Code: WBEC-REG-ENE-01

REGIONAL STRATEGY FOR SUSTAINABLE HYDROPOWER IN THE WESTERN BALKANS

Background Report No. 8
Identification of potential sustainable hydropower projects

Final Draft 3

November 2017

Final Draft

IPA 2011-WBIF-Infrastructure Project Facility-
Technical Assistance 3
EuropeAid/131160/C/SER/MULTI/3C

This project is funded
by the European Union

Western Balkans Investment Framework WBIF

MOTT MACDONALD IPF CONSORTIUM

Final Draft 3

Information Class: EU Standard

The contents of this document are the sole responsibility of the Mott MacDonald IPF Consortium and can in no way be taken to reflect the views of the European Union.

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

Final Draft 3

Final Draft 3

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
CIA	Cumulative Impact Assessment
CP	Contracting Party
CSO	Civil Society Organisation
DG NEAR	Directorate-General for Neighbourhood and Enlargement Negotiations
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECS	Energy Community Secretariat
ECT	Energy Charter Treaty
EIA	Environmental Impact Assessment
ELEM	Elektrani na Makedonija (a power utility of the former Yugoslav Republic of Macedonia)
EIB	European Investment Bank
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
HPP	Hydro power plant
HSAP	Hydropower Sustainability Assessment Protocol
IBRD	International Bank for Reconstruction and Development
ICJ	International Court of Justice
IDMS	Information and Document Management System
IFC	International Finance Corporation
IFI	International Financing Institution
IPA	Instrument for Pre-accession
IPF	Infrastructure Project Facility
IPF3	Infrastructure Project Facility - 3rd Technical Assistance Window
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)
MKD	Acronym used for the former Yugoslav Republic of Macedonia
MNE	Acronym used for Montenegro
MoU	Memorandum of Understanding

Abbr. & Symbols	**Description / Meaning**
Mott MacDonald-IPF Consortium	The Consortium carrying out the sub-project under WBIF-IPF3
NGO	Non-governmental organisation
RB	River Basin
RS	Republika Srpska, Entity of Bosnia and Herzegovina
SAA	Stabilisation and Association Agreement
SAP	Stabilisation and Association Process
SEA	Strategic Environmental Assessment
SER	Acronym used for Serbia
TA	Technical Assistance
ToR	Terms of Reference
WB(g)	World Bank (Group)
UN	United Nations
UNECE	United Nations Economic Commission for Europe
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)

Final Draft

List of boxes

Final Draft 3

List of Tables

Final Draft 3

Final Draft 3

MOTT MACDONALD IPF CONSORTIUM

Final Draft 3

List of Figures

Final Draft 3

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

The work programme of the Study includes 13 Tasks as stipulated in the Terms of reference (ToR):

- Task 1: Hydropower role (past and future) in the regional and national context;
- Task 2: Assessment of the current situation in the institutional-organisational framework relevant for hydropower development;
- Task 3: Assessment of the current situation in the legal-regulatory framework relevant for hydropower development;
- Task 4: Assessment of hydrology baseline, water-management by country and by river basin with transboundary issues;
- Task 5: Grid connection issues in network development context;
- Task 6: Identification of HPP projects and acquiring relevant information for the HPP inventory and investment planning;
- Task 7: Environmental, Biodiversity and Climate Change Analysis on (i) river basin level and (ii) country-level of identified hydropower schemes;
- Task 8: Establishment of the central GIS database;
- Task 9: Development of a web-based GIS application;
- **Task 10: Multi-Criteria Assessment (MCA) of prospective hydropower projects;**
- Task 11: Drafting of Regional Action Plan on Hydropower Development and compilation of Final report on the Study;
- Task 12: Establishment of IT-supported Information and Document Management System (IDMS);
- Task 13: Training and dissemination of Study results.

The Study deliverables encompass separate Background reports (BR) that focus on specific technical issues in professional areas related with hydropower sector development, e.g.:

- 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**

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

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

Final Draft 3

This Background report no. 8 (BR-8), is the output and deliverable of Task 10.

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 Balkans 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)

Final Draft 3

- 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 2001/92/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 Directives 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 Directives (in addition to the WFD and Floods Directives) comprising the EU environmental legislative package (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.

Final Draft 3

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, when the 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.

Final Draft 3

1 Introduction

1.1 Background

As estimated in the Study (see BR-1), there are currently 256 hydro power plants (HPP) in operation in the WB6 Region, with a total installed capacity of 8,423 MW, of which 7,994 MW in large HPPs (larger than 10 MW). Serbia's share in the generation capacity is 37%. BiH and Albania follow, contributing 25.4% and 22% respectively. Montenegro, the former Yugoslav Republic of Macedonia and Kosovo contribute 8%, 7% and 1%, respectively. The vast majority, as much as 92%, of the existing HPPs were constructed in the period 1955-1990. Despite a relatively small capacity addition rate since 1990, 25-54% of electricity generated in the WB6 countries comes from HPPs.

The National Renewable Energy Action Plans (NREAPs) foresee hydropower playing an important role in fulfilling the countries' 2020 RES-E goals. Overall in the Region, there is an established goal of 9,670 MW of newly-installed hydropower capacity, of which 8,377 MW in HPPs with capacity higher than 10 MW.

