the lynx. During the site visit, the representatives of the NGO informed us that lynx cross the open alpine habitats around the site only occasionally. Therefore the impact of this planned project on the lynxes may be considered limited, unless the construction works and the extraction and transport of materials of the dam and the haulage of equipment from lower down the Radika river would cause significant disturbance. However, the information on these aspects provided for the visit was limited, so at this stage no conclusion can be drawn.

In contrast, the Boskov Most HPP site is situated in prime lynx habitat and known to be used by several lynxes as three males have been monitored by GPS tracking and young lynxes have also been camera-trapped in the area.

The planned hydro power plant developments at the Boskov Most site of the Park has been considered by experts in some of the documents not have a large-scale long-term impact on the lynxes, since they are known to have very large ranges. The three GPS-collared males have been found to cover large areas (territories) of 341 km², 434 km² and 324 km², respectively^{59,60}. However, the change of the landscape with the possibly increased human presence and the greater use of the area and around the planned reservoir on the river Mala Reka may cause the lynx to avoid the valley, which they have been documented by GPS-tracking to visit and cross during their movements. This is the core area of the population and important for reproduction. Although disturbance in a male's territory may cause fewer problems than disturbance in an area where females raise kittens, the Boskov Most seems to be important for the reproduction of the lynxes and hence it is a highly sensitive area.

The short-term impacts, however, might be very significant given the volume and intensity of the planned construction works which might affect a much larger area, and which could lead to long-term impacts (loss of habitat around the dam and the reservoir). The short-term disturbance from the civil engineering works, although temporary (a number of years), may have a decisive negative impact on the lynx. According to documentations provided by ELEM for the site visit, ca. 166 000 m³ of material would need to be transported to build the 33 m high dam which would create a reservoir of some 22 hectares in the valley of the river Mala. Some of the technical details of these works are not yet elaborated but some insight can be gained from the Environmental and Social Impact Study of October 2011. Certainly a very large amount of earthworks will be needed with accompanying heavy lorry traffic of carrying the materials for the dam (and conveyor belts carrying materials), and equipment haulage. In addition, 6 water intakes are planned from distances of 1.5 to 4.2 km upstream, and water from these headwaters / springs would be carried through pipes and aqueducts to the dam. These additional works would impact a much larger area than the reservoir. A head-race tunnel of 8.7 km would be constructed through the mountains to a surge tank, from where 2 pipelines would carry water to the power-generating station just at the border of the NP. A total of about 20 km of roads would have to be upgraded or built for the contraction and maintenance works, which would further increase access of people to and the level of disturbance in the area.

In spite of the significance of the Mavrovo NP for the Balkan lynx recognized by scientists and conservationists, it is of interest to note how the recognition of the importance of the planned project

⁵⁸ <https://www.facebook.com/balkanlynx>

⁵⁹ <https://www.facebook.com/balkanlynx>

⁶⁰ http://www.catsg.org/balkanlynx/01_recovery-programme/1_9_newsletter/BLRP_Newsletter_02-2012.pdf

for the conservation of the Balkan lynx evolved through documents providing the basis for the environmental impact assessments. Several of the earlier documents examined had not paid sufficient attention to the possible impact of the planned project on the Balkan lynx population. The July 2011 non-technical summary of the project⁶¹ on pages 16-17 makes a very brief superficial mention of possible impact on the lynx and says that several (unspecified) actions will be taken to reduce disturbance to the minimum. The Environmental and Social Impact Study of October 2011 on page 119 gives a greater recognition of the vulnerable state of the Balkan lynx population and of Mavrovo's significance, and not only mentions in broader terms that the lynx inhabits the Radika valley watershed but also specifies that the project area is used by lynx.

