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REGIONAL STRATEGY FOR SUSTAINABLE HYDROPOWER IN THE WESTERN BALKANS

Final report

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Contents

List of abbreviations and symbols

Abbr. & Symbols	Description / Meaning
ALB	Acronym used for Albania
a.s.l.	Above sea level
BiH	Acronym used for Bosnia and Herzegovina
BR	Background Report
CO2	Carbon Dioxide
CP	Contracting Party
CSO	Civil Society Organisation
DER	HPP with derivation
DG NEAR	Directorate-General for Neighbourhood and Enlargement Negotiations
EAF	Ecologically Acceptable Flow
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECS	Energy Community Secretariat
EIA	Environmental Impact Assessment
ELEM	Elektrani na Makedonija (a power utility of the former Yugoslav Republic of Macedonia)
EIB	European Investment Bank
EnC	Energy Community
ENVSEC	Environment and Security Initiative
EP BiH	Elektroprivreda Bosne i Hercegovine (a power utility of Federation BiH)
EPCG	Elektroprivreda Crne Gore (a power utility of Montenegro)
EP HZHB	Elektroprivreda Hrvatske Zajednice Herceg Bosne (a power utility of Croatian Community of Herceg Bosna)
EPS	Elektroprivreda Srbije (a power utility of the Republic of Serbia)
ERS	Elektroprivreda Republike Srpske (power utility of Republika Srpska)
ESIA	Environmental and Social Impact Assessment
EU	European Union
FBiH	Federation of Bosnia and Herzegovina, entity of Bosnia and Herzegovina
FIT	Feed-in tariff
GHG	Greenhouse gases
HEP	Hrvatska elektroprivreda (a power utility of Croatia)
HPP	Hydro power plant
ICPDR	International Commission for the Protection of the Danube River
IFI	International Financing Institution
IHA	International Hydro Association
IPA	Instrument for Pre-accession
IPF	Infrastructure Project Facility
IPF3	Infrastructure Project Facility - 3rd Technical Assistance Window
ISRBC	International Sava River Basin Commission
IUCN	International Union for Conservation of Nature
KESH	Korporata Elektroenergjitike Shqiptare (a power utility of Albania)
KOS	Acronym used for Kosovo
MCA	Multi-Criteria Assessment (a methodology used in the sub-project)

Abbr. & Symbols	Description / Meaning
MKD	Acronym used for the former Yugoslav Republic of Macedonia
MNE	Acronym used for Montenegro
Mott MacDonald-IPF Consortium	The Consortium carrying out the sub-project under WBIF-IPF3
NGO	Non-governmental organisation
PPA	Power purchase agreement
RB	River Basin
RES	HPP with reservoir (water accumulation)
RES	Renewable energy source
REV	Reversible HPP
ROR	Run-of-river HPP
RS	Republika Srpska, Entity of Bosnia and Herzegovina
SFRJ	Social Federal Republic of Yugoslavia
SE	South-East
SEA	Strategic Environmental Assessment
SER	Acronym used for Serbia
SHPP	Small hydro power plant
TA	Technical Assistance
ToR	Terms of Reference
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WBEC-REG-ENE-01	WBIF designation of this sub-project
WBIF	Western Balkans Investment Framework
WB6	Western Balkans consisting of 6 countries: Albania, Bosnia and Herzegovina, Kosovo, the former Yugoslav Republic of Macedonia, Montenegro and Serbia
WFD	Water Framework Directive (Directive 2000/60/EC)

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0 Preamble

The REGIONAL STRATEGY FOR SUSTAINABLE HYDROPOWER IN THE WESTERN BALKANS[1] — referred as "the Study" — is a sub-project under implementation by the WBIF-IPF3 Consortium led by Mott MacDonald, with the European Commission, DG NEAR D.5, being the Contracting Authority for the WBIF-IPF3 contract.

The six Western Balkan beneficiary countries comprise Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Kosovo*, Montenegro and Serbia - the WB6 region.

This Final report (FR) in the following is the final deliverable of the Study. It connects the 8 Background reports (BRs), each of which focuses on specific technical issues or professional areas related to hydropower development. It draws attention to the important cross-references between the BRs while highlighting important aspects of Study implementation, reports on the key issues identified in individual BRs, and provides the Consultant's main observations, and conclusions.

The Study recommendations and proposals for follow-up actions, extracted from individual BRs, are included as **Annex 1** to this Final report.

The BRs are integral part of the Final report as **Enclosures 1-8 (Annex 3)**. They can be read as standalone documents, and are provided as separate volumes. These are:

- Background report n° 1 (BR-1) – Past, present and future role of hydropower
- Background report n° 2 (BR-2) – Hydrology, integrated water resources management and climate change considerations
- Background report n° 3 (BR-3) – Environment considerations
- Background report n° 4 (BR-4) – Regulatory and institutional guidebook for hydropower development
- Background report n° 5 (BR-5) – Transboundary considerations
- Background report n° 6 (BR-6) – Grid connection considerations
- Background report n° 7 (BR-7) – Inventory of planned hydropower plant projects
- Background report n° 8 (BR-8) – Identification of potential sustainable hydropower projects

The approach taken in the preparation of the Final report is that the summary Study results should be comprehensible to a broad readership. Thus, in the Final report, all detailed information and professionally complex technical aspects are omitted. References are made to the BRs which should guide the more professional reader to the technical details.

* This designation is without prejudice to position on status, and is in line with UN Security Council Resolution 1244/99 and the International Court of Justice Opinion on the Kosovo declaration of independence.

[1] The designated WBIF code of this sub-project is WBEC-REG-ENE-01.

Enlargement process

The EU Enlargement process is the accession of new countries to the European Union (EU). It proved to be one of the most successful tools in promoting political, economic and societal reforms, and in consolidating peace, stability and democracy. The EU operates comprehensive approval procedures that ensure new countries will be able to play their part fully as members by complying with all the EU's standards and rules (**the *"EU acquis"***). The conditions of memberships are covered by the Treaty on European Union.
Each country moves **step by step** towards EU **membership as it fulfils its commitment**s to transpose, implement and enforce the Acquis.

The EU relations with the Western Balkan countries take place within a special framework known as the **Stabilisation and Association Process (SAP)** in view of stabilising the region and establishing free-trade agreements. To this end, all WB6 countries have signed contractual relationships (bilateral **Stabilisation and Association Agreements, or SAAs**) which entered into force, depending on the country, between 2004-2016.

The **accession negotiations** are another step in the accession process where the Commission monitors the candidate's progress in meeting its commitments on 35 different policy fields (chapters), such as transport, energy, environment and climate action, etc., each of which is negotiated separately.

At the time of writing (November 2017), there are four WB6 countries that have been granted **Candidate Country** status: the former Yugoslav Republic of Macedonia, Montenegro, Serbia and Albania, while Bosnia and Herzegovina and Kosovo have the status of **Potential Candidate** countries at this date. With two countries, Montenegro and Serbia, the **accession negotiations** have already started and several of the chapters of the EU *acquis* have been opened.

To benefit from EU financing for projects, each country **should respect the EU legislation relevant to that project,** even if the national legislation has not been yet fully harmonised with the EU acquis.

The "Regional Strategy for Sustainable Hydropower in the Western Balkans" aims to set guidelines for a sustainable development of hydropower in the Western Balkans.

EU Acquis relevant to the Study

In the context of this Study, **the most relevant thematic areas are spread mainly over two Acquis Chapters** (15 on Energy and 27 on Environment) relating to water resources, energy, hydropower development and environmental aspects including climate change.

- Chapter 15 Energy Acquis consists of rules and policies, notably regarding competition and state aid (including in the coal sector), the internal energy market (opening up of the electricity and gas markets, promotion of renewable energy sources), energy efficiency, nuclear energy and nuclear safety and radiation protection.
- Chapter 27 relates to 10 sectors / areas: 1 - Horizontal Sector, 2 - Air Quality Sector, 3 - Waste Management Sector, 4 - Water Quality Sector, 5 - Nature Protection Sector, 6 - Industrial Pollution Sector, 7 - Chemicals Sector, 8 - Noise Sector, 9 - Civil Protection Sector, and 10 - Climate Change Sector.

Commission President Juncker said in September 2017 in his State of the Union address that: *"If we want more stability in our neighbourhood, then we must also maintain a credible enlargement perspective for the Western Balkans".* To Serbia and Montenegro, as frontrunner candidates, the perspective was offered that they could be ready to join the EU by 2025. This perspective also applies to all the countries within the region. This timeline also corresponds to the period for preparing such major infrastructures and their lifetime. Consequently, WB6 countries have to demonstrate now that they are and will develop sustainable hydropower according to EU rules.

Relevant pieces of EU legislation and international agreements

Hydropower development should be done while respecting relevant EU legislation and international agreements to which the WB countries are Parties. This includes:

- Renewable Energy (Renewable Energy Directive 2009/28/EC)
- Energy Efficiency Directives (2012/27/EU; 2010/30/EU; 2010/31/EU)
- Environmental Impact Assessment Directive (Directive 2011/92/EU as amended by Directive 2014/52/EU) and Strategic Environmental Assessment Directive (Directive 2001/42/EC)
- Water Framework Directive (Directive 2000/60/EC)
- Habitats Directive (Directive 92/43/EEC) & Birds Directive (Directive 2009/147/EC)
- Floods Directive (Directive 2007/60/EC)
- Paris Agreement on climate change
- Aarhus Convention (the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters)
- Espoo Convention (the UNECE Convention on Environmental Impact Assessment in a Transboundary Context)
- Berne Convention (the Berne Convention on the Conservation of European Wildlife and Natural Habitats)

The framework conditions and legal obligations for hydropower development stem from the EU acquis and international obligations, the implementation of which should be supported through the Energy Community Treaty (to which all of the WB6 countries are signatories) as well as International River Basin Organisations.

As **Contracting Parties (CPs) to the Energy Community Treaty (ECT),** the WB6 countries have obligations and deadlines to adopt and implement acquis closely related to the energy sector / market development and environment such as:

- Electricity (Directive concerning common rules for the internal market in electricity (Directive 2009/72/EC); Regulation on conditions for access to the network for cross-border exchanges in electricity (Regulation (EC) 714/2009); Regulation on submission and publication of data in electricity markets (Regulation (EU) 543/2013))
- Security of supply (Directive concerning measures to safeguard security of electricity supply and infrastructure investment (Directive 2005/89/EC)
- Infrastructure (Regulation on guidelines for trans-European energy infrastructure (Regulation (EU) 347/2013)
- Energy Efficiency Directives (2012/27/EU; 2010/30/EU; 2010/31/EU)
- Renewable Energy (Renewable Energy Directive 2009/28/EC)
- EIA Directive (Directive 2011/92/EU, amended 2014/52/EU);
- SEA Directive (Directive 2001/42/EC);
- Birds Directive (Directive 79/409/EEC);
- Directive on environmental liability with regard to the prevention and remedying of environmental damage (Directive 2004/35/EC as amended by Directive 2006/21/EC, Directive 2009/31/EC)
- Large Combustion Plants Directive 2001/80/EC

Note:
We recognise that close coordination between the energy, environment and climate change legislation and policies is necessary in the context of sustainable hydropower development.
However, to avoid duplications in the BRs, issues related to the WFD and Floods Directive are addressed in more detail in BR-2 (Hydrology, integrated water resources management and climate change considerations) and BR-5 (Transboundary considerations), respectively while all other environmental Directives (Habitats, Birds and SEA/EIA) are addressed in more details in BR-3 (Environment considerations),

Small Hydropower Plants in the Regional Strategy for Sustainable Hydropower in the Western Balkans

While the 390 small hydropower plants in the Western Balkans 6 region represent almost 90% of all hydropower plants, they only produce 3-5% of the total hydropower generation and constitute 7% of the total hydropower capacity, most of hydropower energy and capacity in the region being delivered by the large hydropower plants.

This raises the question of the role of small hydro power plants and the pertinence of further developing such infrastructures. Their contribution to the global energy production and security of supply, or to the renewable energy sources targets, is extremely limited. In parallel, their impacts on the environment are severe, as they create multiple interruptions in water flows and fish passages, increase habitat deterioration and require individual road access and grid connections. Furthermore, while most of these small hydropower plants were commissioned after 2005, using state-support schemes – mainly feed-in tariffs – which will be phased out after 2020 and hence it is expected that the private sector interest in developing small hydropower plants will diminish significantly.

Due to the large number of small hydropower existing plants and projects, and due to the questions on their role and pertinence, the Regional Strategy for Sustainable Hydropower in the Western Balkans focused on major hydropower contributors to the power system, that is to say large hydropower plants of a capacity above 10 MW. Nevertheless, wherever possible, small hydropower plants have also been addressed in the study.

1 Introduction

1.1 Background

The 6 Western Balkan (WB6) participants (referred as "countries") are abundant with water resources. In Europe, they represent among some of the most water-rich regarding the amount of water available per person (10,600 m3/cap), which is twice the European average.

Among several other water-use purposes (e.g. agriculture, irrigation, tourism & recreation, drinking water supply etc.), the potential energy of water in river systems is used to produce electricity in hydro power plants (HPPs) of various types: reservoir, derivation, run-of-river and reversible HPPs.

The Study's preparation was suggested in March 2016, at a meeting of WB6 Energy and Transport Ministers, and included in the Declaration of the 2016 Western Balkans Summit in Paris; the initiative thus originated in a request from several regional actors for a more integrated approach to hydropower development in the Western Balkans.

The study has as an objective to ensure a balance between developing the region's hydropower potential – to contribute achieving renewable energy targets and reducing greenhouse gas emissions – and the need to guarantee that any development be carried out in a way that minimises its impact on the environment – preserving the rich and vital natural resources of the region, particularly of protected areas. The exercise was expected to result in a regional and sustainable approach to investments, with the development of a recommended list of projects for further exploration, organised by river basins and type of planned facilities and looking primarily at repair, refurbishment, upgrade and rehabilitation projects of existing infrastructure before considering any greenfield hydropower projects

In the context of replacing carbon-intensive generation capacity, and in view of achieving the 2020 renewable energy targets established by the Western Balkans countries in their respective National Renewable Energy Action Plans as part of the obligations agreed under the Energy Community Treaty, all renewable energy sources will play a strategic role in the new energy mix, with hydropower having a role in the case of most WB6 countries notably for historical reasons.

However, hydropower development, if not approached sustainably, and carefully planned in view of changes in climate patterns, and according to *EU Acquis*, applicable international conventions as well as regional and international best practices, can result on underperforming plants and large, negative impacts on the environment, on water resources as well as on ecosystems, in the rivers and on the river banks. In addition, the uniqueness of the region, in terms of nature and biodiversity, imposes an additional obligation on all partners to preserve the environment, which means that any new plant needs to be developed carefully to ensure minimum environmental damages.

The rather unfavourable age structure of the existing fleet of HPPs demonstrates an ever-increasing need for HPP rehabilitation, to ensure that the current high share of hydropower is maintained in the total power generation capacities throughout WB6 (49% in 2015) and overall power production (around 40%) (IEA Statistics). This aging asset structure of existing HPPs and in general delayed refurbishments, gives rise to refurbishment projects as the first priority for future interventions, and provides the opportunity for environmental remediation measures.

When considering the possible hydropower sector development to best meet the increasing demand for energy, in addition to rehabilitation projects, possible "greenfield" projects can be considered. However, the assessment of greenfield sites needs to be done with care, as any new hydropower project can have irreversible environmental impacts.

However, despite the considerable remaining hydropower potential in WB6, the framework conditions governing the development of HPPs have fundamentally changed both in EU as well as in the WB6 countries over the last decades. Water resources are today clearly recognised as a "public good" where users have equal rights and responsibilities both for their use and the protection of water resources, as provided for by the frameworks for integrated water resources management, often in the transboundary context. Furthermore, there has been a fundamental change in public awareness and political commitment to preserve the environment, which is now governed by national legislation based on the implementation of EU environmental acquis and international obligations. The effects of climate change on hydrology is also an increasingly important concern for sustainable hydropower development. Finally, social issues are also more relevant today than they were in the past.

There is a broad consensus that there is a need for a **balanced approach towards further hydropower development in WB6**, in that technically feasible and economically viable HPP development options must be judged having in mind environmental, social and climate change sustainable factors.

1.2 EU-accession process and relevant WB6-country obligations

By signing the SAA, all WB6 countries have committed to **accept, transpose and implement the whole EU *acquis* as any EU Member State**. Therefore, in undertaking this study, one of the main assumptions was that **all WB6 countries are adopting and will eventually be bound by the EU acquis.** Consequently, the methodologies applied in the Study were assumed to be the same across the whole Region, as if acquis transposition and implementation is complete throughout the WB6.

However, due to the different status and progress in EU-accession process, the level of transposition and implementation of the environmental acquis related to water management and nature protection is different between the WB6 countries. The Study was therefore confronted with different regulatory frameworks in the WB6 countries, together with different prospective speeds of legislative change in the future

1.3 Rationale for intervention

All WB6 countries have developed their National Renewable Energy Action plans (NREAPs) which have been adopted by the respective governments. The NREAPs are thus the official policy documents on how the WB6 countries intend to reach their binding renewable energy targets by 2020.

Even though most WB6 countries have adopted strategic planning documents (e.g. energy development strategies) typically through to 2030/2035, there are, as yet, no concrete plans for the implementation of such strategies after 2020, when the EU energy policy targets commitments become even more ambitious.

For 2030, the EU's policy framework is based on ongoing endeavours to 2020, together with even more stringent climate as well as broader energy sector targets (adopted in October 2014), notably:

- At least 27% share for energy from renewable sources (RES) in gross final energy consumption (GFEC);
- At least 30% improvement in energy efficiency;
- At least 40% cuts in greenhouse gas (GHG) emissions (from 1990 levels);

The share of RES in GFEC comprise of use of RES (i) for heating and cooling, (ii) in transport and (iii) for electricity generation (RES-E). The valid mandatory targets include: (i) the overall share of RES in GFEC and (ii) share of RES in transport (10% in 2020). For the time being, there are no RES-E share targets, as many factors may influence the final RES-E technology mix (hydropower, wind, solar, biogas) which remains within the competence of individual countries. Nevertheless, according to IEA Statistics for the WB6 region, hydropower (8,858 MW) represented as much as 96% of the RES-E mix in 2015 (9,193 MW); no more than 334 MW (4%) were installed in wind, solar and biogas.

Following the meeting of WB6-countries' ministers in Brussels on 1 March 2016, DG NEAR was requested to develop a "Regional Hydropower Master-plan".

The **rationale** for intervention was thus the desire of several parties to obtain a study document that would facilitate their further work in hydropower planning and development. Such parties were notably:

1. WB6 countries;
2. EC, to identify which projects could potentially be eligible for EU technical support;
3. IFIs, who are generally interested in investment opportunities in RES-E generation.

1.4 From a Master-plan to the Regional Strategy

Shortly after the start of the project, it became obvious that "Master-plan" in a literal sense would be too ambitious because a master plan is typically understood to be a comprehensive multidisciplinary document, produced on the initiative of a relevant state authority to develop the basis for formal planning and decision-making in a country. In fact, a master-plan is a strategic planning document that should be developed on the basis of the specific legislation of a particular country, which typically includes the establishment of numerous stakeholders' groups, a comprehensive public consultation process, and finally represents a binding document adopted by the instigating government.

In addition to this "Master-plan" title the WBIF-IPF3 sub-project initially held a parallel sub-title "Hydropower Development Study in the Western Balkans", that better demonstrated the mission of the project, which was to **undertake a development study in hydropower generation** made on a regional basis, with the purpose of setting guidelines for the sustainable development of hydropower in the Western Balkans, therefore facilitating national Master-planning processes after the completion of the Study (through a list of recommendations for a sound and strategic planning in hydropower development).

To avoid this confusion, in March 2017, DG NEAR changed the Study title to "**Regional Strategy for Sustainable Hydropower in the Western Balkans**".

1.5 Stepwise approach in Study implementation

The Study was implemented in two principal phases: The **Scoping Phase** (May-June 2016), and the **Study Phase** (October 2016 – May 2017), while the period June – October 2017 was dedicated to the collection of comments from the stakeholders on Study deliverables and completion of the project.

During this period, three events were organised:

- A Regional Conference 'On the Regional Hydro Master-Plan for the Western Balkans', (Belgrade, 27 September 2016; on Scoping Report and draft ToR);
- 1st Workshop (Podgorica, 30-31 March 2017) on technical issues of presented drafts of BR-4, BR-5 and BR-6 and the prospects for the remaining BRs (1, 2, 3, 7 and 8);
- 2nd Workshop (Tirana, 11-12 May 2017), mainly on environmental issues.

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2 Objective, purpose and results

2.1 Overall objective

The **overall objective** of the project was to "*… contribute to fostering the harnessing of environmentally and climate change sustainable hydropower generation in the Western Balkans region in line with the strategic objectives of the European Union and the Energy Community Treaty obligations of its Contracting Parties"* (per the approved ToR).

2.2 Purpose

The **purpose** of the intervention was the "*…development of a prioritised list of HPP development projects, organised by (i) river basins of the region and (ii) type of planned HPP facilities (storage, run-of-river, reversible), through which the remaining hydropower potential in the region would be evaluated."* (per approved ToR).

The list of hydropower investment projects to be developed under the study contains recommendations, which would be subject to further development, taking into consideration for each individual project the technical and financial feasibilities, the environmental impacts, as well as the future designation of Natura 2000 sites and no-go zones by countries.

As a first priority, the refurbishment projects should be considered - the opportunities that HPP operators have to repair, refurbish, sustainably upgrade and rehabilitate their existing hydropower sites – and as a second priority, the potential sustainable greenfield sites required to raise the share of RES in the region and to reduce emissions of GHG.

2.3 Achieved results

The Study deliverables (The BRs together with this Final report), confirm that the Study achieved the results required by the ToR, in particular:

1. The **role of hydropower** generation in the past, at present and in the future (2020, 2030 to 2050) was assessed at both regional and country level (addressed in BR-1);
2. A **database** of existing hydropower plants was prepared and verified with national stakeholders, comprising both large (i.e. of more than 10 MW of capacity) (57) and small HPPs (387) (BR-1). An **inventory** of prospective large greenfield HPP projects (136) (BR-7) of more than 10 MW of capacity was compiled; a list of HPP candidate projects (for both rehabilitation and greenfield

development) was developed (BR-7); this inventory is supported by a comprehensive database of HPP project fiches and a GIS web-application (BR-7);

3. The present **status of planning** and preparatory works for each prospective rehabilitation and greenfield HPP was assessed, including its maturity (BR-7);
4. The **nature and reasons for major implementation barriers** in the past, as well as today, were identified and recommendations made for improvement, based on the proper implementation of EU legislation as well as international best practices. (these issues were addressed from different perspectives in BRs 1-7);
5. The **implementation framework** (legal-regulatory, institutional-organisational) relevant to the development and implementation of HPPs at the national and regional levels was examined, especially from the viewpoint of its effectiveness and complexity of licensing procedures, including recommendations for improvements / streamlining; a guidebook for sustainable hydropower development was developed (BR-4);
6. The **unexploited (remaining / additional) hydropower potentials** of the WB6 countries and of the WB region with a view to generating electricity was assessed (BR-1 and BR-7). In particular, both technical and sustainably exploitable hydropower potential by river and sub-river basins were determined;
7. Major **environmental issues** related to the ecologically acceptable planning of sustainable hydropower was assessed at the river basin level (BR-3). This river basin approach underpins the important regional character of the Study. This assessment included climate change mitigation and adaption effects and measures (BR-2);
8. The importance and relevance of the **transposition and implementation of all EU environment-related directives** (Water Framework Directive, Floods, Habitats, Birds) was confirmed as a fundamental underpinning of developing sustainable hydropower in WB6 (BR-2, BR-3 and BR-5);
9. Environmental issues **and lessons learned from previous SEA/EIA** processes in the region were analysed and recommendations made for future SEA/EIA procedures (BR-3);
10. Important **provisions of the Water Framework Directive** (WFD), applicable for hydropower sector planning in conjunction with equal rights and responsibilities of multiple water users for integrated water resources management (IWRM), were addressed (including the presentation of the most recent best case in the EU); the message confirms the need for a balanced approach between the prospective role of hydropower in the region's future energy supply mix on one side, and the need for sustainable use of water resources by competing multiple users in riparian countries[2] (BR-2); more than ever, there exists the need for prompt resolution of inherited transboundary issues from the past (BR-4);
11. A **portfolio of both (i) rehabilitation / reconstruction projects** (BR-7) as well as **(ii) prospective greenfield HPP projects** (BR-8) in the form of a list of ranked HPPs was prepared. The list is structured by (i) river basin, (ii) country, and (iii) type of facilities (storage, run-of-river, reversible). A four-step tailor-made MCA followed by a Final Expert Assessment methodology was developed and applied. (BR-8);
12. A **draft plan for regional follow-up actions** was prepared, together with proposed measures to be undertaken by various stakeholders, reflecting regional cross-cutting issues, aimed at promoting and stimulating the rehabilitation / reconstruction of existing HPPs and the development of ecologically sound, sustainable greenfield HPPs (Annex 1 to the Final report);
13. **Local institutions of central administrations in charge of hydropower sector development were strengthened** at regional events (1 conference and 2 workshops) in the specific technical topics addressed in the Study; the Study results were broadly disseminated to multiple beneficiaries. In these activities, topics related to the environment and possible impacts of HPPs on ecology were given priority, especially with respect to highlight to beneficiaries the need for developing sustainable hydropower plans, which requires a coherent and thorough application of all relevant assessments from EU environmental legislation and to gaining public and NGO / CSO understanding as well as involvement in this process.

[2] By disintegration of former SFRJ, most previously internal water courses became cross-border rivers of newly established states in WB6. By that the typical transboundary issues like sharing of hydropower potential, cumulative impacts at border-crossing points and impacts of upstream to downstream HPPs became increasingly important or even decisive in the development of RB/SRB and IWRM plans.

2.4 Added value of the Study

The regional character of the Study provided added value over HPP planning on a national basis, both strategically and politically, through:

- Strengthening connections between the WB6 countries and the cooperation with EU countries and in addressing the common challenges of the WB6 region, such as achieving renewable energy production targets;
- Mobilising a variety of potential financing sources and assisting the Study stakeholders in improved energy policy development and their alignment of national and regional policies with the EU acquis, in relation to both environment and energy, being part of the same sustainability policy agenda;
- Proper implementation of the EU environmental and climate change legislation together with applicable international conventions in hydropower development planning, and especially the advantages of adopting a river basin approach in the transboundary context, referring to cumulative impacts of hydropower development;
- Improving cooperation mechanisms and networks between participating countries, leading to greater coordination and efficiency of effort. Multilevel governance was promoted, especially in water management by encouraging cooperation between national, regional and local bodies and between the public and private sectors;
- Contributing to developing and improving access to financing of new, feasible projects and giving momentum to the refurbishment / reconstruction of existing HPPs as the first priority;
- Resolving cross-cutting issues such as the quantification and division of water resources on shared rivers.

2.5 Study limitations

It is broadly recognised that adequate consideration of the **environment, climate change** and **integrated water resources management** are the cornerstone of present and future hydropower development policies. The Study delivered proposals for hydropower development in the Region, bearing in mind that specific conditions and limitations (typically environment, social, political, etc.) will be dealt with in later stages of individual HPP project planning. Therefore, the Study did not address any issues from a narrow perspective or particular interest. For several reasons, (e.g. lack of mandate, prevailing national conditions, time available etc.) **it was not possible to address the following issues (which are not included in the ToR)**. These are the issues for which **national institutions, public, private or mixed entities** are typically responsible in accordance with national legislation in the WB6 countries:

A. **New River Basin Management Plan (RBMP)**. However, the Study assessed the current state of development thereof or even, the current level of transposition and implementation of Water Framework Directive and its likely implications on hydropower development.

B. **New SEA** at the river basin level or programme level**, EIA** at the project level and/or **ESIA** typically requested by IFIs because these are clearly within the competence / responsibility of national policy-making authorities, HPP Developers / Investors or relevant IFIs.

C. **New (pre)feasibility studies (including technical redesign of the currently-known HPP schemes),** because this is within the responsibilities of the HPP Developer.

D. **Assessment of small hydro power plants (SHPPs) at the individual power plant or tributary level**. For the reasons explained in disclaimer of the preamble to all BRs, the Study clearly focused on large HPPs of more than 10 MW of installed capacity only.

E. **Quantitative assessment of cumulative impact assessment (CIA) of planned HPPs.** In order to have a justified decision to go ahead with HPPs, a CIA needs to be produced. For that purpose, the development plans or programmes of new HPPs by river (sub) basins must be confirmed, including the dynamics of HPP commissioning and at least the conceptual design of all considered HPPs – which is currently not the case. Consequently, CIA was addressed in a qualitative manner only and focused primarily on water balance, transport of sediments and ichthyology.

F. **National hydropower master-plan**. The Study results are limited to recommendations rather than any mandatory solutions for the WB6 countries, about which the countries shall retain their sovereignty in decision-making, provided that it is compliant with applicable national and international legislation in force.

G. **“No-go” zones established.** More comprehensive studies providing details on the specific environmental situation along the river basins are needed, and a "Classification of the appropriateness of river stretches for potential hydropower use" as part of a two-level assessment following ICPDR Guiding Principles on Sustainable Hydropower Development in the Danube River basin (2013) requires to be followed. The competence for the determination of such zones clearly rests with the relevant national authorities responsible for natural resources and spatial planning.

H. **New comprehensive research or analysis of biodiversity and habitats.** The Study established a unique Classification of Hydrography System for the WB6, which comprises of 4 Drainage Basins, 13 Watersheds, 28 River and Sub-River Basins, 27 Rivers and 103 Tributaries to the main streams of these rivers. And all these in the context of approx. 140 greenfield HPP projects of more than 10 MW of capacity addressed in the Study. (for detail, see Sub-section 4.1) This would represent an enormous amount of work which by far exceeds the scope of this Study and time available.

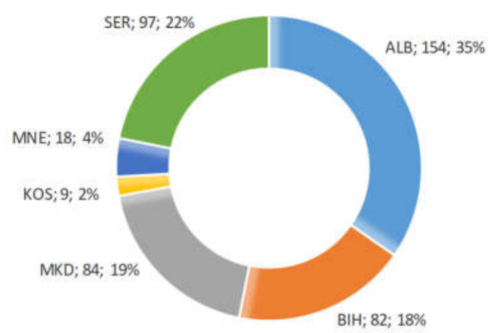
The Regional Strategy **is not based on any agreement with the WB6 governments**, but on the independent opinion of the Consultant and his best professional judgement of the prospects for sustainable (including environment, social and economic viability) hydropower development in the Region. The Regional Strategy is **not binding on any WB6 country**. Consequently, the Regional Strategy is rather a **set of recommendations and advice to WB6 countries on how to approach sustainable hydropower development under their status of (potential) candidate countries**, in order that the applicable EU directives, guidelines, principles and applicable international conventions are adopted, implemented and enforced in an acceptable manner, such that their **candidate HPP projects may be eligible for prospective further EU support and IFI funding.**

3 Past and present role of hydropower

An Excel-based database (DB) of existing HPPs was developed for the Study, to be fully informed about the past developments in hydropower in the WB6 Region and to develop a clear starting point for the future hydropower development. This DB was populated with data collected for each individual HPP identified and from the original sources directly (mainly utilities, the operators of the HPPs and partially also relevant ministries) that finally verified all data. The DB includes 444 HPPs, of which 57 are large HPPs (>10 MW) and 387 are small HPPs (<10 MW). Sections 3.1-3.3 in the following are based on this DB.

3.1 Number of HPPs

Figure 3.1 show the number and structure of existing HPPs by country, separately for large and small HPPs.



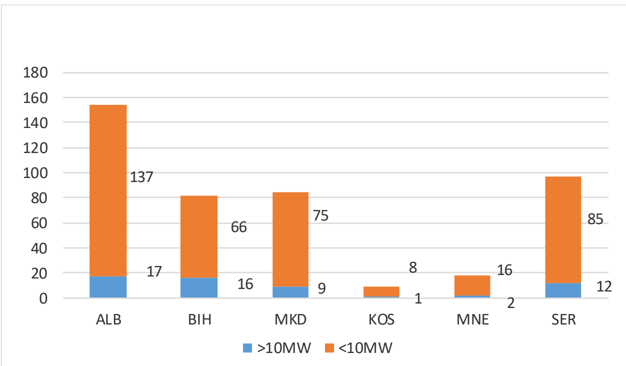


Figure 3.1: Number of existing hydro power plants by capacity range and country

As at end-December 2016, there were 57 large HPPs that represent no more than 13% in terms of the number of existing HPPs. Most large HPPs (17 or 30%) were in Albania, followed by 16 in BiH, 12 in Serbia and 9 in the former Yugoslav Republic of Macedonia, while Montenegro and Kosovo contribute with 2 HPPs and 1 HPP, respectively.

3.2 Installed capacities in existing HPPs

There was 8,605 MW of installed hydropower capacity as of end-December 2016. According to IEA statistics, hydropower represented 49.2% of all power generation capacities and 96.4% of total RES-E capacities (solar, wind, hydro, biomass, other).

As shown in Figure 3.2, the 8,605 MW of installed capacities included 8,022 MW (93% in terms of installed capacity) in large HPPs and 583 MW (7%) in small HPPs.

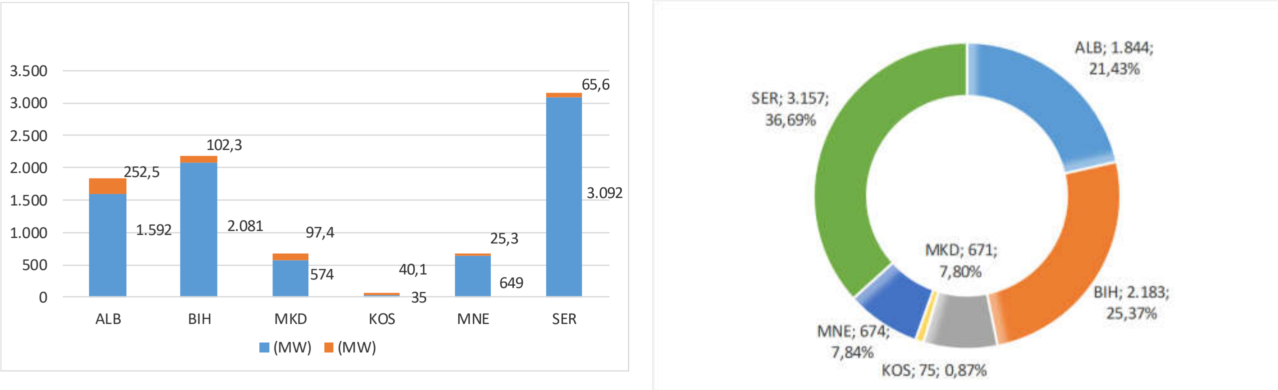


Figure 3.2: Installed hydropower generation capacities by capacity range and country (MW) (status: end-December 2016)

3.3 Dynamics of construction / commissioning of HPPs in the past

The dynamics of construction / commissioning of new HPPs of all capacity ranges by country in the long-term past (1955-2016) is shown in Figure 3.3 (separately for large and small HPPs) and cumulative values in Figure 3.4. Knowing the status of capacities as shown above, Serbia, Bosnia and Herzegovina and Albania were most active and productive.

About 90% (7,739 MW) of the present capacity of 8,605 MW has been constructed and commissioned in the former SFRJ before 1990, and only 10% (866 MW) after its disintegration. The average capacity addition achieved during 1955-1990 was 202 MW per annum while in the period 1991-2016 it dropped to mere 33 MW per annum.

Out of 57 large HPPs in WB6, 26 HPPs are of reservoir-type (RES), 26 run-of-river (ROR), 3 derivative (DER) and 2 reversible (REV). Hydropower capacity additions by year during 2001-2016 are shown in Figure 3.5.

It is obvious that increase of installed capacities in the last years was primarily due to new small HPPs. During the last 15-year period (2002-2016), 379 MW in large HPPs and 403 MW in small HPPs were commissioned, while in the last 5-year period (2012-2016), 206 MW in large HPPs and 307 MW in small HPPs.

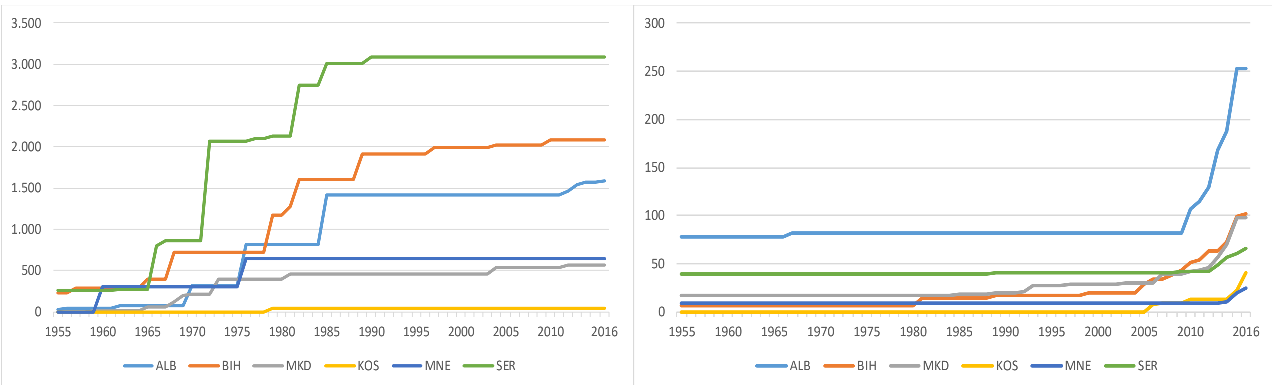


Figure 3.3: Development of installed hydropower capacities over time (1955-2016) and country for large (left fig.) and small HPPs (right fig.), MW

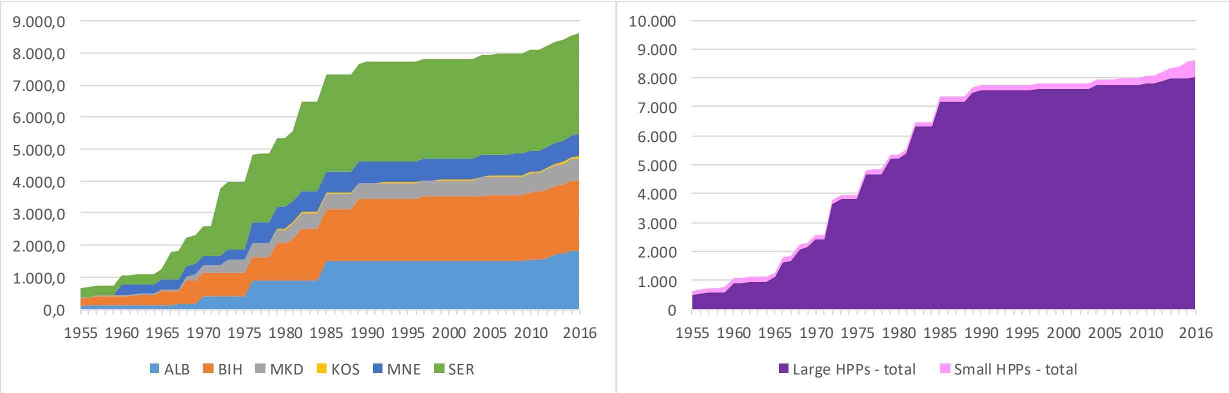


Figure 3.4: Development of cumulative hydropower capacities over time by country and distinction between large and small HPPs (1956-2016), MW

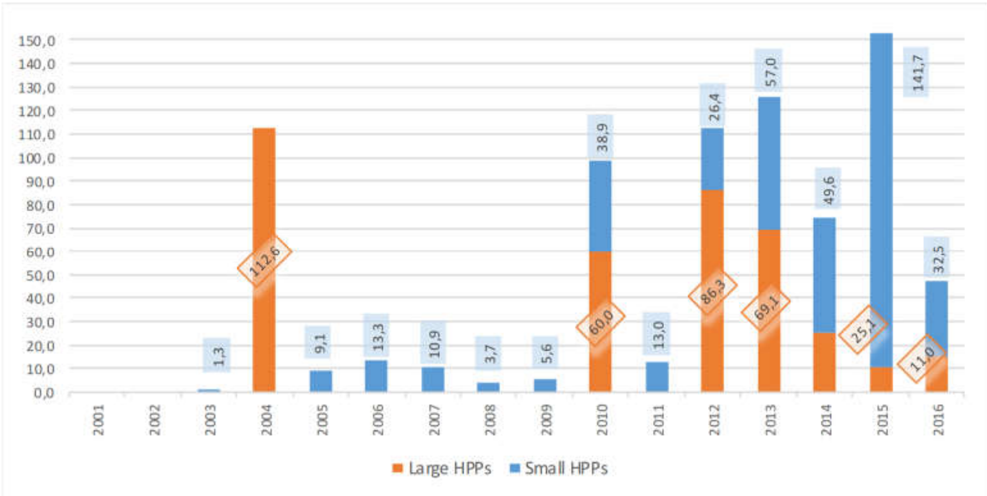


Figure 3.5: Hydropower capacity additions by year – large and small HPPs (2001-2016), MW

3.4 Development of hydropower production over time (2001-2015)

Average annual hydropower generation during 2001-2015 is shown in Figure 3.6.