The underlying reasons for seeing the construction of new HPPs in the mid-term period as one of the strategic goals among all WB6 countries include:

- expected increase in electricity demand and the need for security of supply,
- underutilised hydropower potential,
- strategic goals for low-carbon electricity generation,
- existing technical know-how in the WB6 Region.

Although only a few large-scale HPP projects were actually constructed since 1990, many new projects have been initiated. In total, 480 greenfield HPP candidates with an installed capacity higher than 10 MW were identified under the Task "Identification of HPP projects and and acquiring relevant information for the HPP inventory and investment planning" (BR-7). These HPP candidates are in different project development phases, ranging from only project ideas without any elaborating studies to those with nearly-complete project documentation. It should also be noted that the available studies and project documents were developed at different times over the past decades, and therefore are not fully harmonised and comparable between each other. Thus, it is necessary to review the essential characteristics of all identified candidates in order to evaluate their strategic significance, technical and financial feasibility, as well as their environmental and social acceptability, in order to identify projects offering the highest overall benefits while having the least risk for realisation in the short- to medium-term, i.e. by 2030, taking into account that most of the best sites for hydropower plants have already been taken.

1.2 Objectives

The objective of this Task was to develop a methodology for assessment of HPP candidates based on the Multi-Criteria Assessment (MCA) system, which is applicable to all identified 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" criteriom. Only candidate HPP projects from the "long-list" of approximately identified 400 projects (note: various sources) which passed the "deal-breaking" criterion were put on the "short-list" and further considered in the MCA. The assessment was conducted using the data and results obtained in Tasks 3-6. 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. the 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 project grouping, which resulted in the final lists for the Assessment of prospective hydropower projects in the WB6.

Final Draft 3

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 follow scientific and technical standards considering the objectives of this Study and the 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.

1.3 Activities

This task was conducted by a multidisciplinary team, who undertook the following activities:

1. Review the initial assessment of candidate HPP projects conducted in the Scoping Phase of the Study and the definition of the MCA approach;
2. Development of the Screening System and the MCA methodology:
    a. Defining the screening criteria,
    b. Defining the MCA scope and structure,
    c. Defining the MCA criteria, indicators and weighting factors,
    d. Defining treatment of uncertainties, and
    e. Piloting the MCA;
3. Screening of the HPP candidates from the “long-list”;
4. MCA of the “short-listed” HPP candidates (those that passed the screening criterion);
5. Presentation and interpretation of MCA results;
6. Final expert assessment of MCA results and grouping of HPP systems and/or HPP candidates;
7. Drafting recommendations for follow-up activities on the regional and national scale.

Communication and close cooperation with other Tasks was maintained in undertaking activities listed above.

It is worth emphasising that the assessment process described in this Report was applied only to greenfield HPP candidates (of more than 10 MW installed capacity). Namely, the identified rehabilitation / revitalisation projects related to the existing HPPs in the WB6 region are regarded as “no-regret or win-win” investment projects and were addressed in Task 6 (BR-7).

1.4 Links with other tasks and background reports of the Study

This Task 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 of Tasks 2-7 were inputs for undertaking the activities under Task 10.

In addition, the results of Task 10 were inputs for the analysis of the future role of hydropower in the WB6 Region conducted under Task 1, as well as inputs to Task 11 and Regional Action Plan (Annex 1 to the Final Report).

Final Draft 3

The MCA results are included in the HMP-GIS database established under Task 8 (BR-7). For details, see Figure 1.1.

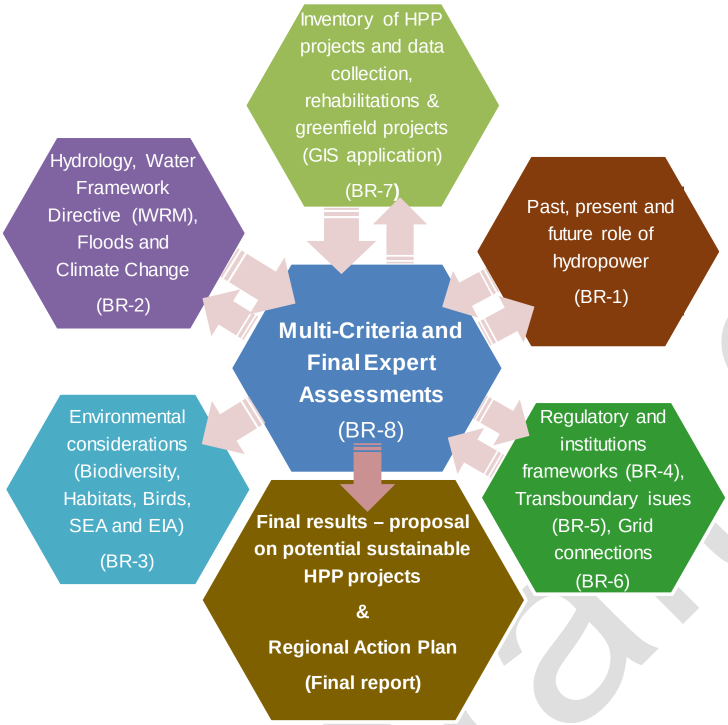


Figure 1.1 Links of Task 10 with other Tasks of the Study

The strongest link was with Task 6 (BR-7) under which greenfield HPP candidates were identified, data collected and a comprehensive database developed. The experts engaged in Task 10 and Task 6 worked closely to define the lists of HPP-specific data necessary for the MCA application, which were then collected from the beneficiaries, project sponsors/developers under Task 6. Outputs from Task 6 were therefore inputs for the Assessment of prospective hydropower projects in WB6.