It is important to consider further steps and documentation produced in a project complaint mechanism of the European Bank for Reconstruction and Development, the co-financer of the project. The eligibility assessment report⁶² of a complaint filed by an NGO stated that the Bank's response to the complainant to the alleged incompleteness of ESIA stated that it was determined by experts, and agreed by the international EASIA expert, there was no need to describe the mammals and lynx in great detail since there would be only limited (if any) impact: in fact the lynx and their prey were described primarily because of the lynx's great rarity and importance as national symbol and to make it clear this was not critical habitat for the lynx. As a result, the ESIA (sections 5.1.1.1 and 5.13.5.4) mentioned that they are found in the area but did not dwell on their presence or importance. Similarly, and for the same reasons, the evaluations of impacts during construction (section 7.10.0.2.1) and operation (7.10.2.2.1) each simply state there would be potential impacts on lynx and other mammals. Thus the assessment was considered adequate for the level of potential impacts (pages 2-3 of Response to PCM Complaint, 15 Dec. 2011 Annex 3). The response cited in the document also stated that the construction works would mainly stop in winter when the lynxes' activities might include large areas of the project site.

However, analysis in the project compliance report⁶³ examining the evidence provided by the complaint and the response from the Bank found that (page 22-23) the ESIA considers the Balkan lynx "critically endangered", and the impact on mammals will be disturbance due to fragmentation by the building of roads; noise due to excavation, mining and movement of heavy earth vehicles; reduction of habitats due to the clearing of construction sites; and possible illegal hunting in the project area not only during the construction phase but with increased access, also possibly later on. It acknowledges that the Project will alter the movement of large carnivores, including the Balkan lynx. The ESIA merely states that '[a]dditional measures will be prescribed to provide smooth movement of animals in the region', though no details are included on such measures.

Neither are detailed measures to this effect set out in the Environmental and Social Action Plan (ESAP). The ESIA also concedes that '[t]he reservoir, siphons and other facilities will be new barriers which have to be overcome' as will roads and increased human accessibility, but it concludes that such interference will be 'small' in terms of its significance."

The appropriate mitigation measures during both the construction and operation of the project cited from the ESIA include-comprehensive bio-monitoring and the installation of large mammal photo-traps to inform the Construction Management Plan; the introduction of various measures for the care of injured fauna; the progressive rehabilitation of the pipeline easements in order to minimize fragmentation and maintain movement corridors for mammals (along with the ongoing monitoring of movements of lynx and other large carnivores); the implementation of compensation measures to offset habitat loss; the introduction of controls on road lighting and other outdoor lighting; the introduction and effective enforcement of very strong hunting controls; and the implementation of a Noise and Vibration Management Plan.

61 <http://www.ebrd.com/english/pages/project/eia/41979nts.pdf>

62 http://www.ebrd.com/downloads/integrity/Boskov_Most_final.pdf

63 http://www.ebrd.com/downloads/integrity/Boskov_CRR.pdf

The conclusion was: "Therefore, the biodiversity assessment can generally be regarded as being quite comprehensive and rigorous in its treatment of the potential impacts of the Project on large mammals, though the ESAP contains very little detail on the actions required to operationalise the mitigation measures proposed above."

Finally, the conclusions of the Compliance Review report include:

- "Though the Compliance Review Expert has concluded that the Bank was not in full compliance with the ESP as regards the assessment of the biodiversity impacts of the present Project, it is only necessary in the present case to recommend that the mitigation measures identified in the ESAP, and any further measures arising under the due process of national law, are rigorously implemented. The reasonably comprehensive desk-based studies undertaken and the complete suite of mitigation measures stipulated ought to be sufficient to ensure the effective application of the requisite standards of protection of biodiversity resources in the present case.
- In ensuring implementation of the mitigation measures stipulated in the ESAP, the Bank should have regard to the outcome of the ongoing revalorization of the Mavrovo National Park by the Ministry of Environment and Physical Planning and any new or additional management goals established thereby."

In the biodiversity survey of the pre-construction phase of the Boshov Most project⁶⁴ required after the review, more attention was devoted to the Balkan lynx (pages 72-73), recognizing the particular conservation interest for "the former Yugoslav Republic of Macedonia". The total population size, however, is given as ca. 100.