Hydropower generation typically considerably fluctuates depending on hydrological conditions in the year, which are impacted by climate change. For 32 of the large 57 HPPs (56%), the year of 2010 represented the absolute maximum in power generation since their commissioning. The second-best year was 2013 and the third-best year was 2005 (Figure 3.7).

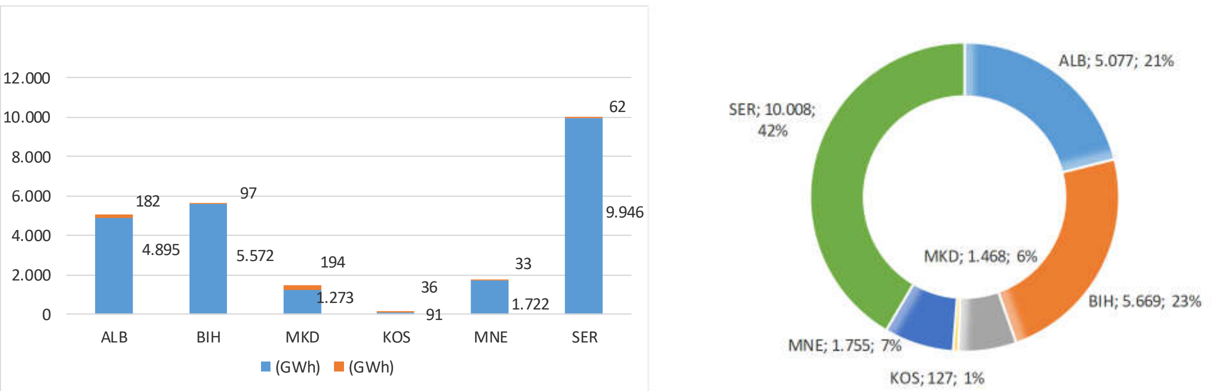


Figure 3.6: Average annual hydropower generation by country in the last 15 years (2001-2016), GWh/a

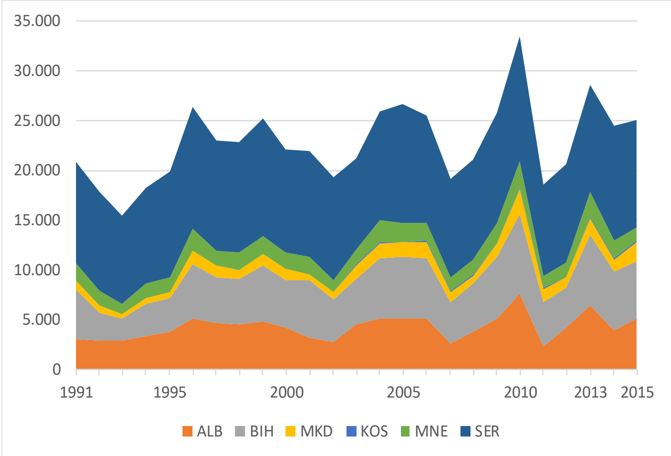


Figure 3.7: Hydropower generation – all HPPs by country in the last 25 years (1991-2016), GWh

3.5 Statistics of hydropower generation in WB6 (1971-2014)

Figure 3.8 shows hydropower generation, total electricity generation, net electricity import-export of the WB6 region and final electricity demand in WB6 region in the last 10-year period (2005-2014) (source: IEA statistics).

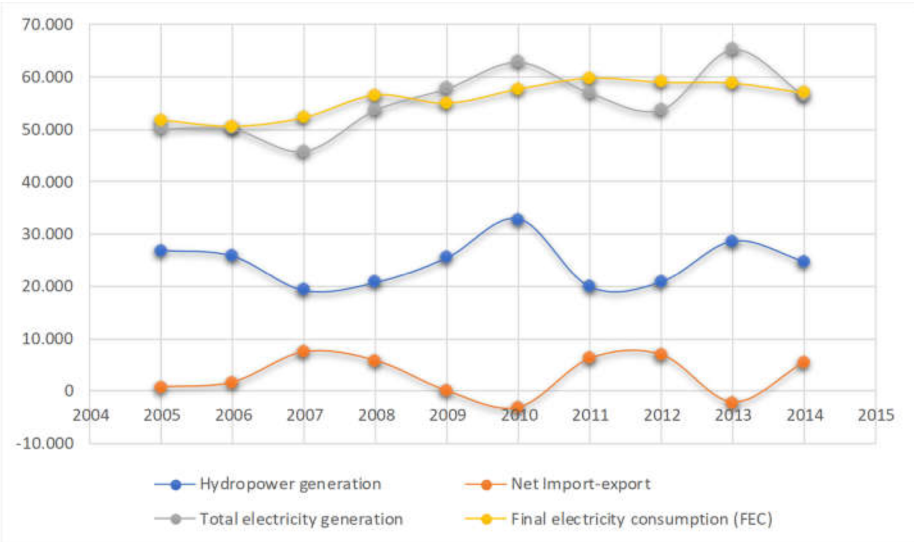


Figure 3.8: Hydropower generation, total electricity generation, final electricity demand and net electricity import-export in WB6 in the last 10 years (2005-2014), GWh

In the observed 10-year period, final electricity consumption grew from 51,742 GWh (2005) to 56,929 GWh (2014) or by 10.0%, which denotes an average annual growth rate of approximately 1%. In 2011, electricity demand was the highest, 59.825 GWh (or 15.6% higher than in 2005) and it has demonstrated a downward trend since then. However, such development is assessed as transitory and short-term demand behaviour, possibly linked to changes in economic activity or heating / cooling requirements.

The WB6 region is a net importer of electricity except in years with high hydropower generation. In good hydrological years, WB6 is a net exporter of power thus contributing to integrated electricity markets elsewhere outside the WB6 region including the EU markets. However, this will be dependent upon the climate change impacts on the hydrological yield forecasts as well as the trade-offs on water uses made between different sectors.

For example, due to its substantial dependence on hydropower, which is typically connected to annual hydrological conditions, further influenced by climate change, Albania particularly is very vulnerable in its security of electricity supply. Albania had to purchase electricity because of the heavy drought and high temperatures that hit the Western Balkan countries this summer (2017), which caused lowered water levels in all rivers. A similar situation was also experienced in other WB6 countries; however, these are less dependent on annually fluctuating hydropower situation. Also, it is worth emphasizing that reduced water availability due to climate change effects will also impact other sectors using the same water resources (agriculture, tourism, drinking water etc.).

In Figure 3.9 in the following, the volume of hydropower generation and its share in electricity production for both the individual countries and the region as a whole for the years 1971 to 2014 is shown (due to multiple changes in the political landscape some data is not available). To have methodologically comparable figures for all countries, the official statistics of IEA (Status of May 2017) have been used for this purpose.

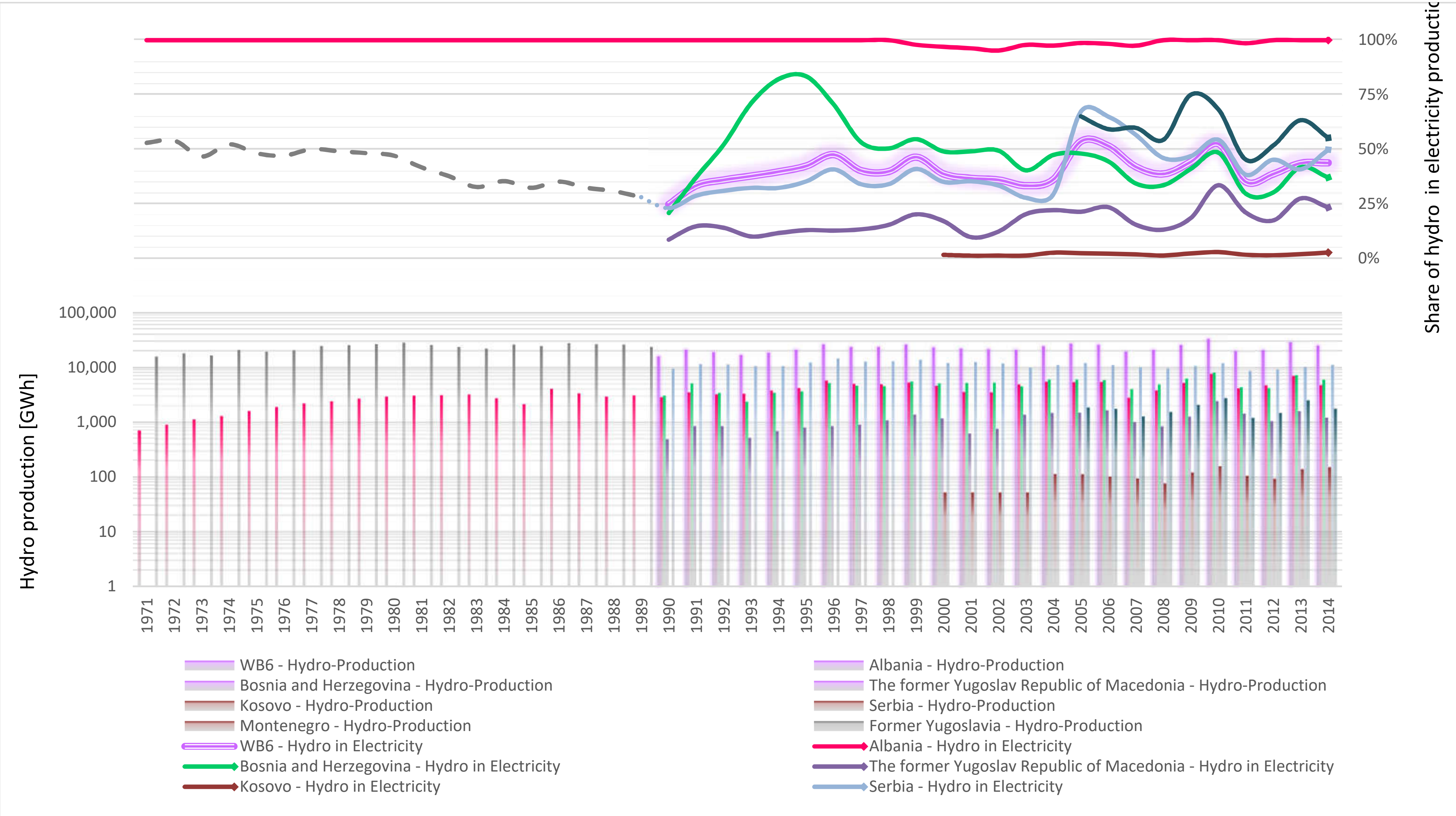
In all observed years (1971-2014), in Albania, hydropower generation represented almost 100% of total electricity production in the country and only in the period 1999-2007, it was up to 5% less.

The former SFRJ, despite considerable capacity additions in hydro, was regularly losing its hydro share in the power generation mix over time, from some 55% in 1971 to 30% in 1990.

From 1990 onwards, the situation in individual successor countries of SFRJ is shown in Figure 3.9. In the period 1990-2014, at the regional level, hydropower generation represented 25-54% of total power generation. Despite rather marginal capacity additions over time, as discussed above, this figure obviously varied by quite some extent, primarily due to different hydrological conditions / hydropower yield in individual years and specific conditions in thermal power generation, the output of which varied due to complete or partial unavailability of thermal power plants for several reasons (e.g. major overhauls, rehabilitations, outages due to war damages etc.).

At the country level, the share of hydropower generation in total power generation was the following average values during the last 10-year period of 2005-2014, for which IEA statistics is available: Albania (99.4%), Bosnia and Herzegovina (38.5%), the former Yugoslav Republic of Macedonia (21.8%), Kosovo (2.2%), Montenegro (58.9%), and Serbia (49.2%).

In the lower part of Figure 3.9, it is possible to observe the development in annual hydropower generation by country, which in combination with the upper part of the figure can lead to conclusions on the extent of progress in hydropower generation over time.



Source: IEA Statistics (May 2017)

Figure 3.9: Hydropower generation volume and its share in total electricity production by country (1971-2014

4 Hydropower potential in Western Balkans

The maximum possible production yield from a hydrological resource is determined as the **theoretical hydropower potential.** It is determined by the quantity of rainfall that falls on ground at a certain altitude a.s.l. thus creating potential energy by the position of water masses that, unless stored in an accumulation basin, is converted into kinetic energy of water flows in rivers.

However, such a theoretical potential has a more scientific than practical value, as numerous limitations apply, from the spatial planning perspective (e.g. protected zones – national parks, other infrastructure requirements, water supply and agricultural areas, living habitats and recreation areas etc.), technical, environmental, economic and market perspectives. Consequently, the theoretical potential is gradually downsized to the reality – which is the actual potential. Depending on the type of limitations, more frequently used terms for such potentials are technically exploitable, economically exploitable, market or even "sustainably" exploitable potentials, for which the above spatial planning and ecological constraints have been considered.

The assessment of technical hydropower potential differs between different literature sources / authors because of the different methodologies and assumptions used. The "standard methodology" typically used for the assessment of technical hydro potential by water authorities comprises of two main approaches. One is the conceptualisation of the hydropower development options in a river basin with the exclusion of river sections where interference with the river section is not possible while another, more elaborate approach is the calculation of energy potential per kilometre of river section (multiplication of head and flow per each) and adding those sections where applicable (excluding protected river sections) without consideration of the constraints governing the technical solution of hydropower plant.

Technical potential particularly assumes the application of a portfolio of presently available mature technologies when exploiting the available theoretical potential. Technical limitations mean that not all theoretical potential can be developed with presently known technologies and techniques.

Economic potential is that part of technical potential, which is economically feasible and financially viable in the prevailing present and foreseeable future conditions and limitations.

For assessment of **market potential**, one should consider also locally specific market conditions, in a competitive environment against other alternatives and the various impediments related to "doing business" in a country.

"Sustainability" is attributed to hydropower due its renewable energy characteristic, while additional sustainability for planned HPP projects is typically demanded from the point of view of (i) the environment, including climate change, (ii) social acceptability of HPP projects, (iii) spatial planning adequacy, (iv) floodwater control and (v) multipurpose use of water from the same source (e.g. drinking water, agriculture / irrigation, recreation, etc.), which is considered "public good", therefore it cannot be used for power generation exclusively.

In accordance with its objective, the Study looked for that part of the additional - **remaining technical potential that can be sustainably developed** in the future, in line with the above sustainability principles. Greenfield projects, identified as candidates in BR-7, are checked against such criteria by deploying a multi-criteria analysis (MCA) in conjunction with Final Expert Assessment in BR-8.

Unfortunately, in the WB6 countries, there is typically no single competent institution that would be responsible for a consistent and up-to-date assessment of hydropower potential at the country level. The following typical cases explain several approaches that considerably differ from the above-mentioned "standard methodology", which makes the assessments hard to compare and consistent:

- Power generation utilities that plan new HPPs consider technical potential as an opportunity for construction of a portfolio of HPP projects that "they" wish to promote;
- Ministries may have different strategies than power utilities, which support "their" projects, and may promote also HPP projects for third party financiers (private sector);
- Some technical potentials are also disputed between the countries sharing the same river basin and represent a "transboundary issue" as addressed in BR-5;
- More constraining assumptions, which have the result of reducing the technical potential over time. Thus, as time passes, the technical potentials demonstrate downsizing trends, because for example, some sites have been

designated as protected zones, the required space has already been used for other purposes, there may be conflicts with planned infrastructure (railways, highways, power lines etc.);

- Assessments of technical potential may encounter numerous problems and gaps, for example tributaries are usually not considered due to a lack of data and thus opportunities for the construction of primary small HPPs will be missed as well;
- Finally, planning of water resources is the basis for assessment of technical hydropower potential, where hydropower is just one of the multiple possible uses of water resources, therefore, multi-sectoral interests are strongly present in the process.

It would be extremely difficult to analyse the root causes of the differences in technical hydropower potential obtained in recent studies. Our approach is that there is no real need to do so, because technical hydropower potential is a relatively weak planning tool when applied across several countries. Each country has differing data available and have, in turn, used different approaches in addressing it.

The Study therefore establishes the possibilities for sustainably developing the **remaining technical hydro potential in the region by taking in full consideration the limiting factors** arising from valid, pertinent legislation and regulations present in individual WB6 countries with respect to planning of hydro power projects, protection of the environment and the combat against climate change, spatial planning and the power sector in general. These framework conditions are governed by applicable EU environmental legislation (Water Framework Directive, Floods, Habitats, Birds, SEA and EIA Directives) and international conventions (e.g. ESPOO, Berne and Aarhus Conventions) as well as EU Climate Change policy commitments (including the Paris Agreement and the 2013 EU Strategy on Adaptation to Climate Change), and HPP development sustainability guidelines of major international sector stakeholders (IHA, ICPDR, IFIs).

4.1 Utilised, additional (remaining) and total technical hydropower potential in WB6

For the Study, as mentioned in Section 2.5, a unique classification of hydrographic elements has been introduced (BR-2), which among others addresses 4 Drainage Basins, 13 Watersheds, 18 RBs, 10 SRBs, 27 Rivers and 103 Tributaries to the main streams. By following the “bottom-up” approach in the assessment of hydropower potentials and applying the “river-basin” approach, the Study develops data and results separately for these RBs, SRBs and rivers.

Table 4.1 shows the presently utilised technical potential (UTP), additional (remaining) technical potential (ATP) and the total technical potential (TTP) by country.

The UTP denotes the sum of average annual outputs of all HPPs in the power system as of end-December 2016, including large and small HPPs, and it is **26,629 GWh**. By adding the ATP, which amounts at **45,342 GWh**, the TTP is obtained amounting to – **71,971 GWh**.

The ATP shown in Tables 4.1 comprises of additional technical potentials as reported by national authorities in WB6 and strategy-related documents and represents the whole remaining hydropower potential where the sustainable potential is just part of it. For breakdown of ATP by RBs and SRBs, see Table 4.1 in BR-1.

Table 4.1: Summary of total, used and remaining hydropower potential by country

Country	Total technical potential (TTP)	Used technical potential (UTP)		Additional technical potential (ATP)	Share in ATP
	(GWh)	(GWh)	(%)	(GWh)	(%)
Albania	10,273	5,940	58	4,333	10
Bosnia and Herzegovina	24,351	6,535	27	17,816	39
The former Yugoslav Republic of Macedonia	9,786	1,443	15	8,343	18
Kosovo	423	203	48	220	1
Montenegro	6,648	2,000	30	4,648	10
Serbia	20,489	10,507	51	9,982	22
Total	**71,971**	**26,629**	**37**	**45,342**	**100**

5 Prospects for hydropower development in WB6 in the context of regional electricity markets

5.1 SWOT

The SWOT analysis presented in Table 5.1 was used to assess the departure point for future hydropower development in WB6. Clearly, hydropower development is primarily Opportunities and Threats for WB6 countries and their citizens, while Strengths and Weaknesses define the numerous shades of grey in this context.

Table 5.1: Strengths / Weaknesses / Opportunities / Threats (SWOT) analysis

STRENGTHS	WEAKNESSES
• High share of hydropower in the power generation mix in the WB6 (in the past as well as likely to remain in future). • Hydropower's flexibility • Hydropower is the most flexible RES-E generation • Remarkable, proven and long tradition in HPP technology in the Region • Hydropower is the most reliable renewable power generation source that ensures predictable and guaranteed low electricity prices in the long-run • Long-term predictable production costs and selling prices	• Legal and regulatory gaps and imperfections • Very complicated and lengthy concessioning, permitting and licensing procedures in most WB6 countries • Quality lacking in EIA / public consultations • Poor political continuity and long-term commitment of frequently changing governments • Lack of interest of international financiers in participating in the ownership structures of regional power utilities, to invest in large HPPs • Multiple users of water resources (multipurpose utilisation of water) with conflicting objectives • Incapability of states and power utilities (in state-ownership) to take a considerable stake in capital-intensive greenfield HPP projects
OPPORTUNITIES	**THREATS**
• High share of still unutilised hydropower potential in all WB6 countries • Hydropower production efficiently substitutes the need for polluting thermal power generation • GHG emissions reduction benefits • Improved Security of electricity supply • Technological development offers multiple improvements • Intraday markets opportunities for hydropower • New scheduling and operation principles • Economic recovery and social stability, multiple macro-economic benefits • Clear and visible demonstration of "National interest" by political structures	• Environmental and social risks if HPPs are improperly planned; the importance of assessment and mitigation is not sufficiently recognised • Reduced duration of output (gradually lowering capacity factor of HPPs) • Improper local understanding of the need for consideration of applicable EU directives (WFD, Habitats (Natura 2000), Birds, SEA and EIA directives), constituting an integrated framework • Limited readiness for transboundary cooperation and mutual planning at River (Sub) Basin level • Financial risk for investors in conditions of presently low electricity market prices • Transboundary issues. Unsolved and possibly continued transboundary issues, in most cases inherited from the former SFRJ, represent a real challenge for the new political establishment in the Region • Climate change will impact precipitation and rainfall regimes in the short- and long-term that may have negative impacts on the output of HPPs

5.2 Hydropower on the regional electricity market

The relatively low prices of electricity in the recent years, as mostly caused by the prices established on the German market that the WB6 region follows closely (average prices in German spot markets dropped by roughly 30% between 2012 and 2015, while the most recent trends show slight improvements) presents a challenge to investors in hydropower. Moreover, the previously typical price advantage of peak power from hydropower over the rest of the hours on the day-ahead spot markets has lowered, mostly due to photovoltaics feed-in delivering most of its power right around mid-day. This effect incentivises HPP operators to move to new scheduling and dispatch patterns if they want to safeguard their revenue levels. The present prices of carbon emissions and the markets for guarantees of origin for renewables do not help hydropower generation much, either, and it seems that this is not going to change for some time.

The benefits of hydropower participation in the regional **balancing market** leads to greater overall efficiency of both the system and HPPs themselves improving both hydropower production volumes and its average financial value. The HPP operators would like to be able to optimise their positions not only on intra-day auctions, but also in intra-day continuous markets, as close to dispatch as possible.

Another important aspect of hydropower role in the market is their participation within the **balancing groups** in their home markets. The balancing groups serve the purpose of aggregation in terms of summing-up the joint effect an individual group of consumers and producers have on their home regulation zone, enabling the balancing group responsible parties to manage deviations from the scheduled effect jointly for a group, instead of individually for each member (producers and consumers). The HPP's flexibility is a great asset that can be used to manage the balancing group's deviations in real-time.

Hydropower continues to grow in importance for the purpose of **security of supply**. Beyond delivering mere energy volume and capacity, its opportunities lie in its flexibility to provide a wide range of system regulation services, like secondary regulation via minute reserve and primary regulation, particularly in connection with the increasing participation of intermittent generation, such as wind and solar, in the interconnected grid and challenges presented by the transition to RES-only power generation. It should be noted that presently, hydropower offers the only large scale (short- and long-term) storage capacity, and, apart from the fairly costly biomass power plants and typically small biogas facilities, hydropower is also the only renewable resource able to guarantee its output.

A summary of the market conditions and opportunities for hydropower:

- Hydropower's flexibility enables an easy move from traditional peak production hours to more variable operation, improving financial results;
- Intraday markets present a great opportunity for hydropower as the prices instantaneously respond to the actual situation in the system;
- Hydropower is the most flexible RES generation able to deliver various system regulation services at competitive prices.

The importance of new opportunities in the area of system regulation apply to both conventional hydropower and pumped storage plants. Particularly for the latter, technological improvements like variable-speed electronics and hydraulic shortcut design are of great importance and may substantially contribute to increased income generation of a plant.

Initial investment into hydropower is fairly high and their ability to generate income sufficient to service the upfront investment cost will make or break the project. Generally, hydropower generated electricity is considered to be on the cheapest side of electricity generation technologies, if its relatively long economic lifetime is taken into account.

Conclusions on technology advances and regulatory environment:

- New technologies like variable speed electronics and hydraulic shortcut design provide hydropower with the capabilities for continuous operation by the ability to instantly and precisely respond to market and system conditions;
- Licensing and fees imposed on hydropower producers will have to be adjusted to the new realities and role of hydropower in both the market and the power system.

The new scheduling and dispatch paradigms will be freely vested (by regulation contracts) hydropower resources, leading to their increased efficiency and use. Benefits of the regional close-to-dispatch markets (i.e. intraday and balancing), identified by simulation on an individual country basis, will undoubtedly spill across borders. The effects of an increased role of regulation in the system and, among other factors, shifting production to peak hours, will allow the less flexible power plants (mostly thermal power plants) to mitigate steep ramping and to generally operate at more efficient levels.

Naturally, the major drivers of these changes will be **hydropower with storage and of the cascade type**. Should the operators on a single cascade be many (mixed ownership of HPPs), many opportunities for a concerted action arise, also at the regional level.

6 Hydrology and integrated water resources management

6.1 Introduction

Alternative options for potential private and/or public investment development projects in the river systems of the WB6 Region involve not only new dams and water storage reservoirs for hydropower, but also other water uses such as: developing agricultural irrigation systems, new touristic resorts and various water-related facilities for urban and industrial water supply.

These developments occur in different river basins where different socio-economic conditions exist and therefore different preferences and objectives prevail. Alternative hydropower options must consider environmental consequences, impacts to ecosystems and human health, and financial and social risks while optimising water power use. The impacts on the environment and often social impacts including mitigation should be weighed against the economic benefits of HPP construction.

Since the 6 countries of the WB6 Region are candidates or potential candidates and are committed to transpose and implement the EU legislation, their in-depth understanding of mutual interdependencies across borders must mature. Therefore, an urgent need for cooperation and the application of EU guidelines for **Integrated Water Resources Management (IWRM)** in the shared river basins has emerged.

The concept of IWRM or Integrated River Basin Management (IRBM) has been defined as a process that promotes the **coordinated development and management of water, land and related resources to maximise the resultant economic and social welfare (efficiency) in an equitable manner without compromising the sustainability of vital ecosystems**.

Despite the usual emphasis on “environmentally sound energy”, hydropower (particularly those with storage reservoirs) has multiple effects; it is well-known that some reservoirs are emitting both CO_2 and methane and have indirect impacts on river outflow areas to the sea with decreased deposition of silt. There is a small greenhouse effect connected to run-of-river hydropower reservoirs, however, the effect is much larger in the reservoirs of large dams. Dissolved methane builds up from decayed plants and trees, which remain under tamed stream. Methane is estimated to have up to 25 times the impact on climate change than CO_2 and is released mostly through the dam turbines.

Based on case studies made at four HPPs referenced in the World Bank, 2015, Water & Climate Adaptation Plan for the Sava River Basin, an important conclusion was made regarding effect of **climate change** on discharge.

The general trend is that the near future demonstrates the availability of energy in winter and autumn, whilst there would be a small decrease expected in spring. In the foreseeable future, a decrease in spring and summer energy production is expected, between 4% and 10% on average, respectively, whilst the winter and autumn, energy production is expected to increase by 11% and on average 5%.

By acknowledging the baseline of long-term climate processes and climate change, which has been presented globally by leading international institutions like UN and European Environment Agency (EEA) for this report, we have further examined currently held views and opinions relating to the climate change in the context of river and hydropower development. Consequently, this report endorses the key recommendations for hydropower development and reservoirs based on the latest elaboration of mitigation and adaptation measures available through literature sources, and the EC / Climate Action position on climate change, available via https://ec.europa.eu/clima/change/consequences_en. The purpose of the present report is to emphasise the need to take into account climate change considerations when planning and developing HPP investments.

Mitigation of climate change effects, by the substitution of regionally-prevailing fossil-fuelled power plants with renewable energy (of which hydropower is one possibility), will have an immediate positive effect on total GHG emissions. Balanced against these CO2 emission savings is the question of the volume of GHGs that are emitted from the water reservoirs. This question is addressed in more detail in BR-2, however current opinion points to the fact that reservoirs in temperate zones represent a sink for GHG if they are maintained correctly.

6.2 Hydropower status within water management

The Study followed a regional and River Basin approach in line with Water Framework Directive (WFD) and applicable guidelines (e.g. ICPDR). The objective was to prepare a **baseline for policy documents** that are typically adopted by governments or even parliaments in some cases. The Study contains numerous recommendations that will help national authorities in the development of their own plans, to follow at a later stage. Therefore, it is evident that the Study results are limited to **recommendations rather than any mandatory solutions** for the WB6 countries, for which the countries clearly retain their sovereignty in decision-making, provided such policy-making is compliant with the applicable national and international legislation in force.

When one or more interventions in a river system are planned, like water controlling measures such as reservoirs, then the cumulative impacts will be significant, and must be assessed. It would be too early at this Study phase, to assess concrete cases of cumulative effects of selected HPPs in the WB6 region. For that purpose, at least a conceptual design of a HPP, or a cascade of HPPs, together with planned reservoirs, would be needed to identify measures to alleviate and compensate for cumulative impacts.

Besides, the systematic development of river basin management plans would not only allow for compliance with the requirements of the EU Water Framework Directive but also collecting this essential data for appreciating the cumulative effect of existing infrastructures and prospective projects.

It should be understood in the planning stages, when dealing with development of HPP schemes in the region, that a coherent technical concept must be first developed which may require considerable funding to achieve, before conceptualising measures to overcome issues such as sediment trapping, the migration of water organisms, salami slicing of river habitats, or extensive hydro-peaking and drying up of the river.

Quantitative assessment of the cumulative effects along main rivers in terms of selected key environmental categories such as water discharges, sediments and biodiversity issues of river (sub)basins with other major river basins (e.g. at the confluence of Drina and Sava) is not feasible at this stage. Cumulative effects can be assessed in a more precise way, by modelling, once (i) a RBMP is available, and (ii) the dynamics, number and specific technical designs of proposed individual HPPs in each particular river basin, including their possible mitigation measures, have been clearly determined. This is very far from the reality in the WB6 region. Therefore, cumulative effects have been assessed in the Study to the extent possible, predominantly in qualitative terms, and which may differ from one river basin to another, depending on river basin specifics and the data available.

By the introduction of simplification in the river and hydrology network classification, the very complex system of water streams in the WB6 countries was made more transparent and manageable for the purpose of the Study. Eventually, the Study dealt with 4 Drainage Basins (Black Sea, Adriatic Sea, Ionian and Aegean Sea), 13 Watersheds, 18 River Basins, 10 Sub-River Basins, 27 Rivers, 78 Tributaries 1, and 25 Tributaries 2 in the Study (Table 6.1). The difficult nature of territorial divisions in the catchment areas will surface again when water-management plans will be scaled down from larger regions to smaller areas. This case is illustrated by the Sava RB Management Plan, which was harmonised in principle within all the countries of this RB, but when the details and solutions for the Drina RB will be decided, like changing of the water balance, connectivity etc., the complexity of resolving such issues within larger River Basins will emerge in full.

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Table 6.1: Classification of hydrographic elements

							Affiliation to WB6-countries					
DRAINAGE BASIN (DB)	**WATERSHED (WS)**	**River Basin (RB)**	**(Sub) River Basin (SRB)**	**River**	***Tributary 1***	***Tributary 2***	**ALB**	**BIH**	**KOS**	**MKD**	**MNE**	**SER**
BLACK SEA	DANUBE	**Danube** /SER part only/		Danube								
		Velika Morava /SER/	**Zapadna Morava** /KOS, MNE, SER/	Ibar								
			Južna Morava /SER/	Južna Morava								
					Nišava	*Temska*						
					Vlasina							
		Timok /SER/		Timok	*Crni Timok*	*Zlotska*						
					Beli Timok	*Grliška*						
						Svrljiški Timok						
						Trgoviški Timok						
		Temištica /SER/		Temištica								
					Visočica							
		Sava /BiH, MNE, SER/	**Drina** /BiH, MNE, SER/									
				Drina								
					Rastošnica							
					Osanica							
					Bistrica							
					Čehotina							
					Lim	*Djurička*						
						Grnčar						
						Kaludarska						
						Ljesnica						
						Sekularska						
						Trebačka						
						Uvac						
						Visočica						
						Zlorečica						
				Piva								
					Vrbnica							
					Tusina							
					Bukovica							
					Bijela							
				Tara								
			Bosna /BiH/	Bosna								
					Željeznica							
					Kozica							
					Babina r.							
					Fojnička r.							
					Krivaja	*Strupčanica*						
						Bioštica						
						Orlja						
					Spreča							
			Vrbas /BiH/	Vrbas								
					Bistrica							
			Una /BIH, CRO/	Una								
					Jezernica							
					Sana							
ADRIATIC SEA	TREBIŠNJICA	**Trebišnjica** /BIH, CRO/		Trebišnjica								
					Tihaljina							
	NERETVA	**Neretva** /BIH,CRO/		Neretva								
					Rama							
	BOJANA / BUNA	**Morača** /MNE/		Morača								
					Zeta							
					Mala rijeka							
					Cijevna							
		Drin-Bune /ALB/	**Bune/Bojana** /ALB/	Bojana/Bune								
					Gjader							
			Drini /ALB/	Drini								
					Curraj							
			White Drin, Drini i Berthe /ALB, KOS/	White Drin, Drini i Berthe								
					Drini i Berthe							
					Lumebardhi i Decani							
					Restelica							
					Lum i Istogut							
					Dikance							
			Black Drin, Drini i Zi /ALB, MKD/	Black Drin, Drini i Zi								
					Shale							
					Lumi i Zi							
					Borjes							
					Luma	*Caje*						
					Zalli i Okshtunit							
					Valbona							
					Gomsiqe	*Tetajve*						
					Nikaj (Drin-Bune)							
					Radika							
	MAT	**Mat** /ALB/		Mat								
					Sete							
					Mat (Milot; Kurbin)							
					Fan i Madth	*Mati*						
					Mirdite							
					Fan i Vogel							
					Prroni i Gjurajve							
	ISHEM	**Ishem** /ALB/	-	Ishem		-						
					Gjole							
					Zeze							
					Dushna							
	ERZEN	**Erzen** /ALB/		Erzen								
					Radicina							
					Sheja e Librazhd							
					Zalli i Lunikut							
	SHKUMBIN	**Shkumbin** /ALB/		Shkumbin								
					Bushtrices							
					Qarrishte							
					Gostime (Shkumbin)							
	SEMAN	**Seman** /ALB/		Seman								
					Osumi							
					Devolli	*Shishtavecit and*						
					Cemerica (Devolli)	*Verces*						
	VJOSA /AOOS	**Vjose** /ALB, GRE/		Vjosa								
					Smokthine							
					Drinos							
					Sarantaporos							
IONIAN SEA	BISTRICE	**Bistrice** /ALB/		Bistrice								
AEGEAN SEA	AXIOS / VARDAR	**Vardar** /MKD, GRE/										
				Vardar								
					Rakita r.							
					Sapunčica							
					Zrnovska							
					Korab							
					Lepenac							
					Treska							
					Madinar r. and Markova r.							
					Lepenac	*Psaca*						
					Pčinja	*Kriva Lakavica*						
					Topolka and Babuna							
					Bregalnica	*Dosnica*						
					Reka Crna							
					Bosava							
	STRUMICA	**Strumica** /MKD, BUL/		Strumica								
4	**13**	**18**	**10**	**27**	**78**	**25**	TOTAL					

Increasing distance from the Sea (DB) to the Tributary

Note: The classification system shown was a basis for the Databases of existing HPPs (BR-1) and the Inventory of candidate greenfield HPPs (BR-7), and the GIS support system developed in the Study.

6.3 Hydrography of the WB6 region

The hydrography of the region studied encompasses both the Black Sea and Mediterranean Sea Drainage Basins. The dividing watershed line signifies the geographical complexities of hydrography in the region. There are several River Basins, most of them being shared between the countries. Transboundary issues in water management have strong presence throughout the region.

The Danube is the second largest river in Europe and drains an area of approx. 801,093 km2. This basin drains parts of 19 countries with a total human population of 83 million (census in 2002). The average altitude of the basin is 458 m.

The major River Basins that encompass the bio-geographical diversity of the Balkan Peninsula are presented in Figure 6.1. From the Mediterranean side, one river enters the Aegean Sea (Axios/Vardar), while three enter the Adriatic Sea (Neretva-Trebišnjica, Drini/Drim and Vjosa/Aoos). Each of these River Basins are transboundary.

Source: HDS-GIS of WBEC-REG-ENE-01 project

Figure 6.1: Drainage Basins and selected River Basins

6.4 Activities undertaken

The Study rests upon safeguarding protected areas and adopting sound environmental and water management principles. BR-2, relating to Hydrology, Integrated Water Resources Management and Climate Change was prepared based on well-established and accepted hydrological principles. For sustainable hydropower development practices, beyond EU legislation (notably the need to do SEA and EIA at an earliest stage of HPP planning), additional guidance has been developed. The European Commission is providing a range of guidelines, notably with the forthcoming guidance document on Natura 2000 and hydropower, the CIS Guidance on WFD Article 4(7) jointly elaborated with Member States and stakeholders, as well as other organisations, such as those of the ICPDR, the International Hydropower Association (IHA), financial institutions.