Two other tasks with very strong links to this Task were Task 4, the Assessment of hydrology baseline, water-management by country and by river basin, with transboundary issues (BR-5) and Task 7 Environmental, Biodiversity and Climate Change Analysis (BR-2 and BR-3). The results of the HPP analyses conducted under these Tasks were used as direct inputs in the MCA.

The outcomes of Final Expert Assessment of MCA results were also used as inputs for estimating the future level of electricity demand to be supplied by hydropower in Task 1 (BR-1), and hydropower's contribution to the fulfilment of the RES-E targets in 2020, 2030 with an outlook to 2050.

Final Draft 3

2 Methodology

Multi-Criteria Assessment (MCA) is a tool which can facilitate the comparison of alternatives (in this case HPP projects) when multiple, often conflicting, factors play a role in decision-making. The advantage of the MCA methodology is that the importance of criteria relevant for decision-making is indicated through weighting factors, while the scoring system reflects the level of fulfilment of those criteria. The selection of appropriate criteria will generally depend on the goal of the assessment and the data available.

In the case of HPP project assessment, there is no “ready-made” MCA methodology that could be easily applied in this Study, but there are several documents which were consulted and referenced when identifying criteria relevant for analysis of HPP candidates in the WB6. These include:

- 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),
- Environmental and Social Guidance Note for Hydropower Projects of the European Bank for Reconstruction and Development (EBRD, 2014a),
- 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 considered.

Among the above-listed references, the Hydropower Sustainability Assessment Protocol is by far the most suitable and detailed methodology for HPP assessment. 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 this Protocol, the Energy Institute Hrvoje Požar (EIHP) developed a “tailor-made” approach and MCA methodology. The methodology described below is scientifically based and is easily applicable to the available HPP datasets, which gives sound results without prejudice to the country of implementation, HPP size, promotor, etc.

Due to the fact that 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 a Final Expert Assessment and HPP systems and/or HPP candidates grouping.

The evaluation structure. The HPP candidates identified in Task 6 (“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* (Figure 2.1).

Final Draft 3

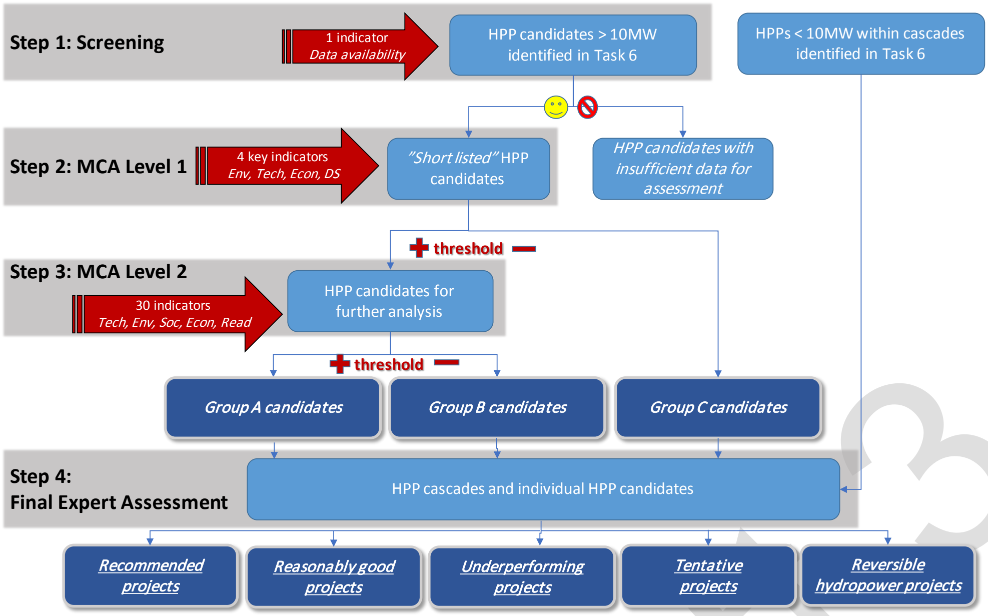


Figure 2.1 The HPP candidates evaluation structure

As presented in Figure 2.1 above, 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 the 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.

Definition of the Screening criterion. The Screening aimed to eliminate projects with a 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 where such documentation was not provided by the project promotors, were excluded from further evaluation.

Development of the MCA. The MCA was developed in a manner to be applicable to all short-listed HPP candidates, irrelevant of their development phase. The aim was to identify the most promising projects, i.e. those projects with the least project realisation risk and which would bring highest benefits, in a non-discriminatory and objective way.

All aspects relevant for HPP development are considered using five criteria groups:

- Technical adequacy,
- Financial viability,
- Social viability,
- Environmental acceptability, and
- Realisation readiness.

Each criteria group encompasses a number of indicators which relate to not only the characteristics of the project *per se*, but also that project's merit in the national and regional context, thus allowing for a comprehensive analysis and comparison.

- A quantitative scoring system is used whenever possible. When impossible, an unambiguous descriptive scoring system is used. Indicators are scored from 1 to 5 (5 being the highest, representing the lowest risk for project realisation concerning the respective aspect).