The report considers that in the area of HPP Boskov Most project, thanks to prey abundance during summer and autumn, lynxes move and hunt mostly upstream of the planned dam, beyond the area directly affected by the project development where the most intensive activities are expected during construction phase and consequently potential disturbance of game. Male lynx have significantly larger home range than females and they have been seen in different spots of the area.

During winter, in case of high snow cover, chamois, after roe deer the main prey of the lynx, move down to the boundary of the forest or in the very forest areas, which implies that the lynxes also visit the same localities. The report considers that since construction activities will not be carried out during winter, there is no probability for lynx disturbance during this period, even in case of its movement within the range area of the project.

In the context of direct loss of terrestrial habitats resulting from implemented project of HPP Boskov Most, taking into account that the lynx have large home ranges, the report said that "conclusion may be drawn that the impact on the survival of this species from the proposed project for establishment of HPP Boskov Most is of minor significance". Additional arguments to support this conclusion are given as the availability of prey in the whole territory of the national park and the fact that the impacted area the project HPP Boskov Most affects the lower courses of the rivers Tresonechka and Jadovska and downstream areas of the watershed of Mala Reka, in the extreme southern border peripheral zone of Mavrovo. The report also points out that the project area already is under anthropogenic impact and land use (two settlements, noise and traffic on local roads), as well as due to habitat fragmentation (roads, long distance power lines), already prior to the project. The authors of the report consider that the existence and the current management of the NP will ensure the survival of the lynx even if the project area is under limited impact in their view.

These findings are challenged by the complainant who refers to recent scientific studies carried out in the project area and not used by the authors of the report⁶⁵. On pages 6-7 it is pointed out that the main prey of the lynx in the area is roe deer and not chamois and GPS-tracking shows that the lynx does use the project site since its habitat preference is forest and transitional woodland-shrub.

⁶⁴ http://www.elem.com.mk/images/stories/ekoloski_izvestai_en/Annual%20Report%20on%20pre-construction%20biodiversity%20survey%20--%20HPP%20Boskov%20Most%20Macedonia.pdf

⁶⁵ http://www.ekosvest.com.mk/docs/NGO%20dokumenti/NGO_comments_Boskov_biomonitoring.pdf

Finally, the Standard Data Form for the proposed Emerald site MK0000007 – Mavrovo (date: September, 2011) lists *Lynx lynx* as permanently present and common. The site assessments are A (very significant) for population, A (excellent) for degree of conservation, C (not isolated in extended distribution range) for isolation and A (excellent value) for global assessment of the site. However, the free text on the quality and importance of the site does not mention the Balkan lynx.

Conclusions about the impact of the planned Boskov Most HPP projects on the Balkan lynx

Although the planned construction site would cover only a very small part of the National Park, the current analyses have not documented in a convincing manner that the associated massive construction works of not only the dam itself but the construction or upgrading of roads and the construction of 6 intakes, even if temporary (several years) would not pose a high level of risk of major disturbance to and displacement of both to the prey species of the lynx and the lynx individuals themselves. Statements made during the meetings also gave indications that the surrounding area of the reservoir would be opened for developments and these aspects have not been properly addressed in the assessments.

Since such an additional stress to a population in such a critical state must be taken properly into account in the assessments, further research by recognized scientist using the most up-to-date techniques will be needed to have a much better understanding of the impact of the planned project on the Balkan lynxes. In order to assess these biological data, further technical details of the constructions works (such as building of roads, haulage of construction material, blasting of the tunnel) will be needed to allow a more precise assessment of the levels and kinds of impacts on the lynx. The ecological impact assessment of the project, especially the considerations of the process of the construction works, will have to be updated in light of the further technical details and the updated scientific information before the project can proceed without underestimated impact. If plans for mitigation measures are made, they must be disclosed in details and widely discussed with scientists and other stakeholders to evaluate their feasibility and efficacy.

Before proceeding with any of the above-mentioned actions, following the precautionary principle, the project as currently designed must be abandoned until the conservation status of the Balkan lynx population is brought back to a safe level and until when the Mavrovo National Park is no longer the only known core area of reproduction of this species. This conclusion for the Balkan lynx does not prejudice any other conclusions concerning the ecological integrity of the project sites with respect to other biological and hydromorphological features, for the protection of which the national park has been designated.