The hydrological data available in the WB6 is either inadequate or missing. For hydropower yield calculation or climate change modelling, the data available either does not exist or is of poor quality.

Since adequate data was not available throughout the Region, it was not possible for us to further analyse the effect of future climate change on river discharges. In that regard, it was not possible to accurately predict the effect of future climate change on river discharges. However, the impacts of climate change on the run-off is expected to approximately equally affect all existing / planned HPPs throughout the Region, not creating significant differences in climate change impact between individual HPPs or river basins, but affecting the region and therefore the hydropower sector as a whole (For references, see climate change impact chapter in BR-2). At present, the effect of climate change on run-off has not been discernible in terms of hydropower output. Clearly, potential investors in HPPs are expected to make their individual assessment of what the effect of climate change will be on hydrological yield and consequently energy yield for the expected 40/80 years of HPP asset life. Current appropriate sources were used to develop the study conclusions in respect of hydrology and related issues such as WFD requirements, cumulative impacts and climate change.

Several information exchanges and country visits were conducted to obtain information and additional insights into the planning processes in individual WB6-countries relating to rivers and water resource development, including hydropower.

When considering hydropower development, several pieces of EU environmental acquis should be considered: the_**Water Framework Directive (Directive 2000/60/EC) WFD, the Strategic Environmental Assessment (SEA) and Environmental Impact Assessment Directive, the Habitats Directive, the Wild Birds Directive and the Floods Directive.**

With regard to the WFD and in relation to new hydropower development, in particular WFD Article 4(7) is of relevance and has to be considered. This because hydropower falls within the scope of Article 4(7) by entailing "new modifications to the physical characteristics of a surface water body or alterations to the level of groundwater". A planned hydropower project may cause deterioration of the current status of a water body (defined by WFD). An assessment has to be undertaken in advance about the expected effects on water body status. If status is expected to deteriorate, then the project can only go ahead in case the conditions as outlined in Article 4(7) of WFD are met. It should be noted that the size of the project is not a relevant criterion whether Article 4(7) is triggered since also small projects may cause deterioration. Thus, projects of any size may fall under Article 4(7) and must be checked against its legally binding requirements. The conditions which have to be met include that all practicable mitigation measures are taken to reduce the environmental impacts, that the benefits of the project outweigh the impacts and/or that the project is of overriding public interest, that there is no better environmental option and that the reasons for those modifications are set out and explained in the River Basin Management Plans.

Hence, a key element of Article 4(7) is to balance sustainable economic development with environmental protection.

Further details can be obtained from existing guidance on sustainable hydropower of the ICPDR and the forthcoming guidance elaborated at EU level.

The **EU Directive 2007/60/EC on the assessment and management of flood risks (EU Floods Directive)** entered into force in 2007. The aim was to establish a framework for assessment and management of flood risks, having adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the EU. In the context of hydropower development, flood protection can be an important benefit of reservoir development in case properly managed. The EU Floods Directive is also relevant from the point of view of transboundary Issues.

If properly planned, the development of sustainable flood protection in a particular River Basin should be possible without compromising the environmental objectives of the WFD. All flood risk management activities should be planned and carried out in line with Article 9 of Directive 2007/60/EC, which requires taking appropriate steps to coordinate the application of the Floods Directive with the WFD, focusing on opportunities for improving efficiency, information exchange and for achieving common synergies and benefits regarding the environmental objectives of the WFD.

However, existing flood protection measures are still one of the main causes of river and habitat continuity interruption. A normal part of flood action plans are the technical flood defence measures (especially the construction of new dykes and consolidation of the banks). These plans must however be combined with the measures for restoration of river and habitat continuity interruptions. Appropriate regulations regarding land use and spatial planning (e.g. limitations related to land use in flood-prone areas) must be adopted in parallel with flood protection activities.

It is crucial to recognise the links between the WFD EIA, SEA, Habitats and Birds Directives. The Directive on the assessment of the effects of certain public and private projects on the environment, known as the **Environmental Impact Assessment (EIA) Directive (2014/52/EU amending 2011/92/EU)**, includes special provisions for the cases in which a project implemented in one Member State is likely to have significant effects on the environment of another Member State. The **Convention on Environmental Impact Assessment in a Transboundary Context** (UNECE1991), known as the **Espoo Convention**, introduces specific rules for conducting an EIA of activities located on the territory of one contracting party, defined as the Party of origin, and likely to cause significant adverse transboundary impact in another contracting party, defined as the affected Party.

7 Climate change – effects on flood management and hydropower generation

Albania's high exposure and sensitivity ranks it as the most climate-change vulnerable country in the region. However, each of the countries faces its own climate change challenges with political and economic instability, demographic changes and limited institutional capacity, among others. The generally low adaptive capacity rankings in the "The Environment and Security Initiative" (ENVSEC), 2012, Climate change in the West Balkans, reflect the difficulty of these challenges and the relatively short time the countries have had to make progress. The individual country adaptation plans and the South-East European Climate Change Framework Action Plan are promising beginnings, and participation in the Global Environment Facility, the Dinaric Arc and Balkans Environment Outlook and the EU Stabilisation and Association process are further evidence of progress.

All this work lays the foundation for the even more challenging work that lies ahead at the regional level. A regional strategy for the management of water resources appears to be the key to successful climate change adaptation in the Western Balkans. The water resources in the region have a high exposure and sensitivity to climate change, and the fates of the flood protection, agricultural and energy sectors are all closely tied to the water sector. With so many transboundary river and lake basins, the countries of the region have the best chance of managing their water resources in cooperative fashion, whether through an existing agreement or a new one, or a series of bilateral efforts.

7.1 EU policy in climate change

The current EU climate change policy represents a demanding and determined strategy in the fight against climate change, demonstrates a high level of responsibility and awareness of the global problem by EU Member States and its citizens, and can be considered as a model for the rest of the world as such. It is based on the acquis communautaire in the fields of climate action and ozone layer protection that comprise several sets of climate-related legislation.

One of the world's most ambitious climate protection targets set for 2020 has been set up by the EU, and is on track to reach the 20% GHG emissions decrease goal over the pre-industrial (1990) levels. For 2030, the EU's policy framework is based on ongoing endeavours to 2020 and even more stringent climate as well as broader energy sector targets adopted in October 2014, notably:

- At least 40% cuts in GHG emissions (from 1990 levels);
- At least 27% share for renewable energy in gross final energy consumption;
- At least 30% improvement in energy efficiency.

Thereafter, the long-term strategy aims to fully transform the EU into a competitive low-carbon economy through the realization of measures including GHG emissions reductions of 80-95% percent over 1990 levels by mid-century. Achieving this goal relies on long-term investment in low-carbon technologies, the use of renewable energy, energy efficiency, and the deployment of smart grid infrastructure.

The European Commission has adopted an EU strategy on adaptation to climate change aiming at creating a more climate-resilient Europe (2013).

Climate action is globally guided by the Paris Agreement (2016). Its central aim is to strengthen the global response to climate change by keeping temperature rise well below 2 degrees above pre-industrial levels and to pursue in limiting temperature increase even further to 1.5 degrees.

7.2 Understanding of the relationships and impacts

The Balkans region has been under significant scrutiny to guide the application of EU and other funds towards Mitigation and Adaptation actions that should (i) reduce/stabilise GHG emissions and (ii) adapt to climate change consequences that are already developing.

When considering the long-term climate processes and climate change, which has been presented by leading international institutions like the UN, the European Environment Agency (EEA) and World Bank, currently held views and opinions relating to climate change in the context of hydrology and hydropower development were examined during this study. Consequently, the study endorses key recommendations for hydropower development and water-regulating structures, based on the latest elaboration of mitigation and adaptation measures available through literature sources, and in particular, the EC / Climate Action position on climate change, available from: https://ec.europa.eu/clima/change/consequences_en and guidance document Climate Change and Major Projects, EU-2016. However, the purpose of the study was not to discuss the climate topic as such, but to address how climate change impacts affect the rationale and ranking of the lists of sustainable greenfield HPP projects.

On the **mitigation side** of Climate Change, the substitution of currently-prevailing fossil-fuelled power plants by renewable energy based power generation will have an immediate, positive effect on total GHG emissions. Balanced against these CO2 emission savings is the question of the volume of GHGs that are emitted from the water reservoirs. This question is addressed in more detail in Section 3.2.3 of BR-2.

Several authors report trends of decreasing annual average flow in the rivers and streams of the Balkans. The most referential work related to the Western Balkans is UNEP's "Outlook on climate change adaptation in the Western Balkan Mountains", 2015 and "Climate Change in the West Balkans", ENVSEC, UNEP, 2012. Based on our assessment of the poor quality of hydrological data gathered in the region within the scope of the Study, such as daily discharges, it is apparent that overall trends of decreasing flows are an indication of what could happen in the future. This requires a solid analysis of planning, design, operation and maintenance of the HPP. Adaptation options must be part of the design, perhaps to be realised during large maintenance projects – by which time more and better data will be available. Also, water demand and water use in the river basins in which the HPP will be constructed, should be taken into account. If not, the hydropower generation design parameters will not reflect the economic potential during the life cycle of the HPP. The estimation of climate-induced variations to average hydropower production, significant in terms of HPP bankable assessments, will be improved after the effect of climate change mitigation measures becomes measurable in water flows.

Future temperature increase will have roughly the same effect on hydropower potential in the region (with slight differences). Therefore, climate change has very limited impact on the comparison of advantages of hydropower development – i.e. the prioritisation of HPP-candidate investments, being one of the objectives of the Study – because it affects electricity production differentially only slightly across the region. Those differences are too small to be considered in the comparative performance assessment and ranking of HPP candidates in Section 16 (and BR-8). However, on an individual basis the effect of climate change will play an important role in that HPP's electricity production assessment. Therefore, we would suggest that possible reduction of electricity generation in an individual HPP planned (or an extra chapter on possible impacts of Climate Change) becomes a standard part of sensitivity analysis during the feasibility stage of any HPP project development.

For more reliable hydropower generation planning, all countries in the region are advised, as a matter of top priority, to **improve their hydrological data gathering network for future integrated water resources planning**. However, gathering discharge/meteorological data and modelling rainfall/run-off is not an objective per se, but is necessary because it serves better decision-making and planning on river basins.

Based on case studies made at four HPPs referenced in the World Bank, 2015, Water & Climate Adaptation Plan for the Sava River Basin, several important conclusions were made regarding effect of climate change on discharge:

- A general conclusion is that all models show a temperature increase across the SRB, with larger values for the period 2041-2070. Precipitation change is more complex, but in general shows an increase during the winter and a decrease for the summer months. Summer precipitation deficit is more pronounced in 2041-2070 period.
- The SRB is also especially sensitive to climate change due to socio-economic factors that are particularly adverse, since the general migration of the population is away from agricultural areas towards cities.
- Core activities within the SRB that have been found to be important in the context of climate change are: navigation, flood protection, agricultural water management/irrigation, hydropower and public water supply, as the sectors that are most vulnerable to the impacts of the increasing temperature and decreasing river discharges.

The assessment of effects on the hydropower sector due to climate change provided the following conclusions:

- Impacts are principally associated with direct effects on power generating potential, but also indirectly through increased general demand for energy for heating and cooling due to higher or lower temperatures.
- With increasing evaporation due to future temperature increase, a larger decrease of hydropower production is expected to occur on reservoir type and pumped storage type dams that have high storage area/volume ratio and small reservoirs. Other types of HPP would show smaller effects, but would still experience a decrease in hydropower generation.
- A decrease in river runoff would affect power generation with a reduction on all hydropower facilities, but run-of-river schemes that are solely dependent on runoff will be most affected.
- Floods in the autumn/winter and droughts in the spring/summer would mostly affect run-of-river HPPs and HPPs with small reservoirs. In these types of HPPs, an overall power generation decrease is expected.
- Results for the longer-term future showed a significant variance between the climate models. Energy production would change between -8% decrease for HPP Bočac and +4% increase for HPP Bajina Bašta, although the order of the magnitude of these changes is within the range of the modelling and measurement uncertainties.

The general trend in most cases, however, was decreasing hydropower production.

Furthermore, the study assumes that both drought and flooding will become more extreme compared to the present state, while the average annual discharge, important for hydropower production, will remain approximately the same in the near to mid-term period. Consequently, the adaptation of hydropower facilities to climate change, characterised by occurrence of extreme low and high discharges, should be in reservoir development. **Reservoir volumes should be sized to compensate for the increased seasonal water imbalance in future.**

7.3 Flood management

Current flood protection in the river basins of WB is insufficient for effective flood management for many reasons, including inadequate infrastructure, poor maintenance, the lack of coordination in the basin in terms of monitoring, forecasting, and warning systems, and so on. This was starkly evident during the destructive floods of May 2014, which were assessed as some of the worst floods on record.

The main predicted impact on future flood management is not only climate related, but associated also with future social, economic, and infrastructure development. Without any doubt, the impact that climate change will have on flooding in the future is significant and should not be underestimated, since the flood hazard is increasing. Although the modelling results indicate that the climate-induced impact will be smaller in the downstream plains than in the upstream mountainous regions, the role of flood protection infrastructure should not be ignored, as the infrastructure protecting the upstream regions is at the same time increasing the downstream risk.

In Croatia, for example, the May 2014 floods proved that the existing natural retentions have a limited capacity to accept major flooding, thereby emphasising the need to increase this means of flood protection to complement the aging and insufficient system of embankments or to retain more volume in the upper river sectors. At the same time, severe flooding occurred in the northern part of Bosnia and Herzegovina, and central parts of Serbia.

Catastrophic events with floods occurred in region during 2014, which once more pointed out and raised the issue of the importance of urgent activities needed to develop an integrated solution for river Bosna on the part of the river which is located within the territory of Republika Srpska.

8 Hydrologic data in the Western Balkans

Collection and assessment of hydrological data are at two levels, (1) by Water Catchment Area (i.e. river basin) and (2) by Country. During this activity, the project team initially experienced a reluctance in countries to deliver daily discharge data. Eventually, data was obtained through local experts for Albania, Bosnia and Herzegovina, Serbia, and the former Yugoslav Republic of Macedonia, however this data differed in both quality and measurement periods. Those data that were analysed were generally of poor quality and were not suitable for the energy potential estimation throughout the Region. To achieve this, harmonised hydrological data by period, site / river basin and quality needs to be available. The daily discharge data collected for this Study is available in a digital form and can be supplied upon request.

Improving basin-wide hydrology monitoring, data verification and exchange, and knowledge sharing are often the obvious solutions identified in the Region. These include joint monitoring (e.g. water flows and quality), joint forecasting (e.g. weather forecasts, energy demand), as well as the identification of good practices at local and national level, for example in the areas of non-economic valuation of external benefits and costs.

An implementation of the Water Framework Directive requires a practical reference to establish monitoring programmes/networks needed for a coherent and comprehensive overview of water status including wetlands within each River Basin. Therefore, effective monitoring is an essential component of “good practice” in river basin planning and management, and a central element of measuring progress in WFD implementation:

- Work on establishing monitoring networks (including evaluation of existing monitoring) must be carried out at an early stage of WFD implementation;
- Steps should be taken to establish the level and type of monitoring needed for maintaining an overview of changes in pressures and impacts, which may reflect shifts of root causes;
- Existing data — held by different governmental and non-governmental bodies (e.g. water supply companies, environmental agencies, conservation NGOs, local municipalities) — should be sought out and used as much as possible. It is important to ensure that data set ‘links’, are in place to provide the integration and/or aggregation of information needed for effective river basin planning and management.

WFD principal requirements of monitoring are the following:

- Establish monitoring programmes/networks needed for a coherent and comprehensive overview of water status including wetlands within each RBD;
- Cover both surface-water and ground-water bodies, as well as coastal waters;
- Include ‘surveillance’, ‘operational’ and ‘investigative’ components;
- Additional monitoring for protected areas.

Data quality for hydrology of the Western Balkans streams is of utmost importance for analysing hydropower potential, climate change and cumulative effects (in transboundary context). Without a reliable set of data with sufficient coverage of the river basin, no analysis would be possible.

9 WFD framework for hydropower

The Water Framework Directive is intended to act as an ideal guideline for multi-country cooperation, as it promotes the management of watercourses at the scale of the hydrological river basin which may cross administrative boundaries in both EU and non-EU countries. It requires the establishment of common management plans at the river basin level, whereas the bilateral agreements signed so far do not contain these provisions and none of the bilateral bodies established so far, (for example between Bosnia and Montenegro, or the former Yugoslav Republic of Macedonia and Kosovo) have the competence to undertake this responsibility. The issue of common planning and river basin management is of great importance in effective co-operation. Since the WB6 countries are in accession, it would be a good opportunity for EU Member States (the relevant ones for the region are Slovenia, Croatia and Greece) and the WB6 counties to commence working together to develop agreements for their mutual benefit.

There are two good examples of River Basin Management planning done for the whole Danube basin (in the frame of the ICPDR) and for the Sava River Basin (in the frame of the ISRBC), which are relevant for the Region. The River Basin Management Plans elaborated in the frame of these institutions are addressing hydropower, also with specific documents like the ICPDR Hydropower Guiding Principles. However, more detailed planning and follow-up is needed at national and/or regional level. While all water using sectors (municipalities, hydropower, nature parks, etc.) have prepared their own development plans, much work is now required to integrate and coordinate these sectorial plans, as well as the water management plans, with the economic development and land use plans. This needs to be done and coordinated simultaneously at different levels:

- per sub-basin (tributary), because many interventions have only local impacts and serve only local interests),
- for each country (and in BiH, for each entity), because each has either sovereign or certain autonomous rights and national/entity development priorities, and because of the differences in the national/entity legal frameworks, and the need to harmonise, and
- at the aggregate level of the Drina RB.

For example, it has been observed that cooperation in the Drina River Basin is relatively weak between the different users/sectors, between the three countries, and between different stakeholders, such as local governments, tourists and anglers.

Such integration would help prioritise investments based on the identification of the common points between different proposals – either at local or at regional scale – that can be of competitive or of synergistic nature. Thus, some investment or management proposals may be mutually exclusive, requiring a proper trade-off analysis, or they may, when taken together, help achieve economies of scale, mutual benefit, or possibly create win-win situations. The investment and management prioritisation needs to be guided by environmental protection, economic development and land use strategies, while such strategies in turn should take into account water availability.

The recently-published “Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the European Union Strategy for the Danube Region” is accompanied by an Action Plan, which includes actions and examples for projects to be implemented during the implementation of the strategy. A measure that is directly addressing hydropower planning has been referred to as: the development of a comprehensive action plan for the sustainable development of the hydropower generation potential of the Danube River and its tributaries (e.g. Drina River, Vrbas River, etc.). This plan is intended to pave the way for the coordinated and sustainable development of new power stations in the future and the retrofitting of existing power stations such that the environmental impact and the impact on the transportation function of the rivers (navigation) is minimised.

9.1 Best practices to achieve the environmental objectives

Cooperating in the planning and implementation of hydropower projects helps to make the most of the comparative advantage of the river basin, to achieve an efficient and optimal resource use, while minimising environmental impacts and given that hydropower generation potential and energy demand are geographically imbalanced. Hydropower schemes should undergo a process of thorough IWRM planning where both SEA and EIA (including transboundary assessments for plans/programmes and projects that have significant effects on another country) play a decisive role, next to the WFD and nature legislation, with consent being granted for the acceptability of impacts on biota, water, sediment, etc. In a transboundary environment, there is one more consent to be provided from each of the involved countries administration. This consent depends on their agreement and is not achieved very often, according to current experience.

Joint mechanisms implemented from the start of a cooperative hydropower project can help to prevent, mitigate and monitor adverse effects, such as the consequences on ecosystems integrity and diversity (aquatic, terrestrial, hydrological dynamics and sediment/nutrient transport) and on social systems (because of the negative impacts on fisheries, agriculture and food security) and ensure that nonetheless emerging adverse effects (as well as benefits) are shared in a fair and equal manner among the countries.

Whether these benefits and risks will emerge, depends on many factors common to all hydropower schemes, however some factors characteristically differ in transboundary related cases, therefore the following advice and recommendation should be consulted in a hydropower case:

1) Proposed reservoirs use:
   - A hydropower reservoir can exacerbate peak floods and droughts in downstream countries, change sedimentation regimes, and block fish passages, but when developed in conjunction with flood protection significant benefits could be obtained. The use of a reservoir for flood control can help flood prevention in downstream countries and regularise flow regimes.
   - Diversion of a water quantity from one river basin to another should be approached on an individual basis. The transfer of water is not specifically excluded, however if the benefits and externalities are in favour of it, any decision making should consider such possibility.
2) Geographical position of reservoir:
   - If a reservoir (or cascade) is in an upstream state A and has positive and/or negative externalities in downstream state B (e.g. Vardar/Axios, Ćehotina), then negative impacts and externalities should be mitigated within economic feasibility conditions. Together with any beneficial effects and externalities, a Cost-Benefit Analysis will be developed and used for negotiations. Cumulative Impact Analysis will be used as a reference for the evaluation of reservoir impacts on a downstream state B. If the flow downstream is modified in a beneficial way it can be the subject of compensation from state B to state A or the opportunity to rightfully participate in an investment model.
3) Measures/instruments/legal acts to plan and survey the environmental and social effects of a hydropower plan including transboundary:
   - Legally required environmental impact assessments as requested by EIA, Espoo Convention, Habitats Directive and WFD, together with project planning and strategic environmental assessment (SEA) for plans and programmes, to foresee environmental impacts and address the question if the project should proceed. Then during construction and operation, mechanisms to monitor and mitigate cumulative environmental impacts.
   - Measures to monitor and mitigate water balance, sediment transport and connectivity of biodiversity. Realisation of a river monitoring service at gauging stations located at state borders.
   - Mechanisms to assess the socio-economic effects of hydropower/flood protection reservoirs: in this respect the existing agreement, especially if relatively ancient, should be rewritten and negotiated again in the present political constellation. Exceptionally, agreements can be reconfirmed if acceptable to all parties.
   - Economic effects of multipurpose reservoirs, but predominately energy and flood protection should be maximised, to promote faster realisation under the condition that environmental impacts are compensated realistically.
   - The Water Framework Directive (and Floods Directive when applicable) should be taken fully into account.

10 Environment considerations

The purpose of BR-3 on Environment considerations was to propose recommendations for rehabilitation of existing HPPs and to present the main results of the environmental and social assessment activities carried out at (i) river basin level and (ii) country-level of the greenfield hydropower schemes identified and under consideration in the Study. The main goal being to develop a sound environmental basis, including the social aspects (resettlement, land use, cultural heritage), for the classification and evaluation of the hydropower proposals under consideration. Furthermore, in association with the Multi-Criteria Assessment (MCA) of prospective HPP projects in BR-8, the assessment undertaken in BR-3 was used to assist in determining the sustainability aspects of proposed HPP development projects from the ecology, environmental and social perspectives.

Hydropower projects in WB6 are diverse in terms of state and concepts - from large dams to run-of-river plants. Hydropower development project documentation varies greatly from a large number of Ideas and Concepts through to a few Detailed Designs. The associated environmental documentation also varies throughout the region, notwithstanding the fact that most of the governing national environmental legislation is already harmonised to a great extent with EU legislation. However, gaps do seem to exist in the regulations and procedures for obtaining environmental consent (for details, see BR-4), and especially the time required to get an environmental consent, which is mandatory for hydropower development planning.

The MCA scoring system defined the criteria and sub-criteria to be used from the environmental perspective, their relative weights and the scoring system to be applied. Also “deal-breaking” criteria were identified and defined (for details, see Section 16 and BR-8).

Certain activities under the environmental assessment were dependent on, and support other tasks undertaken within the scope of the Study, in detail:

- **HPP location definition for assessment** – Task on Identification of HPP projects and acquiring relevant information for the HPP inventory and investment planning (BR-7);
- **Defined HPP location in GIS** - Task on Establishment of central HMP-GIS database (BR-7);
- **Definition of river basins** (basis for river basin approach), **Cumulative effects** (water flows, sediments, fishes, etc.), **Ecologically Acceptable Flows** – Task on Assessment of hydrology baseline, water-management on country and river basin and transboundary issues (BR-2);
- **Protected areas data input preparation for MCA** - Task on Multi-Criteria Assessment (MCA) of prospective HPP projects (BR-8).

The first step for the Environmental Analysis undertaken in the Study is the assembly and collection of all relevant and available data. In the context of this project, the environmental data collected was geospatially positioned in order to assemble, evaluate and present a clear baseline of the environmental characteristics throughout the WB6 as a whole and at the level of specific river basins / sub-basins. Once all available data were collected, and HPP locations confirmed, an analysis of environmental issues was conducted, based upon the HPP location / river stretch / watershed / river basin.

Spatial and environmental data were acquired through available sources; open source data, through consultations with environmental authorities, and confirmed through dialogue with all other relevant stakeholders and interested parties.

The current state of applicable acquis related with natural / water resources and environment is different between the countries. However, independently of this, full and detailed assessment, in full compliance with EU legislation, based on relevant and valid data must be conducted prior to planned HPP construction.

The requirements of EU environmental legislation and applicable international conventions shall remain the reference for hydropower projects in WB6 countries, the implementation of which should be supported through the Energy Community Treaty. The most important to fully consider in the HPP development process is the Water Framework Directive, the Floods Directive and the Birds and Habitats Directives as well as the Environmental Impact Assessment Directives (EIA and SEA). These directives are interlinked and should therefore be implemented in a coordinated way to ensure that they operate in an integrated manner.

The potential environmental and social effects of both greenfield HPP construction and the rehabilitation of existing HPPs were analysed. The most adverse environmental impacts of project development were identified and analysed for priority HPP schemes by river basin, and both the upstream and downstream river stretches were taken into consideration. Any other areas potentially affected by the project, such as reservoir areas and local communities, were also considered. This analysis also specifically includes the environmental assessment and potential mitigation of any new electricity transmission lines for connection of a greenfield HPP site to the appropriate node on the electricity grid.

A “River Basin” management approach has been adopted for the purposes of the Study per the Water Framework Directive. The “River Basin” approach, introduced by the Water Framework Directive, is a commonly-agreed principle in various guidelines (e.g. Guiding Principles on Sustainable Hydropower Development in the Danube Basin”) and in worldwide hydropower development practice generally. This principle states that water management and utilisation must be considered in the context of a whole catchment area and not river-by-river[3].

Both protected areas and protection zones are analysed for each HPP location (136 in the Study). **Natura 2000 areas are not yet designated in WB6**, and because of that, the environmental analysis was focused on those areas already identified, such as **Ramsar, Emerald, Biosphere Reserves, World Heritage Sites (Nature) and protected areas categories** transposed and proclaimed, according to current national legislation. Since HPPs may have irreversible impacts on protected areas, especially within the HPP direct impact area, potential impacts were identified and used in the MCA[4] assessment process of greenfield HPP projects. For derivation / reservoir type of HPPs, the direct impact area is designated as the "planned flooded area". These flooded areas were defined according to the technical data available on the elevation of the accumulation / retention basin, the coordinates and height of the planned dam and were estimated using a 3D elevation model.

For a detailed quantitative assessment of cumulative impacts assessments (relating to, for example, water flows, sedimentation transport, fish paths) by river basin, one needs to have; (i) SEA and EIA undertaken at as early stage as possible during development and prior to adoption of strategic planning documents, (ii) an integrated water management plan, (iii) a plan of construction of HPPs on the main water streams and tributaries including the dynamics of their commissioning, and (iv) developed HPP proposals (i.e. PFS and FS studies completed) etc. In practice, these preconditions are fulfilled in very rare cases in the WB6 region at present. Therefore, only a qualitative cumulative impact assessment by river system has been completed in the Study.

To minimise the negative environmental effects of HPP projects, the required environmentally acceptable flow (EAF) must be analysed and assessed. Formulas for the determination of residual flow are numerous and this is a real problem for the legislator who should set up the regulation governing these flows, and in practical terms this makes it difficult to establish reference values or formulas to comply with. Within a given group of methods, the differences in the results can vary significantly from one method to another. Therefore, existing legislation has been analysed based on national legislation, and a recommendation on the next steps for a reserved flow estimation throughout the WB6 countries has been proposed.

The change from a flowing river to reservoir with still waters (in storage HPPs) represents a crucial change of living environment for a certain number of species. This and similar effects and impacts are identified as a factor which is used in the selection of priority HPP development schemes. Since it is not possible within the scope of this study to conduct full SEA/EIA procedures, which are expected to follow from this study, fish fauna has been selected as a representative indicator of the most adverse negative effects on nature (wild life).

Recent findings show that the majority of environmental impacts can also be present in the development of small HPPs, while at the same time their contribution to overall energy production is negligible, especially when a number of HPPs are constructed in a single river basin without assessing cumulative impacts, both negative (environment) and positive (energy production).

Fish play a specific role as an indicator, since a broad spectrum of abiotic variables of different spatio – temporal scales are linked to the habitat requirements of particular species and their onthogenetic stages (Jungwirth et al., 2000). A first indication of the ecological integrity of a river is the structure of the assemblage, the presence or absence of individual species of fish, and their state of endangeredness (Scheimer, 2000).

Building a sustainable hydropower requires full accordance with the relevant environmental conditions and guidelines.

[3] Notes and remarks to the Classification of Watersheds and River Basins in the WB6 region for the purpose of this study, Zoran Stojič, WBIF-IPF3, 2016

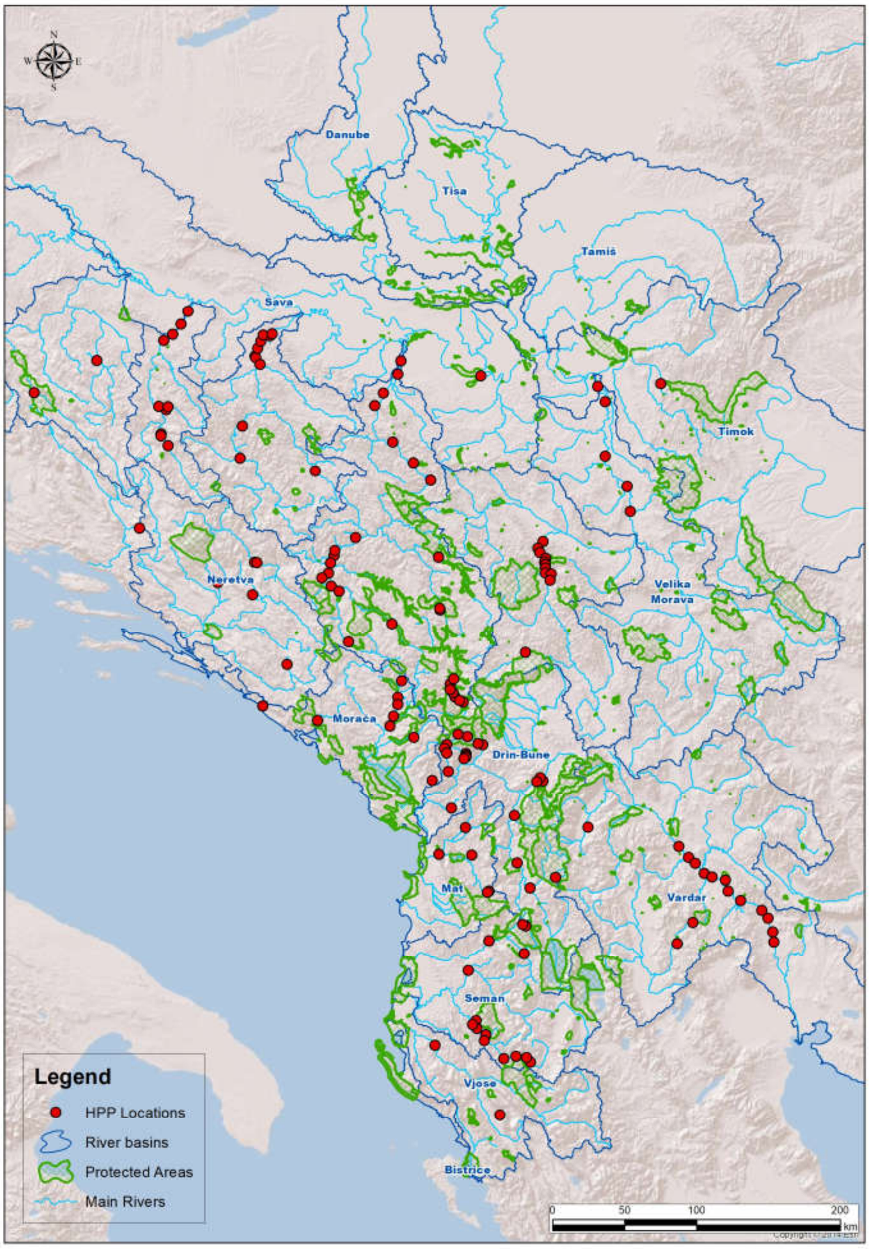
[4] Multi-Criteria Assessment (MCA) of prospective hydropower projects, EIHP, WBIF-IPF3, 2016

10.1 Protected areas by river basin

In order to follow a river basin approach, protected areas by river basin were identified. Below is an analysis of protected areas which are either fully inside river basin borders, or just partially. The numbers per river basin / sub-river basin are as follows:

- In Sava river basin, there are 91 protected areas or locations. In Una sub river basin, there are 3 protected areas/locations. In Vrbas river basin there is one monument of nature (Prokoško jezero) and 5 locations protected under national law. In Bosna Sub-River Basin there are 7 protected areas. In Drina sub-river basin 42 protected areas/locations can be found.
- In Velika Morava river basin there are 91 protected areas/locations.
- In Timok river basin 58 protected areas/locations can be found.
- In Temišnica (Nišava) river basin there are 10 protected areas/locations.
- In Neretva river basin there are 6 protected areas/locations.
- In Morača river basin there are 22 protected areas/locations.
- In Drin – Bune river basin there are 20 protected areas/locations.
- In Mat river basin there are 11 protected areas/locations.
- In Seman river basin there are 4 protected areas/locations.
- In Vjose river basin there are 3 protected areas/locations.
- In Vardar river basin there are 56 protected areas/locations.
- In Bistrice river basin there is 1 protected area.

Figure 10.1 shows the national park / protected areas within the WB6 study area



Source: HDS-GIS of WBEC-REG-ELE-01 project

Figure 10.1: HPP locations and protected areas by river basins

If a HPP is planned inside a protected area (or an area proposed for protection), additional assurances are needed that construction will not negatively affect habitat and species in the area. According to EU environmental legislation (BR-3, Section 2.3 Relevant EU directives and policies), **construction in a protected area is possible only under a very limited set of circumstances** (e.g. Birds and Habitats Directives – Analysis of the impacts through development of Appropriate assessment, According to Article 4(7) of WFD).

To avoid irreversible damage to nature, we recommend that **all WB6 countries define areas in the specific river basin for further HPP development and areas in which HPP development should be limited or completely avoided ("no–go" zones).**

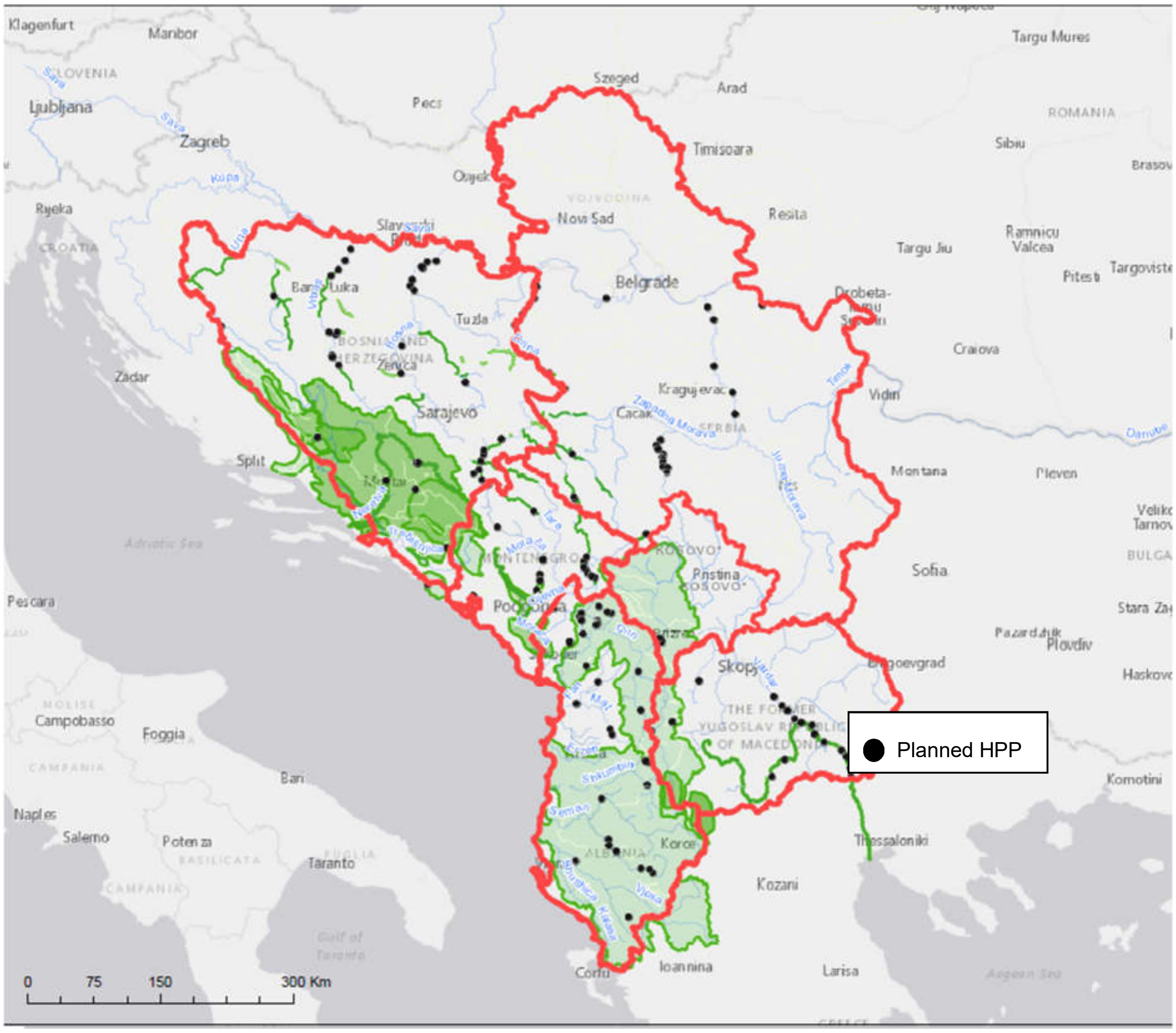
10.2 Fish fauna analysis

Fish fauna of the Balkans is very diverse, endemic species are numerous. In comparison with Central and Western Europe, the WB6 countries still have longer pristine stretches of rivers with highly diverse fish assemblages. From all European threatened species, 28% (52) of freshwater fishes occur in the Balkans, which makes the Balkans a "hotspot" for threatened biodiversity in Europe. At least 75 % of threatened fishes in the Balkans are very sensitive to the construction of HPP, which poses the most serious threat to freshwater fishes in the region (Freyhof, 2012).