Final Draft 3

- The relevance of each indicator is defined with a specific weighting factor. (as agreed with client and beneficiaries during 2 workshops)
- The assessment results are presented on a 1-100 scale, 100 being the maximum. The overall project score is calculated by summing the multiplications of indicator-score and respective indicator-weighting factor. The sum is then reduced by 1 and multiplied by 25 to levelise the overall score with the results scaling system.
- The uncertainty of MCA results is transparently indicated. Due to differences in project development phases and different data sources between the HPP candidates, the data used for the MCA are not fully harmonised. The uncertainty arising from insufficient information about a particular project is therefore determined by the importance of missing data, i.e. by the weighting factor of the respective indicator. The level of uncertainty is given for each assessed candidate and it is expressed as a score range (a range ± of a certain score).

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 assessment, 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 further 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 the 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 in order 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 objective assessment criteria, and it reflects the team's best professional judgement, based on the information available. The Final Expert Assessment was necessary to overcome some limitations in the assessment process that could not be quantified in the standard MCA approach. In this step, where applicable, the HPP candidates which are part of a cascade were observed as HPP systems. 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.
  - o These projects are more likely to successfully pass the development process and be implemented, if conforming to highest standards as required by EU Acquis and international obligations. These

Final Draft 3

projects will also be subject to further examination of their technical, financial and environmental feasibilities.
    - 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.
    - This list is also subject to the further designation of Natura 2000 sites, protected areas and no-go zones by countries.

- ***Reasonably good projects* -** The cascades or individual HPPs that scored lower compared to the Recommended projects
    - These projects should not be dismissed from future consideration by EU institutions but have a 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 the MCA Level 1 threshold,
    - are cascades where the majority of constituting HPP candidates have a 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 that have been identified that could not have been captured in the MCA parameters.
    - Tentative projects in many aspects have good potential for future development, provided 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.

The following section, Section 3, gives an introduction into the MCA Methodology for HPP sustainability in the WB6 Region, including the methodological background, scope and limitations. Sections 4 and 5 include a list of indicators, their description, rationale and scoring system, and the criteria weighting systems used in MCA Level 1 and MCA Level 2, respectively, while Section 6 includes a description of the Final Expert Assessment approach.

Section 7 includes a description of the evaluation process and the assessment results. Based on the assessment results, proposals for follow-up actions are drafted in Section 8. Finally, Section 9 includes conclusions, recommendations and final remarks. Annex 1 includes the list of assessment results for each of the WB6 country, while Annex 2 includes an example of economic indicators that may be used to improve the MCA methodology, if more detailed data about the HPP candidates is available.

Final Draft 3

3 MCA Methodology for Assessment of HPP Sustainability in the Western Balkans Region

The aim of the MCA methodology developed within this Study is to facilitate the comparison of new HPP candidates whose development can contribute to the sustainable and rational development of the technical hydropower potential throughout the WB6 Region.

The MCA Methodology for Assessment of HPP Sustainability in Western Balkan Region builds on the principles used in the HSAP (IHA, 2012) and the EBRD's and the EIB's guidelines on environmental and social requirements (EBRD, 2014a; EBRD, 2014b; EIB, 2013), including the ICPDR "Guiding Principles on Sustainable Hydropower Development in the Danube Basin". These methodologies are consistent in defining the relevant aspects of HPP environmental and social sustainability, whereby the SHAP is the most detailed in determining/naming various aspects of HPP development. The following table gives an overview of the aspects covered by the HSAP, and the IFI's environmental and social requirements.

Table 3.1 Overview of the aspects covered by the HSAP, EBRD Environmental and Social Policy and EIH Environmental and Social Standards

Hydropower Sustainability Assessment Protocol	EBRD Environmental and Social Policy (ESP) Performance Requirements	EIB Environmental and Social Handbook
P-1 Communication and consultation	PR 10 - Information Disclosure and Stakeholder Engagement	10. Stakeholder engagement
P-2 Governance		
P-3 Demonstrated need and strategic fit		
P-4 Siting and design		
P-5 Environmental and social management	PR 1 - Assessment and Management of Environmental and Social Impacts and Issues	1. Assessment and management of environmental and social impacts and risks
P-6 Integrated project management		
P-7 Hydrological resources	PR 3 - Resource Efficiency, Pollution Prevention and Control	2. Pollution prevention and abatement 4. Climate-related standards
P-8 Infrastructure safety		
P-9 Financial viability	PR 9 - Financial Intermediaries	
P-10 Project benefits		
P-11 Economic viability		
P-12 Procurement		
P-13 Project affected communities	PR 5 - Land Acquisition, Involuntary Resettlement and Economic Displacement	7. Rights and interests of vulnerable group
P-14 Resettlement		6. Involuntary resettlement
P-15 Indigenous peoples	PR 7 - Indigenous Peoples	
P-16 Labour and working conditions	PR 2 - Labour and Working Conditions	8. Labour standards 9. Occupational and public health, safety and security
P-17 Cultural heritage	PR 8 - Cultural Heritage	5. Cultural heritage
P-18 Public health	PR 4 - Health and Safety	9. Occupational and public health, safety and security
P-19 Biodiversity and invasive species	PR 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources	3. Biodiversity and ecosystems
P-20 Erosion and sedimentation		
P-21 Water quality		
P-22 Reservoir planning		

Final Draft 3

P-23 Downstream flow regimes		

Table 3.2 Recommended list for national/regional criteria (the ICPDR "Guiding Principles on Sustainable Hydropower Development in the Danube Basin")