Management planning of the Mavrovo National Park for the Balkan lynx

Irrespective of the hydropower plant projects, the Government of "the former Yugoslav Republic of Macedonia" and the management authority of the Mavrovo NP must recognize their special responsibility for the conservation of the Balkan lynx and formulate policy and take measures accordingly. Within this framework, the management plan of the Mavrovo National Park should place greater emphasis on the special role that this protected area plays in the recovery of the Balkan Lynx. The next 5-10 years absolutely crucial for the survival of the Balkan Lynx.

The draft new management plan of Mavrovo provided for the visit briefly mentions the lynx but does not highlight its very poor conservation status and the national park's significance for its conservation.

More dedicated efforts should be made, based on sound scientific data, to implement concrete conservation measures, such as well- trained park rangers monitoring lynx presence and stopping illegal activities and disturbance to the animals. The mission of the NP should include the outstanding task of caring for a critically endangered species, and this new approach and increased outreach to the public can also be turned into a win-win situation in terms of ecotourism.

If the Mavrovo "nucleus" of reproducing population is successfully preserved, it could in the long-term serve as the basis for the recovery of the Balkan lynx. According to habitat models, only 17% of the historical range of distribution still offers suitable habitats but could host up to 275

resident individuals (Ivanov, 2014; see also BLRP Newsletter 02/2014⁶⁶). Such a range with good conservation measures could allow to down-list the Balkan lynx from Critically Endangered to Vulnerable, which would be a major conservation success for both "the former Yugoslav Republic of Macedonia" and the other range states.

⁶⁶ Ivanov Gj. 2014. Spatially explicit model for habitat suitability and potential distribution of the critically endangered Balkan lynx (*Lynx lynx balcanicus* Bures 1941). MSc Thesis. Institute of Biology, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University, Skopje, Republic of Macedonia. Article in BLRP Newsletter 02/2014
http://www.catsg.org/balkanlynx/01_recovery-programme/1_9_newsletter/BLRP_Newsletter_02-2014.pdf

III. REPORT BY MR ALEKSANDAR DUTSOV

**On-the-spot appraisal to Mavrovo National Park, (FY) Republic of Macedonia,
24/25th June 2015**

Report by Aleksandar Dutsov (Bulgaria),
Observer to the visit, representing IUCN/ BBSG member
Final version
Sofia, 01st October 2015

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INTRODUCTION

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. In 1952 the territory of National Park Mavrovo increased 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. With proposal for new proclaiming as a National Park in February 2015 by Ministry of Environment and Physical planning.

According to Article 66 paragraph 1 of the Law on Nature Protection, the category of national park is the second category of protected area.

According to Article 72 of the same law, a national park is spatial natural area of land or water, which includes one, or more preserved or insignificantly altered ecosystems, with particular multiple natural values, established for the protection of ecological processes, as well as the species and ecosystem characteristics complementary for the area.

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).

Mission was based upon intent of ELEM with EBRD and governmental funding to build two hydro power plants (HPP) “Boshkov most” and “Lukovo pole” in the territory of the park.

The observer’s report has been compiled on the basis of available documentation, EIA, scientific papers, project reports, discussions with the parties involved and on site observations. It is an independent statement based on the level of expertise of the observer. Due to the limited time frame, the report had to concentrate on the most important documents. For more information, please see the references in the annex.

As author I would like to express my gratitude to the representatives of the Ministry of Environment and Physical Planning, ELEM, EBRD, NGOs and scientific institutions, as well as the representatives of the National Park Mavrovo and the communities Mavrovo-Rostushe and Debar.

EXECUTIVE SUMMARY

Currently, the R Macedonia is planning to invest in renewable energy sources and storage on its territory with emphasis on hydro power plants. It is planned to have about 22 HPP constructed in the Mavrovo National Park area alone. 20 of them are small-scale hydropower and storage projects and two of them – the Hydro power plants “Boshkov Most” and “Lukovo Pole” are large scale projects with accumulation of water from several rivers and building dams. Out of the planned 22 projects so far two small scale hydro power plants have already been constructed.