Totally, 42 threatened fish species were used in the study to delineate the areas which are threatened the most by hydropower development and to illustrate the diverse impacts of HPPs on fish fauna.

Distribution of selected species is known relatively well; their conservation status is assessed by IUCN (*The IUCN Red List of Threatened Species*).

An overview of threatened fishes of WB6 region reveals that there are some areas with outstanding diversity, high portions of endemic species and with pristine and preserved rivers that present a remarkable habitat for many native species. Most of 42 threatened fish species included in the study were used to delineate six "areas of special importance for fish fauna". The areas hold at least two, but usually more populations of threatened species and freshwater habitats that are in a condition to maintain these populations. (Figure 10.2).



Source: HDS GIS of WBEC-REG-ENE-01 project

Figure10.2: Distribution areas of selected threatened species, used to delineate "areas of special importance for fish"

In the study, special attention was paid to long distance migratory species (sturgeons, shad, European eel) which migrate between marine and freshwaters in order to spawn and are highly endangered by unpassable dams and weirs which block their migration. The importance of restoring migration routes for sturgeons in the Danube and major tributaries is also stressed by ICPDR guidelines, the allocation of funding to restore sturgeon migration at the Iron Gate dams must be pursued by highest priority.

Table 10.1: Areas of special importance for fish

Area of special importance for fish	Drainage basin	Country
Self-sustainable populations of Danube salmon	Black Sea	BIH, SER, MNE
The Neretva drainage with its endemic fish fauna	Adriatic Sea	BIH
Karstic fields with its endemic fish fauna	Adriatic Sea	BIH
The Morača river drainage with Lake Skadar and its unique fish fauna	Adriatic Sea	MNE, ALB
The Drin river drainage with Lake Ohrid and Lake Prespa and its unique fish fauna	Adriatic Sea	ALB, MKD
The Vjose river as one of the last preserved rivers of Europe	Adriatic Sea	ALB

10.3 Good practices recommendations

Since changing discharge in interaction with the local geology determines the shape and size of river channels, the distribution of riffle and pool habitats, and the stability of the substrate and it provides different habitats and significantly influences water quality, temperature, nutrient cycling and oxygen availability, it has a major influence on: distribution, abundance, and diversity of stream and river organisms. It is now recognised that ‘‘minimum’’ flows are inadequate—the structure and function of a riverine ecosystem and many adaptations of its biota are dictated by patterns of temporal variation in river flows.

EU legislation use different terms for required flows, very common is “environmental flow" but other terms are also frequently used, such as “ecological flow” or “ecological minimum flow” or “minimum acceptable flow”, “ecologically acceptable flow”, “common low flow”, “minimum allowable flow”, “minimal residual flow”, “biological minimum”, etc. In WB6 region, “ecologically acceptable flow”, as defined in the WFD, is the most commonly used term and is used also in this study. Ecologically acceptable flows are now defined as “the quality, quantity, and timing of water flows required to maintain the components, functions, processes, and resilience of aquatic ecosystems which provide goods and service to people” (Hirji and Davis, 2009).

Good practice recommendations for **environmental mitigation during hydropower refurbishment projects** includes providing:

- An ecologically optimised river flow reflecting the ecologically important components of the natural flow regime, including a relatively constant base flow and more dynamic/variable flows.
- Where relevant, effective provision for upstream and downstream migration of fish, including sufficient flows.
- Dampening of hydropeaking by, for example, gentle ramping or discharging tailrace flows into a retention basin.

The choice and design of mitigation should take account of relevant site-specific circumstances, in particular the potential for ecological improvement.

Good practice recommendations related to **strategic plans**:

- Good practices on strategic planning include:
    - Using the strategic planning process as a key opportunity to help integrate water and energy policy objectives as well as the objectives of other key policy areas, such as nature conservation (e.g. by engaging the different Ministries/policy leads in the development of the plan; sharing ownership of the plan).
    - Linking strategic planning for the water environment, nature conservation and hydropower with the national energy planning on renewable electricity.
    - Involving all interested parties in the development of plans.
    - Using the planning process to help set priorities (e.g. with respect to balancing energy, environment and water management priorities)

   - Transboundary cooperation.
- Good practice uses of strategic plans include:
   - Using the plan to provide upfront information to developers about where (geographically) gaining authorisation will be more, or less, difficult.
   - Using the criteria on which the strategic plans are based as a framework for project level decision-making.
   - Using the policies and criteria established in the plans to help manage risk of cumulative impacts from schemes in the sub-river basin and even to decommission hydropower plants on priority river sections.
- There is already considerable expertise on strategic planning in relation to hydropower and the water environment. It is recommended to establish a mechanism to collate and share the criteria on which countries' strategic planning frameworks are based.

10.4 Summary of environmental analysis – regional level

The full transposition, implementation and enforcement of EU environmental legislation within the WB6 Region will provide a stronger base for sound environmental planning. Hydropower projects must be planned and developed based upon either already-transposed and implemented legislation or the principles of EU legislation where transposition and adoption does not yet exist. In the environmental and sustainability context, this refers to the SEA, EIA, Birds and Habitats directives, together with the Water Framework Directive and Floods Directive, and the Espoo, Aarhus and Berne Conventions. Using additional guidance (such as the forthcoming European Commission guidance documents on Natura 2000 and hydropower) during hydropower planning may also prove instrumental for the successful development of sustainable hydropower in the Western Balkans. WB6 HPP developers must follow this route if their preparatory activities will be supported by the EC and the HPP construction will be financed by EIB, EBRD or another IFI.

It is very important to use pre-planning and planning mechanisms to designate specific river basins, or stretches of rivers, for areas for hydropower development, either for individual projects or hydropower cascades. Our view is that from an environmental perspective, rather that random HPP development, it makes more sense to develop hydropower as a cascade along a particular river system, such that in the planning of that cascade full investigations can take place for environmental baselines, and SEA studies can be undertaken within the context of whole cascade to understand and resolve cumulative impacts and transboundary issues. More importantly, it is our view that the WB6 countries should establish clear “no-go” areas for new hydro-power projects, based on the protection of nature conservation values. The available strategic planning mechanisms (SEA, RBMP) are irreplaceable tools for sustainable hydropower development and successful multiple water uses.

The impact evaluation of existing and planned HPP's on fish species was based on the distribution of selected species in each drainage and river basin in the WB6 region and was related to the types of HPPs being planned in that river basin. The distribution of selected species represents the fish assemblages and their freshwater habitats that are the most sensitive to the changes in the waterbody resulting from planned HPP development, while their threat status reflects their risk of global extinction.

Regional recommendations are:

- Establishment of Ecologically Acceptable Flow (EAF), and the processes for monitoring that the EAF is maintained.
- Transboundary issues and cumulative effects must be addressed properly at the river basin area level.
- Stimulate transition to more adaptive management of transboundary regimes which differs between river basins throughout the WB6 region.
- A full assessment of cumulative effects should be undertaken for every hydropower project during the HPP projects development.
- Joint mechanisms implemented from the start of a cooperative hydropower project can help to prevent, mitigate and monitor adverse effects, and on social systems, where the dialogue will ensure that any emerging adverse effects are shared in a fair and equitable manner between the countries.
- Unmitigated or poorly mitigated negative impacts can cause flooding of houses and land in the HPP surrounding area and in

downstream area – a Resettlement / compensation plan must be developed.

- Prospective mitigation concepts are identified and based on that, recommendations for follow-up made.
- Sustainable development of hydropower in the WB6 region relating to possible environmental and social impacts would be greatly improved if regional level planning and pre-planning mechanisms and procedures were in place, especially regarding the establishment of "no-go" areas for new hydropower plants.
- Transboundary planning of hydropower use is essential for the proper protection of all new "no-go" or sensitive zones across the Region. Governments of WB6 countries should, through their agencies and Ministries, initiate transboundary dialogue as soon as possible.
- It is of utmost importance for each country in the region to ensure that mitigation measures for ecology and biodiversity are location- and project-specific. Development of monitoring systems for the effectiveness of prescribed mitigation measures is essential for the assessment of their successful application.
- It is recommended for the countries of WB6 region to develop a harmonised methodology for EAF calculation, and to harmonise respective regulations across the region.
- It is essential to map all the riparian habitats and harmonise habitat data across the region.
- It is recommended that WB6 countries develop and maintain a regional inventory of benthic fauna and invasive species.
- WB6 countries should develop and harmonise a biodiversity monitoring programme for transboundary river basins.
- All countries in the region should make a strong effort to ensure that all pollutants are moved outside of the flood plains (e.g. landfill) or are appropriately managed (e.g. wastewaters).
- WB6 countries should start as soon as possible, for all planned HPP's with potential transboundary impact, development of transboundary river basin environmental impact assessments (transboundary EIA), or cross-border SEA, including CIA, as an activity to be carried out at the earliest stage of project identification.
- All WB6 countries need to develop a public inventory of all planned protected areas. The database on planned protected areas should include whenever possible, the GIS defined borders of planned protected areas.
- Sustainable development of hydropower in the region absolutely requires the improvement of resources, skills and institutional capacity within both the agencies dealing with the technical approaches to hydropower development, and also within agencies responsible for the environmental protection and formulation of relevant policy solutions.

10.5 Remarks and observations

The key message of BR-3 on Environmental considerations to WB6 countries is that without properly addressing and resolving the conflicts of interest between the maximum development of the hydropower potential and use of water resources, and the preservation of environmental values and biodiversity, it is not possible to develop sustainable hydropower in the region.

The focus must be on the best use of water resources. Best use does not mean maximum use, but confining the development of hydropower to the level where mitigation measures can minimise impacts on habitats, species and local communities.

Important sustainability issues are better to be resolved during the planning and designing phases of a HPP project. This subject is even more important when a HPP cascade is planned. For that reason, all stakeholder sectors must be involved and a strategic assessment must be made to consider all the development plans for that specific river basin, in the transboundary context. By adopting such a process, potential conflicts are identified at an early stage and different solutions can be discussed before reaching a final decision.

In the cases where a design has been already developed without proper assessment relating to environmental factors at the strategic level and/or at the project level, redesigning should be considered to avoid the cost of retrofitting environmental mitigation measures afterwards, when the HPP is already operational. Additional unforeseen mitigation measures are usually costlier and harder to implement after construction and in the private sector the concessionaire, operating under contract, will not be prepared to finance these measures.

Because of HPP construction without adequate mitigation, negative effects are visible in all WB6 countries. HPP rehabilitation projects should also include ecological restoration measures (e.g. EAF, measures for improvement of river continuity for sediment transport, and fish migration).

Integrated planning is even more essential in cases where a river basin is shared between countries; all countries sharing a river basin should be involved in a joint process, to conduct assessments, to follow the guidelines, recommendations and conclusions from that process, to establish a common monitoring system, to share collected data and to react by implementing additional mitigation measures if unpredicted negative effects occur.

It is important to emphasise that no matter if it is strategic policy, plan or project level, the public must be involved from the earliest planning phase - for example in the development of a spatial plan, renewable energy plan, water management plan, irrigation plan and similar plans which relate to the same natural resources.

WB6 are in the process of transposing and implementing EU legislation. We advocate that HPPs are planned and developed in a coherent way, following the provisions of the EU directives. After the transposition of EU legislation into the national legislation of WB6 countries, it is then important to implement, monitor and enforce the terms and regulations contained within the relevant national laws, not just satisfy formal adoption, but to ensure sustainable hydropower development and operation.

If all prospective positive and negative effects are not considered together in a systematic, structured and coherent way, adequate mitigation measures cannot be effectively implemented and the consequences could be irreversible, permanent damage to ecosystems and the environment.

11 Transboundary considerations

11.1 Background to transboundary issues

Transboundary issues analysis provided in BR-5, provides the basis for assessing transboundary considerations during both the planning and operation of HPPs. Through the analysis of a number of specific transboundary case examples in the region, the analysis develops recommendations relating to the harmonisation of differing national practices relating to the resolution of HPP transboundary problems.

Options for potential private and/or public investment projects in the transboundary-related river systems of WB6 involve not only new dams and water storage reservoirs for hydropower, but also other water uses such as: developing agricultural irrigation systems, new tourist resorts and various water-related facilities for urban and industrial water supply. These developments will be implemented in river basins shared between countries, where different socio-economic conditions and therefore different preferences and different objectives prevail. Hydropower options must consider environmental consequences, impacts to ecosystems and human health, together with financial and social risks, while optimising the development of hydropower potential.

Despite numerous earlier transboundary agreements throughout the Region, some previously planned hydropower potential has not yet been developed, while some other HPPs that have been developed are now facing complaints from several transboundary parties. Until now, no satisfactory agreements have been reached during a series of negotiations between several WB6-countries facing transboundary problems. A failure to resolve these issues has resulted in even more complicated relations between nations in a conditionally stable Region.

The final goal in resolving potential water use conflicts is an agreement concerning the sharing of water quantity and hydropower potential between countries or entities. Nowadays, noticeable pollution from one part of river basin, especially after heavy rainfall, can raise tensions in the Region highly dependent on irrigated agriculture and hydropower.

11.2 International rights and obligations – an overview

From the aspect of their impact on hydropower development in the region, the following Conventions should be applied together with the implementation of the **EU Acquis** containing transboundary aspects (i.e. of the EIA, SEA and WFD):

- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo 1991);
- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus 1998);
- Danube River Protection Convention (1998).

Cooperation on use of the resources shared across the border is necessary for most of the WB6 territories in many aspect – still, Kosovo, due to their limited ability to become party to many of the relevant agreements, has significantly less rights and obligations in this regard that other countries in the region.

EU Member States are responsible for the performance of those obligations resulting from the Espoo Convention not currently covered by Community law and more specifically by the EIA Directive. The Community underlines that the EIA Directive does not cover the application of the Espoo Convention between the Community on the one hand and non-Member States party to the Espoo Convention on the other hand. From this, it follows that the Community, within the limits indicated above, is competent to enter into binding commitments on its own behalf with non-members countries which are Contracting Parties to the Espoo Convention (ratified by Albania and accessed by all other countries except Kosovo).

The focus of the **Energy Charter Treaty (ECT)** is cross-border cooperation in the energy industry by addressing the energy trade, energy investments, energy transit, energy efficiency and dispute settlement. On dispute resolution, the ECT provides for jurisdiction in disputes limiting the possible participants to being either two states (both parties to the ECT) or an investor (a national of a party to the ECT) against a state (another party to the ECT).

Both the ECT and the International River Commission can support the implementation of EU Acquis on transboundary cooperation. Coordination across the (international) river basin is a requirement under the EU Water Framework Directive (WFD), while globally the practical application/achievement of equitable water sharing in an international basin necessitates (as a prerequisite) the establishment and operation of a proper International River Commission (IRC) such as the International Commission for the Protection of the Danube River (ICPDR) and the International Sava River Basin Commission (ISRBC). IRCs are formal interstate institutional governing bodies, which will have as a basic task the recommendation (and monitoring upon implementation) to the policy makers of the participating countries, of appropriate decisions regarding plans, projects and policies consistent with IWRM. The establishment of such IRCs should be based on three basic supporting pillars: operational (technical cooperation), political (responsible for an enabling environment) and institutional (responsible for laws and institutions). A prerequisite for the WB6 countries to have IWRM established is that they must operate within a fully transposed and implemented Floods Directive (2007/60/EC) framework, requiring coordination across the river basin, including transboundary coordination.

A ‘soft law’ instrument, the UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992) is also relevant, but does not substitute for the formal agreements sought between countries under the WFD.

Three multilateral agreements address the individual river basins in the region, namely of the Danube, of the Sava, and of the Drin. They all introduce a river basin focused approach to management and use of water with some level of hazard prevention and adverse consequences reduction. The Water Framework Directive is explicitly referred to as a source of law and/or good practice among the parties in Sava and Drin agreements. Today, out of 20 countries sharing the Danube river basin that includes all six from the region, 14 are parties to the Danube convention with 2 of WB6 missing. The Sava River Basin is also shared by all the WB6 territories with only two of them, namely Bosnia and Herzegovina and Serbia, being parties to the Sava framework agreement. All the WB6 countries sharing the Drin river basin are parties to the related Memorandum of Understanding.

In the field of bilateral agreements, our research yielded only a handful with varying degree of importance and relevance to the hydropower development. It appears that very few of the bilateral agreements concluded in the past between former Yugoslavia and other countries have been effectively succeeded and can be today perceived as valid and operative. In relation to hydropower development, there only four bilateral agreements have been found valid, recognised and thus able to effectively govern relations of the sovereign states from the WB6 region and respective counterparties. The pairs of countries they apply to are: Albania and

Greece, Bosnia and Herzegovina and Croatia, Montenegro and Croatia, and Albania and Montenegro.

An important move has been made in the recent years from agreements based on mutual rights and obligations towards agreements based on the needs of individual countries, as such a principle has been identified as leading to more balanced and just solutions. Therefore, transboundary issues can be addressed only if the parties are willing to understand each other and share a common understanding of the issues at stake.

While many beneficial actions can be taken at the national level, **Multi-country coordination and cooperation** at basin and regional level offers an additional opportunity for optimisation. The WFD provides this basis, through the preparation of a RBMP and River Basin-orientated institutions like ICPDR or ISRBC. In assessing the river basins from the regional point of view, there is clearly scope to improve the legal basis for cooperation, to clarify the roles and responsibilities of basin institutions and to develop their capacities. Coordination and cooperation is required to provide incentives for institutions which do not yet exist, such as for the Drini/Drim River Basin which is shared by Kosovo, the former Yugoslav Republic of Macedonia and Albania. Indeed, most of the solutions identified are related to knowledge management and the development of integrated planning processes. Among the Sava Basin countries, the European Union's acquis communautaire and the Energy Community are gradually harmonising regulation and integrating the energy market.

Improving basin-wide hydrology monitoring, data verification and exchange, and knowledge sharing are often the obvious solutions identified. These include joint monitoring (e.g. water flows and quality), joint forecasting (e.g. weather forecasts, energy demand), as well as the identification of good practices at local and national level, for example in the areas of non-economic valuation of external benefits and costs.

In general, the stakeholders are expecting stronger planning processes being put in force. River basins of the Region, current or planned processes, offer interesting insights, such as the Sava River Basin Management Plan, to coordinate actions between water, energy and agricultural sectors, and the Flood Risk Management Plan of the Sava River Basin to coordinate action around the flood retention areas and wetlands. In the Drina River Basin, coordinating measures have been identified in the areas of climate change adaptation, flood risk management and water quality protection, together with strategic planning for developing hydropower potential through optimising hydropower development considering the cumulative effects of multiple hydropower plants.

11.3 Relevant EU Acquis provisions and EIA procedure for transboundary projects

There are two transboundary aspects[5] dealt with for large-scale infrastructure such as hydropower (for details see BR-5):

1. Water resources management in the case which discharge and water head representing hydropower potential is shared between countries and should be divided somehow. This aspect has been elaborated in detail and represents a main part of the Study. Integrated River Basin Management involves riparian countries and resources use and should be agreed upon in an IRBMP, meaning that transboundary process is inherently involved in all cases of water resources planning.
2. Transboundary process of large-scale infrastructure authorisation, which is regulated and important in the phase of project realisation.

BR-5 provides a review of the state-of-the-art in Transboundary Issues regarding organisation and information management. Furthermore, in addition to general analysis, it presents lessons-learned from studying a number of specific transboundary cases in river basins of the Region and develops the extent to which those cases support solution management. The subject of this report is to present an approach to the planning and development of transboundary hydropower schemes and to address certain aspects of the existing transboundary issues in the region, many of which emerged during the conflict and transition towards a market-orientated economy.

Transboundary issues and the transboundary authorisation process are covered by EU legal

[5] Adapted in one part from: "Guidance on the Application of the Environmental Impact Assessment Procedure for Large-scale Transboundary Projects, European Union, 2013.

instruments. Specifically, the transboundary process is regulated by three pieces of key EU legislation:

- The SEA Directive with its obligation to consult another country in the case of potential transboundary impacts of a program or strategy.
- The WFD Directive with its requirement to adopt (and revise on regular basis) a RBMP in close coordination with other states in the case of a Transboundary River Basin.
- The EIA Directive with its obligation to notify and consult another country in the case where a project is likely to have a negative impact on another country.

Environmental impact assessment of transboundary projects has been carried out for many years under the EIA Directive and the Espoo Convention. The most common situation involves two countries - one where the project is situated and another where it may cause significant environmental effects. In recent years, lately more large-scale projects are being realised covering the territory of more than one country (e.g. water-management, but typical for roads, power transmission lines, etc.). These 'transboundary' projects are likely to have significant environmental effects on each side, and involve many stakeholders (national, regional and local authorities, NGOs, the public).

The countries responsible for authorising such projects often differ in legal systems and EIA procedures. In addition, the environmental and socio-economic impacts of transboundary projects are not limited to project boundaries but rather go beyond physical borders. Multilateral cooperation is therefore essential.

The WB6 countries are signatory countries to the Espoo Convention except for Kosovo.

For the time being, there is only limited practical experience applying the EIA procedure to large-scale 'transboundary' projects in the water-management arena. It has been gained mainly from the HPP development on Sava River between Slovenia and Croatia, which can be regarded as most recent and successful implementation of the mentioned transboundary procedures. This project is not significant only for EU, where it is the only hydropower project realised under transboundary procedures, but it is significant for the WB6 Region, because of its location at the periphery of the Region. This is also a case of good practice in realisation of hydropower maintaining good relations between the countries involved.

Some of the lessons learned from this practical experience are the following:

- There was no prior relevant bilateral agreement between the two countries, but only points of contact and focal points accredited for Espoo Convention and SEA Protocol were designated with their tasks and responsibilities. The case shows that the procedures could be managed successfully via these focal points.
- A formal contact has been carried out to meet the legal requirements of the SEA Protocol. The cooperation shows that it is important to activate informal negotiation throughout the process and especially at the: starting, consultation and final stages.
- Experience shows that the negotiations which were conducted between points of contact and responsible authorities within both countries as well as between authorities and NGOs and public on both sides of the borders were essential for the positive outcome of the procedure.
- To manage the process, working groups in Slovenia and in Croatia were organised and cooperated during the entire process until the final decision was taken.

For large-scale transboundary projects, a straightforward interpretation of the rules of the Espoo Convention and the EIA Directive would be the best starting point of action. It must consider the overall objective of EIA, namely ensuring that likely significant adverse effects of transboundary projects are assessed before development consent is issued and that they are integrated into project planning and considered in decision-making. This is the reason to prepare joint EIA documentation before any national EIA procedure is started or carried out. This approach ensures that projects are not split along border lines artificially and that their overall cumulative effect is considered possibly by elaborating separate Cumulative Impact Analysis. Finally, learning from the latest law cases of the EU Court of Justice, it is up to the competent authorities to ensure that the overall assessment of a project’s effects on the environment is carried out.

In the EU, the European Commission does not participate in EIA and authorization procedures; these responsibilities lie solely with the EU Member States authorities. Similarly, EIAs required under the Espoo Convention are carried out under the sole responsibility of the concerned parties; the Convention's Secretariat has only an advisory role.

11.3.1 Overview and proposed action

Hydropower schemes should undergo a process of thorough IWRM planning where EIA plays decisive role with consent granted in acceptability of impacts on biota, water, sediment, etc. In a transboundary environment, there is one more consent to be provided from each of the involved countries administration. This consent depends on agreement, which needs to be achieved more often.

Despite that integrated water resources planning is today clearly dealt with in the WFD, which provides a legal guide for river basin approach, it has not been so in the past decades.

By neglecting transboundary situations, mistakes were made which still require to be resolved. Those mistakes generally concern the division of water quantity and water head at the river basin level and an omission in determining management rules (reservoir function) from source to river mouth. The absence of river basin authorities further exacerbated the transboundary issues experienced.

The range of benefits that can be realised in a transboundary situation is motivating countries to abandon the unilateral decision making usually practised, in favour of joint action. However, joint action is only possible if the benefits from cooperation are higher than those from unilateral action and countries have full understanding of that.

When countries engage in negotiations relating to water resources planning, the countries are effectively negotiating about national development plans, because governments frequently want to optimise the use of their available water resources for multiple purposes, including energy production. Thus, the development of hydro power plants are directly connected to national development interests, being at the same time a transboundary issue and an issue of national sovereignty.

The key message is that without properly addressing Transboundary Issues the best use of the hydropower potential, and water resources in general, will be lost. It has been demonstrated that co-operation between parties is possible and considerable good practice of sharing hydropower potential has been established in the past. Nevertheless, resolving transboundary concerns is in the best interest of countries, so positive outcomes from the process could be expected.

11.4 Objectives: principles and solutions

Non-integrated planning may result in unforeseen negative consequences of human interventions (engineering-structural and/or policy measures), which are difficult to correct and may give rise to tensions between riparian countries sharing the water system. The EU Water Framework Directive addresses this issue by requiring the preparation of integrated River Basin Management Plans (RBMP).

Very often, interests differ within the same shared river basin inside a country. Consequently, riparian countries' administrations may develop diverging policies and plans that are not compatible with the IWRM concept. The prerequisite for IWRM in WB6 is to fully transpose and implement the Water Framework and Floods Directive.

This represents a sovereignty issue: to what extent may individual countries develop and use resources found within their territories and to what extent do they have to consider interests of other riparian countries, and the common benefits of the river basin as a whole? One of the biggest challenges in sharing international rivers is to identify development strategies whereby all riparian countries eventually gain from an equitable allocation of investments and benefits.

Many principles of transboundary Integrated Water Resources Management (IWRM) can be found. The guiding principles recognised through international conventions, treaties and resolutions are: limited territorial sovereignty, the principle of equitable and reasonable utilisation, a unilateral declaration not to cause significant harm, the principles of cooperation, information exchange, notification and consultation, and the peaceful settlement of disputes.

The operational pillar is central to the success of any IRC's tasks. It must support most of the load if one of the two other pillars are not sufficiently effective.

11.5 Solving integrated water resources management problems

11.5.1 Achieving hydropower consensus

Consultation is required to review the impacts of national and sectorial development strategies, plans, programmes and major projects affecting River Basin scale resources (provided for by some of these instruments) to promote inter-sectorial harmonisation. Laws on EIA and SEA have been introduced at the framework level throughout the Region, but in some administrations implementation is not yet complete and is being developed further. The EIA procedures apply at the level of specific HPP project proposals and SEA at the level of planning, and both require consultation with other countries if a significant adverse impact is assessed to affect another country (see details in Section 2.2.2 - EU and International Transboundary Legal Framework of BR-5).

A rational use of resources, both water and energy, together with the protection of the environment, needs to be established. Most of the countries sharing the river basins in the Region have adopted either the "user pays" or the "beneficiary pays" principles, however energy producers are usually not charged for the water they use.

11.5.2 Infrastructure

Sustainable management of river basin resources requires larger investments in infrastructure and in the proper operation of power plants. Investing in the modernisation of built (grey) infrastructure contributes towards the preservation and protection of the rivers basin's resources, because no new space is taken. This includes, for example, thermal power plants reducing their water demand for cooling and reducing system losses in energy transmission. Investing in protecting natural (green) infrastructure, such as floodplains, wetlands and forests in the upper watersheds, may be a cost-effective and sustainable solution in many cases and is generally worth exploring further.

Other infrastructure options include ensuring that new water reservoirs (sometimes built with the main objective of hydropower generation) are designed to maximise the benefits to multiple users and to coordinate infrastructure investments such as in hydropower with other potential renewable energy sources. Furthermore, upgrading existing infrastructure may be more advantageous than developing new projects. In the river basins, it is not only the design but also the operation of hydropower infrastructure that requires specific attention as it affects downstream flows of water (and subsequent water users, e.g. irrigation).

11.6 Ever changing transboundary relations

The transboundary situation is not a constant, it is undergoing permanent changes with the development of the political situation. When analysing transboundary relations and issues, diverse geography and changing political background should be considered.

Some 90% of the territory of the South-East (SEE) Europe falls within transboundary river basins, including those of Danube, Drin, Martisa/Meriç/Evros, Vardar/Axios, Neretva, Vjosa/Aoos and others. These and other transboundary rivers of SE Europe flow into the Adriatic, the Aegean, the Ionian and the Black Sea, while WB6 countries are drained into the same seas but from a somewhat smaller territory. More than half of the transboundary basins are shared by three or more riparian states. Shared basins with lakes include Doiran, Ohrid, Prespa and Skadar/Shkoder lakes.

Prior to 1992, there were six major transboundary rivers crossing the sub-Danubian geographical area, which consists of the territories belonging to WB6-region countries. These rivers are the Aoos/Vjosa, Drim, Axios/Vardar, Strymon/Struma, Nestos/Mesta and Evros/Maritza/Meriç. With the emergence of new states (Croatia, Slovenia, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Serbia, Kosovo and Montenegro) in the SE Europe (Balkan) region, the number of transboundary rivers in the area has more than doubled. In fact, several other rivers (e.g. Sava, Kupa/Kolpa, Cetina, Una, Drina, Neretva and Trebišnjica) are now listed as transboundary rivers.

BR-5 addresses relevant topics of transboundary management, support to the rehabilitation of rivers as well as providing directions in planning to form a useful basis for the harmonisation of open issues between the involved countries on a case-by-case basis, paving the way for the guidance in other cases. Numerous management problems do occur daily, like water balance, sediment accumulation, riverbed erosion and endangered biodiversity in flood plains, and these problems are transferred across state borders.

Even though there may be no full resolution of transboundary issues without IWRM/IRBM, some natural resources in HPP development must be shared directly. This is the case with water head, land surface and water volumes / flows. These parameters are described by the difference in height between the upper and lower water table and the size of land required for reservoirs and discharges. These parameters must be directly agreed upon by stakeholders (countries, entities). To be agreed in a fair and open manner, some value attributions must be known or agreed in advance. Head and water quantity have equivalents in energy value, while land surface needed and other external benefits must be assessed using non-market methods.

12 Regulatory and institutional framework for hydropower development in WB6 region

By signing the Stabilisation and Association Agreements (SAA), all WB6 countries have committed to **accept, transpose and implement the whole *acquis* as in any EU Member State or (potential) candidate country**.

The mandatory actions arise on the WB6 countries from the acquis under the SAA and conventions which (relating to the Study) comprise of:

- Renewable Energy (Renewable Energy Directive 2009/28/EC)
- Energy Efficiency Directives (2012/27/EU; 2010/30/EU; 2010/31/EU)
- Environmental Impact Assessment Directive (Directive 2011/92/EU as amended by Directive 2014/52/EU)
- Strategic Environmental Assessment Directive (Directive 2001/42/EC)
- Water Framework Directive (Directive 2000/60/EC)
- Habitats Directive (Directive 92/43/EEC)
- Birds Directive (Directive 2009/147/EC)
- Floods Directive (Directive 2007/60/EC)
- Paris Agreement on climate change
- Aarhus Convention (the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters)
- Espoo Convention (the UNECE Convention on Environmental Impact Assessment in a Transboundary Context)
- Berne Convention (the Berne Convention on the Conservation of European Wildlife and Natural Habitats)

Additional mandatory actions on the WB6 countries arise from their status as Contracting Parties (CPs) to the Energy Community Treaty (ECT), where the CPs to the ECT have clear obligations and deadlines to adopt and implement several acquis closely related to the energy sector / market development and environment:

- Electricity (Directive concerning common rules for the internal market in electricity (Directive 2009/72/EC); Regulation on conditions for access to the network for cross-border exchanges in electricity (Regulation (EC) 714/2009); Regulation on submission and publication of data in electricity markets (Regulation (EU) 543/2013))
- Security of supply (Directive concerning measures to safeguard security of electricity supply and infrastructure investment (Directive 2005/89/EC)
- Infrastructure (Regulation on guidelines for trans-European energy infrastructure (Regulation (EU) 347/2013)
- Energy Efficiency Directives (2012/27/EU; 2010/30/EU; 2010/31/EU)
- Renewable Energy (Renewable Energy Directive 2009/28/EC)
- Environmental acquis included in ECT: EIA Directive 2011/92/EU amended 2014/52/EU; SEA Directive 2001/42/EC; Birds Directive 79/409/EEC; Directive on environmental liability with regard to the prevention and remedying of environmental damage 2004/35/EC as amended by Directives 2006/21/EC, 2009/31/EC, 2013/30/EU).
- Large Combustion Plants Directive 2001/80/EC

The objective of BR-4 on Regulatory and Institutional guidebook for hydropower development was to investigate and analyse the existing institutional-organisational aspects, together with the governing legal-regulatory framework (I.O.L.R) in the WB6 countries that concern the development of hydropower generation projects, both from the regional perspective as well as from the position of the individual WB6 countries. A gap analysis was conducted and a list of recommendations is provided.

Gap analysis of the I.O.L.R. framework involved several main work streams. Under this task various activities were undertaken, in order to:

- identify institutions in each WB6 country which are involved in the framework for development and implementation of HPP projects;
- identify the roles and responsibilities of these institutions, as well as interrelations between them, followed by the acquisition and

compilation of all relevant documents that define the entire HPP development framework;

- identify all parts/phases/sequences of hydropower project development as they are currently regulated in the effective legislation;
- scrutinize I.O.L.R. framework for HPP development for its feasibility, efficiency and transparency.

In order to enable the comparison and detailed analysis of the I.O.L.R. procedure, flow charts were developed for each WB6 country (including two for BiH as I.O.L.R. procedure slightly differs between Republika Srpska (RS) and Federation of Bosnia and Herzegovina (FBiH) that are part of Annexes 1-2 (pdf and MS Visio files, respectively) of BR-4.

12.1 Comparative analysis of I.O.L.R. licensing procedures in WB6

In general terms and overall logic, all (7) I.O.L.R. licensing procedures in 6 countries[6]are similar. All of them, except the Albanian one, have their roots in the same legal and regulatory environment of the former Yugoslavia.

For easier organisation and interpretation, the entire licencing procedure has been divided into 4 major phases:

(i) Prefeasibility phase - Location selection, investigation and additional preparatory works are done like geological and hydro studies. The phase ends with defining the project; including a conceptual design and prefeasibility study;

(ii) Project development & Design – Includes the procedure of issuing concessions, issuing of environmental, construction and other permits, water related acts and grid connection terms;

(iii) Construction – Includes the construction of HPP with all related procedures;

(iv) Trial & Operation – Includes the issuing of operational permits and documents before putting plant to work.

Simplified comparative I.O.L.R. diagram for the licensing procedures currently in force in WB6 countries is shown in Figure 12.1, with comparison of the key aspects shown in Table 12.1, while more detailed I.O.L.R. diagrams can be found in Annexes 1-2 of BR-4.

[6] Note: BiH has separate diagrams for the two entities; FBiH and RS.

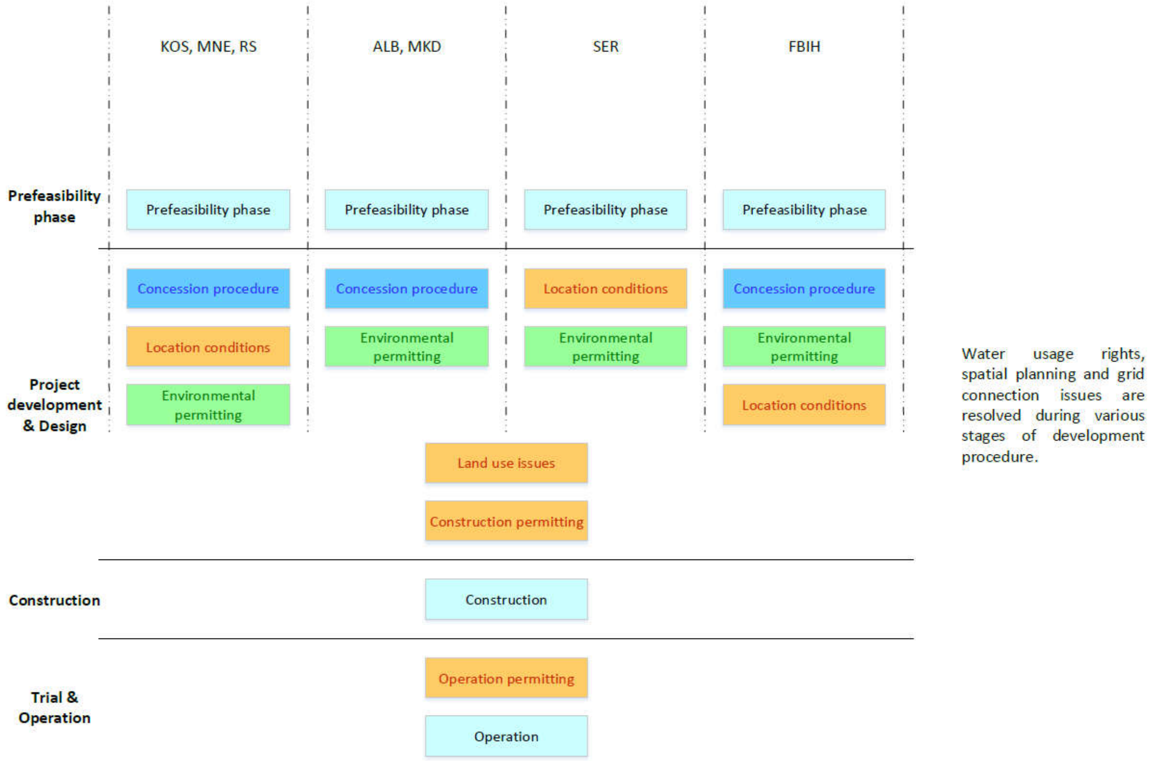


Figure 12.1: Simplified comparative I.O.L.R. diagram for the licensing procedures in WB6

Table 12.1: Comparison of key aspects of the IOLR licensing procedure in WB6

	Albania	Serbia	Kosovo	Montenegro	The former Yugoslav Republic of Macedonia	Bosnia and Herzegovina	
						FBIH	RS
Developed planning docs (spatial, energy, water usage); Established locations for large HPPs	-	+	-	-	+	-	+
Procedure for issuing concessions for water resources	+	-	+	+	+	+	+
Tender for concession	+	-	O	o	o	o	o
Included with concession contract	-	-	-	Energy permit	Water permit	-	Water guidelines
Body issuing the concession	Ministry of Energy and Industry	-	Ministry of Environment and Spatial Planning	Ministry of Economy	Ministry of Environment and Physical Planning	Ministry of Energy, Mining and Industry	Ministry of Energy, Mining and Industry
Water acts	Water permit	Water conditions Water approval Water permit	Water conditions Water approval Water permit Water order	Water conditions Water approval Water permit	Water permit	Preliminary water consent Water consent Water permit	Water guidelines Water consent Water permit
Body issuing water acts	National Water Council	Ministry of Agriculture and Environmental Protection	Ministry of Environment and Spatial Planning	Directorate for waters	Ministry of Environment and Physical Planning	River Basin Water Management Agency	Water Management Agency
Body issuing environ. permit	Ministry of Environment	Ministry of Agriculture and Environmental Protection	Ministry of Environment and Spatial Planning	Environmental Protection Agency, Ministry of Tourism and Sustainable Development	Ministry of Environment and Physical Planning	Ministry of Environment and Tourism	Ministry of Spatial Planning, Civil Engineering and Ecology
Location conditions before/after environmental permit, name of the permit	After Development permit	Before Location conditions	Before Zoning permit	Before Urban-technical conditions	-	After Urban conditions	Before Location conditions
Construction permit issuing body	National Territory Council	Ministry of Construction, Transportation and Infrastructure	Ministry of Environment and Spatial planning	Environmental Protection Agency, Ministry of Tourism and Sustainable Development	Ministry of Transport and Communications	Ministry of Spatial Planning	Ministry of Spatial Planning, Civil Engineering and Ecology
Energy permit	-	Ministry of Mining and Energy	3 step authorisation procedure by Energy Regulatory Office	Energy Regulatory Agency (with concession)	(included with concession)	Ministry of Energy	Energy Regulatory Commission
Energy generation license	Energy Regulatory Entity	Energy Agency	See above	Energy Regulatory Agency	Energy Regulatory Commission	Regulatory Commission	Energy Regulatory Commission

In the following Sub-sections 13.1.1-13.1.11, the above aspects of the licensing procedure are explained in more detail.