National/Regional criteria	**Description**
Energy Management	
Hydro-electrical potential (theoretical or line Potential)	Product between quantity of flow and head [GWh/TWh]
Environment	
Naturalness	Status of river stretches/water body in relation to the deviation from type-specific natural conditions regarding hydrology, morphology biological and sediment continuity as well as biological communities
Status of water body with regard to rarity and ecological value	Rarity of the river type, ecological status of a river stretch and sensitivity
Specific ecological structure and function of the river stretch also with regard to the whole catchment/ sub-basin and in relation to ecosystem services	e.g. Particular habitats for sensitive/valuable fish species or other biological quality elements in the riverine ecology (e.g. red list species)
Conservation areas and protected sites	e.g. Natura 2000 areas (Birds and Habitats Directive), Ramsar sites (Ramsar Convention), UNESCO Biosphere Reserves, National, Regional and Nature Parks (IUCN I-IV)
Landscape	
Naturalness	no significant anthropogenic impacts
Diversity	Intact terrestrial ecology with extensive use (e.g. small agriculture with low fertilizer use, sustainable forestry); diverse patterns of land use
Landscape scenery	e.g. aesthetic values, high architectonic and historical quality
Recreation value	Use for soft tourism and recreation, such as organized camping sites, canoeing, etc.
Cultural heritage	Historical buildings and villages or towns Traditional practice such as handicrafts and culturing,
Spatial planning obligations	Legal regulation for different areas and uses

Final Draft 3

Table 3.3 Recommended list for project-specific criteria (the ICPDR "Guiding Principles on Sustainable Hydropower Development in the Danube Basin")

Project-specific criteria	Description
Energy Management	
Hydropower plant size	Installed capacity
Hydropower plant type	e.g. run-of-river, diversion, storage, pumped storage
Security of supply	Production and supply of energy (Auto supply),
Quality of supply	Production characteristics - base load/ peak load (storage option, pumping storage)
Contribution to climate protection	lower $C0_2$ emissions of the energy mix
Technical efficiency	Grid connection, potential use, size of plants
Environment and water management	
Ecological impacts of the project	Longitudinal/lateral/vertical connectivity; impacts on habitats and biota taking into account already existing impacts
Flood control	Protection of sites at flood risk; alteration of flow regime
Irrigation	Positive or negative effects on water availability for irrigation
Sediment management	Reservoir siltation, bedload transport, sediment contamination, plant design
Surface and groundwater quantity	Infiltration and exfiltration, minimum ecological flow,
Surface and groundwater quality	Nutrients, persistent organic substances, hazardous substances, thermal effects
Drinking water supply	Positive or negative effects on quality and service security
Bank protection and restoration	Foster erosive banks
Fisheries	Ensuring natural reproduction and fish migration across dams and residual water stretches
Effects of climate change	Changes in flow regime and impacts on economic feasibility of projects
Effects on water bodies already restored	water bodies restored by public money should not be effected again

Considering the aim of the MCA for the assessment of HPP in the WB6 and the best practices of the existing methodologies, on the one hand, and the limited data and time available for the assessment on the other, the Energy Institute Hrvoje Požar (EIHP) developed a “tailor-made” methodology described below which is easily

Final Draft 3

applicable and which gives sound results without prejudice to the country of implementation, HPP size, promotor, etc.

The comparison of aspects considered by SHAP and the MCA Methodology for the Assessment of HPP in the WB6 is given in Table 3.2.

Table 3.4 Aspects covered by the MCA for HPP in WB6 compared to those covered by the HSAP

Hydropower Sustainability Assessment Protocol		MCA Methodology for the Assessment of HPP in the WB6
Topics assessed	**Y/N**	**MCA Level 1 or 2 - Criteria group (Indicator)**
P-1 Communication and consultation	N	
P-2 Governance	N	
P-3 Demonstrated need and strategic fit	Y	MCA L1 – Contribution to generation adequacy; MCA L2 – Realisation readiness
P-4 Siting and design	Y	MCA L1 - Location of HPP candidate in respect to protected areas MCA L2 – Environmental Criteria Group MCA L2 – Technical adequacy
P-5 Environmental and social management	Y	MCA L1 - Location of HPP candidate in respect to protected areas MCA L2 – Environmental Criteria Group MCA L2 – Social Criteria Group
P-6 Integrated project management	N	
P-7 Hydrological resources	Y	MCA L1 – Contribution to generation adequacy MCA L2 – Technical Criteria Group MCA L2 – Environmental Criteria Group
P-8 Infrastructure safety	N	
P-9 Financial viability	Y	MCA L1 – Specific investment per unit of electricity generated MCA L2 – Economic viability
P-10 Project benefits		MCA L2 – Technical Criteria Group MCA L2 – Social Criteria Group
P-11 Economic viability	Y	MCA L1 – Specific investment per unit of electricity generated MCA L2 – Economic viability
P-12 Procurement	N	
P-13 Project affected communities	Y	MCA L2 – Social Criteria Group
P-14 Resettlement	Y	MCA L2 – Social Criteria Group
P-15 Indigenous peoples	N	
P-16 Labour and working conditions	N	
P-17 Cultural heritage	Y	MCA L2 – Social Criteria Group
P-18 Public health	N	
P-19 Biodiversity and invasive species	Y	MCA L1 - Location of HPP candidate in respect to protected areas MCA L2 – Environmental Criteria Group
P-20 Erosion and sedimentation	N	
P-21 Water quality	N	
P-22 Reservoir planning	Y	MCA L2 – Technical Criteria Group
P-23 Downstream flow regimes	Y	MCA L2 – Environmental Criteria Group

From the table above, it is evident that certain aspects addressed in the SHAP were not covered with the MCA Methodology developed in this Study. The reasons for this were insufficient environmental baseline information, different project development stages and respective specific data for the assessed HPP candidates.