Boskov Most hydropower plant is to be located near the town of Debar in the upper Mala Reka valley in the southernmost part of Mavrovo National Park. The Project intends to utilise the tributaries that combine to make up the river Mala Reka and will include a dam (33 metres high) and reservoir and the construction of a tunnel and headrace from the reservoir to the hydro power plant near the village of Tresonce. Total capacity shall be about 70 MW and the annual generation is forecast to be around 118 GWh. Main source of funding for this dam project is the EBRD – the European Bank for Reconstruction and Development. In November 2011 the EBRD approved a 65 million EUR credit to the project promoter ELEM for the implementation of the project. The overall project costs are estimated to be 107 million EUR.

About 80% of the project will be situated in the territory of the Mavrovo National Park.

Lukovo Pole hydropower plant is planned to be constructed close to the Macedonian border with Kosovo. The project comprises on the one hand the construction of an about 20 kilometers long covered channel, running slope parallel, to transfer water from Korab catchment to Lukovo Pole storage and Crn Kamen river and an about 70 meter high dam at Lukovo Pole that will have a storage capacity of about 39 million cubic meters, and on the other hand additionally a small hydropower project (Crn Kamen) of about 5 MW downstream of Lukovo Pole shall be constructed. The Lukovo Pole project shows many similarities with Boskov Most. The water will be diverted

from several tributaries to the Radika River, which will be channeled to the reservoir through a pipe system. The main funding source for this project is the World Bank.

National Park Mavrovo is declared as strictly protected area and as stated in the national law with IUCN category II. As a protected territory of such a category, a national park should be managed prior to the preservation of intact natural ecosystems, protection of source populations of endangered species and their habitats.

Macedonian government had ratified Convention on the Conservation of European Wildlife and Natural habitats (BERN Convention), and therefore is responsible for preserving wild flora and fauna, especially threatened one that need international effort to be preserved.

FACTS AND FINDINGS

According to statement of Ministry of Environment and Physical Planning and according to Article 66 paragraph 1 of the Law on Nature Protection, the category of national park is the second category of protected area.

According to the criteria of IUCN – *Category II National park protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.*

Category II areas are typically large and conserve a functioning “ecosystem”, although to be able to achieve this, the protected area may need to be complemented by sympathetic management in surrounding areas.

1 The area should contain representative examples of major natural regions, and biological and environmental features or scenery, where native plant and animal species, habitats and geodiversity sites are of special spiritual, scientific, educational, recreational or tourist significance.

2 The area should be of sufficient size and ecological quality so as to maintain ecological functions and processes that will allow the native species and communities to persist for the long term with minimal management intervention.

The composition, structure and function of biodiversity should be to a great degree in a “natural” state or have the potential to be restored to such a state, with relatively low risk of successful invasions by non-native species.

These state the philosophy of protecting large ecosystem and preserve their functionality intact.

Functionality of fresh water ecosystems in the park have been already violated for the purpose of the existing hydro energy system (HES) “Mavrovo”, where water have been cached and derived to Mavrovo reservoir and low river bed with insufficient water level to maintain sustainable fauna, which changed the biodiversity by decreasing the number of species and specimens of fresh water vertebrates and invertebrates (e.g. trout and crayfish). The present reports on biodiversity are presenting the parameters of fresh water ecosystems at the present (moment of field research), but there are missing criteria to compare natural parameters of these rivers before HES “Mavrovo”. Without references it is impossible to assess the level of impact already done to natural river condition.

Fish

In the rivers in the planed accumulation HPP Boshov Most are registered only 2 species of trout. Both are with conservation importance;

Salmo obtusirostris Heckel with synonyms Salmo monenegrinus Karaman is listed in IUCN list as endangered species.