12.1.1 Strategic planning documents

Adequate spatial planning documentation preceded by Strategic Environmental Assessment (SEA) is recognised as best practice and a key primary step in sustainable development of infrastructure, including hydropower. SEA should be done for all national strategies which are relevant for hydropower development. Failure to conduct the SEA procedures in the early stages of a project (before the development of respective spatial plans) is one of the key problems in the implementation of these projects. However, such strategic planning documents are implemented adequately only in Serbia, in the former Yugoslav Republic of Macedonia and the Republika Srpska entity of Bosnia and Herzegovina. In Montenegro, the new Law on Spatial Planning and Construction is currently in the public hearing procedure, which foresees numerous aspects of environmental considerations being addressed during the development of the national spatial plan. Although it is not clearly stated that a SEA should be developed to this purpose, the complexity of the described procedures ensures that, once the law is adopted, adequate assessment of various environmental aspects, as well as social, historical, etc., will be undertaken.

12.1.2 Prefeasibility phase

In this phase, a HPP project is being defined; its location, overall technical solution, plant sizing, estimation of the possible generation. Depending on the level of the establishment of the hydro cadastre, overall hydro planning documents, energy strategy, spatial planning documents, HPP projects might already be defined in these general documents or a developer might be able to propose a new project. Overall planning documentation, defining possible sites for new HPPs (particularly large) are well-developed in the former Yugoslav Republic of Macedonia, Serbia and the Republika Srpska entity. On the other hand, FBiH (entity of BiH), Montenegro, Kosovo and Albania do not have satisfactorily developed planning documentation relevant for HPP development.

12.1.3 Concession issuing

Concession obtaining for the usage of water resources, as one of the first steps after the definition of the project, is the required step in all WB6 countries except in Serbia. Concessions are issued generally through the tender procedures or through direct agreement, usually if public interest is recognized. The tender can be issued based on unsolicited proposal from the developer or at the initiative of the relevant government body itself; the Ministry in charge of energy. In first case, if the HPP Developer is the one who takes the initiative, he is obliged to prepare all the necessary supporting documentation (location selection, conceptual design, prefeasibility study etc.).

In WB6 countries, all previously explained procedures and steps are similar with certain variations:

(i) ALB: There is no option of direct agreement in the procedure for issuing concessions;

(ii) RS (BIH): Direct agreement is mostly made with public companies while there is a possibility for private person to obtain it under special conditions. By signing concession contract, water guidelines are automatically obtained;

(iii) FBIH (BIH): To request concession issuing, the HPP Developer needs to acquire a preliminary water consent;

(iv) MNE: Within concession contract, energy permit is automatically obtained;

(v) MKD: Unlike in RS, direct agreement cannot be made with private person. Only public companies have that privilege. By signing concession contract, water permit is automatically obtained;

(vi) KOS: It is not clear in which circumstances the concession would be issued through the tender. In practice, concessions are issued through direct agreement;

(vii) SER: There is no concession procedure. The rights and obligations regarding the usage of water are solved throughout the I.O.L.R. licensing procedure through the water related acts: water conditions, water approval and water permit. Law in Serbia recognizes concessions only in case when relevant Ministry issues the concession for construction of additional generation capacity (in case the plans of existing subjects are not sufficient to meet the national energy strategy goals). In that case the concession contract would entail the water related acts, the location conditions, and other relevant permits.

12.1.4 Water related acts

Apart from the conditions prescribed in the concession contract, water acts are generally issued in several consecutive steps throughout the I.O.L.R. licensing procedure. Generally, these can be divided into:

(i) Water Conditions - to define the overall conditions for the usage of water - serves as an input to the preliminary design;

(ii) Water Approval - to confirm the water conditions have been respected in the main design of the project;

(iii) Water Permit - issued after the construction of the plant; to confirm the construction has been performed in accordance with the main design and water approval. These also prescribe the rights and obligations to be respected throughout the operation of the plant.

Some procedures are quite different from country to country and described below:

(i) ALB: Only relevant water acts are the concession contract and the water permit which is obtained after construction of HPP;

(ii) RS (BIH): As mentioned in the previous section, water guidelines are automatically obtained with concession contract. They are later needed for acquiring water consent which should be obtained before energy and construction permit. After construction water permit is issued which concludes water acts;

(iii) FBIH (BIH): In comparison to RS, a preliminary water consent (which is almost equivalent to water guidelines in RS) must be acquired before the procedure for issuing concessions since it is needed document for even qualifying to compete for concession. Other acts, water consent and water permit, are similar to RS (procedure position);

(iv) MNE: Water conditions and water approval are obtained by the Ministry of Tourism and Sustainable Development as the “one-stop-shop” body for issuing urban-technical conditions and construction permit. Only water act which should be requested and acquired by the HPP Developer as stand-alone document is water permit (issued after construction);

(v) MKD: In comparison to other countries, there is only one water act, water permit. It is obtained automatically with concession contract;

(vi) KOS: 4 water related acts recognized in the I.O.L.R. licencing procedure:

   a. Water conditions and water approval before construction permit,

   b. Water permit and water order before HPP construction;

(vii) SER: Water conditions are obtained by the Ministry of Construction, Transportation and Infrastructure as a “one-stop-shop” for issuing construction related permits. Water approval and water permit are to be obtained by the HPP Developer directly from the Ministry of Agriculture and Environmental Protection.

12.1.5 Location conditions

This document is issued in all WB6 countries except in Albania and the former Yugoslav Republic of Macedonia. However, its name varies in each WB6 country. Its purpose is to provide input for the HPP Developer on the location limitations and to be used as an input for development of project documentation (preliminary design).

12.1.6 Environmental permitting

The Environmental permit is one of the key steps in the development of the HPP projects. The procedure leading to the environmental permit can result in the cancellation of the project or its significant alteration. In most countries, an environmental impact assessment (EIA) should be done to examine all the expected impacts of the projects on the environment. EIA’s are subject to public scrutiny. Finally, the relevant Ministry decides if environmental permit should be granted, and under what conditions.

Environmental permit is the prerequisite for the issuing of the location permit/urban-technical conditions.

The differences among WB6 countries in terms of environmental permitting are described below:

(i) ALB: Preliminary EIA is needed which, when examined, can lead to acquiring environmental permit. If Ministry decides it’s not sufficient, a detailed EIA is made which then can lead to environmental permit;

(ii) RS (BIH): Similar to ALB, a preliminary EIA should be made which then leads to decision if detailed EIA is needed or present state of document is sufficient for acquiring the environmental permit;
(iii) FBIH (BIH): Detailed EIA is needed from the start, which leads to an environmental permit;
(iv) MNE: Similar to FBIH, a detailed EIA is needed. The Environmental Protection Agency is the body that issues the environmental permit;
(v) MKD: Procedure is similar to MNE;
(vi) KOS: With accepted EIA, an environmental consent is granted which then leads to environmental permit;
(vii) SER: A request should be made if, for a certain project, EIA is needed. If "yes", then the procedure of EIA and public hearing follows and the final decision by the Ministry.

12.1.7 Land use issues

Subject to obtaining the environmental permitting, as a significant milestone in HPP development the developer should resolve the land use rights. The resolution of these issues is a prerequisite for obtaining the construction permit. Depending on the owner of the land, land use rights can be obtained through:

(i) Acquisition of the land; in case of the private owner and agreement between the parties;
(ii) Land use rights; usually in case of the state-owned land and/or public goods: These are limited in duration (usually 30-99 years);
(iii) Expropriation; in case of privately owned land and lack of agreement between the parties. For expropriation, a public interest must be determined.

This procedure is similar in all WB6 countries.

12.1.8 Construction permitting

Key prerequisites for the construction permit are usually: solved land use rights, environmental permit and main design.

Even though the procedure and key steps (documents and permits) are similar, some countries have additional conditions which should be met for obtaining construction permit:

(i) ALB: Concession contracts are one of the needed documents for obtaining construction permit;
(ii) RS (BIH): Energy permit and concession contract are also needed;
(iii) FBIH (BIH): Like RS, the same additional documents are needed with some minor changes;
(iv) MNE: The HPP Developer doesn't prepare main design for construction permit, Preliminary design is sufficient. Main designs are prepared sequentially for each of the project elements and submitted to the relevant Ministry to obtain the construction works approval;
(v) MKD: Like BIH and ALB;
(vi) KOS: Preliminary application decision is needed from ERO as one of the key documents for obtaining the construction permit;
(vii) SER: Like BIH, ALB and MKD.

12.1.9 Grid connection issues

Grid connection issues are described in detail in BR-6.

12.1.10 Energy permitting

Energy permits are granted either by the ministry in charge for energy or by the respective energy agency.

Energy permits are not recognised in Albania and the former Yugoslav Republic of Macedonia.

12.1.11 Operational permitting

Operational Permits or in some cases Use Permits are issued after the construction of the HPP. Usually these permits are issued by the Ministry in charge for the construction.

In addition to Operational/Use Permit, also the Energy Generation license is issued by the relevant national electricity/energy regulatory authority.

12.2 Conclusions on I.O.L.R. – regional level

The main conclusions arising from the assessment presented above in this topic are split into conclusions which are typical for all or most of the regional countries, and additional conclusions which are specific for each individual country. The conclusions which are indicated as "regional" can also be applied to each individual country. The conclusions of BR-4 are the following:

1. The Institutional-organisational-legal-regulatory (I.O.L.R.) framework for large hydropower generation development in all WB6 countries exists, it is reasonably well-developed and operational, but due to certain gaps and inconsistencies it is not as efficient as it could and should be.
2. Important steps have been successfully undertaken in all WB6 countries towards harmonisation of the I.O.L.R. framework in the electricity/energy sector with the EU 3rd Energy package, due to the intensive activities of all WB6 countries, their relevant authorities, and huge support from the Energy Community Secretariat. Except in BiH, where activities are on-going, in all WB6 countries new Electricity/Energy Laws have been adopted recently and harmonised with EU Directives and Regulations.
3. Roles and responsibilities of individual stakeholders in the I.O.L.R. framework for large hydropower generation development have been defined by the recent amendments of the national Electricity/Energy Acts. Due to the lack of recent investments in large HPPs, these I.O.L.R. role determinations could not be checked in practice[7].
4. Like the electricity/energy legislation, a significant improvement in the WB6 region has been recognised in the environmental legislation and practice. These improvements are mainly driven by the process of accession to the EU. Unfortunately, in other areas of interest for hydropower projects development, such as concessions, private-public partnership, construction, etc. the legislation is either out of the date or legislative changes are very frequent, which creates uncertainty and has had a negative impact on investments.
5. There are number of cases in different WB6 countries where primary legislation exists, but secondary legislation (including so called "tertiary legislation" which includes various rulebooks, instructions, procedures, etc.) is not sufficiently developed which consequently makes the legal framework incomplete and requirements from primary legislation are practically impossible to implement. Strategic planning is an issue in the WB6 region in general. Energy strategies are either delayed in development, or are not regularly updated. (development of fully updated and sustainable action plans, as foreseen by the legislation.)
6. In most of the WB6 countries, it has not been fully established and implemented practice to perform SEA and EIA at sufficiently early stage. This one of the key problems in the implementation of HPP projects.
7. High quality SEA for plans and programmes and EIA for all projects and appropriate assessments as per the requirements of the Habitats Directive must be undertaken at the time of development of the strategic planning documents (e.g. energy and water strategies, spatial plans at different levels etc.) and before the adoption thereof. These should be associated with improved public consultation processes for SEAs and EIAs.
8. There are no permanent institutional forms of cooperation and coordination among the regional countries at the river basin level. Meetings are usually focused on isolated projects only, in most of the cases bilateral, and accordingly the effects of these actions on the improvement of the hydropower generation development framework are minimal.
9. In each WB6 country, it is well known who oversees water management, who takes care about electricity supply, who coordinates agriculture, irrigation, fishery, who is responsible for transport, but there is no integrated coordination of all these aspects of water use, except in Kosovo, where the Inter-Ministerial Water Council (IMWC) undertakes this role.
10. It is unclear from the strategic documents who is responsible, at the country level, for overall coordination of multiple aspects (flooding, irrigation, fishery, tourism, etc.) of the hydropower generation development planning, since it is difficult to identify all prospective benefits of hydropower generation projects through energy assessments only.
11. In all WB6 countries the term "one stop shop" is heavily used, as the best model for

[7] In addition, large HPP projects often have many specific aspects and the licensing procedure may include other, non-typical, steps which have not been considered in the presented I.O.L.R. diagrams (for example, procedures in case of need for cultural heritage protection).

improving framework for investments in any kind of projects, including hydropower developments. A similar heavily used term is "private public partnership – PPP". Unfortunately, in practice, none of those are operational, even if formally introduced in certain countries.

12. In all WB6 countries there is a law or another regulation on legal proceedings, specifying procedures for application and issuing of various permits, approvals, consents by the relevant state, regional or local administration. In practice, the public institutions do not stick to the terms specified in the legislation, which significantly delays execution of projects, increase costs and raises uncertainty among investors. Also, unlike in many EU Member States, there is no regulation on the "silence of administration" which stipulates that, if an administration does not respond within specified period, the approval/permit/consent is considered as being granted.

Note: Conclusions on individual WB6 country assessments are given in BR-4.

13 Grid connection considerations

13.1 Regional overview

All WB6 countries are obliged to fully transpose and implement the EU legislative framework applicable to the energy sector, based on decisions made by the Ministerial Council of Energy Community (MC-EnC). This applies also to the ownership, organisation and operations of the electrical transmission and distribution networks in the WB6 countries, in accordance with the EU 3rd Energy Legislative Package, which is mandatory for all CPs to the ECT. Consequently, all transmission and distribution network operations are subject to a very similar set of rules, with the prospect to completely unify them under the ENTSO-E Network Codes umbrella.

Electricity grids in WB6 countries have been significantly improved during the last 20 years. This applies mainly to the transmission networks, including cross-border transmission interconnection lines. The HV electrical grid in the WB6 region today has much higher power net transfer capacity (NTC) than in the 1990s. On the other hand, the development of major hydro power plants and their integration into existing electrical grids practically ended in the early 1990s.In all WB6 countries, the transmission network includes facilities operating at voltage levels of 110kV, 220kV and 400kV. Nowadays, the trend in transmission networks is to limit the network facilities to only two voltage levels, 400kV and 110kV, the 220kV voltage is being phased out and is not developed any more. Accordingly, all refurbishment works of existing 220kV facilities are planned as upgrades to 400kV. The main reason for this is the optimisation of development and maintenance costs.

On the other hand, most of the major HPPs in the region are still connected to the 220kV network, because at the time of their commissioning it was the highest voltage level in their respective networks. Later, these 220kV lines have been connected to the nearest 400kV substations, but majority of HPPs in the region are still heavily dependent on their original 220kV connections: Drinsko-Limske HPPs in Serbia, HPP Piva and HPP Perućica in Montenegro, all HPPs in the Neretva river basin in BiH, and all major HPPs on Drini river in Albania.

In recent years, because of electricity sector unbundling and a high increase in the demand for connection of RES power generation units to electrical grids, the rules for access and connection to the network have become an important component of each hydropower development project, equally important from the technical and from the financial side.

The regulatory framework in most of the WB6 countries states that, for the connection of RES-E power generation to electrical grids, the investor in RES-E facility should bear the connection costs up to the nearest (or the most convenient, optimal) connection point in the electrical network. Works at the connection point and the consequent network extensions and reinforcements necessary to enable the connection should be made on the account of the network operator and subsequently recovered through tariff.

This is one of the critical points which significantly delays a number of RES-E power generation projects, including the development of small HPPs - simply because network operators, due to the relatively low prices of electricity for final consumers in their countries, have no capacity to finance all these works, while at the same time maintaining and operating the rest of their network to the desired quality.

Concerning grid access and grid connection regulations and practices in the WB6 region, the situation is quite uniform, because all WB6 countries are obliged to ensure full compliance with EU legislation in the electricity sector. As a result, all regional countries achieved significant progress in unbundling of their electricity industries, harmonisation of their legislation with EU 3rd Energy Package, and transparency in their operations. Access to the electrical networks is fully granted in a non-transparent manner to all potential network users. Grid connection procedures are defined in the relevant legislation at the country level – through relevant Electricity/Energy Laws, Transmission and/or Distribution Codes, as well as by various Methodologies, Procedures and Rules defined by the network codes. A summary of the transmission network connection regulations and practices in individual WB6 countries is presented hereafter in Table 13.1, while a summary of the distribution network connection regulations and practices in individual WB6 countries is presented in Table13.2.

Table 13.1: Transmission grid connection regulations and practices in individual countries

	Albania	Bosnia and Herzegovina	The former Yugoslav Republic of Macedonia	Montenegro	Kosovo	Serbia
Electricity/Energ Law articles on DSO	2015, harmonised with 3rd Energy Package	2004, NOT in line with 3rd EU Energy Package, new draft ready	2011, amended and harmonised with 3rd EU Energy Package	End 2015, fully harmonised with 3rd EU Energy Package	Mid 2015, harmonised with 3rd EU Energy Package	End 2014, harmonised with 3rd EU Energy Package
Transmission Code (TC)	2008, needs update	End 2016	End 2015, very comprehensive	2011, needs update	February 2015	October 2015
Connection Rules	From the Code	From 2008, new draft in the procedure	In the Transmission Code	Partly in Law, partly in TC	2015, Connection Code (KOSTT)	2015, Connection Procedure (EMS)
TSO's right to refuse connection	NO	YES	YES, with justification	NO	NO	NO
Connection costs methodology	Guidelines by OST from 2010	Transmission Company Rulebook approved by DERK	Annex 7 of the TC	CGES 2016, in the approval procedure	Connection charging Methodology, KOSTT October 2013	AERS (Regulator) December 2015
Connection payment principle	Shallow connection costs[8] in legislation, Deep Connection costs[9] in reality	Shallow connection costs	Realistic connection costs	If investor constructs and transfers connection assets to TSO, connection costs are Shallow. If not, are Deep.	Realistic connection costs	Realistic connection costs
Ownership transfer	Voluntary, with compensation	Mandatory	Mandatory		Mandatory	Mandatory
Use-Of-System charges	Consumers only	Consumers only	Consumers only	Consumers only	Consumers and Generators	Consumers only

[8]Shallow connection costs are only costs of the connection infrastructure on its side of the connection point.

[9]Deep connection costs are all costs of the connection infrastructure, including costs of the necessary network reinforcements.

Table 13.2: Distribution grid connection regulations and practices in individual countries

	Albania	Bosnia and Herzegovina	The former Yugoslav Republic of Macedonia	Montenegro	Kosovo	Serbia
Electricity/Energ Law articles on DSO	2015, harmonised with 3rd EU Energy Package	2015, harmonised with 3rd EU Energy Package	2015, harmonised with 3rd EU Energy Package	End 2015, fully harmonised with 3rd EU Energy Package	2015, harmonised with 3rd EU Energy Package	End 2014, harmonised with 3rd EU Energy Package
Distribution Code (DC)	2003, needs update	2008/2009, new version in procedure	2012/2014 very comprehensive	2012, EPCG, needs update	2014, KEDS	2009, amendments 2013,2014 and 2015
Connection Rules	Partly available in the DC	2008 (FBiH in DC) 2014 (RS, separate from DC)	Part of the DC	2012, EPCG	Inside the DC	Amendments to the Distribution Code from 2014
DSO's right to refuse connection	NO	YES	YES, with justification	NO	NO	NO
Connection costs methodology	None	Methodology by entity Regulators	Annex 1 of the DC	Not available	2005, KEK	AERS (Regulator) December 2015
Connection payment principle	Shallow connection costs in legislation, deep in reality	Between[10] Shallow and Deep connection costs	Between Shallow and Deep connection costs	Not available	Realistic connection costs	Deep connection costs
Ownership transfer	Voluntary, with compensation	Voluntary[11]	Voluntary[12]	Not available	Mandatory	Mandatory

13.2 Review of the existing electrical networks capability to accommodate connection of planned large HPPs – regional level

[10]Investor participates partly in the costs of the distribution network reinforcement for facilitation of the requested connection. Share is defined on a case-by-case basis at early stage of the project development.

[11]Investors which do not transfer ownership of the connection infrastructure to the DSO are obliged to maintain it.

[12]Same as above.

In the following, an analysis is presented of the existing electrical networks, together with their likely development plans, to determine if the networks are sufficiently strong to accommodate the expected development of the hydropower generation in the WB6 region, and if not, to propose measures on how to achieve this required capacity. Sufficient hydropower generation in the electricity generation mix of individual countries or in the region as a whole, is essential for power system control and stability - a critical issue which is becoming more acute with the ever-increasing amounts of rapidly fluctuating wind and solar generation being connected to the networks. This issue was traditionally related to the transmission network only. However, with the development of distributed generation throughout the WB6 region, the analysis of distribution networks becomes equally important with respect to their capacity to accommodate new hydropower generation projects.

Transmission network: The existing capacity of the transmission network's 400kV and 220kV backbone, due to the numerous new 400kV lines that have been developed during the last two decades, is sufficient to accommodate **all the existing major HPPs**. The capacity of the transmission grid, if observed from the regional level, seems to be sufficient to facilitate **any additional major planned HPP development projects**. This fact, however, does not apply equally to all countries and in general does not apply to the transmission network facilities in the specific vicinity of the planned hydro generation plants where significant improvements will, in general, be required at the time of project implementation.

Hydropower generation development sites are rather often far away from populated areas, where most of the existing electrical network facilities are located. Especially in the cases of HPP cascades or a series of independent projects in the same geographical area, some major reinforcement of the 110kV network may be required (more details for each country is given in the following paragraphs).

To be on the safe side, each individual project needs to be assessed separately from the network connection perspective, to make sure that all power generated can be evacuated from the HPP in all operational circumstances and regimes. Having in mind that the development of transmission network facilities is few times faster than the development of generation projects, **power network capacities and facilities should never be a major constraint for hydropower generation development projects**.

Hydropower plants connected to the transmission network, by default, are required to have a capacity / capability to deliver secondary and tertiary load-frequency control to the TSO, as well as to provide voltage support at the connection point and black start capability for support of power system restoration. Because of this, **all new hydropower generation projects connected to the transmission network:**

- **Improve the overall stability of regional power system operations,**
- **Increase power system control capacities, and**
- **Enhance conditions for integration of other generation facilities using renewable energy sources, such as wind and solar generation**.

Distribution networks: Distribution networks in all regional countries consist of facilities operating at the voltages below[13] 110kV, i.e. medium voltage (MV) networks at 35kV, 20 kV and 10 kV, and low voltage (LV) networks at 0.4 kV. These networks are local by their character and there either are no interconnections or they are interconnected to a very limited extent in order to provide a desired level of security of supply. **The development of the distribution networks is, in general in the WB6 region, lagging behind the development of the electricity transmission facilities.** Historically, the development of the distribution networks has always been demand driven, easily controlled and coordinated through centralised planning.

Distribution networks in WB6 countries are predominantly radial, except in and around the big cities where distribution networks can become looped and heavily meshed. Development of distributed generation has changed planning and operational routines for distribution network operations dramatically. Distribution networks are becoming very active, the embedded level of generation is increasing and operational scenarios are multiplying. It is becoming critical to undertake major rehabilitation and upgrading of the distribution grid in all WB6 countries by adding new facilities and modernising existing ones.

The general perspective for the WB6 region as a whole is that, **the capacity of the distribution**

[13] There are however, certain facilities operating at 110kV and even higher voltages, but still part of the distribution network assets. The reason is fact that they are within the distribution network and used exclusively to that purpose.

networks in the region is insufficient to facilitate growing demand for connection of new small HPPs and distributed generation in general[14]. Distribution companies are lacking network assets, control facilities, communications, metering, human resources. In short there is a pressing need for a radical upgrade of the distribution networks.

Looking country by country, the situation is most critical in Albania, where the gap between demand for connection and network capability is the largest. All of the other WB6 countries need reinforcement of the distribution networks particularly in the areas where new HPPs are planned (because they are by default in the remote, scarcely populated areas). However, this demand is stronger and more urgent in Montenegro, BiH and Kosovo, and less critical in Serbia and the former Yugoslav Republic of Macedonia.

Hydropower plants connected to the distribution network may contribute to the delivery of ancillary services for power system control. The most recent Distribution Grid Codes drastically increased technical requirements for connection of small HPPs, including their capability for voltage and frequency control. It is expected that in the future, **contribution of the smaller HPPs connected to the distribution network to provide ancillary services may be larger in total than the contribution from the large HPPs**, because they are closer to the demand and may have higher flexibility. It is only matter of the legal/regulatory mechanism and technical legislation to determine when these opportunities will start to be implemented.

Note: Country-level specific assessments are given in BR-4.

[14] Although main focus of this study is connection of new HPP facilities, in case of distribution network cumulative effects are caused by multiple requests for connection coming from various distributed generation sources (especially solar and wind due to the incentives of feed-in-tariffs).

14 Inventory of planned hydropower plant projects

The following sections present the methodology used in the development of the Hydro Power Plant database (HPP-DB), an essential registry of planned HPPs. Further, the results and analysis of the collected data on HPPs in WB6 are presented. The report also presents the findings on the rehabilitation potential/needs of existing HPP plants in the region.

Hydropower has a long tradition and history in WB6 countries. Many plans for additional HPP projects have been proposed, particularly in the period 1960-1990. A legacy of that extensive study work done in the second half of the 20th century is a number of hydropower project ideas. Many of those project ideas are still appearing in various documents and strategic plans - even though some of them are outdated in terms of the technical solution proposed, changing environmental considerations or outdated in that the land is already used (or intended to be used) for other purposes.

The “bottom-up” approach, taken in the Study, in its essence relies on decades of investigative work and hundreds of studies already undertaken to try to identify the technically available hydropotential in WB6. It also provides a list of projects which already have a certain development history, some of them with also quite advanced project documentation, and are therefore possible to be developed in the medium term. The HPP-DB and the HPP projects identified therein therefore provide the remaining (or additional) technically exploitable hydropower potential for construction of greenfield HPPs of greater than 10 MW of installed capacities – probably the maximum HPP development potential that could be exploited in the medium- (next 10-15 years) to long-term future (to 2050 and beyond). Considering the long history of HPP development in WB6 countries and the Study findings, it is not likely that significant additional larger HPP projects would be identified and implemented in the medium-term on new locations not already identified within the course of this Study.

The database information was collected from project promoters, relevant national ministries, experts and publicly available information. Collected data were organized into following main groups:

- Basic information: (project name, owner/promotor, Country, Location machine room and dam, capacity, mean annual electricity output, capacity factor, plant type, generation type;
- Hydrology/water management: drainage basin/watershed/river basin/ sub-river basin/river/tributary, medium flow, usable reservoir storage, total reservoir storage, cumulative effects within HPP chain;
- Technical information: head, flow, configuration & turbine types, grid connection details, dam type and height, Maximum elevation of backwater;
- Economic & financial information: investment cost, year of evaluation of investment cost, possible financing model, investment structure, support scheme details, external costs and benefits, nominal corporate cost of equity and debt, O&M costs, other OPEX costs, corporate financing structure;
- Environmental and social information: protected area details, availability of SEA/EIA, environmental and social concerns, multi-purpose use, transboundary/riparian issues;
- Maturity information: general status, grid connection status, Status of completed preparatory works, Location permit, Construction permit, tendering for construction works, energy strategy, spatial planning, land ownership, water concession contract, financial assistance, planned commissioning;
- Other aspects: information source, additional information
- MCA results: MCA results.

The database was also uploaded into a GIS application, which was developed as separate task of the Study.

Other task experts used the data provided in the database in order to derive their own inputs, primarily MCA assessment of the projects.

14.1 Rehabilitation projects

Rehabilitations of existing HPPs have been clearly, unambiguously and unanimously recognised as **priority investments in further exploitation of the hydropower potentia**l by virtually all relevant beneficiaries and stakeholders in the Study, including EC, financing institutions, national authorities, plant operators, expert institutions and individuals and civil society.

Rehabilitation projects are primarily essential to safeguard existing aging power generation capacities and to enable the continuation of their service for a future period. In effect, rehabilitation projects are generally not primarily aimed towards the prospect of increasing power capacity or electricity generation but towards maintaining the existing capacity and generation; they focus on avoiding loss of their capacity and energy production, as well as of loss of planned revenues in the case of discontinuation or technical degradation of the facility. Potential increase in capacity and generation output is a welcome additional benefit, when it is achievable. In addition, rehabilitation projects also provide a good opportunity to implement additional environmental improvement measures that were often not considered at the time that the plants were constructed and indeed environmental improvements may be mandated in future as the national environmental legislation changes in respect of the acquis process in the WB6

In terms of availability of financing (in effect, typically the owner's capacity to take additional debt), rehabilitation projects can be in competition with greenfield projects from the owner's, i.e. the same investor's, perspective. The decision on the rehabilitation of existing units is not whether to undertake the rehabilitation or not, but is only about the optimum timing for that investment and its scope - which depends on the owner's current priorities, actual plant operational issues and financing availability. Investment considerations on a new greenfield HPP, on the other hand, might result in a positive or a negative investment decision. In assessing the feasibility of greenfield HPP project, financial and economic analysis is aimed at assessing the costs and benefits of the new MWh being produced. In assessing the feasibility of rehabilitation projects, the primary issues are safeguarding the existing capacity, prolongation of the service life time, avoiding lost generation, increasing plant availability, increasing safety and similar. So, from the investors perspective, the value of additional capacity usually comes only after securing refurbishment of the currently-owned generation assets.

Most existing large HPPs are owned and operated by state-owned power generation utilities in the WB6 countries. In the case where a state guarantee for obtaining financing is required, rehabilitation projects are in competition with other infrastructure projects if such loan-security mechanisms are expected from the lending institution. For the mostly quite-indebted power utilities prevailing in the region (many have taken loans for rehabilitation of their thermal power plants), financing from their own sources is very limited. Therefore, the scope and timing of rehabilitation measures is mainly related to loan availability and financing terms. In conditions of typically scarce resources, there is a general tendency that rehabilitation measures tend to be postponed to the latest reasonable deadline. Such strategies can, however, be very risky as potential failures of even minor supporting parts (e.g. turbine bearings) could cause an unplanned outage of the facility for several months, which always has detrimental financial consequences. And every utility wants to avoid such situations.

Even though in terms of availability of financing it may be considered that rehabilitation and greenfield HPP projects are in competition from the HPP investment portfolio point of view. However, this is definitively not the case because the two choices considerably differ in:

- The objective / rationale for intervention;
- Economic / financial indicators, as the costs of rehabilitation measures (typically relating to electrical and mechanical parts while the civil construction part will last for many additional decades) by which the service lifetime of the HPP is prolonged is definitively much lower than the costs of construction of a greenfield HPP;
- Impacts on the environment, as any new greenfield HPP is additional and may cause significant impact on the environment and the water bodies with their surrounding areas.

Many of these elements cannot be even properly monetarised. However, based on the experience of

IFIs typically supporting such projects and the current plans of HPP operators, one could conclude that rehabilitation of the existing HPP would always come prior to any greenfield HPP if a common list of prioritised HPP investments is to be established.

Environmental issues are a primary concern of the developers when assessing greenfield HPPs, as those are very often the reason HPP development project get cancelled. In rehabilitations of existing HPPs, plant owners do not perceive the environmental aspects as critical. However, priority in upgrading hydropower installations should also be given to improving their ecological footprint through the application of a wide range of environmental protection measures.

Another significant difference between greenfield and rehabilitation projects is reflected in licensing complexity; usually being very demanding for greenfield projects and significantly simpler and easier for rehabilitation projects.

According to the results of BR-1, the demand for electricity in the region will still steadily increase until 2030/2050 but with decreasing annual growth rates over time. Hydropower, as one renewable energy source among others, is needed to ensure a sufficient electricity supply to meet that growth reasonably from a countries own resources (i.e. form the national security of electricity supply perspective) so a country does not become too dependent on the volatile electricity market still under development.

14.1.1 Risk of losing production; the main case for rehabilitation projects

Existing HPP schemes with a proven track record and no obvious technical problems often have a difficult case to lobby for their rehabilitation investment. No imminent problem is pushing the investment decision and the risk of losing the available capacity and generation due to major equipment or structure failure is often not perceived in its full negative financial extent. Postponing the rehabilitation increases the risk of such a failure occurring. Depending on the nature of that failure the lost production and revenues can significantly outweigh the cost of the entire rehabilitation project.

14.1.2 Safety aspect

Rehabilitations often include activities aimed at increasing or maintaining the safety of the existing HPPs, a particularly important issue in high dam HPPs. Safety is without doubt a key aspect of HPPs, and may be the sole reason for undertaking a rehabilitation project. According to the data received from the plant operators, no existing HPP larger than 10 MW has safety issues that would initiate a rehabilitation project. Generally, any activity aimed at prolonging plant lifetime through renewal of equipment at the same time increases the operational safety of the plant.

14.1.3 Increase of rated power and plant electricity generation

Increase of rated power is usually a secondary target of rehabilitation projects. The capacity of the HPP is defined by the installed flow (limited by the HPP structures: tunnels, penstock, turbine stator etc.), and the available head (defined by geography). Thus generally, only minor improvements and modifications can be applied to increase the capacity, unless the HPP was originally designed for subsequent expansion. From a purely mechanical aspect, the potential of capacity and generation increase is fairly limited by the already high efficiency factors of existing HPP’s, and fixed structures of the scheme (for example the diameter of the tunnel and the penstock, draft tube). It is generally not feasible to change the fixed structures of the scheme as it would usually require complete reconstruction of key plant structures. The cost of such activities, additionally augmented by the cost of demolishing of old structures and considerable plant downtime and lost production would greatly exceed any potential benefit that may be achieved.

The potential for the increase of electricity production is larger as it can be affected by optimisation of operational procedures; for example, improved water and reservoir management. However, those are operational issues and not necessarily dependent on the rehabilitation itself.

With respect to the changing patterns of rainfall, it is becoming more challenging to the plant operators in terms of optimum water and reservoir management and planning.

14.1.4 Decrease of operational costs and increasing availability

Activities undertaken within rehabilitation projects can include improvements and modifications related to the implementation of advanced sensing and monitoring technologies, often paired with digital remote control & supervision of the plant. This enables the improvement of predictive maintenance procedures and reducing overall maintenance costs

14.1.5 Environmental aspects

The potential environmental impacts of rehabilitation projects are in most cases positive, in comparison to the current state (exceptions being cases of establishment of new or enlargement of reservoirs aiming to increase production capacity of an HPP). However, a review of implemented environmental improvements at existing HPP's shows those have been of very limited scope. Operators in the region generally do not exploit the full flexibility potential of existing HPPs as to ensure Ecologically Acceptable Flow (EAF). See BR-7 on Environment for detailed analysis of EAF, related to existing HPPs. Sometimes minimal flow is applied, which is not sufficient to preserve the quality and quantity of river biota.

HPPs represent an obstacle in the natural flow of a river. Many of the existing HPPs that have undergone rehabilitation up to now, did not have fish passes, nor have those been implemented within the scope of the rehabilitation. The water level difference between upstream and downstream often exceeds 15 m which is something of a practical limit to install fish passes. Aquatic ecosystems have over the years developed independently, being separated by the existing dam, and the rivers have not been recognised as fish migration routes. This approach does not follow modern guidelines and European directives, since open corridors are required and are recognised as one of the top priorities in sustainable use of hydro potential of rivers. Opposed to that, in the small HPPs constructed in the past decade, fish migration has been recognised as a major issue and implementation of fish pass is very often considered mandatory (see BR-7 on Environment for detailed analysis of fish passes, related to existing HPPs).

Beside applying EAF and building fish passes at HPPs sites where practical, further mitigation measures can be used to minimise the impacts of the existing HPP.

1. Opening of the corridors in the tributaries of the accumulation lakes, by establishing fish passes at impassable weirs or removing obstacles in the watercourse that are not in function any more. In the tributaries, we often find spawning grounds for fish species, which means that populations can survive if fish have the access to their spawning grounds.
2. Changing the operation of the HPP. By minimising the amplitude or/and frequency of the releasing discharge the impact of the hydropeaking[15] can be reduced. In case of a cascade HPP, this negative effect can be mitigated by harmonising the operation of all HPPs in the chain.
3. Ensuring sediment transportation by the HPP, to prevent river bed erosion and the lack of gravel, which is needed for spawning grounds for fish below the dams.

As those measures generally decrease the income of the operators and increase their costs, they are generally not eager to introduce these measures unless required by either financing requirements from IFI's or legal requirements. As the information on rehabilitation plans were received from the plant operators, no such measures were reported. Case by case analysis would need to be undertaken to determine the need and the scope of such measures in each of the rehabilitation projects. Besides technical documentation, the basis for environmental rehabilitation plan should be up-to-date ecological studies.

The majority of existing HPPs in the WB6 region are not equipped with fishpasses, furthermore there are practically no plans for building them during the process of rehabilitation (except for HPP Una Kostela). To our knowledge, there are two HPPs in the capacity range above 10 MW, which have fishpasses: HPP Ujmani (Kosovo) and HPP Zvornik (Serbia). We did not have any reports on the performance of those two fishpasses at our disposal. Issues related to EAF and water usage by HPP in WB6 region is explained in detail in Section 4.8 of BR-7. So far, we obtained data on determined EAF for five HPPs planned for the rehabilitation: HPP Višegrad and HPP Una – Kostela (BIH) and HPP Shiplje, HPP Tikveš and HPP Globočica in MKD. The vast majority of existing HPPs do not have EAF determined.