Final Draft 3

The MCA for the assessment of HPP candidates in the WB6 relies on a two-step approach, which helps the evaluator to first identify projects with comparatively low environmental risks, high techno-economic performance and relatively reliable technical data (MCA Level 1) and then to assess those projects more in detail and rank them according to the comparative performance (MCA Level 2).

In the MCA Level 1, projects are assessed against key environmental, technical, technical readiness and economic indicators. Projects that pass the set threshold are then further assessed in the MCA Level 2 process. In this second step, they are subjected to a detailed assessment against 30 indicators classified into five criteria groups (*Environmental acceptability Social viability, Technical adequacy, Realisation readiness and Financial viability*). The following Sections, Sections 4 and 5, include the list of indicators with their description, rationale and scoring system, as well as the criteria weighting systems used in the MCA Level 1 and MCA Level 2.

Final Draft 3

4 MCA Level 1

4.1 Definition of MCA Level 1 indicators

4.1.1 Environmental indicator: Location of HPP candidate in respect to protected areas

Definition: Location of the prospective HPP in respect to the protected area type and the respective regulatory limitations.

Rationale: Realisation of a prospective HPP may be limited by the category of protected area, the objective and purpose of its designation and the legally-prescribed limitation of activities allowed in such areas. A protected area may be proclaimed as of international and/or national importance. Therefore, the respective legal provisions were considered when defining the scoring system.

Table 4.1 MCA Level 1 - Environmental indicator scoring system

HPP location	Score
HPP located outside protected area	5
HPP located in or crosses protected natural landscape (PNL), Protected Cultural Landscape (PCL) whose value will not be significantly diminished	4
HPP located in or crosses NAT (Natura 2000), EME (Emerald)	3
HPP located in or crosses WA (Wilderness Area), MHS (Management areas of Habitats/Species), NM (Nature Monument), NP (Nature Park),	2
HPP located in or crosses national park (NPA), Strict Nature Reserve (SNR), Ramsar site (RAM) and/or Biosphere reserve (BIO)	1

Data Source: Geo-referenced database developed in Task 6 and Task 8 and description of national nature protection legislation developed in Task 7.

4.1.2 Technical indicator: Contribution to generation adequacy

Definition: Ratio of the expected generation, expressed in GWh, to the country's electricity demand in 2015, expressed in GWh.

Rationale: Expected generation of a HPP *per se* does not reveal the project's effect on the fulfilment of national electricity demand. This indicator shows the portion of demand covered by the assessed HPP candidate. The higher the contribution, the higher the score allocated.

Table 4.2 MCA Level 1 - Technical indicator scoring system

Contribution to generation adequacy	Score
GC > 4.5%	5
2 % < GC ≤ 4.5%	4
1% < GC ≤ 2%	3
0.4% < GC ≤ 1%	2
GC ≤ 0.4%	1

Data Source: Task 1. Hydropower role (past and future) in the regional and national context and Task 6. Identification of HPP projects inventory and investment planning.

4.1.3 Realisation readiness: Available technical documentation

Definition: Technical documentation available for the project.

Rationale: This indicator identifies and considers the project's development phase, whereby the HPP candidate is evaluated according to its available project documentation. The more detailed technical documentation that exists indicates a higher technical readiness for project realisation and higher reliability of information about the project.

Table 4.3 MCA Level 1 – Realisation readiness indicator scoring system

Finalised technical documents	Score
Main design or detailed/executive design is finalised	5
Preliminary design is finalised and/or environmental permitting initiated	4
Feasibility study is finalised	3
Prefeasibility study is finalised	2
Preliminary assessment is conducted	1

Data Source: Task 6: Identification of HPP projects inventory and investment planning.

4.1.4 Financial indicator: Specific investment per unit of electricity generated

Definition: Ratio of the estimated capital expenditure, expressed in EUR, to the expected annual electricity generation, expressed in MWh.

Rationale: The specific investment per unit electricity generated is the best proxy for cost-effectiveness of the investment since it indicates how much capital is required to generate a unit of produced electricity and enables comparative analysis of projects on the same scale with regards to capital intensity of its production. It is easily calculated with a limited set of data, as is the case in this Project where considerable data is outdated or missing.

Table 4.4 MCA Level 1 - Financial indicator scoring system

Specific investment (SI)	Score
SI < 200 €/MWh	5
201 ≤ SI < 450 €/MWh	4
451 ≤ SI < 800 €/MWh	3
801 ≤ SI < 1200 €/MWh	2
1201 ≤ SI €/MWh	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning.

4.2 MCA Level 1 Weighting factors and threshold value

The MCA Level 1 score of the HPP candidates assessed is calculated by summing the multiplications of indicator-score and respective indicator-weighting factor. The weighting factors of the MCA Level 1 indicators were defined based on the significance of the particular aspect for project realisation and the reliability of data used for the assessment.