Salmo farioides Karaman. This species probably represents an artificial assemblage of several species. *Salmo* occurring from Alfios (Peloponnese) possibly refer to this species. Status of threat: near threatened. Not in IUCN list but listed in LIFE.

Hydro power plants are causing changes in river hydrologic regime, which affects the reproduction. Observed small HPP in the Mavrovo NP are already effecting trout populations since the ecological study of the accumulation is registering small number of individuals. Probably reproduction occurs in some of tributaries since mainstream dries in low water due to several small HPP. Planed dam wall, have not foreseen any fish passes, and therefore will block migrations upstream for reproduction. Artificial lakes are habitat for different fresh water species, competing local fast water fauna.



Reptiles and amphibians

List of reptiles and amphibians in the park consist of 27 species. Two species of amphibians and two of reptiles are listed in Annex II of 92/43 directive and 5 species amphibians and 13 species reptiles are in Annex IV of Habitat directive. Amphibian species are vulnerable to changes in hydrology as their reproduction is strictly related to water. Amphibians and Reptiles could be affected by the channels of the accumulation, since there is no final plan if the accumulation will collect water with open channels or with pipes, we have to consider variant with channels, which are natural trap for small animals.

Bird Species

Important Bird Areas In the frame of the park there are two Important bird area based in criteria of Bird Life International: First one is Radika river catchment with IBA CODE; MK002; and partially Shar Planina with IBA Code: MK001 (Velevski et all. 2010) Both sites are evaluated wit criteria A3 and B2 (Global and European importance).

Shar Planina list totally 130 species (Melovski et all. 2010), some of them with significant importance.

List of triggering and other important bird species in the IBA Šar Planina Mountain

Species	Population	Criteria
<i>Prunella collaris</i>	20-40	A3
<i>Tichodroma muraria</i>	5-10	A3
<i>Pyrhacorax graculus</i>	100-200	A3
<i>Montifringilla nivalis</i>	10-30	A3
<i>Aquila chrysaetos</i>	3-4	B2
<i>Alectoris graeca</i>	50-150	B2
<i>Crex crex</i>	20-50	B2
<i>Bubo bubo</i>	5-10	B2
<i>Pyrhacorax pyrrhacorax</i>	Common	B2?
<i>Gyps fulvus</i>	1-10 ind.	N
<i>Falco peregrinus</i>	2-5	N
<i>Eremophila alpestris balcanica</i>	Common	N

Radika River Catchment: The list of registered bird species amounts to over 140 species (Veleviski et al. 2003a, Micevski 2010). Triggering species are the Golden Eagle (4–6 pairs) and Eagle Owl (8–15 pairs),

List of triggering and other important bird species in the IBA Radika River Catchment

Species	Population	Criteria
<i>Prunella collaris</i>	10-50	A3
<i>Tichodroma muraria</i>	10-20	A3
<i>Pyrhcorax graculus</i>	100-200	A3
<i>Montifringilla nivalis</i>	10-30	A3
<i>Aquila chrysaetos</i>	4-6	B2
<i>Crex crex</i>	30-100	B2
<i>Bubo bubo</i>	8-15	B2
<i>Monticola saxatilis</i>	30-100	B2
<i>Falco tinnunculus</i>	Common	B2?
<i>Gyps fulvus</i>	5-10 ind.	N
<i>Eremophila alpestris balcanica</i>	Common	N
<i>Pyrhcorax pyrrhcorax</i>	Frequent	N

Of particular interest is Radika river catchment territory, which will be flooded under “Lukovo pole “ HPP. The area is feeding place for eagle owl, golden eagle and other species in the table above with European importance.