Environmental recommendations for HPP rehabilitation projects:

- Data on existing fishpasses and their functionality must be obtained and reviewed by experts (hydrologists, ichthyologists).
- Fishpasses are the most commonly used mitigation measures, used to mitigate negative impacts of existing HPPs. There are published documents and guidelines that need to be incorporated in order to construct functional

[15] Practice when plant is operated with large and rapid swings of flow discharge; employed in order to generate electricity during the peak-load hours.

fishpasses for present fish assemblages, with special care for the largest species (Danube salmon, sturgeons) and species with special requirements (European Eel).

- “Guidelines and technical solutions for restoring river continuity for fish migration, prepared for Danubian countries” by ICPDR (2013a), gives some technical framework for fishpasses, that can be used by different fish communities along the river course, as well as by sturgeons, as the largest fish in the drainage basin.
- “Guiding Principles on Sustainable Hydropower Development in the Danube River Basin” (ICPDR, 2013b) stress the importance of restoring migration routes of sturgeons in the Danube and major tributaries. Planning new hydropower plants in river sections formerly used by sturgeons must at minimum include sturgeon migration and habitat requirements in the requested EIA, and in dialogue with Priority Areas of EUSDR - PA2 (Energy) is essential. The allocation of funding to restore sturgeon migration at the Iron Gate dams (Djerdap 1 and Djerdap 2) must be pursued with highest priority.
- Elver and eel passes must be considered for existing HPP on rivers in the Adriatic and Aegean drainage basin.
- Adoption of legislation, which requires the building of fishpass, is necessary. Monitoring of functionality of fishpasses should be prescribed.
- Downstream fishpasses, fish friendly turbines, adaptations of the operational mode of spill flow and modifications of hydropower plant management are methods to enable downstream migration (AG-FAH, 2011). Some measures should be applied, especially on the rivers where European eel is, or was historically present and where upstream connectivity for the species is going to be approved.
- Since the EAF methodology is not adopted in legislation in all countries, this should be a priority for them. For areas with conservation status, with high ecological values or areas inhabited with rare or endangered species, special holistic approaches should be planned. Monitoring compliance with the EAF is very important and should also be implemented in legislation.
- The forthcoming European Commission "guidance document on Natura 2000 and hydropower" mentions good practice examples in mitigating impacts and applying ecological restoration measures to hydropower.

14.1.6 WB6 rehabilitation potential

A distribution of the years of the start of commercial operation of HPPs throughout the WB6 are given in Figure 14.1. An industry standard is that approximately 40-50 years is considered an appropriate operational lifetime before major rehabilitation of HPPs is required.

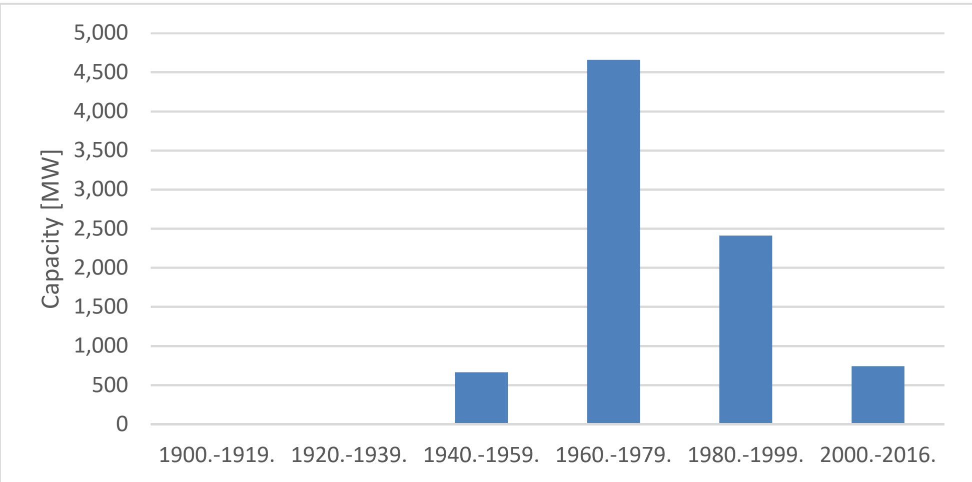


Figure 14.1: Commercial operation starting year for HPPs in WB6

Figure 14.2 depicts the planned/needed rehabilitation (dark blue depicting already conducted rehabilitation) of existing HPPs larger than 10 MW in WB6. It is made under the assumption that plants should undergo significant rehabilitations 40 years after start of commercial operation, or other periods of time based on the input from plant operators where that is available. The year at which rehabilitation is due is provided until 2030 only.

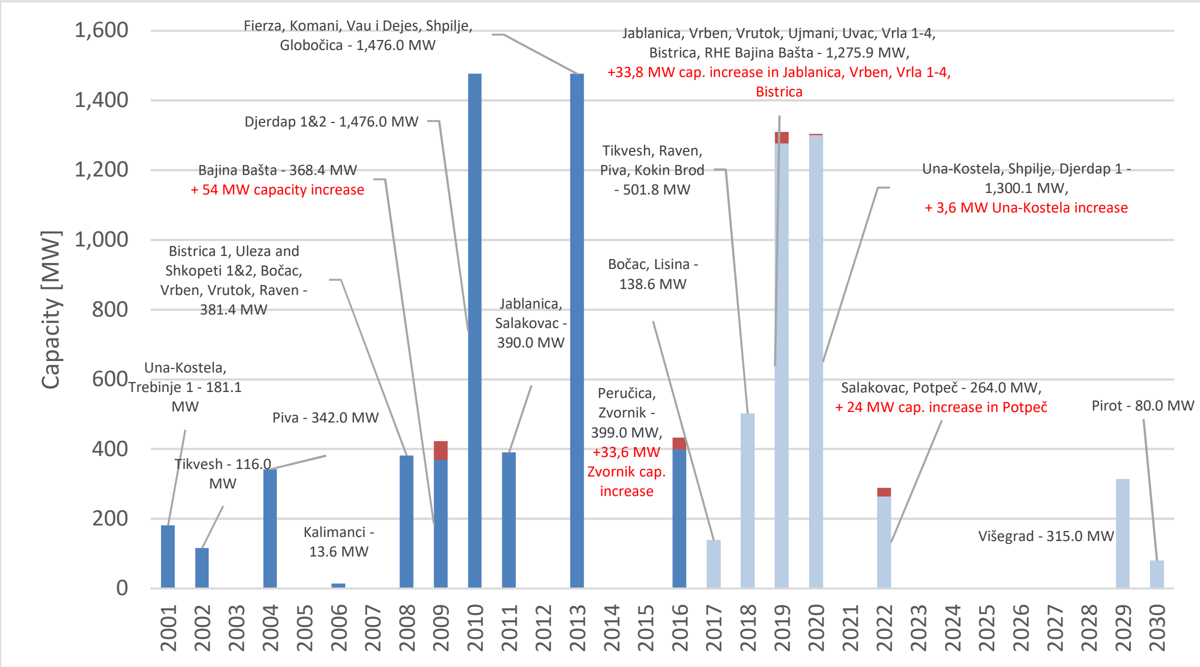


Figure 14.2: Rehabilitations completed and planned in WB6 for HPPs larger than 10 MW

Many rehabilitations are planned or are due in the coming period. In total that sums up to approximately 3,700 MW of HPP capacity should be rehabilitated in next 5 years. The scope of these projects varies considerably. This will represent a significant effort and financial burden for the operators / owners of these HPPs.

On the other side, this refurbishment backlog represents a considerable portfolio of investment projects with high probability of implementation, and as such, these represent an opportunity for strengthened cooperation with IFIs that traditionally support such measures. However, this is also an indication that the current operators are likely to be unable to act as investors in greenfield HPPs in the forthcoming decades during which time they are expected to have significant debt repayment obligations in respect of the refurbishment activities which will naturally be their topmost priority.

The summarised investment cost of rehabilitation projects with available data is over 760 mln €. Considering that the cost information is not available for significant number of projects, the total cost of coming rehabilitation projects will be significantly higher.

During refurbishment, the average increase in capacity is approx. 4% and in electricity production is a relatively modest at 5-6%. Those averages also include the addition of new unit at HPP Potpeč, which is technically not a rehabilitation, but the addition of a new unit.

Based on the preliminary assessment with limited data provided by the utilities – the operators of the HPPs, within the course of this study, below Table 14.1 presents a provisional list of priority rehabilitation projects. The list is prioritized based on the following criteria:

- Project rehabilitation is either overdue or will become overdue within 3 years
- Rehabilitation is expected to include significant interventions on capital hydromechanical equipment

The list does not include projects where rehabilitation has already started such as Piva, Peručica, Komani, Fierza. That does not presume those projects are not in need of technical or financial assistance. The comprehensive list of all rehabilitation candidates with respective data is provided in Tables 4.2-4.7 in BR-7.

Table 14.1: Provisional list of priority rehabilitation projects ("REH list")

HPP	Country	Capacity [MW]	Rehabilitation due	Planned investment [mln. €]
Vau i Dejes	ALB	250	2010	n.a.
Uleza	ALB	25.2	1994	n.a
Shkopeti	ALB	24	1996	n.a.
Jablanica	BIH	180	2019	n.a.
Una-Kostela	BIH	10.1	2020	16.8
Bogatići	BIH	10	1987	9.2
Vrben	MKD	12.8	2019	4.6
Shpilje	MKD	84	2020	3.9
Tikvesh	MKD	116	2018	0.84
Vrutok	MKD	165.6	2019	4.05
Raven	MKD	21.3	2018	0.92
Globočica	MKD	42	2019	5.8
Ujmani	KOS	35	2019	
Uvac	SER	36	2019	n.a.
Potpeč	SER	54	2022	43
Djerdap 1	SER	1,206	2020	216.5
Djerdap 2	SER	270	2020	
Pirot	SER	80	2030	
Kokin Brod	SER	22.5	2018	
Vrla 1-4 (Vlasina)	SER	128.5	2019	60
Lisina	SER	28.6	2017	
RHE Bajina Bašta	SER	614	2019	

Regarding the rehabilitation project the following can be summarized from the Study:

- Rehabilitations are a must for safeguarding the existing HPP capacity and the current level of power generation from hydropower sources in WB6 region;
- Rehabilitation projects potential for additional capacity and generation is relatively modest (in the range of up to 6% of the capacities and up to 6% of generation of remaining, non-rehabilitated HPPs larger than 10 MW). Estimated potential for the total increase in capacity and electricity production are up to approximately 200 MW and 670-770 GWh, respectively.
- Considering the information available in the current practices in WB6, environmental issues have not been recognised as a significant driver for future rehabilitations. The main driver of rehabilitation is the extension of plant operational lifetime and increasing its reliability, with an additional potential to reduce operational costs. In future rehabilitation projects, due considerations should be given to possible environmental improvements.

14.2 Greenfield projects

Out of all the projects identified in the research, HPP entries, investigation and data collection campaign, a screening has been conducted to screen the projects suitable for further analysis. The screening excluded: a) the projects already in construction, b) projects without a minimum data set available, c) projects below 10 MW capacity, d) less likely variants of a proposed project – only the most likely variant was considered.

In total over 480 projects were identified. Out of that 136 projects were selected in the screening process. Summary figures for those 136 HPP candidates per countries are presented in Table 14:2 below.

Table 14.2: Summary of 136 greenfield HPP projects analysed in the Study

	Number of HPP candidates	Capacity, MW	Generation, GWh *)	Total investment. mln €	Total additional usable reservoir storage, GWh *)
Albania	35	897	3,500	1,207	239
Bosnia and Herzegovina	44	3,093	6,479	5,431	102
Montenegro	16	1,644	3,889	2,156	1.490
The former Yugoslav Republic of Macedonia	17	982	1,850	1,991	137
Kosovo	3	785	398	644	198
Serbia	21	2,395	1,940	2,382	17
Total	**136**	**9,797**	**18,056**	**13,811**	**2,182**

*) Not including reversible generation.

14.2.1 Maturity of the projects

Generally, the level of maturity of those projects is relatively low. A total of 481 MW of projects have construction permits (and even for some of those it is uncertain whether they will ever be implemented – e.g. Boškov most). These projects are:

- Albania: Pesqesh, Suha, Shkopet 2, Shkopet 3, Gomsiqe 1, Mollas, Seke, Begaj, Kiri 1
- Bosnia and Herzegovina: Buk Bijela, Paunci, Foča, Cijevna 3, CHE Vrilo
- The former Yugoslav Republic of Macedonia: Boškov Most

Thus, very little additional generation capacity from large hydro can be put on line in the near-term period. Significant effort should be put into developing the documentation for the most promising projects. The issue is further augmented with the fact that even the existing documentation is often outdated and needs renewal.

According to the information received, in addition to the figures above, already in construction there are 12 HPPs larger than 10MW, with total capacity of 670 MW and planned generation of 1,992 GWh. The total investment reported stands at over 1,3 bln €. Six projects are in BiH (Ulog, Dabar, Vranduk, Mrsovo, Bistrica 1, Bistrica 3) and 6 are in Albania (Kalivac, Moglice, Fangu, Dragobia, Lubalesh 1, Lubalesh 2).

14.2.2 Country notes

Albania

Looking at the HPP candidates, Albania has the largest remaining hydropower potential in WB6, expressed in terms of prospective installed capacities (MW).

As per September 2016 data of the Ministry of Energy and Industry, in the period 2005-2015 the Albanian government has signed total of 184 concession contracts for the construction of 505 HPPs with total generation capacity of about 2,200 MW and with a forecast investment of around 3 bln €. That includes some projects which are already implemented and in construction (114 plants with 280 MW capacity already in operation, and 38 plants with capacity of 511 MW – including HPP Devoli with 255 MW currently under construction). Most of these HPPs are small HPPs of less than 10 MW of capacity.

The majority of HPPs in development are not developed by the national electricity utility but by a number of private investors. Concessions issued up to now were based on a tendering process that favoured bids with larger installed power. Among other parameters, that resulted in a number of over-capacity projects, which hinders their feasibility. In addition to that, the basic hydrological data is often insufficient and/or measurements inadequate, which also resulted in overestimation of feasible installed power at a number of sites.

Other problems identified through the development, construction and operation of HPPs are:

- Problems with sediment transport and sediment removal structures; which negatively influences the turbines performance and life expectancy.
- Lack of fish passes and control of EAF in many of the newly built HPPs
- Overall lack of environmental protection measures during the construction of HPPs
- Difficulties in securing equity by the project owners
- Difficulties in sourcing debt financing, due to poor financial efficiency of the projects
- Not sufficiently clear and transparent licensing and permitting process; overlapping of the competences between institutions, duplication of work, various interpretations of law, lack of respect for deadlines on behalf of institutions, delays in the communication from institutions to investors.

Concerning the numerous issues identified in the development of Albanian HPPs and a vast number of concessions issued opposed to relatively modest number of implemented projects, there have been a number of initiatives to revise issued concession contracts. The underlying idea was to cancel the contract where non-performance is caused by significant delays and concession contract breaches by the concessionaire, and to streamline the projects where non-performance is caused by the government or some if its institutions. Even though AKBN is appointed as a concession contract monitoring body on behalf of the government, it seems AKBN alone does not have sufficient influence nor clear directions on how to resolve these issues.

Bosnia and Herzegovina

Bosnia and Herzegovina is rich in hydro resources and despite its significant existing hydro generation there is significant potential that is still unexploited. By far the largest potential lies in the river Drina, which is largely shared with Serbia. Exploitation of that potential requires to be conditioned by an interstate agreement or other arrangement that would enable the projects to be developed and implemented.

BiH has a specific political and territorial organisation; with state level government, two entity government levels, cantonal level in one of them (FBiH), and further municipal level authorities. Such organisation makes the development of HPP projects very demanding, with jurisdictions between different government levels often intertwined and boundaries unclear. The additional level of cantonal governments makes that even more challenging for developers in FBiH.

Within the Federation of Bosnia and Herzegovina, two major players in terms of new HPP development are the two public electricity utility companies: JPEP BiH from Sarajevo ("Javno preduzeće elektroprivreda Bosne i Hercegovine") and EPHZHB from Mostar ("Elektroprivreda Hrvatske zajednice Herceg Bosne"). Complexity and entanglement of the jurisdictions between government levels in FBiH pose significant obstacle to the development of greenfield HPPs.

In addition to that, the lack of an adopted spatial plan and energy strategy for FBiH and BiH as a whole poses further challenges to HPP project developers.

ERS is the main developer concerning the projects larger than 10 MW in Republika Srpska. Projects on the river Drina are largely subject to resolution of transboundary issues between the concerned countries (see Sub-section 3.3.5 in BR-5). So-called small Buk Bijela and reversible Buk Bijela, Paunci and Foča are projects which are exclusively within the jurisdiction of RS and could be developed by ERS alone. However, it might be the case RS is reluctant to proceed with the development of "small"[16] Buk Bijela as it hopes for the resolution of transboundary issues with Montenegro and agreement to construct "large" Buk Bijela.

Projects on upper ("Gornji horizonti") Trebišnjica river are in the development phase, while the extension of existing Dubrovnik HPP is subject to agreement with HEP and Montenegrin and FBiH authorities.

Projects on Vrbas river were developed by Norwegian Statkraft, however the activities have been dormant in the recent years, indicating that the developer may have lost interest in further development.

Cijevna projects have been developed by Norwegian Technor, however the company faced certain issues and the projects are largely dormant in recent years, with uncertain status and prospects for the future development.

[16] "small" and "large" are used to annotate the height of the dam. "small" project variant has a lower dam and the resulting accumulation does not cross into Montenegro. "large" Buk Bijela accumulation crosses into Montenegro with its higher dam.

The former Yugoslav Republic of Macedonia

The main developer regarding large HPP projects is the national power utility ELEM. Support of the government for the development of HPP projects is strong. However, in the recent period several disagreements have emerged with the EU bodies and IFI's considering financing the development and implementation of proposed HPP projects. The disagreements are mainly related to environmental concerns regarding the proposed projects. In light of that, EBRD has recently announced its cancellation of the financing of HPP Boškov Most. It remains to be seen whether the Government and ELEM will resolve the financing issue with other potential investors or they will adjust their investment plans to IFI's requirements in order to obtain their funding.

Montenegro

Montenegro is very rich in hydro-energy potential. Its hydro-energy potential could be considered as one of the largest national natural resources. Adequate exploitation of this potential could significantly contribute to the national economy. On the contrary, though, the level of development of HPP projects in Montenegro is generally quite low. Most projects are only at pre-feasibility level and even those analyses are generally more than 10 years old. Many of the potential sites are only generally analysed and the exact projects have not been defined jet. Some of the proposed technical solutions are not adequate any longer or are not possible due to different usage of the land in practice (e.g. Lim river). This indicates the dormant HPP development activities in the past decade and more. In the past, EPCG, a national electricity utility (formerly republic utility) was the driver of HPP development. In 2009, 49% of shares, including the majority management rights of EPCG were sold to Italian A2A.

In recent years, EPCG has not shown significant interest in the development of new HPP projects, and the main driver of the development is the Ministry of Economy. This is defined also in the Law on Energy (2016) which defines the Ministry of Economy as responsible for the strategic development in the field of energy. For the Ministry to be able to fully take that designated role it requires additional resources and capacity building.

Exceptions to the situation described above are the projects on Morača and Komarnica. Development of documentation and site investigations for HPP Komarnica are currently in process and are being conducted jointly by EPCG and EPS (51%:49%), based on the agreement between the two companies. A tendering process for concession for HPPs on Morača river was started in 1998 and again in 2010, both times unsuccessfully. Currently, negotiations are ongoing with possible foreign partners outside the official tendering procedure, however it is still unclear which model of partnership that would be, i.e. who would be concession holder/owner/user of the future HPPs.

Other activities currently ongoing are regarding the Lim watershed; EPCG, in cooperation with Ministry of Economy, is launching a tender for procurement of consultancy services aimed at revising and bringing innovation to the existing studies of hydropotential on the Lim river.

It needs to be noted that the current Spatial plan envisages only plants on Morača and Komarnica. No other projects of HPP's larger than 10 MW have been listed. In addition, in 2004 the Montenegrin parliament passed the Declaration on the protection of Tara river (OG 78/2004). Even though UNESCO protects Tara canyon as a world heritage site, the Declaration extended that protection to the entire Tara river. Emerald zones as they are drafted at the moment might further hinder any further development of a number of HPP projects in Montenegro. HPP Ljutica and HPP Koštanica, two projects on Tara river, may encounter significant problems not only due to the foreseen protected areas, but also due to issues regarding the planned highway towards Serbia. In addition, there are transboundary issues with Serbia regarding water usage.

The above factors present significant limitations that are in contrast to the significant hydro potential of Montenegro. Environmental protection concerns that seem to have been the motivation for the limitations set out above and should be duly taken into account and properly evaluated when developing the needed hydro resources planning document of Montenegro. That document should provide a balance between environmental and economic development concerns.

Boka project is planned by Montenegro, however it is planning to use the same water currently used in Trebišnjica and Dubrovnik HPPs.

Lack of adequate documentation and information for a number of projects was the reason why many of the identified projects could not be sufficiently analysed and consequently were not considered as HPP candidate projects. Development of HPP planning documentation with accompanying prefeasibility assessments for the identified projects is therefore important in order to assess the actual technical HPP potential in Montenegro in today's context.

Montenegro shares most of its hydropotential with neighbouring countries, therefore reaching interstate and intercompany agreements is essential for future development of majority of HPP candidate projects.

Kosovo

Kosovo's hydro-energy potential is not large. This is reflected through "only" 3 HPP candidate projects being identified and analysed: Zhur I, Zhur II and Vermica. The current priority of Kosovo's government in terms of energy is the development of new lignite power plant(s), utilising existing large reserves of lignite.

Zhur HPP has reasonable technical documentation which was developed in 2009 (albeit only with a preliminary EIA assessment). The validity of that documentation is questionable due to significant unresolved transboundary issues with Albania (for detail, see BR-5). The waters that were to be collected and directed towards planned HPP Zhur are already being used in several small HPP projects that have recently been licenced and constructed in Albania.

Serbia

EPS is the main developer of greenfield HPP projects in Serbia. Projects on river Ibar and Velika Morava have been developed in partnership with German RWE and Italian SECI. It is unclear at the moment whether these partnerships will be continued or EPS will finish the development of these projects on its own. In any case, the projects design will likely need to be changed and financial feasibility reassessed. Bistrica project, although with well-developed documentation, doesn't seem to be among the top priorities of EPS. EPS is also involved in the development of transboundary projects on Drina river (BR-5), and also in the development of Komarnica project in Montenegro. Further Drina river project development is subject to resolution of transboundary issues and determining and aligning interests of all relevant parties. Đerdap 3 project, with its design size of 1,200 MW represents a very significant investment for EPS and might need to be reassessed, both in terms of electricity market needs and capacity of EPS to implement a project of such size.

At the moment, it seems that EPS, as the largest HPP developer and investor in Serbia, has a priority focus and its funds are oriented towards renewing and expanding its coal thermal generation capacity.

Brodarevo projects are being developed by a private developer. However, it seems they have been stalled due to a combination of several factors, both from the side of the developer and from the side of the state and its institutions.

15 Identification of potential sustainable hydropower projects

The objective was to asses a large number of HPP candidate projects on comparative performance basis, on the basis of which most promising HPPs would be listed as priorities for further Study follow-up preparatory actions.

Due to a large number of finally shortlisted HPP candidates (136 HPPs remain after the initial screening of 480 HPPs identified in various documents), the Study developed a methodology / tool for assessment of HPP candidates based on the Multi-Criteria Assessment (MCA) system, which is applicable to all the remaining HPP candidates.

The aim was to consider data availability and the relevant guidelines, assessment methods and best practices (such as Guiding Principles for Sustainable Hydropower Development in the Danube Basin, Hydropower Sustainability Assessment Protocol, Environmental and Social Guidance Note for Hydropower Projects of the European Bank for Reconstruction and Development).

In general, the MCA should support the comparison of greenfield HPPs for hydropower development and facilitate identification of the new HPPs that can contribute to the structured and sustainable development of the technical hydropower potential throughout the WB6 Region.

Based on the developed system, all identified greenfield HPP projects from the HPP-DB ("long-list" of candidate HPP projects) are first screened against the "deal breaking" criterion. Only candidate HPP projects from the "long-list" of approximately 480 identified projects (note: various sources) which passed the "deal breaking" criterion were put on the "short-list" and further considered in the MCA. The assessment is conducted using the data and results obtained from several other tasks addressed in BRs 2-7. The MCA allowed for comparison of the HPP candidates and facilitated their ranking. The assessed candidates are presented in three groups according to the obtained scores in the MCA, i.e. MCA results ranking list: Group A, Group B and Group C. At the end of the process the MCA results were subjected to the Final Expert Assessment, and resulted in project grouping, the outcome of which present the **final results of the Assessment of prospective hydropower projects in the WB6.**

To fulfil this main objective, it was necessary to develop a sound MCA methodology applicable in a relatively short time to a large number of projects which are in different development phases, which do not have ideally harmonised data and are individually subject to different WB6 jurisdictions (e.g. permitting procedures). The key requirement for the MCA methodology was to provide a systematic assessment process for HPP proposals delivering objectively comparable results. The MCA matrix and the scoring system was developed in collaboration with all Key Experts. The system defines the criteria and sub-criteria, their relative weights and scoring system. The scoring system and relative weights of the criteria follows scientific and technical standards considering objectives of this Study and HPP project development cycle. Non-quantifiable aspects related to the successful development and implementation of a project were considered in the Final Expert Assessment of the MCA results.

The subordinate objectives were to:

a) Carry out the MCA and categorise the analysed HPPs into Groups A, B, C and 0 in accordance with their comparative performance assessed against the MCA thresholds and indicators.
b) Assess the MCA results considering the project development risk aspects and group the HPP systems and/or HPP candidates according to their potential for successful development and implementation.
c) Provide inputs for the Regional Action Plan (Annex 1 of the Final report), and recommendations for further actions on a Regional and country level based on the Final Expert Assessment results.

15.1 Links with other tasks and background reports of the Study

This task (BR-8) was closely linked with other tasks, which assessed the state of affairs in the WB6 countries and/or collected data and analysed specific aspects of hydropower development. The results discussed in BRs 1-7 were inputs for undertaking the activities under BR-8.

In addition, the results shown in BR-8 were inputs for the analysis of the future role of hydropower in the WB6 Region addressed in BR-1, as well as inputs to the development of a Regional Action Plan (Annex 1 to the Final report). The MCA results are included in the HMP-GIS database established discussed in Annex 2 of BR-7. For detail, see Figure 15.1.

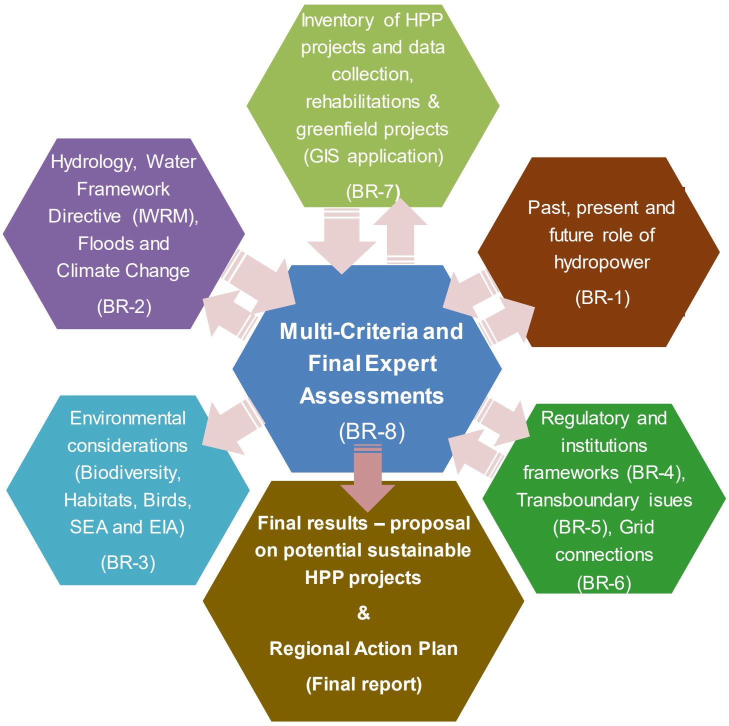


Figure 15.1: Links of BR-8 with other BRs of the Study

15.2 Methodology

Since the datasets of the HPP candidates in WB6 were not adequate, nor was the timeframe of the Study sufficient for the required level of data collection and application of an existing approached and/or methodologies, the Energy Institute Hrvoje Požar (EIHP) developed a “tailor-made” approach and MCA methodology.

Several documents were consulted and referenced when identifying criteria relevant for analysis of HPP candidates in the WB6:

- The ICPDR "Guiding Principles on Sustainable Hydropower Development in the Danube Basin" (ICPDR, 2013).
- Hydropower Sustainability Assessment Protocol (HSAP; IHA, 2012),
- Environmental and Social Handbook of the European Investment Bank (EIB, 2013a),
- IUCN Protected Areas Categories System (IUCN, 2016).

In addition to the listed documents, the WB6 legal and regulatory framework for protected areas management (as described in BR-3) and the appropriate HPP permitting procedures (in BR-4) were fully taken into account.

Because the MCA methodology could not capture all the issues related to the specific risks of project development and implementation, the MCA results were subjected to the Final Expert Assessment and HPP systems and/or HPP candidates grouping.

The evaluation structure. The HPP candidates identified (“the long-list”) were evaluated in four steps: Step 1: *Screening*, Step 2: *MCA Level 1*, Step 3: *MCA Level 2* and Step 4: *Final Expert Assessment*

As presented in Figure 15.2 below, the HPP candidates were first screened against the “deal-breaking” criterion. The candidates that passed the *Screening* were then assessed in a two-level MCA process. The *MCA Level 1* assessment was used to differentiate Group C, from the remaining candidates which were subjected to the MCA Level 2 assessment. After the *MCA Level 2* assessment the candidates were grouped into Groups A and B. The top ranked candidates, i.e. those above the MCA Level 2 threshold, are categorised as Group A, while the remaining candidates as Group B. The final step of the assessment was *Final Expert Assessment* of the MCA results. In this step, the experts assessed unquantifiable aspects impossible to encompass within the MCA, but important for the successful implementation of projects (HPP systems and/or HPP candidates), such as non-energy benefits, public acceptance and political factors, etc. The Final Expert Assessment was necessary to support an objective methodology and to overcome the limits of the MCA process. Those Final Expert Assessment findings are specified in more detail in the comments sections of the Tables containing the respective projects.

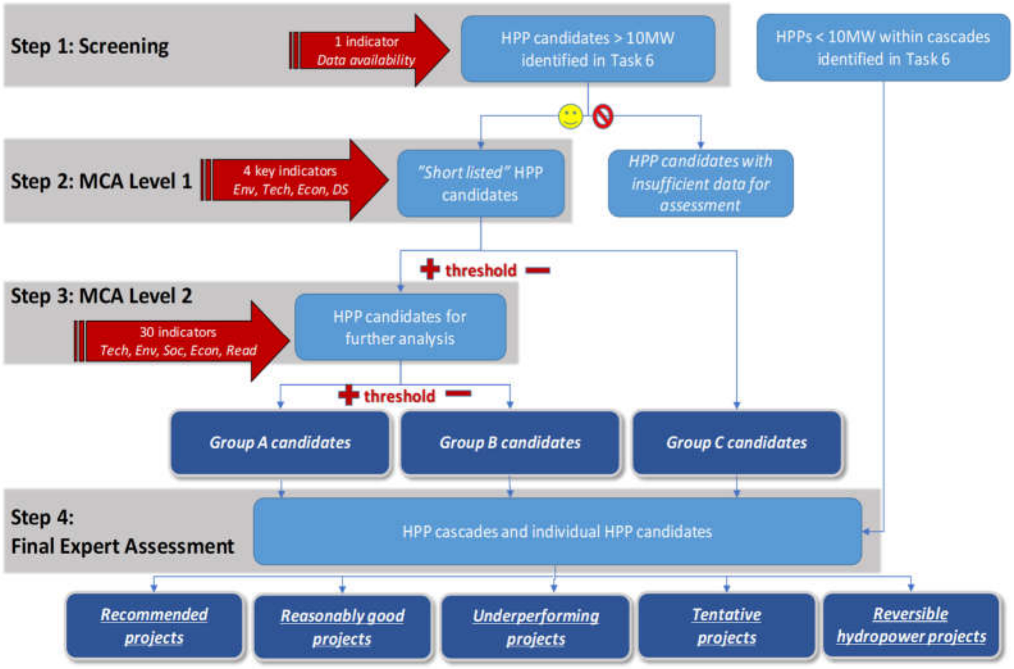


Figure 5.2: The HPP candidates' evaluation structure

Definition of the Screening criterion. The Screening aimed to eliminate projects with low potential for realisation in the "mid-term", i.e. until 2030. Therefore, projects with no documentation providing (at least) a minimal level of information needed for conducting the MCA, or such documentation was not provided by the project promotors, were excluded from further evaluation.

MCA Level 1. In the MCA Level 1 the "short-listed" projects were assessed against four indicators, each representing the key indicator of the environmental, technical, technical readiness and economic criteria:

- Environmental: Location of HPP candidate with respect to protected areas,
- Technical: Contribution to generation adequacy
- Technical readiness: Available technical documentation,
- Financial: Specific investment per unit of electricity generated (€/GWh).

The HPP candidates scored below 60 were perceived as less credible investments under the prevailing (market and regulatory) conditions, and were therefore designated as *Group C*, while those scored above this threshold passed this phase to enter the MCA Level 2 process.

In the MCA Level 2, the remaining HPP candidates were subjected to a detailed assessment against 30 indicators classified into five criteria groups (*Technical adequacy, Financial viability, Social viability, Environmental acceptability and Realisation readiness*). Candidates which scored 50 points and more, were designated as Group A, while the other candidates evaluated in MCA Level 2 are designated as Group B.

The results of the MCA assessment are a rank list of the analysed HPP candidates, which are categorised into four groups:

- ***Group A*** – HPP candidates with good comparative performance among the assessed HPPs, i.e. the candidates with the MCA score above a defined MCA Level 2 threshold;
- ***Group B*** – the HPP candidates with moderate comparative performance against the MCA indicators; i.e. the candidates with the MCA score below the MCA Level 2 threshold;
- ***Group C*** – the HPP candidates which underperformed against the key MCA indicators, i.e. the candidates that scored below MCA Level 1 threshold;

- ***Group 0*** – HPP candidates which were not analysed, due to insufficient data.

The **Final Expert Assessment of MCA Results** was performed to account for the issues that are known regarding certain projects but could not have been recognized and captured within the MCA scoring system. In this step, the feasibility and realisation options of the highest-ranked HPP candidates were further analysed individually by the Consultant team, using an agreed set of assessment factors (detailed in 15.3.3) and the outcome of this Final Expert Assessment reflects the team's best professional judgement, based on the information available to the project. In this step, where applicable, the HPP candidates which are part of a cascade were considered as integrated HPP systems, although national authorities will confirm this HPP aggregation when a developer is identified. The HPP systems and/or candidates were assessed to **comparatively distinguish projects according to their assessed potential for successful development and implementation**. The final results of the Assessment of prospective hydropower projects are thus classified into five groups:

- ***Recommended projects -*** The highest-ranking cascades or individual HPPs evaluated as comparatively the best among all evaluated projects.
  - These projects are more likely to successfully pass the development process and be implemented.
  - These projects could be the priority projects for technical assistance and other financial support by EU institutions.
  - These projects could be used as showcases of transparent and sustainable development process in accordance with EU best practices. Projects that successfully pass the required development process would then be implemented.
- ***Reasonably good projects -*** The cascades or individual HPPs that scored lower compared to the Recommended projects
  - These projects should not be dismissed from future considerations by EU institutions but have relatively lower assessment score compared to Recommended projects.
- ***Underperforming projects*** – projects that were not assessed in MCA Level 2, because
  - the HPP candidates did not pass MCA Level 1 threshold,
  - are cascades where the majority of constituting HPP candidates have capacity lower than 10 MW and were not evaluated in MCA Level 1, or
  - input data are evidently questionable, which indicates that the MCA results and scoring are unreliable.
  - These projects are not suitable candidates for priority development activities because they underperformed in one or several assessed criteria.
- ***Tentative projects*** - Projects that scored well in MCA Level 2, but have significant issues identified that could not have been captured in the MCA parameters.
  - Tentative projects in many aspects have good potential for future development, given that the identified significant issues are resolved.
- ***Reversible HPP candidates***
  - Reversible projects do not contribute to the overall energy generation; however, they have a very important role in balancing the system, particularly with the increasing share of renewables.

15.3 MCA indicators, weighting factors and threshold values

15.3.1 MCA Level 1

Table 15.1: Weighting factors of MCA Level 1 criteria

Indicator	Weighting factor
Environmental indicator - Location of HPP candidate in respect to protected areas	0.4
Technical indicator - Contribution to generation adequacy	0.3
Realisation readiness – Available technical documentation	0.2
Financial indicator - Specific investment per unit of electricity generated (€/MWh)	0.1

The above Table 15.1 includes a list of indicators used in the MCA Level 1 assessment and their weighting factors.

The threshold used to determine HPP candidates which were then evaluated in the MCA Level 2 process, was based on the minimal overall performance the assessed HPP candidate should achieve to allow for further development without major risks for successful realisation. Considering the scoring system for each indicator (1-5) and the weighting factors of the considered indicators, the threshold value was set at sixty (60) points. At this threshold a candidate scored the lowest (i.e. 1) for the environmental indicator (which has the highest weighting factor, i.e. 0.4) must obtain the highest score for all other indicators to pass to the next level of evaluation. In this way the candidates bearing significant environmental risks with below-excellent performance in technical and economic aspects, and project realisation readiness were not evaluated in the MCA Level 2. To present the rank order list of MCA Level 1 results on the 1-100 scale the score of each HPP was diminished by one and multiplied by 25.

15.3.2 MCA Level 2

Five main criteria groups were used to in the MCA Level 2 assessment: Technical adequacy, Financial viability, Social viability, Environmental acceptability and Realisation readiness.

Technical adequacy criteria evaluate the most important technical parameters of the HPP. Financial viability criteria assess the cost-effectiveness of the plant’s construction and operation. Social viability criteria consider elements related to the territorial identity and the life-quality of local communities. Environmental acceptability criteria are related to the environmental performance of the plant, (the level of impacts), regarding ecological sensitivity of the impact area and climate change factors. The realisation readiness aspects criteria consider the project development phase (technical readiness, financial, permitting, etc.) in relation to its readiness for financing and construction.