The location of the HPP candidate in respect to protected areas (Environmental indicator) is considered the most significant indicator, with a weighting factor of 0.4. Namely, the national legislation of the WB6 countries and international conventions recommend the avoidance of any interventions that might alter the ecosystems within protected areas and/or diminish their value. In general, construction of a HPP in protected areas is not legally prohibited, but should follow certain legal requirements (e.g. WFD and Habitats Directives). The ultimate objective of the Habitats Directive is to protect, maintain or restore a favourable conservation status of selected species and habitats of Community importance. The Habitats Directive also seeks to establish and develop a coherent network of special areas of conservation (Natura 2000 sites). In addition, species (e.g. priority fish and

Final Draft 3

other river species) outside a protected area are covered by the BHD; a particular focus of establishing a coherent network of protected areas is also developing habitat connectivity outside of the protected areas. Both the WFD and the Birds and Habitats Directives aim at ensuring healthy aquatic ecosystems while at the same time ensuring a balance between water/nature protection and the sustainable use of nature's natural resources.[2] In the case it is considered justified because it is only the best possible alternative to fulfil public needs, the legislation prescribes administrative procedures for justifying the "prevailing public interest", which should encompass broad public consultation. In addition, special attention is given to the implementation of relevant mitigation measures, which can notably increase the investment and operation costs of the HPP. When considered for financing, IFIs screen projects in protected areas in a very similar way (EBRD, 2014; EIB, 2013). Another reason for allocating a rather high weighting factor to this indicator is the high reliability of input data. The physical location was available for all HPP candidates and they are easily compared with legally defined boundaries of protected areas, which have been provided by the national authorities responsible for nature/environmental protection.

The contribution to technical adequacy (Technical indicator) is the most important aspect of a HPP candidate considering security of supply. It is expected that projects with a high contribution to technical adequacy will enjoy both political and public support for realisation, if environmentally acceptable. The weighting factor for this Indicator is 0.3.

The Realisation readiness indicator reflects the technical advancement of project development, and thus the reliability of data used for the assessment. Although this is important for the implementation of projects in a short-term period, it is not a crucial factor for the determination of project quality. Namely, the data provided by project promotors included only the type of finalised technical studies (preliminary assessment, pre-feasibility study, feasibility study, etc.), but not information about their content, quality and/or verification of validity. Thus, the allocated weighting factor is 0.2.

Finally, the Financial indicator is weighted with 0.1, because the assessed HPP candidates are in different development stages, many of them in an initial stage. The assumptions used for the stated total investment and electricity generation are not uniformed across the candidates and it was not possible to verify them at this level of analysis. Once the candidates attain higher technical maturity, a sound evaluation of their financial performance will be possible.

Weighting factors of the MCA Level 1 indicators are given in the following table.

Table 4.5 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

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. An example of the MCA Level 1 score calculation is given in Text Box 4.1 below.

[2] Background Report No. 3: Environmental considerations

Final Draft 3

Text Box 4.1 Example of MCA Level 1 results calculation

Calculation of a MCA Level 1 score for an example Project A

Project A scores for each indicator:
Environmental indicator – 5; Technical indicator – 3; Technical readiness– 5; Financial indicator – 4.

$$Total\ score = \sum Indicator\ score\ \times\ Indicator\ Weighting\ factor$$
$$Total\ score = 4 \times 0.4 + 3 \times 0.3 + 5 \times 0.2 + 4 \times 0.1 = 3.9$$
$$Score\ in\ the\ MCA\ Level\ 1\ Rank\ order\ list = (total\ score - 1) \times 25 = 2.9 \times 25 = 72.5$$

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 which scored the lowest (i.e. 1) for the environmental indicator (and that 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 the technical and economic aspects, and project realisation readiness, were not evaluated in the MCA Level 2.

5 MCA Level 2

5.1 Definition of MCA Level 2 indicators

Five main criteria groups were used in the MCA Level 2 assessment:

- Technical adequacy
- Financial viability
- Social viability
- Environmental acceptability
- 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 the 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 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.

5.1.1 Environmental acceptability

The construction of a HPP inevitably causes changes in the environment, mostly causing adverse environmental impacts. The significance of these impacts varies depending on the size, type and design of the HPP as well as on the prevailing environmental conditions at the HPP location and in the surrounding area. Assessment of environmental acceptability aims to compare the HPP projects according to the estimated significance of the potential environmental impacts (based on the analysis conducted in Task 7, Environmental, Biodiversity and Climate Change Analysis). The indicators included in the criteria group were defined considering the available

Final Draft 3

environmental baseline data and the information about HPP candidates, on the one hand, and on the other the ambition to address as many relevant environmental aspects as possible at this level of analysis.

The group includes eight indicators, which can be categorised into four subgroups: indicators related to protected areas and potential impacts on them; indicators related to fish fauna and fish habitats; indicators addressing hydrology and potential impacts on ecosystems arising from hydrological changes; and an indicator related to terrestrial habitats and potential impacts related to ecosystem services and climate change.

Each indicator is scored with a rating between 1 and 5. In this range, a score of 1 indicates possibly severe or irreversible negative impacts, while score 5 potentially positive, easily avoided negative impacts or no impacts.

5.1.1.1 Indicator: Protected areas location

Definition: If located in the proximity of protected area, the construction of a HPP may have negative impacts on it and thus diminish its ecological value.