In the report: Ornithofauna of the NP Mavrovo; Contractor: UCODEP, Unity and Cooperation for the Development of Peoples; Project: Protection of Environment, Economical Development and Promotion of Sustainable Eco- tourism in the National park Mavrovo, by: Seo, prof. Dr Branko Micevski - Skopje , November 2010. For the area of Lukovo Pole and radika river there are several species of conservation status listed: *Aquila chrysaetos*, *Coturnix coturnix*, *Actitis hipoleucos*, *Gyps fulvus*, *Anthus trivialis*, *Sturnus vulgaris*, *Perdix perdix*, *Cinclus cinclus* and the most interesting and important one is the corncrake (*Crex crex*). Corncrake is Bern Convention Appendix II species, Species of highest priority for protection because it is a globally threatened species. During on-the-spot appraisal to Mavrovo National Park 24-25 June 2015 several birds were recorded displaying in flooding zone of « Lukovopole », which is not reported in ESIA (Environmental and Social Impact Assessment). There is lack of information for the size of Mavrovo population and what number of couples will lost its habitats. According to personal communication (Veleviski M 2015) this is one of the largest breeding populations in “the former Yugoslav Republic of Macedonia” and therefore flooding of Lukovo Pole will affect it. In that case official study is needed to assess the size of population in Lukovo Pole, number of reproducing pairs reported, assessing the percentage of nesting birds on Mavrovo scale and National level; Forecast model of flooding on the effect of flooding on the local population and percentage of loses to the national population.

Lukovo pole is also important feeding, resting and reproduction site for the other species listed above. With highest conservational importance is golden eagle (*Aquila chrysaetos*) and gryfon vulture (*Gyps fulvus*). These species are using Lukovo pole as feeding ground, and therefore study should be conducted on the effect of changing the habitat type, since effect of changing habitat type has proven to be with negative effect on birds of prey populations.

LUKOVO POLE



For the area of HPP Boshkov Most available data is from Ecological Monitoring of River system of HPP Boskov Most (summer, autumn, winter spring) report. The most important from all species of birds is again corncrake (*Crex crex*), reported for the upper stream of Yadovska reka, which is not in the range of HPP Boshkov Most direct influence. There are 75 registered species during the summer monitoring, breeding in the area, 26 are with conservation status in Europe. From them 12 species are listed in Appendix II of the BERN Convention.

The from Ecological Monitoring of River system of HPP Boskov Most (summer, autumn, winter spring) reports 32 species of mammals from total 49 in Mavrovo NP (Студија за ревалоризација на заштитено подрачје Маврово, Oxfam), from all reported mammals 24 are with different protection status in Europe. From this 28 are listed as Least Concern in IUCN list, one is Near Threatened (*Lutra lutra*) and 1 is Data deficient (*Spalax leucodon*). For the area of Lukovo pole is lacking specific information for mammalian fauna.

Species

Ред Insectivora

- 1 *Erinaceus roumanicus*
- 2 *Talpa europaea*

Ред Rodentia

- 3 *Sciurus vulgaris*
- 4 *Arvicola terrestris*
- 5 *Apodemus flavicollis*
- 6 *Apodemus sylvaticus*

- 7 *Rattus norvegicus*
- 8 *Myoxus glis*
- 9 *Muscardinus avellanarius*
- 10 *Dryomys nitedula*
- 11 *Spalax leucodon*
- Ред Lagomorpha
- 12 *Lepus europaeus*
- Ред Carnivora
- 13 *Canis lupus*
- 14 *Vulpes vulpes*
- 15 *Mustela nivalis*
- 16 *Martes foina*
- 17 *Lutra lutra*
- 18 *Meles meles*
- 19 *Ursus arctos*
- 20 *Felis silvestris*
- 21 *Lynx lynx*
- Ред Artiodactyla
- 22 *Sus scrofa*
- 23 *Capreolus capreolus*
- 24 *Rupicapra rupicapra*

As a species connected to water bodies Otter (*Lutra lutra*) will be affected by change in river regime. In the final assessment there is not estimation on total otter population in Mavrovo NP and number of breeding pairs in the accumulation of HPP and what part of the population in the park will be affected. Otter need holes with entrance under water, and changing the river level will decrease the number of usable dens for reproduction. In the from Ecological Monitoring of River system of HPP Boskov Most (summer, autumn, winter spring) reports, there is lacking of mapping of otter reproduction sites, and the population size of affected rivers. Additional study and publication about otter species is missing and as result the effect of HPP Boshkov Most and Lukovo Pole could not be evaluated as losses from the Mavrovo population.