Each of these criteria groups comprise several indicators that are weighted according their significance. During the assessment, the HPP candidates are scored in the similar way to the previously-described MCA Level 1 process: for each indicator was scored between 1 and 5, the scores were then multiplied by the indicator-weighting factor within the group, the criteria group scores were multiplied by respective weighting factors and summed up with the scores obtained in the other groups.

The weighting factors for the MCA Level 2 criteria groups were defined using similar approach as in MCA Level 1. They are based on the rated significance of the particular criteria group for project realisation and the reliability of data used for the assessment.

Due to differences in project development phases and different data sources among the HPP candidates, data used for the MCA are not fully harmonised. The uncertainty arising from insufficient information is therefore determined by the importance of the missing data, i.e. by the weighting factor of the respective indicator. In other words, in the case of missing information to assess a particular indicator, that indicator was scored 3 ±2 implying that the score could range from 1 to 5. This uncertainty is then expressed score range of the total MCA Level 2 score (total score, ± uncertainty points). The weighing factors of the Criteria groups (CG-WF) and indicator weighting factors used within Criteria groups (I-WF) within CGI are summarised in Table 15.2. The table also includes overall weight of each indicator in the total score of HPP candidate (Overall IW).

The complete list of indicators, including their definition, rationale and scoring system is included in the BR-8.

Five main criteria groups were used to in the MCA Level 2 assessment: Technical adequacy, Financial viability, Social viability, Environmental acceptability and Realisation readiness.

Technical adequacy criteria evaluate the most important technical parameters of the HPP. Financial viability criteria assess the cost-effectiveness of the plant’s construction and operation. Social viability criteria consider elements related to the territorial identity and the life-quality of local communities. Environmental acceptability criteria are related to the environmental performance of the plant, (the level of impacts), regarding ecological sensitivity of the impact area and climate change factors. The realisation readiness aspects criteria consider the project development phase (technical readiness, financial, permitting, etc.) in relation to its readiness for financing and construction.

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The weighing factors of the Criteria groups (CG-WF) and indicator weighting factors used within Criteria groups (I-WF) within CGI are summarised in Table 15.2. The table also includes overall weight of each indicator in the total score of HPP candidate (Overall IW).

The complete list of indicators, including their definition, rationale and scoring system is included in the BR-8.

The MCA Level 2 score of the assessed HPP candidates is calculated by summing the multiplications of Criteria group-score and respective Criteria group-weighting factor. The score of each Criteria group is calculated by summing the multiplications of indicator-score and respective indicator-weighting factor within the Criteria group. To present the rank order list of MCA Level 2 results on the 1-100 scale the total score of each HPP was reduced by one and multiplied by 25.

Table 15.2: Weighting factors of MCA Level 2 Criteria groups and indicators

CG	CG - WF	Indicator	I-WF within CG	Overall IW
	0.25	Protected areas location	10%	3%
		Potential impact on protected area	20%	5%
		Threatened species distribution area	10%	3%
		Level of potential impact on target species	15%	4%
		Lateral connectivity with wetlands	15%	4%
		Waterflow continuity	15%	4%
		Transfer of water between rivers	5%	1%
		Land occupation by the HPP	10%	3%
Social viability	**0.15**	Multipurpose use of HPP	15%	2%
		Land use / Livelihoods	15%	2%
		Cultural heritage sites in the impact area	15%	2%
		Resettlement	55%	8%

Realisation readiness	0.20	Technical readiness	15%	3%
		Financial readiness	10%	2%
		Energy Strategy	15%	3%
		Land ownership	10%	2%
		Water use concession	10%	2%
		Location permit	25%	5%
		Grid connection	15%	3%
Technical adequacy	0.30	Type of HPP	20%	6%
		Contribution to generation adequacy	20%	6%
		Contribution to capacity adequacy	15%	5%
		Diversification potential	15%	5%
		Utilisation of hydropower potential	10%	3%
		Capacity factor	15%	5%
		Size of storage	5%	2%
Economic viability	0.10	Specific capital investment (CAPEX) per unit of installed capacity (€/kW)	20%	2%
		Specific capital investment (CAPEX) per unit of generated electricity (€/MWh)	20%	2%
		Levelized Cost of Electricity (in 40 yrs. lifetime) €/MWh	30%	3%
		Breakeven sales price of electricity (which makes project feasible) €/MWh	30%	3%

15.3.3 Final Expert Assessment

The MCA assessment could not capture certain aspects of HPP candidates which are important for successful development and implementation of a project. Therefore, the MCA results were subjected to the final expert assessment as to address the following issues:

1. Input data was collected from available sources and not produced through a unified methodology; potential problems with comparability of data for different projects (various methodologies used by project promotors, different ages of the information).
2. Evidently outdated and obsolete information for some projects as actual circumstances have significantly changed since the conclusion of the project feasibility studies or other documentation.
3. Inability to quantify and validate the externalities of the projects (impacts on downstream plant production, flood protection, irrigation etc.).
4. HPP candidate projects were treated as individual plants instead of entire cascades being treated as a single project.

In performing the Final Expert Assessment, each of the HPP greenfield projects was individually assessed and discussed among the team of study experts. Particular emphasis was given to the projects ranked highly within MCA. The aspects assessed in this step can be grouped as follows:

- **Non-energy effects of projects**, those may significantly impact the economic cost benefit analysis of a project and include:
  - flood protection
  - irrigation
  - water supply
- **Indirect energy effects**, which may
  - increase or decrease of generation and/or
  - Increase or decrease operational flexibility on other downstream and/or upstream HPPs.

  Those were generally potentially positive effects of projects.
- **"Political aspects"**. Within this group a variety of aspects was considered including:
  - transparency of the licensing procedure
  - on-going judicial cases
  - transboundary issues
  - level of state support for the project

  - environmental issues, such as potential protection areas and known biodiversity features
  - CSO/public acceptance of the project

  Those aspects were generally considered as negative for the individual project ranking, and increasing the project risks.
- **Level of input data reliability**; herein the expert trust in the project data was assessed due to the following:
  - age and assessed obsoleteness of the project documentation,
  - or in some cases due to obvious underestimation of investment costs or other apparently questionable data.

  Such aspects were considered as negative for the project ranking and increasing the project risks.
- **Business aspects**; herein the following was considered:
  - strength, references and eagerness of the current project developer,
  - financial feasibility of the project compared to the assessed market conditions. Herein the projects with estimated LCOE above 90 €/MWh were considered as not feasible in the near term. Provided the adequate CBA is performed in the future, this could potentially be mitigated by positive non-energy benefits of the projects (mostly relevant for projects with significant flood-protection role).

In addition, certain project reservations known to the project team were considered. Project specific comments and considerations identified according to the considered aspects are provided in Table 15.8 and other tables (Tables A2-1 – A2-4) in Annex 2.

15.4 Assessment of HPP projects

The application of the described methodology in Sub-section 15.3 is presented in the following Sub-sections 15.4.1-15.4.4. The procedure follows the Steps 1-4 as shown in Figure 15.2.

15.4.1 Step 1: Screening

In BR-7 on Inventory of planned hydropower plant projects, 480 HPP candidates were identified in the WB6 countries. The largest number of candidates are located in Albania (232), while Montenegro and BIH follow with 93 and 74, respectively. In Serbia, the former Yugoslav Republic of Macedonia and Kosovo 24, 20 and 15 candidates were identified. Among the identified HPP candidates 22 are transboundary candidates: 11 between Montenegro and BIH, 7 between BIH and Serbia, 2 between Montenegro and Serbia, 1 between BIH and Croatia and 1 between Montenegro and Albania. Distribution of the screened HPP candidates is shown in Figure 15.3.

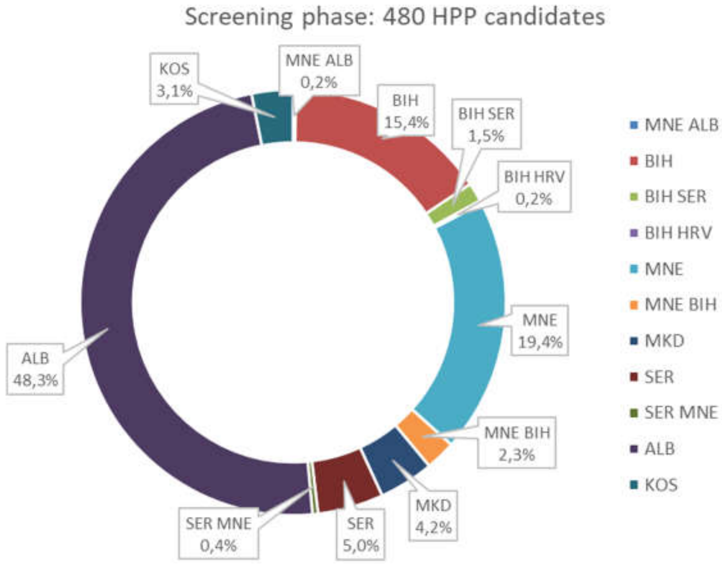


Figure 15.3: Distribution of the screened HPP candidates per country

The identified candidates were screened against the "deal breaking" criterion to identify candidates without any technical documentation and/or minimum level of information needed for the MCA process. In total 136 candidates were shortlisted for the next step, while the remaining 344 were categorised as *Group 0*.

15.4.2 Step 2: MCA Level 1

The MCA Level 1 process was applied to 136 HPP candidates: 35 in Albania, 36 in BIH, 21 in Serbia, 17 in the former Yugoslav Republic of Macedonia, 14 in Montenegro and 3 in Kosovo, and 10 transboundary candidates. Among the transboundary candidates 7 are located between BIH and Serbia, 2 between Montenegro and BIH and 1 between BIH and Croatia. Table 15.3 and Figure 15.4 show distribution of the Shortlisted candidates per country

Table 15.3: Short listed HPP candidates assessed in MCA Level 1

Country	ALB	BIH	BIH HRV	MKD	KOS	MNE	MNE BIH	SER	BIH SER	MNE ALB	MNE SER	Total
No. of HPPs	35	36	1	17	3	14	2	21	7	0	0	**136**

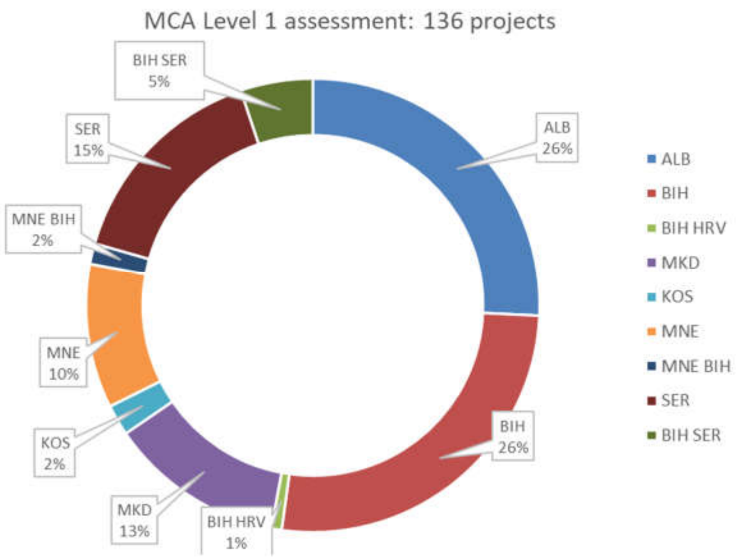
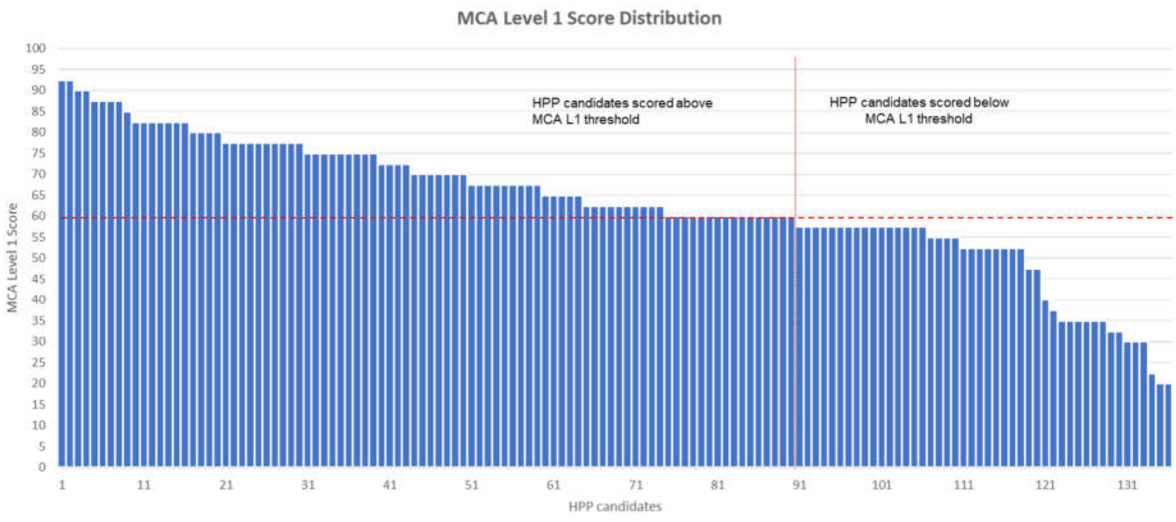


Figure 15.4: Distribution of the *Short listed* HPP candidates per country

Overall, 90 candidates scored 60 points and higher in the MCA Level 1 assessment. Among the candidates that scored above the threshold only 4 had more than 90 points, while 46 candidates scored between 70 and 89 points, and as many as 40 candidates obtained between 60 and 69 points.

The majority of candidates which did not pass the threshold scored between 50 and 59 points, in total 28 HPP candidates. The distribution of scores across all assessed candidates is presented in the following Figure 15.5.



Score range	90-100	80-89	70-79	60-69	50-59	40-49	30-39	20-29	10-19	0-9	Total
No. of HPP candidates	4	16	30	40	28	3	12	3	0	0	136

Figure 15.5: MCA Level 1 score distribution

The candidates which obtained less than 60 points in the MCA L1 are designated as *Group C* projects. While those with more than 60 points were analysed in the MCA Level 2 process and then, based on the final ranking list, classified into *Group A* and *Group B*. The full list of projects which passed the set threshold are included in BR-8.

15.4.3 Step 3: MCA Level 2

The MCA Level 2 process was applied to 90 HPP candidates: 27 in Albania, 24 in BIH, 11 in Serbia and 10 in the former Yugoslav Republic of Macedonia, 6 in Montenegro and 3 in Kosovo, and 9 transboundary candidates (Figure 15.6 and Table 15.4). Among the transboundary candidates 7 are located between BIH and Serbia, one between Montenegro and BIH and one between BIH and Croatia.

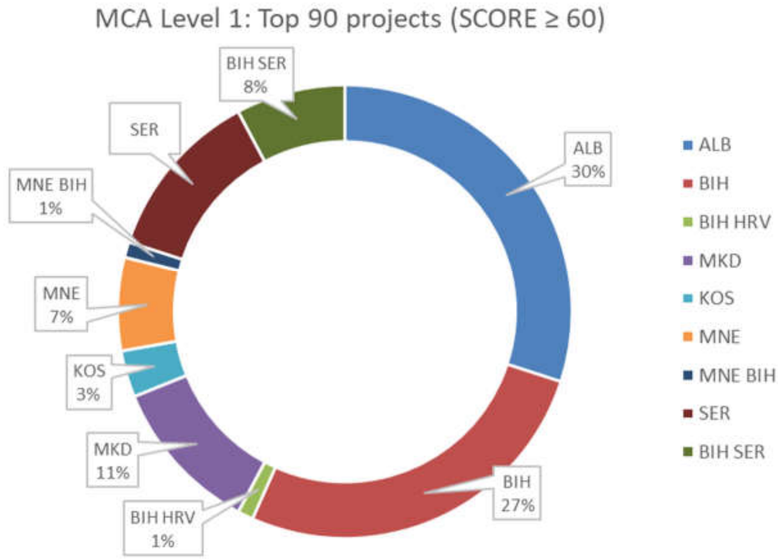
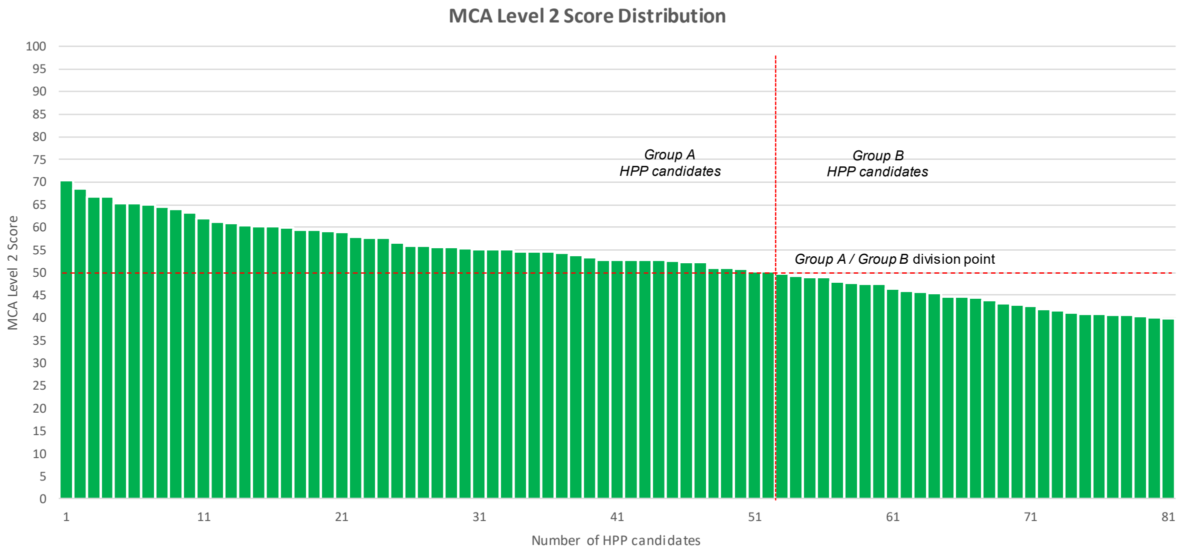


Figure 15.6: Distribution of the HPP candidates assessed in MCA Level 2 per country

Table15.4: Number of HPP candidates assessed in MCA Level 1 and MCA Level 2 per country

MCA Level	Country						Transboundary candidates					Total
	ALB	BIH	BIH HRV	MKD	KOS	MNE	MNE BIH	SER	BIH SER	MNE ALB	MNE SER	
MCA L1	35	36	1	17	3	14	2	21	7	0	0	**136**
MCA L2	27	24	1	10	3	6	1	11	7	0	0	**90**

The HPP candidates were screen and scored against 30 indicators of the five Criteria Groups encompassed in the MCA Level 2. The results show that the evaluated HPP candidates scored in the range from 32.4 to 70.3 points. Only seven candidates scored gained more than 65 points. Considering the overall performance of the candidates, 52 candidates scored above 50, thus passing the division point between the *Group A* and *Group B*. This means that the Group A comprises the top 38% of the candidates assessed in the MCA Level 1 and Level 2. The projects included in Group A represent 57,8% of the candidates assessed in the MCA Level 2. The MCA Level 2 score distribution is presented in Figure 15.7.



Score range	≥65	60-65	55-59	50-54	45-49	40-44	35-39	30-34	≤29
No. of HPP candidates	7	9	17	19	12	16	6	4	0

Figure15.7: MCA Level 2 score distribution

The full list of Group A, Group B and Group C projects, and their presentation for each country are included in BR-8. The summary of MCA results indicating performance group (Groups A, B and C) and country is presented in Table 15.5, while summary of the group A — with and without reversible HPPs — is shown in Table 15.6.

Table15.5: Summary of MCA Results: Distribution of Group A, Group B and Group C per country

	Group A				Group B				Group C				TOTAL		
	HPP	MW	GWh	TB*	HPP	MW	GWh	TB*	HPP	MW	GWh	TB*	HPP	MW	GWh
ALB	23	667	2,625		4	97	444		8	133	432		35	897	3,500
BIH	15	1,710	3,953	1	18	766	2,822	8	13	295	1,033	1	46	2,771	7,808
MKD	7	743	1,954		3	50	243		7	189	493		17	982	2,690
MNE	3	246	485		4	829	1,943	1	9	397	970	1	16	1,471	3,398
KOS	2	742	1,107		1	43	55						3	785	1,163
SER	2	1,880	2,650		16	644	2,438	7	10	214	895		28	2,738	5,983
Total	**52**	**5,988**	**12,774**	**1**	**38**	**2,430**	**7,945**	**8**	**46**	**1,227**	**3,823**	**1**	**136**	**9,645**	**24,542**

*TB – Transboundary HPP candidates; MW and GWh for TB divided between countries at 50% each

Table15.6: Summary of Group A HPP candidates – with and without reversible HPPs

	Group A total			Reversible HPP			Group A without reversible HPP		
	# HPP	MW	GWh	# HPP	MW	GWh	# HPP	MW	GWh
ALB	23	666.9	2,624.6				23	667	2,625
BIH	15	1,709.6	3,953.4	3	1,166.0	2,390.0	12	544	1,563
MKD	7	743.2	1,953.8	1	332.8	840.3	6	410	1,113
MNE	3	246.0	484.9				3	246	485
KOS	2	742.0	1,107.2	1	480.0	765.0	1	262	342
SER	2	1,880.0	2,650.0	2	1,880.0	2,650.0	0	0	0
Total	**52**	**5,988**	**12,774**	**7**	**3,859**	**6,645**	**45**	**2,129**	**6,129**

15.4.4 Step 4: Final Expert Assessment

The projects ranked in accordance with MCA 2 results were scrutinized on a project by project basis and the final lists of projects are produced with additional expert intervention. Thereby, all projects that are designed as a part of a wider functional HPP system, the projects were grouped into relevant cascades or hydro power systems (except for reversible HPPs, which are shown in a separate list). According to the individual project scores resulting from the MCA Level 2 assessment an average cascade score was calculated, weighted according to the installed capacity of individual projects within the cascade. For individual projects, the MCA score used was the project score. Each HPP project, cascades and individual HPP, were then assessed against the criteria (aspects) described in the Section 3.3 and categorised into five groups:

- ***Recommended projects***
- ***Reasonably good projects***
- ***Underperforming projects***
- ***Tentative projects***
- ***Reversible HPP candidates***

Table 15.7 below summarises the results of the expert assessment process and grouping of HPP candidate projects according their assessed potential for successful development and implementation. Note that all per country statistic and totals are made assuming the cross-border HPPs are shared 50-50% between the two involved countries.

Table 15.7: Key figures of the HPP-DB and results

	Recommended projects	Relatively good projects	Underperforming projects	Tentative projects	Reversible projects
Number of cascades/hydro power systems	7	11	23	18	7
Number of projects	16	25	65	64	7

Total capacity, MW	1,009	1,028	1,418	2,691	3,859
Total generation, GWh	2,863	4,104	4,588	7,428	
Total investment, mln €	2,092	3,095	2,505	3,867	2,583

The summary of Final Expert Assessment results grouping of HPP candidate projects according their assessed potential for successful development and implementation is presented in the following Table 15.8 (Recommended projects), while the lists of projects for other groups (Reasonably good projects, Underperforming projects, Tentative projects and Reversible hydropower projects are given in Tables A2-1 - A2-4 in Annex 2). A detailed presentation of the results is given in BR-8.

The Recommended projects are a proposal for further specific detailed development and assessment as well as the further designation of Natura 2000 sites and no-go zones by countries.

Table 15.8: Recommended projects

(Including individual projects within hydropower cascades)

SN	Project name	Country	River basin	Capacity (MW)	Electr. output (GWh)	Plant type	Invest. cost *) (mil. EUR)	Comments
1	**Gornja Neretva HPS**	BIH	Neretva	128.5	327.7	HPS	238.6	Candidate for construction within long-term development plan of EP BiH. Project has been in development by Intrade energija, in 2016 EP BiH submitted an unsolicited request for concession for Glavaticevo, Bjelimici and PHE Bjelimici.
2	**Mati cascade**	ALB	Mat	29.5	108.6	CAS	37.3	
3	**Gornja Drina**	BIH	Sava	225.0	770.7	HPS	574.6	Variant with "small" Buk Bijela with no cross-border issues.
4	**Tenovo**	MKD	Vardar	35.0	140.0	ROR	55.0	Ongoing tender for Prefeasibility Study. Additional generation on the existing HPPs on Treska river approx. 140 GWh and possible installation of new HPP with annual generation of 74-92 GWh.
5	**Morača cascade**	MNE	Morača	238.0	616.0	CAS	498.4	MoUs signed with potential strategic partners. Negotiations ongoing. Possible redesign. Flood protection, irrigation.
6	**Komarnica (var 2)**	MNE	Sava	172.0	227.0	DAM	178.3	Field investigations ongoing in cooperation between EPCG and EPS.
7	**Drini cascade**	ALB	Drin-Bune	181.0	673.0	CAS	509.9	(Skavica) Tender on concession cancelled. Intention is for KESH to develop the project with strategic partner. Potential cooperation with Kosovo.
	Total			**1,009**	**2,863**		**2,092**	

Note: *) Normalised total investment cost for reference year.

The multi-criteria assessment of HPP projects in the WB6 conducted through this Study is the first such exercise conducted in the Region. The outcomes should be used as a foundation for follow-up actions both on the regional and the national levels. The countries in the region may continue to collaborate and work jointly on the development of the regional sustainable hydropower system. Certainly, each country will continue developing its national energy sector. Based on the lessons learned, we propose a set of follow-up actions which can be implemented as a regional collaboration or on the national levels.

16 Concluding remarks

The study began under conditions where the situation with regard to the present status of the hydropower sector in the WB6 region was rather unclear, largely due to unsystematic data collection both in the area of existing hydropower infrastructure and in the planned HPP projects. In this regard, the study significantly contributed to the improvement of the information and the related knowledge base (e.g. 2 databases, for the existing and currently recognized new HPP projects with up-dated data as well as the GIS web-based application system in support of planning in the sector were developed).

At the outset of the Study, the existing information was not able to provide a clear assessment of the situation in the region, which is a prerequisite for the creation of hydro-energy policy and strategies in both the region and in individual countries. A large number of inherited problems were wrapped in fog and non-transparency, which could be easily exploited for system play and search for shortcuts with negative and irreversible implications. However, these are no longer possible for WB6 countries being in the EU-accession process.

The framework conditions and legal obligations for hydropower development stemming from *the EU acquis* and applicable international obligations, which implementation is supported through the Energy Community Treaty and International River Basin Organisations. The future of the development of the sector is therefore only possible in a perfect harmony with the existing legislation in the EU, especially in the area of environmental protection and management, climate change considerations, and the general guidelines for the development of energy and environmental policy and related strategies in the EU.

The requirements to ensure the reduction of the greenhouse gases and the production and use of energy from renewable sources in line with the implementation of the Renewable Energy Directive represent an important driver for the development of renewable energy, among which hydropower is one source. However, this cannot be done without a coherent and thorough application of all relevant assessments required by the EU environmental Acquis and applicable international conventions. It needs to fulfil the objectives of the WFD to ensure that water bodies are reaching a good status and of the nature protection legislation, according to which the habitats need to achieve a favourable conservation status (Habitats Directive).

The study thus presented the obligations of the WB6 region in conjunction with the transposition, implementation and enforcement of specific directives such as Water Framework Directive, Floods, Habitats, Birds, SEA and EIA, in conjunction with the planning of hydropower and listed some examples of good practice in EU Member States in this field in which the WB6 could benefit and usefully used in subsequent procedures in their own countries.

Due to the greater number of deviations from the desired practice in the past, the study clearly identifies the need for strategic and balanced planning between energy development desires on the one hand and the expectations of many other competitive users of water resources, which are regarded as a "common good” as well as environment and climate change considerations in other. The demands and expectations of the society are clearly present, to protect the environment, to take account of climate change and equal rights (and duties) in the planning of the use of water resources and these provisions on environment, climate change and energy also constitute EU legislative requirements, which have to be transposed, implemented and enforced. Development of River Basin Management Plans (RBMP) and Integrated Water Resources Management (IWRM) principles, and preparation of professionally-sound SEA at the plan / programme level and of EIA at the project level are prerequisite for efficient search for a consensus that is definitively needed that hydropower development would (re)gain on the lost momentum in the last three decades since the disintegration of the former SFRJ in the 1990s.

Today’s political map of WB6 region is quite different from that in the past. Most internal water-courses in SFRJ became suddenly cross-border ones, with more than ever needs for coordination, cooperation and mutual treatment of inherited problems from the past associated with several major projects. Provisions of Espoo Convention, Transboundary SEA / EIA, cumulative impact assessment etc. are typical references which should open the door to successful HPP projects and close the prospects if they are not implemented properly and especially, not at a sufficiently early stage.

Hydropower is an important industry in the national economy of almost all WB6 countries, with its average regional share accounting for almost 50% of all electricity generation in the past, with the estimated utilization rate of the total technical potential being slightly below 40% at present. Hydropower thus appears as an opportunity for further development of the region on the one hand and as a thread for additional irreversible interventions in the environment with possible negative effects on society impacted by greenfield HPP projects.

Due to its irreversible effects of new HPPs on the environment, the study recognizes that the renewal of existing HPPs is the clear first priority for a number of reasons listed and analysed in the study. Most of today's existing HPPs were built 3-5 decades ago and today are quite obsolete, which requires their renewal / upgrade / refurbishment after typically 4 decades of operation. Many power utilities in the region possess high level of awareness of this and plan such interventions in a timely manner, but their practical implementation is of course dependent on the currently available funds and other priorities of the HE owner (typically state). The study expresses the urgent need to continue the work on the preparation of rehabilitation projects of the remaining HPPs with an aim of not reducing the availability of HPPs and their production reliability, which would have a great adverse effect on the security of electricity supply both at national level as well as in still-evolving regional markets. At the same time, this is an opportunity for close cooperation with several IFIs that are traditionally interested in financial assistance in such projects. Last but not least, rehabilitation is an opportunity to introduce measures to protect the environment, which are otherwise mandatory for the construction of new HPPs in accordance with legislation and best practice.

In the WB6, as in all developing economies, energy demands, and specifically the demands for electricity, are growing. This is a significant issue, because these increases in demand mean that unless new sustainable hydropower capacity is continuously added, the share of hydropower in final electricity consumption will naturally decline over time. This presents a significant problem for WB6 countries to be able to contribute, through hydropower, to the fulfilment of the higher RES targets to 2030 (at least 27%) and beyond.

Annex 1: Regional Action Plan on the Hydropower Development - Proposals for Follow-Up Actions

1 Introduction

Consultant's proposals for the Study follow-up actions (Action Plan) are depicted from the Background Reports 1-8. Therefore, they focus on the following issue-areas addressed in the BRs 1-8:

- Background report n° 1 (BR-1) – Past, present and future role of hydropower
- Background report n° 2 (BR-2) – Hydrology, integrated water resources management and climate change considerations
- Background report n° 3 (BR-3) – Environment considerations
- Background report n° 4 (BR-4) – Regulatory and institutional guidebook for hydropower development
- Background report n° 5 (BR-5) – Transboundary considerations
- Background report n° 6 (BR-6) – Grid connection considerations
- Background report n° 7 (BR-7) – Inventory of planned hydropower plant projects
- Background report n° 8 (BR-8) – Identification of potential sustainable hydropower projects

By following this sequence of issues, the proposals are grouped first, in those at the Regional level (Section 2) and then at the Country level (Section 3). Rationale and further justification for the proposals can be found in the respective BRs1-8.

2 Regional level

Table A1.1: Proposals for follow-up actions at the Regional level

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	(1) Past, present and future role of hydropower		
1.1	Data and information on the contentious issue of total and remaining hydropower potential should be made available at river basin / sub-river basin or even river / tributary level to allow full implementation of the "bottom-up" approach and application of a "river-basin" rather than "country" approach in hydropower planning. Such a database should be developed / updated by a single authority responsible for multi-purpose use of water resources at the national level. In most countries (except Kosovo), such an inter-ministerial authority (council) still needs to be established.	Inter-ministerial council attached to government directly	ASAP
1.2	Any rehabilitation of an existing HPP project should address the possibility of introducing environmental improvement measures in addition to the typical technical improvements of the facility aiming at improving safety, availability and ensuring prolongation of service lifetime. That shall include determination of Environmentally Acceptable Flow (EAF), feasibility of introducing fishpasses and any other measure that may improve the environment (e.g. sediments, erosion etc.)	Power utilities (public and private) – operators of HPPs, Ministries responsible for energy and Ministries for environment	When rehabilitations are due
1.3	Future energy development strategies in WB6 countries should be developed / updated for a time horizon extending at least for the next 15 years (i.e. to 2030-2035) and with a long-term outlook to 2050. The hydropower sector shall be addressed in terms of possible further development of the entire	Ministries responsible for energy and Ministries for environment	When Strategy updates are due

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	remaining technical hydropower potential including; (i) additional capacity and output yield of HPP rehabilitations, and (ii) greenfield projects (large and small HPPs). Hydropower development shall be promoted based on clear sustainability criteria and in the context of its competitiveness against other RES-E sources (PV, Wind, biomass) and its technical advantages for the power system. The interdependencies between water and power or water and agriculture shall be taken into account, which will be more important in the future. Therefore, a full analysis incorporating such dependencies will be needed and required when it comes to hydropower. A high-quality SEA has to be done at the earliest stage on energy strategies, during its development and prior to adoption thereof., accompanied by extensive public consultation processes.		
1.4	Electricity generation from renewable sources (RES-E) should become an indicative target and quantified (GWh, %) in the future NREAPs of all WB6 countries. In addition, the breakdown of RES-E generation by source (hydro: large and small, PV, solar, biomass etc.) shall become a standard approach.	Ministries responsible for energy and Ministries for environment	When new NREAPs for the next decade are due
1.5	Electricity demand development shall be assessed in the context of economic growth, reduction of poverty, improvement of lifestyle of population, the introduction of energy efficiency measures and use of renewable energy sources. Energy demand modelling and energy demand-supply analysis should become a standard approach in all WB6 countries, to support their preparation of future NREAPS and NEEAPs. Capacity building to responsible institutions in charge of such analysis should be provided to ensure local know-how and skills to undertake such tasks independently from external assistance.	Ministries responsible for energy, National institutes and universities, Energy Community Secretariat	ASAP
1.6	Further detailed electricity market development studies are required in the WB6 to assess the potential for cost-competitive penetration of electricity generated from RES by the type of RES-E generation (hydro, PV, wind, biomass) and its optimal supply mix in conditions of possible electricity demand development by 2050. Special attention should be given to the effects on electricity prices and electricity bills for final consumers, security of supply and the potential that WB6 could become a net exporter of RES-E to other regional markets including the internal market of EU (e.g. via the new submarine cable between Montenegro and Italy presently under construction).	Ministries responsible for energy, Energy Community Secretariat	ASAP
1.7	Improve information and database on planned rehabilitation projects as opportunities for intensified cooperation between state-owned utilities and IFIs. Timely inspections of the technical status is required to prepare high-quality specifications and to ensure effective tendering procedures and implementation of planned activities / works that typically last 5-10 years.	Power generation utilities – operators of the existing HPPs	ASAP (urgent due to rapidly approaching deadlines)
1.8	Perform deep analysis of financing needs in the region, taking into account currently available funds on supply side and characteristics of financing needs on the demand side. Start undertaking actions needed to remove barriers to financing, and compensating for currently present fiscal constraints, in order to put much needed project finance mechanics into motion, local governments should commit themselves to: develop a fully-functional legal system with the sponsorship of the EU as a key prerequisite for project finance; improve the business climate to attract credible, risk averse, private investors; determine what financial products are missing (i.e. private equity, mezzanine financing etc.) and work closely with IFIs focusing on the development custom-made solutions which cover the needs; work closely with IFIs to develop much-needed guarantee programmes and schemes to compensate for lack of sovereign guarantees (European Investment Fund and EIB could be one solution) – again custom-made solutions are needed to address true needs,	WB6 governments/Ministries responsible for energy and environment under guidance and sponsorship of EC/IFIs	ASAP

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	and work closely with, or sponsor the process of, financial institutions in creating specialised insurance products which are base for any project finance scheme and implementation of any complex long-term project such as large HPP development.		
(2) Hydrology, integrated water resources management and climate change			
2.1	Implement a full-scale monitoring system on water quantity, including meteorology and surface characteristics enabling analysis of climate change impact on watershed run-off.	Governments, Environmental agencies	Mid-Term
2.2	Implement WFD not only in strictly legal terms but substantiate water-management organisation and practice.	Government	Short-Term
2.3	Plan new set of hydrologic studies including modelling of run-off for prioritised river basins.	Government, Utilities	Mid-Term
2.4	Integrated water management plans are first step of water resources utilisation management at river basin level.	EC DG, IFI, Governments, International development agencies	Continuous, Short-Term
2.5	Publicise the knowledge acquired through preparatory work on planning and realisation of hydropower stations in the Region	Governments, IFI, EC DG	Continuous
2.6	Upgrade state owned hydrometeorology systems and expand existing network according to energy, water use and climate change needs appropriately to priority river basins	Governments, Environmental agencies	Continuous
2.7	Continue realising adequate measures (in detail in BR 3) that consider and protect biodiversity and ecosystem services.	Electric Power Utilities	Continuous
2.8	Enable exchange of information on the official hydrological and meteorological data in the Region (it is efficient to implement the case of Danube river projects) among all riparian countries (priority at the Drini/Drim River Basin.	Governments, Environmental agencies, Research support	Mid-Term
2.9	Prepare for public participation activities from the hydrology point of view as equally important with other planning issues.	Governments, Utilities	Short-Term
2.10	Prepare guidelines for future hydropower projects, based on lessons learned, incl. costing issues, best practice of mitigation considering offsets, followed by development of a comprehensive action plan for the sustainable development of the hydropower generation potential of the river and its tributaries.	EC DG, Governments	Short-Term
2.11	Pre-planning mechanisms allocating “no-go” areas for new hydro-power projects should be developed. This designation should be based on a dialogue between the different competent authorities, stakeholders and NGOs.	Governments, Utilities	Short-Term
2.12	Develop specific guidelines on environment and water related rehabilitation of existing hydropower stations and include good description of hydrology related subjects, such as data quality, climate change, tendencies in run-off, etc.	EC DG, IFI	Short-Term
2.13	While planning, climate change modelling should be done on a project development basis.	Electric Power Utilities	Short-Term
(3) Environment considerations			
3.1	Develop pre-planning mechanisms and designate “no-go” areas for new hydro-power projects.	Governments, regulators, with public participation	ASAP
3.2	Full transposition, implementation and enforcement of EU legislation (Environment – Birds and Habitats Directive, WFD)	Governments, regulators	ASAP
3.3	Ensure that mitigation measures for ecology and biodiversity are specific for	Governments, regulators	ASAP