Brown bear (*Ursus arctos*) is species with high priority for EU. Macedonian population is part of Dinara-Pindos subpopulation in Europe estimated to around 3070 individuals (Brown Bear Specialist Group 2013). The species inhabits the area of planed investments and part of the individual territory of the individuals in the park will be lost. Additional negative effect will be caused by disturbance during the building phase and after by the recreational use of reservoirs (not described in project, bud described as desired development during meetings with local communities). In the available reports there is missing information on existing den sites by bears and more specific birth den used by females. More information is needed about loss of reproductive habitats. There is lack of data about the total size of the reproductive population, fragmentation barriers and bottlenecks and the cumulative effect of existing fragmentation. Candidate member countries have to maintain healthy reproductive populations.

In order to assess the effect of planed HPP we need to know the *Minimum viable population* (MVP) of the total bear population including neighboring mountains. MVP is the population size necessary to ensure between 90 and 95 % probability of survival in the next 100 years. Here, we've assumed a threshold of 250 adults (Wielgus 2002), based on population research on Grizzly Bears. A population includes all non-isolated (regularly exchanging individuals) source populations, stepping-stones and tiny populations. In this case to ensure the long-term survival we have to be sure that all connected (exchanging individuals' populations) should maintain a minimum of 250 reproductive individuals and they do not face fragmentation issues. *Source population* (SP) is a breeding group that produces enough offspring to be self-sustaining and that often produces excess cubs that must scatter to other areas. A SP must include more than 30 adults. *We need to ensure Mavrovo NP as SP, although it is potential SP (pSP)* - having a carrying capacity for more than 30 adults, but with unknown current population.

Eurasian lynx, Balkan subspecies (*Lynx lynx balcanicus*) – For the lynx population in Mavrovo NP, there are several studies published in scientific papers. The subspecies is clearly identified (Breitenmoser, 2008) and expert assessment and scientific results are clearly describing it as the most endangered from all subspecies, being subject of forthcoming listing in IUCN Red List. For the lynx all countries are bearing the responsibility to maintain Minimal Viable Population, as with the Balkan subspecies the threshold could be close to endangered genetic diversity since the total estimation is for 27-54 individuals. From Melovski et. all it is clear that the area of planned HPP “Boshkov Most” is the only one with proven reproduction and area where females are raising the offspring’s, which is giving high importance of that geographical area and its habitats and playing role of SP for recovery of this subspecies. Recommended full protection of site with limited disturbance in the area with perspective of SP and reproductive nucleus for remaining Balkan Lynx population.

CONCLUSIONS

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. With the territory of 72 416.8 ha (revalorization report) it hosts variety of animal and plant species, some of them with international conservation importance. As stated in the Law on Nature Protection, the category of national park is the second category. The natural beauty, variety of species and landscapes and its protective status define the role of Mavrovo NP as an area for preserving natural habitats at its original natural look with intact ecosystems to serve as source populations for recovering ecosystems and endangered species.

From all available studies and technical reports it is impossible to assess the level of influence from the foreseen hydro power plants: Lukovo Pole and Boshkov Most. There is no background information for the key areas for reproduction of brown bear, wolf, wild cat, trout species and some more and there is no way to properly assess the effect of construction work and HPP. For the extremely vulnerable in fresh water ecosystems *Astropotamobius torrentium* there is only vague data in the revaluation report that states this species is present in fresh waters in the park. There is lack of assessment of the influence of HPP building on this crayfish.

The HPP “Boshkov Most” clearly fits in the reproductive area of rarest of all lynx subspecies – Balkan Lynx.

Lukovo pole area is key reproduction site for corncrake.

The other unclear point was the statement of investor that there is not final decision on method of building of the accumulation – difference between pipes and open channels will affect a lot of small animals.

Detailed analyses on the effect on biodiversity are needed to ensure the existence of Mavrovo, as area of international importance, national park with category II IUCN, preserving taxa threatened from extinction.

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