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	the area and project and that they are implemented – develop a monitoring system for the effectiveness of mitigation measures assessment		
3.4	Develop a unified methodology for EAF calculations and harmonise regulations between countries (MKD and SER - harmonisation)	Governments	ASAP
3.5	Map riparian natural habitats according to Habitats Directive	Governments, Environmental agencies, Scientific institutions	ASAP
3.6	Develop inventory of benthic fauna and invasive species	Governments, Environmental agencies, Scientific institutions	ASAP
3.7	Develop and harmonise biodiversity monitoring programme for transboundary river basins	Governments, Environmental agencies, Scientific institutions	ASAP
3.8	Ensure that all pollutants are moved outside flood plain (e.g. landfill) or are appropriate managed (e.g. wastewaters)	Governments, Environmental agencies	ASAP
3.9	Conduct transboundary river basin assessment (transboundary EIA) or cross-border SEA, including CIA, as an activity to be carried out at the earliest stage of project identification	Governments	Planning phase
3.10	Map all planned and proposed protected areas (including future Natura 2000 areas and assessment under article 6 of the Habitats Directive).	Governments, regulators	ASAP
3.11	Build capacity within agencies on technical approaches and also on policy solutions	Governments, regulators	ASAO
	(4) Regulatory and institutional considerations		
4.1	In general, the Western Balkans countries need to further harmonize the entire I.O.L.R. framework with the *acquis communautaire* in order to align their energy markets with European standards and norms, but also to provide support for integration of their markets into the regional and European electricity transmission grids. However, it is critical to ensure that this alignment, not only happens, but that it happens simultaneously and in close coordination among the countries.	Line Ministries	ASAP
4.2	In each WB6 country, the establishment of the institution for coordination of water use at the country level must be initiated, bringing together all decision makers from interested institutions. Since water sectors in each country are different, proposals should be customised for each WB6 country (except for Kosovo where this entity already exists), followed by the brief/indicative terms of references for their future activities.	Governments	ASAP
4.3	A pilot project should be launched on the establishment of the institution (council) for coordination of planning, development and utilisation of the river basin commonly selected by WB6 partners. This pilot project should develop all organisational documents for such river basin coordination centre, by undertaking an inventory of available resources vs. scope of work, objectives and available facilities. The final development study should be submitted to WB6 Ministers for further decision making and action proposals on implementation.	WB6 Governments, line Ministries, DG NEAR, ECS, IFIs	2018
4.4	Undertake analysis and propose a framework model for the coordinated hydropower generation development planning. Introduce a clear determination of roles and responsibilities of individual institutions in this process into the strategic documents of energy sector as well as in other sectors (waters, agriculture, environment, tourism, international cooperation, etc.)	WB6 Governments and line Ministries	ASAP
4.5	Additional assessment of the capacities of local municipalities to actively and efficiently participate in the existing I.O.L.R. framework for HPP development	WBIF	ASAP

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	should be undertaken in each of the WB6 countries separately. Initiate various capacity building and strengthening projects to train administrative staff in assisting investors for various hydropower development projects.	IFIs	
4.6	Development of integrated planning documentation (including spatial planning and hydrological resources usage planning) in countries where it is not sufficiently developed: MNE, SER, ALB, KOS, partially FBiH. Consider the integration of the procedure for issuing various permits, especially in cases when the same Ministry is issuing these permits, e.g. certain water acts and environmental permit or water acts and concession.	Governments and line Ministries	ASAP
4.7	Strategic documents (Energy Strategies, Action Plans for implementation of energy strategies and NREAPs) must go through an SEA procedure and must be regularly updated using realistic data on feasible hydropower potential and sustainable hydropower generation development projects. Where a trans-boundary impact exists for new HPP projects, neighbouring countries should be consulted and inputs harmonised in the planning process.	Line Ministries	Permanent action item
4.8	It is essential to introduce at earliest stage the practice of conducting a high-quality SEA during the development of all strategic planning documents (not only on spatial planning but also energy) and adoption thereof. Similar requirements/practice at earliest stage should be introduced for EIAs for all projects, including Appropriate Assessment (Precondition: Proclamation of Natura 2000 or incentivisation of target species and habitats according to Birds and Habitats directives). It is essential to improve existing practices concerning public participation and public consultation processes for SEAs and EIAs.	Line Ministries, Governments	ASAP
4.9	Improve current practice in the implementation of the EIA Directive concerning the willingness to consider alternatives and appropriate justification for the proposed solution in individual projects, to propose adequate protection measures to avoid negative impact or to notify another country in case of transboundary impact.	Governments and line Ministries	ASAP
4.10	Introduce a "Silence of administration" rule in WB6 countries for the permitting process.	Governments	ASAP
4.11	Introduce a "one stop shop" for the development of HPP projects – investors apply and the responsible administration which issues spatial planning and construction documents and permits takes care of all necessary consents and approvals. Undertake necessary preparations, training, institutional and individual capacity building.	Governments, line Ministries, ECS, DG NEAR, IFIs	2018
4.12	All WB6 countries should employ maximum efforts to improve their current practice towards sustainable, mature and sound project planning procedure.	Governments	ASAP
	(5) Transboundary considerations		
5.1	Adequate legal set-up in the countries concerned based on EU environmental legislation and applicable international conventions for enabling transboundary cooperation, eventual resolving of stranded cases and hydropower development.	WB6 Governments	Mid-term
5.2	Integral assessment of development impacts and benefits on existing environmental, social and economic conditions.	Developer	Within a project timing
5.3	Prepare a support proposal for a mediation platform of transboundary disputes and assistance in transboundary negotiations resulting in corresponding agreements.	DG NEAR, ECS	ASAP
5.4	Guidelines for an EIA-SEA transboundary procedure adapted to the geographic, politic and administrative conditions in the region and per each country. Develop an approach in mitigation measures.	DG NEAR, WB6 Governments	ASAP

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
5.5	Practical Guidelines on the principles of the division of water and other resources in transboundary conditions.	DG NEAR, WB6 Governments	Short-term
5.6	Detailed analysis of existing transboundary case(s) resolving issues of hydropower, and the preparation of guidance based on cases of good practice in the EU, followed by actual support provided in resolving transboundary problem to be selected with EU expert support.	WB6 line Ministries, IFIs	Short-term
5.7	Training programme tailor made and organised for the administration personnel from the Region, focusing on resolving transboundary issues in the development of hydropower.	WBIF, Line Ministries	ASAP
5.8	Realisation of the IRBMP, RB to be selected in a transboundary set-up.	WBIF	Mid-term
5.9	Review the existing design of HPP Reservoirs in transboundary conditions and assess the benefits of a multipurpose role and mitigation measures in the light of relevant EU legal instruments, such as the WFD, Floods Directive, Habitats Directive etc. prepare conceptual solutions and estimate the effects on feasibility.	Line Ministries	ASAP
5.10	Develop a business model for HPP for selected transboundary cases on Group 1 of HPP projects (see BR-7)	Governments, line Ministries	ASAP
	(6) Grid connection considerations		
6.1	Regular (timely) revision of the Energy Strategy, Action Plans for implementation of Energy Strategy and NREAPs using realistic approach vs. project overall feasibility and expected time of commissioning and entry into operation	Line Ministries	Regular planning cycle
6.2	Develop pending or update existing secondary legislation (Network Codes) and associated connection procedures and charging methodologies.	TSOs DSOs	ASAP
6.3	Further improvement in transparency of the conditions and charges for connection to the transmission and distribution networks. Perform regional study/benchmarking on connection costs and tariffs, assessing legislation vs. practice in WB6 with respect to the best international experience.	TSOs DSOs	Regular activity
6.4	Application of realistic apportionment of costs for connection to the transmission and/or distribution network. This includes using a fair solution on all aspects of financing network reinforcement for facilitation of the requested connection and future ownership of those assets	Line Ministries, TSOs, DSOs, Regulators	1 year
6.5	The DSOs responsible for distribution system planning and implementation shall conduct regular 10-years distribution network development planning studies (DNDP) with yearly updates to provide for regular network development which can facilitate growing demand for connection of new generation facilities, and submit them to national Regulators for approval	DSOs, Regulators	Every year
6.6	The TSOs which do not have fully functional cycle of 10-years transmission network development planning studies (TYNDP) with yearly updates and approvals by the national Regulators should improve their practice	TSOs, Regulators	Every year
6.7	Invest in development of new and refurbishment of existing distribution network facilities – action item is applicable to all WB6 parties only the level of necessary investment differs	DSOs, Regulators, IFIs	ASAP
6.8	Improve distribution network monitoring and control facilities	DSOs	ASAP
6.9	Provide technical assistance to regional countries where the process to undertake preliminary assessment of the grid connection options, before concessions are given does not exist yet. The main objective is to improve efficiency of the project execution which is beneficial for the investor, for the network operator and for the state/society	EU, ECS	ASAP

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	(7) Inventory of planned hydropower plant projects		
7.1	Large number of projects are transboundary. Support regional (and intra-country cooperation). Respect obligations for trans-boundary consultations in line with EU legislation and Espoo Convention.	DG NEAR, ECS, Governments	Permanent action item
7.2	Support plant operators to enable the adequate planning of rehabilitation projects, together with potential environmental improvement measures. Support implementation of rehabilitation projects.	DG NEAR, ECS, IFIs	ASAP/Permanent action item
7.3	Undertake hydro-development and planning study focused on Albania in order to clarify the situation	ALB Line Ministry, DR NEAR, IFIs	ASAP
7.4	Promote the development of a functioning electricity market, which would provide additional momentum for private investors in HPPs.	Line ministries, ECS, Regulator	Permanent action item
	(8) Identification of potential sustainable hydropower projects		
8.1	**Perform more detailed analysis of the *Recommended projects*** – revise/perform feasibility studies, EIA/SEA, assessments required by the WFD and Habitats Directive, cumulative and transboundary assessment, and other project documentation using a single methodology in accordance with EU best practices and IFI requirements, such as ESIA. The Recommended projects could be used to demonstrate a transparent and sustainable approach to HPP development in the region. TA assistance could be provided to motivate the developers, and the projects that successfully pass through the process could be used as showcase examples of the sustainability and feasibility of such approach.	DG NEAR, IFIs, relevant national line ministries, project promoters	ASAP
8.2	**Undertake a unified methodology CBA for recommended HPP projects where significant multipurpose aspects are identified (particularly if estimated LCOE is high)**: - Verify economic feasibility - Identify beneficiaries and potentially damaged parties and propose a model for distributing projects costs and benefits Study possible PPP or similar models to mitigate risks for the investors and to enable a more equitable division of costs and benefits between stakeholders. Develop viable business models	DG NEAR, IFIs, relevant national line ministries, project promoters	In accordance with project prioritization and actions proposed in point 2.
8.3	**The feasibility of REV projects should be studied on a regional level.** Reversible projects are important for the development of electric systems, particularly for the integration of large amount of RES. The Study identified 7 mostly large REV projects. These facilities could generally provide services to several countries' power systems.	ECS	ASAP
8.4	**Development of HPP projects catalogue** Review, verification and update of the data on the HPP candidates developed in this Project and the identification of other planned HPP projects, review of the available documentation and data verification. Development of a catalogue with a database of the HPP projects which includes data on the technical, financial, organisational, environmental, spatial, and other relevant data.	Ministry of Energy and Ministry of Environment	6 months
8.5	**Improvement of the data on the environmental baseline** Review of the existing information on the state of environment, including environmental, social and land use aspects, if needed the implementation of additional studies so as to catalogue and map ecologically and social sensitive areas, the remaining hydropower potential and the identification of areas (locations) suitable for HPP construction.	Ministry of environment / environmental agency / academic institutions / NGOs	Continuous
8.6	**Application of the MCA Methodology for Assessment of HPP Sustainability in the Western Balkan Region using updated/upgraded HPP datasets and environmental baseline** The methodology described in this Report can be applied at both regional and	Government / Ministry of Energy and Ministry of Environment	6 months

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	national levels, even sub-nationally. An analysis conducted with more detailed and harmonised information about the HPP candidates, on the one hand, and better information about the prevailing environmental conditions in the catchments with underutilised hydropower potential on the other, will allow for a better distinction between the HPP candidates and their sustainability. It is also important to emphasise that more detailed input data would allow for the adaptation of the methodology so as to fully reflect national/catchment characteristics. The adaptation may encompass the inclusion of additional indicators in each of the Criteria groups used in MCA Level 2, the refinement and/or redefinition of the scoring system and thresholds, elaborated with close stakeholder involvement. An example of a more detailed assessment of financial viability is presented in Annex 4 of BR-8.		
8.7	**Development/update of the Sustainable Hydropower Development Action Plan** Once the sustainable HPP candidates are identified using the MCA methodology and further case-by-case assessment, development of the conceptual design of the best alternative and action plan can be initiated. This process should encompass discussion and consultation with all relevant stakeholders, including governmental organisations, academic society and the civil society organisations. The general public should also be informed about the process.	Ministry of Energy and Ministry of Environment	2018/2019
8.8	**Strategic Environmental Assessment (SEA) of the Sustainable Hydropower Development Action Plan** Once the development of a Sustainable Hydropower Development Action Plan has started, the SEA process should be initiated. The aim of the SEA is to provide information on the environmental effects, or consequences of proposed plans, programmes (or policies), also considering cumulative and synergic effects with other existing and planned activities in the assessment area. Following this information, the objective of SEA will to support the Development of the Sustainable Hydropower Development Action Plan in finding the best alternative, avoidance and mitigation measures and thus ensure the environmental acceptability of new HPPs.	Ministry of Energy (with the support of the Ministry of Environment)	2018/2019

3 Country level

3.1 Albania

Table A1.2: Proposal for follow-up action at the country level – Albania

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	(1) Past, present and future role of hydropower considerations		
1.1	See other Regional proposals in Table A1.1 that are applicable also at the Country level.		
	(2) Hydrology, integrated water resources management and climate change considerations		
2.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
	(3) Environment considerations		
3.1	Identify biodiversity areas of potential significant impact	Governments, Environmental agencies, Scientific institutions	ASAP
3.2	Assess potential transboundary impacts		

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
3.3	Transpose and implement EU directives	Governments, regulators	ASAP
	(4) Regulatory and institutional framework considerations		
4.1	Streamline the process and limit the duration of the permitting procedure. Provide support for capacity building and strengthening of institutions.	Government and MEI, IFIs	ASAP
4.2	Abandon the concept of granting concessions through unsolicited proposals, by making it more predictable and transparent. Use competitive process (tendering) for new generation facilities, including HPPs instead.	MEI and AKBN	Permanent activity
4.3	Having in mind complexity of SHPP/HPP permitting procedures in Albania, defining a reference permitting process would represent strong starting point for potential developers. In other words, Albania should create generic procedure outlining the major milestones and minimum contents of procedures.	MEI	ASAP
4.4	Integrate spatial planning into the permitting procedure.	Line Ministry	ASAP
	(5) Transboundary considerations		
5.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
	(6) Grid connections considerations		
6.1	Harmonise and complete exiting framework for HPP development: Law – Network Codes – Connection Procedures – Methodology for connection charges – Connection Agreement	MEI, ERE, OST	ASAP
6.2	Develop, adopt and approve the revised version of the Transmission Grid Code, reflecting definitions from new Electricity Law	OST, ERE	2017
6.3	Develop TYNDP framework and provide for regular planning, adoption, approval, implementation and yearly updating of the TYNDP	OST, ERE	End 2017
6.4	Execute planned transmission network developments, in particular new 400kV OHLs Elbasan – Bitola and Elbasan – Fier, as well as numerous developments of the 110kV network components, OHLs and substations	OST, IFIs	As planned
6.5	Develop, adopt and approve revised version of the Distribution Grid Code, reflecting definitions from new Electricity Law	OSHEE, ERE	2017
	(7) Inventory of planned hydropower plant projects		
7.1	Assure implementation of the relevant environmental acquis (i.e. EIA, SEA, WFD, Floods Directive, nature protection) and international agreements (i.e. Espoo Convention)	Government, Line ministries	ASAP
7.2	Strengthen HPP development planning process and procedures, including the integrated hydrological resources planning and management approach, spatial planning, grid connection planning.	Line ministries, IFIs	ASAP
7.3	Strengthen resources (probably in AKBN) for adequately managing a huge number of issued HPP concession contracts.	Government, Line ministry	ASAP
7.4	Improve the level of monitoring of HPP development concessions in order to facilitate the development and implementation of perspective HPP projects and to expedite the resolution of issues in problematic HPP projects or projects where the concession contract has been seriously breached.	Line ministry, AKBN	ASAP
7.5.	Support KESH in timely planning and execution of rehabilitation projects of their HPP portfolio.	ECS, IFIs	ASAP
7.6.	Investigate the potential and the interest of private HPP developers for cooperation with IFI's, EU, EC in the development and implementation of	ECS, DG NEAR, IFIs, Line ministries	ASAP

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	their HPP projects. As a number of projects are apparently lacking financing, cooperation with IFIs and EU institutions could ensure that good quality projects are developed in a transparent and sustainable manner. At the same time the developers could benefit from bridging the financing gap.		
	(8) Identification of potential sustainable hydropower projects		
8.1	Regional proposals in Table A1.1 are applicable also at the Country level.		

3.2 Bosnia and Herzegovina

Table A1.3: Proposal for follow-up action at the country level – Bosnia and Herzegovina

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	(1) Past, present and future role of hydropower considerations		
1.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
	(2) Hydrology, integrated water resources management and climate change considerations		
2.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
	(3) Environment considerations		
3.1	Conduct new biodiversity surveys and field investigations	Governments, Environmental agencies, Scientific institutions	ASAP
3.2	Improve social and economic impact assessment procedures	Governments, regulators	ASAP
3.3	Harmonise regulations on EAF within the State	Governments, regulators	ASAP
	(4) Regulatory and institutional framework considerations		
4.1	Adopt new versions of the outdated or pending legislative acts, streamline the process, update legislation and limit the duration of the permitting procedure.	Governments	ASAP
4.2	Ensure consistency over application of the regulation and permitting procedures across different levels of government in each entity (particularly in FBIH).	FBiH Government	ASAP
4.3	Improve standard contracts and legislation enabling project financing (step-in rights related provisions in respective laws on concessions, e.g.).	FBIH and RS Government	ASAP
4.4	Simplify the HPP development process by reconsidering some of the requirements arising out of the applicable legislation (in particular Article 78 of FBIH's Electricity Law and extension of expropriation beneficiary concept to private investors in Law on Expropriation in FBIH).	FBiH Government	ASAP
	(5) Transboundary considerations		
5.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
	(6) Grid connections considerations		
6.1	Adopt new Law on Electricity transposing EU 3rd Energy Package	Council of Ministers	ASAP
6.2	Finalise, adopt and approve new Distribution Grid Codes for all DSOs, as well as associated follow-up procedures and methodologies	DSOs, FERC, RERS	ASAP

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
(7) Inventory of planned hydropower plant projects			
7.1	Assure implementation of the relevant environmental acquis (i.e. EIA, SEA, WFD, Floods Directive, nature protection) and international agreements (i.e. Espoo Convention)	Governments, Line ministries	ASAP
7.2	Reaching Interstate agreements is crucial for the development of a significant portion of identified projects (Drina, Trebišnjica)	Governments, Line ministries	Mid term
7.3	Promote cooperation between entities and cantons in order to optimise the usage of hydro resources and enable the timely development of perspective projects.	All levels of governments in BiH	ASAP
(8) Identification of potential sustainable hydropower projects			
8.1	Regional proposals in Table A1.1 are applicable also at the Country level.		

3.3 The former Yugoslav Republic of Macedonia

Table A1.4: Proposal for follow-up action at the country level – the former Yugoslav Republic of Macedonia

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
(1) Past, present and future role of hydropower considerations			
1.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(2) Hydrology, integrated water resources management and climate change considerations			
2.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(3) Environment considerations			
3.1	Amend cost-benefit assessment of the projects and alternatives taking into account mitigation measures	Governments, regulators	Conceptual solution phase
3.2	Implement and use in practice transposed legislation for SEA and EIA	Governments, regulators	ASAP
(4) Regulatory and institutional framework considerations			
4.1	Streamline the process and limit the duration of the permitting procedure, especially in relation to long term land lease of the state-owned land.	Government	ASAP
4.2	Diligently develop and apply the PPP process and any other alternative approaches	MoE, MoEPP	ASAP
(5) Transboundary considerations			
5.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(6) Grid connections considerations			
6.1	No country specific proposals for action.	N/A	
(7) Inventory of planned hydropower plant projects			
7.1	Assure implementation of the relevant environmental acquis (i.e. EIA, SEA, WFD, Floods Directive, nature protection) and international agreements (i.e. Espoo Convention)	Governments, Line ministries	ASAP
7.2	Development plans need to be aligned with the targeted financing institution/partner preferences.	Project developers, Line ministries	Permanent action item

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	(8) Identification of potential sustainable hydropower projects		
8.1	Regional proposals in Table A1.1 are applicable also at the Country level.		

3.4 Kosovo

Table A1.5: Proposal for follow-up action at the country level – Kosovo

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
	(1) Past, present and future role of hydropower considerations		
1.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
	(2) Hydrology, integrated water resources management and climate change considerations		
2.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
	(3) Environment considerations		
3.1	Identify biodiversity areas of potential significant impact	Governments, Environmental agencies, Scientific institutions	ASAP
3.2	Improve waste disposal issue	Governments, regulators	ASAP
3.3	Assess potential transboundary impacts	Governments, regulators	Before main design
3.4	Capacity building in environmental and nature protection sector	Governments, regulators	ASAP
	(4) Regulatory and institutional framework considerations		
4.1	Provide assistance in capacity building of the MoE, ERE and local administrations due to their central role in HPP/SHPP development	Government, IFIs, MoE	ASAP
4.2	Consider granting access to land together with the permit to ensure that project developer may start construction as soon as the permit is enforceable.	Line Ministry	When applicable
	(5) Transboundary considerations		
5.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
	(6) Grid connections considerations		
6.1	No country specific proposals for action.	N/A	
	(7) Inventory of planned hydropower plant projects		
7.1	Assure implementation of the relevant environmental acquis (i.e. EIA, SEA, WFD, Floods Directive, nature protection) and international agreements (i.e. Espoo Convention)	Governments, Line ministries	ASAP
7.2	Resolve hydro resources sharing and other transboundary issues with Albania regarding HPP Zhur.	Governments, Line ministries	
	(8) Identification of potential sustainable hydropower projects		
8.1	Regional proposals in Table A1.1 are applicable also at the Country level.		

3.5 Montenegro

Table A1.6 Proposal for follow-up action at the country level – Montenegro

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
(1) Past, present and future role of hydropower considerations			
1.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(2) Hydrology, integrated water resources management and climate change considerations			
2.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(3) Environment considerations			
3.1	Conduct SEA process in early phases of project prepared	Governments, regulators	ASAP
(4) Regulatory and institutional framework considerations			
4.1	Streamline the process, fill in the gaps in legislative framework, update necessary legislation and limit the duration of the permitting procedure.	Government	ASAP
4.2	Improve standard contracts and legislation enabling project financing (e.g. step-in rights related provisions in respective laws on concessions).	MoE	ASAP
4.3	Diligently develop and apply the PPP process and any other alternative approaches	Government, MoE	When applicable
(5) Transboundary considerations			
5.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(6) Grid connections considerations			
6.1	Develop, adopt and approve a revised version of the Transmission Grid Code, reflecting definitions from new Electricity Law	CGES, REGAGEN	2017
6.2	Approve TYNDP by the Regulator (REGAGEN) and maintain regular update of planning framework	REGAGEN	ASAP
5.3	Finalise on-going and planned reinforcement of the transmission network, such as section of the 400kV Transbalkan corridor in Montenegro and extension of existing 110kV network in the country	CGES, REGAGEN, IFIs	As planned
6.4	Develop, adopt and approve revised version of the Distribution Grid Code, reflecting definitions from new Electricity Law	EPCG DSO, REGAGEN	2017
(7) Inventory of planned hydropower plant projects			
7.3	Strengthen administrative capacities in the ministries (i.e. Ministry of Tourism and Sustainable Development and Ministry of Economy) to assure implementation of the relevant environmental acquis (i.e. EIA, SEA, WFD, Nature Directives, Floods Directive) and international agreements (i.e. Espoo Convention) and to enable strategic planning of hydro development.	Government	ASAP
7.1	Develop/revise hydro resources planning documentation per selected water sheds and rivers and on the national level. The document should take into account both the environmental and economic development concerns.	Line ministries	ASAP
7.2	Reaching Interstate and intercompany agreements is crucial for the development of a significant portion of identified projects (Trebišnjica, Drina tributaries projects)	Governments, Line ministries	Mid term
(8) Identification of potential sustainable hydropower projects			
8.1	Regional proposals in Table A1.1 are applicable also at the Country level.		

3.6 Serbia

Table A1.7: Proposal for follow-up action at the country level – Serbia

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
(1) Past, present and future role of hydropower considerations			
1.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(2) Hydrology, integrated water resources management and climate change considerations			
2.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(3) Environment considerations			
3.1	Assess potential transboundary impacts	Governments, regulators	Before main design
3.2	Implement and use in practice transposed legislation for SEA and EIA	Governments, regulators	ASAP
(4) Regulatory and institutional framework considerations			
4.1	Adopt and/or update strategic documents: Energy Strategy, Action Plan for implementation of Energy Strategy and NREAP	Government, MRE	ASAP
4.2	Diligently develop and apply the PPP process and any other alternative approaches	Government, MRE	When applicable
4.3	Ensure equal level playing ground for private sector investors and incumbent companies (EPS)	MRE	Permanent activity
(5) Transboundary considerations			
5.1	Regional proposals in Table A1.1 are applicable also at the Country level.		
(6) Grid connections considerations			
6.1	Completion of the development projects for upgrading of existing 220kV OHL Bajina Bašta – Kraljevo, Kraljevo – Kragujevac and Kraljevo – Kruševac to 400kV, as well as construction of the Transbalkan corridor, primarily upgrading of existing OHL Obrenovac – Bajina Bašta from 220 kV to 400 kV and construction of new 400kV OHL Bajina Bašta (SER) – Višegrad (BiH) – Pljevlja (MNE).	EMS	As planned
6.2	Approve TYNDP by the Regulator (AERS) and maintain regular update of planning framework	AERS, EMS	ASAP
(7) Inventory of planned hydropower plant projects			
7.1	Assure implementation of the relevant environmental acquis (i.e. EIA, SEA, WFD, Floods Directive, nature protection) and international agreements (i.e. Espoo Convention)	Governments, Line ministries	ASAP
7.2	Reaching Interstate and intercompany agreements is crucial for the development of a significant portion of Drina and tributaries projects	Governments, Line ministries	Mid term
7.3	Support Serbian government and EPS in execution of overdue HPP rehabilitation projects.	DG NEAR, ECS, IFIs	ASAP
(8) Identification of potential sustainable hydropower projects			
8.1	Regional proposals in Table A1.1 are applicable also at the Country level.		

Annex 2: Lists of Reasonably good projects, Underperforming projects, Tentative projects and Reversible HPP candidates

Table A2.1: Reasonably good projects

(Including individual projects within hydropower cascades)

SN	Project name	Country	River basin	Capacity (MW)	El. output (GWh)	Plant type	Investment cost (mil. EUR)	Comments
1	**Kovanici**	BIH	Sava	13.3	65.7	ROR	38.8	Candidate for construction within long term development plan of EP BiH.
2	**Janjici**	BIH	Sava	13.3	68.3	ROR	55.0	Candidate for construction within long term development plan of EP BiH.
3	**Babino selo**	BIH	Sava	11.5	59.9	DER	30.3	Candidate for construction within long term development plan of EP BiH. Planned unification of design for Babino Selo and Vinac HPPs.
4	**Vinac**	BIH	Sava	11.5	61.3	ROR	25.1	Candidate for construction within long term development plan of EP BiH. Planned unification of design for Babino Selo and Vinac HPPs. Opposition to construction from Municipal government (Jajce).
5	**Ibar cascade**	SER	Velika Morava	121.5	456.6	CAS	345.4	JV of EPS & SECI. Unclear continuation of cooperation. Likely redesign of the cascade.
6	**Srednja Drina HPS**	BIH SER	Sava	321.5	1,197.0	HPS	878.5	Transboundary issues. Positive effect for downstream HPPs & water management.
7	**Donja Drina HPS**	BIH SER	Sava	365.0	1,588.6	HPS	1,346.5	Transboundary issues. Positive effect for water management and flood protection.
8	**Skakala**	BIH	Neretva	26.4	124.3	ROR	82.3	Border area between "jurisdictions" of EPHZHB and EP BiH
9	**Ustikolina**	BIH	Sava	60.5	236.8	ROR	139.9	Candidate for construction within long term development plan of EP BiH. Development stalled as Urban conditions were denied in 2015. due to missing spatial planning.
10	**Gorazde**	BIH	Sava	37	169.9	ROR	56.3	Strong opposition from local public. Candidate for construction within long term development plan of EP BiH.
11	**Ribarice**	SER	Velika Morava	46.7	76.1	DER	97.3	
	Total			**1,028**	**4,104**		**3,095**	

Table A2.2: Underperforming projects

SN	Project name	Country	River basin	Capacity (MW)	El. output (GWh)	Plant type	Investment cost (mil. EUR)	Comments
1	**Donje Krusevo**	MNE BIH	Sava	120.0	321.9	DAM	119.1	Option in case of "small" Buk Bijela.
2	**Krusevo**	BIH	Sava	10.7	30.8	DER	33.3	Candidate for construction within long-term development plan of EP BiH.
3	**Doboj**	BIH	Sava	8.4	36.8	ROR	36.4	Multipurpose project (flood protection, irrigation). Inactivity of the concessionaire. Possibly redesign needed to adjust for higher dikes (flood protection). Possible spatial conflicts with other infrastructure (5C highway) at Cijevna 4.
4	**Lim cascade**	MNE	Sava	86.7	276.3	CAS	353.5	Positive effects on downstream HPPs. Ongoing renewal of studies to determine possible technical solution; due to land use conflicts related to previous solutions.
5	**Velika Morava cascade**	SER	Velika Morava	147.7	645.5	CAS	355.4	JV between EPS and RWE. Unclear continuation of cooperation.
6	**Shpilje 2 (Spilje 2)**	MKD	Drin- Bune	28.0	20.0	DAM	22.0	Currently the development is halted as FS showed negative results due to electricity market conditions.
7	**Han Skela**	BIH	Sava	12.0	52.0	DAM	24.4	
8	**Vrletna kosa**	BIH	Sava	11.2	23.3	DAM	7.4	Border between "jurisdictions" of EP HZHB and ERS.
9	**Ivik**	BIH	Sava	11.2	21.9	DAM	7.4	Border between "jurisdictions" of EP HZHB and ERS.
10	**Ugar-Usce**	BIH	Sava	11.6	33.2	DAM	13.4	Border between "jurisdictions" of EP HZHB and ERS.
11	**Caplje**	BIH	Sava	12.0	56.8	ROR	31.7	Candidate for construction within long term development plan of EP BiH. Development stalled due to lack of support from municipality.
12	**Ljutica (var 1)**	MNE	Sava	250.0	533.0	DAM	333.3	Project development difficult due to protected area & Tara protection declaration of MNE.
13	**Valbona cascade**	ALB	Drin- Bune	51.0	244.0	CAS	60.8	Concession granted 2013. Data to be verified. Further analysis required.
14	**Cem cascade**	ALB	Morača	52.8	213.1	CAS	37.3	Data to be verified. Further analysis required.
15	**Zalli i Qarrishtes cascade**	ALB	Shkumbin	37.5	149.0	CAS	45.0	Concession granted 2013.
16	**Osumi cascade**	ALB	Seman	152.2	410.5	CAS	219.6	No official information on these projects. Many inputs assumed or of the record information. Seems that the projects are at much earlier stage of development then indicated. Concession granted 2013.

SN	Project name	Country	River basin	Capacity (MW)	El. output (GWh)	Plant type	Investment cost (mil. EUR)	Comments
17	**HPPs on Vrbas HPS**	BIH	Sava	85.7	367.2	HPS	452.6	Project development stopped in 2010. No activities since. Water management, flood protection & irrigation role.
18	**Boskov Most**	MKD	Drin- Bune	68.2	117.0	DER	156.2	Within NP Mavrovo. In 2017 EBRD cancelled the loan for the project.
19	**Unac (Rmanj Manastir/Monastir)**	BIH	Sava	72.0	250.0	DAM	87.0	Area in zone of protection according to IUCN; NP Una.
20	**Seke**	ALB	Mat	12.7	55.7	DER	8.5	Concession granted 2013. Recheck input data.
21	**Kiri cascade**	ALB	Drin- Bune	25.2	98.1	CAS	19.1	Concession granted 2013. Recheck input data.
22	**Suha**	ALB	Vjose	24.0	97.7	ROR	12.3	No activities. Concession granted 2011.
23	**Shala cascade**	ALB	Drin- Bune	127.6	534.9	CAS	69.6	Need to recheck the input data, including investment costs. There is no HV network in the area. Very complex and costly connection. May be connected to the future 110kV Valbone, if it gets constructed.
	Total			**1,418**	**4,588**		**2,505**	

Table A2.3: Tentative projects

SN	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (mil. EUR)	Comments
1	**Fani cascade**	ALB	Mat	52.4	191.5	CAS	62.9	Concerns have been expressed over the water related controversies related to some projects in this cascade as reported in a recent study - https://issuu.com/help-cso/docs/water_conflict_study__2017_ Concession granted in 2011. Summary figures do not contain projects in construction.
2	**Galiste**	MKD	Vardar	193.5	262.5	DAM	235.7	Ongoing tender for concession for Cebren-Galiste HPS: 11 bids received. Each bid with different conceptual solution. Tender for PS to determine optimum solution. The project is in conjunction with HPP Cebren. Concerns have been expressed related to the Čebren-Gališe system on the sustainability of the Cebren project.
3	**Gornji Horizonti HPS**	BIH	Trebišnjica	252.2	487.6	HPS	327.4	Under construction. Reservations have been expressed on the project, due to the inadequate consideration of the transboundary environmental impacts under the ESPOO convention.
4	**Dubrovnik 2**	BIH HRV	Trebišnjica	304	318.0	DER	173.1	Development of second phase is burdened by transboundary issues involving Croatia, BiH (both RS and FBiH) and Montenegro. Relies partially on same water resources as Risan.
5	**Risan-Boka (var 1)**	MNE BIH	Trebišnjica	225.4	661.0	DER	290.2	Transboundary issues with CRO and BiH. Project aims to use "MNE part" of Bilećko lake. Likely negative effects on the existing plants Trebinje 1&2 and Dubrovnik. Connection point is not defined, but the only possibility (from the connection capacity point of view) is SS Lastva Grbaljska 400/110/35kV which is currently under construction. This is, however, major challenge for the power plant development.
6	**Zhur HPS**	KOS	Drin-Bune	305	397.6	HPS	335.9	Transboundary issues. Water use conflicts with several SHPPs in ALB. Feasibility study needs to be revised.
7	**Pocem**	ALB	Vjose	102	366.8	DER	66.3	In 2016, Turkish company won the tender, however it has been cancelled. Initiative to stop further development on Vjosa and its tributaries due to environmental concerns. Lawsuit filed contesting environmental permit.
8	**Kupinovo**	SER	Sava	140	530.0	ROR	250.0	Project seems dormant. Need to verify & confirm the development plans.
9	**Kostanica**	MNE	Sava	552	1,254.0	DER	383.2	Transfer of waters from Tara to Moraca. Effects on possible Moraca HPPs and Drina HPPs. Transboundary issues. Variant with reversible HPP also considered. Possible land use conflicts. Tara protection declaration conflicts.

SN	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (mil. EUR)	Comments
10	**Brodarevo HPS**	SER	Sava	59.1	232.1	HPS	144.5	Environmental permit cancelled. Strong opposition from local public. Brodarevo 2 ranked as MCA - C.
11	**Vardar cascade**	MKD	Vardar	324.5	1,310.2	CAS	1,141.6	Ongoing tender for Prefeasibility Study. Expected change of technical solution. Storage will flood existing railway. Necessary dislocation. Some projects ranked as MCA - C.
12	**Gomsiqe cascade**	ALB	Drin-Bune	21.6	65.3	CAS	32.9	Data not clear. Further investigation needed.
13	**Curraj cascade**	ALB	Drin-Bune	97.6	456.2	CAS	114.2	No activities. Concession granted 2011.
14	**Qukes cascade**	ALB	Shkumbin	65.5	340.8	CAS	83.2	Concession granted 2011.
15	**Begaj**	ALB	Drin-Bune	24.8	131.0	ROR	20.0	Concession granted 2014. Input data not clear. Status of the project not clear.
16	**Shkopet cascade**	ALB	Mat	23.968	95.3	CAS	28.8	Concession granted 2013. Court investigation on concession tender.
17	**Thane and Mollas cascade**	ALB	Seman	17.5	85.0	CAS	21.2	Thane concession cancelled. Status of the project not clear.
18	**Cijevna cascade**	BIH	Sava	82.2	401.7	CAS	243.0	Multipurpose project (flood protection, irrigation). Inactivity of the concessionaire. Possibly redesign needed to adjust for higher dikes (flood protection). Possible spatial conflicts with other infrastructure (5C highway) at Cijevna 4. As various companies hold concessions for individual projects it may be challenging to optimally develop and exploit the scheme.
	Total			**2,843**	**7,587**		**3,954**	

Table A2.4: Reversible hydropower projects

SN	Project name	Country	River basin	Capacity (MW)	El. output (GWh)	Plant type	Investment cost (mil. EUR)	Comments
1	**Cebren**	MKD	Vardar	332.8		REV	380.6	Project dependent on realization of HPP Galiste.
2	**RHE Bjelimici**	BIH	Neretva	500		REV	232.9	Project is a part of Gornja Neretva hydropower system.
3	**RHE Bistrica**	SER	Sava	680		REV	551.1	
4	**Djerdap 3 - Phase 2**	SER	Danube	1,200		REV	638.1	Not defined in the SER 10-Year Network Development Plan. There should be new 400KV SS connected in/out to existing 400kV OHL no. 401/2 Kostolac B - HPP Djerdap 1. It is inside the National Park Djerdap and OHL should be constructed in the NP.
5	**RHE Buk Bijela**	BIH	Sava	600		REV	376.1	Part of Gornja Drina hydropower system.
6	**CHE Vrilo**	BIH	Neretva	66		REV	95.9	
7	**PSHP Vërmica**	KOS	Drin-Bune	480		REV	308.6	
	Total			**3,859**			**2,583**	

Annex 3: List of enclosed background reports

- **BR-1: Past, present and future role of hydropower**
- **BR-2: Hydrology, integrated water resources management and climate change considerations**
- **BR-3: Environmental considerations**
- **BR-4: Regulatory and institutional guidebook for hydropower development**
- **BR-5: Transboundary considerations**
- **BR-6: Grid connection considerations**
- **BR-7: Inventory of planned hydropower plant projects**
- **BR 8: Identification of potential sustainable hydropower projects**