Rationale: A HPP may have irreversible impacts on protected areas (national parks, Ramsar, Emerald, Natura 2000[3] and others), altering the river ecosystem and the ecological, social, and economic importance of protected areas. In such a situation, it is essential to identify nature-protected areas and to take in full consideration the limitations arising from the valid environmental and nature protection EU, national and international acts or conventions.

Table 5.1 MCA Level 2 Environmental acceptability – Protected areas location scoring system

HPP location	Score
HPP located outside protected area	5
HPP located in or crosses protected natural landscape (PNL), Protected Cultural Landscape (PCL) whose value will not be significantly diminished	4
HPP located in or crosses NAT (Natura 2000), EME (Emerald)	3
HPP located in or crosses WA (Wilderness Area), MHS (Management areas of Habitats/Species), NM (Nature Monument), NP (Nature Park),	2
HPP located in or crosses national park (NPA), Strict Nature Reserve (SNR), Ramsar site(RAM) and/or Biosphere reserve (BIO)	1

Data Source: Task 7. Environmental, Biodiversity and Climate Change Analysis.

5.1.1.2 Indicator: Potential impact on protected areas

Definition: The significance of potential negative impacts on protected areas

Rationale: Depending on the type and size of the planned HPP, together with integrated safeguard measures, impacts that may occur during construction and operation of the HPP may vary. The other relevant factor for impact characterisation is the reason for the protection of a certain area. These two factors are considered when evaluating HPP candidates against this indicator.

Table 5.2 MCA Level 2 Environmental acceptability – Impact on protected areas scoring system

Expected impacts on protected areas	Score
No impacts on protected areas - HPP located more than 10 km from the protected area	5

[3] Since the process of designation of Natura 2000 sites is not finalised in any of the WB6 countries this is for information purposes only; no speculation was made concerning this during the MCA, but the element is included as the MCA criteria is a valid tool for the future. However, it should not be neglected that the final decisions on Natura 2000 sites will need to be taken into consideration and will affect the assessment of relevant projects in the future.

Final Draft 3

Expected impacts on protected areas	Score
Low impact on protected areas - HPP located 5-10 km downstream of the protected area	4
Moderate impact on protected areas - HPP located 5-10 km upstream of the protected area or up to 5 km downstream of protected are	3
High impact on protected areas - HPP located up to 5 km upstream of the protected area	2
Severe impact on protected areas - HPP located within the protected area	1

Data Source: Geo-referenced database containing type and location of protected areas developed in Task 8: Establishment of central HMP-GIS database. Assessment of environmental impacts, evaluation of present state, conclusions and proposed recommendations, developed in Task 7 of this project.

5.1.1.3 Indicator: Distribution area of selected threatened fish species

Definition: Location of the HPP candidate in respect of the present and historical distribution area of selected threatened fish species important for the region and globally.

Rationale: River ecosystems in the Western Balkans are predominantly in good health (in good or very good condition), with high levels of biodiversity for species and habitats. Such a valuable condition should be maintained and preserved. Indicators of this group aim to provide information about the ecological sensitivity of the areas of HPP candidate locations. The classification of the area as of special importance for fish fauna; the present distribution of selected threatened fish species as well as the present and historical distribution of migratory species are therefore used as a proxy for evaluating the potential impacts of HPP candidates on the ecologically important rivers.

Table 5.3 MCA Level 2 Environmental acceptability – Selected threatened fish species distribution area scoring system

Distribution area of selected threatened fish species	Score
No target species in the area	5
Present or historical distribution area of target species	3
Areas of special importance for fish fauna	1

Data Source: Task 7. Environmental, Biodiversity and Climate Change Analysis.

5.1.1.4 Indicator: Level of potential impact on target species

Definition: The potential magnitude of negative impacts on target species is based on the type of planned HPP.

Rationale: The potential magnitude of impacts on target species can be assessed by assessing the level of habitat fragmentation. Run-of-river HPPs may provide for least change in water flow and can integrate fishpasses at a relatively low cost, whereas a cascade of HPPs may result in habitat fragmentation with significant negative effects on migratory species. The establishment of well-functioning fishpasses on a cascade system may be challenging and, of course, rather expensive.

Table 5.4 MCA Level 2 Environmental acceptability – Impact on target species scoring system

Type of HPP candidate	Score
Run-of-river HPP without a dam	5
Run-of-river HPP with dam height up to 25 m	3
Single HPP with reservoir/derivative or run-of-river with dam height above 25 m	2
Planned HPP is part of a cascade	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning, Geo-referenced database containing type and location of protected areas developed in Task 8. Establishment of central HMP-GIS database and Task 7, Assessment of environmental impacts, evaluation of present state, conclusions and proposed recommendations.

Final Draft 3

5.1.1.5 Indicator: Lateral connectivity with wetlands

Definition: Potential influence of the planned HPP on the existing connection of the main river channel with wetlands.

Rationale: Floodplains can be heavily impacted by HPP interventions causing a loss of connection with the main river channel (i.e. water supply). Preserving lateral hydraulic connectivity between wetlands, fringe habitats and riparian land with the adjacent river channel is extremely important to maintain the natural functioning of floodplain wetlands.

Table 5.5 MCA Level 2 Environmental acceptability – River connection with wetlands scoring system

River connection with wetlands	Score
No impact on connection with wetlands	5
River connection with wetlands impacted	3
River connection with wetlands disrupted	1

Data Source: Task 4, Assessment of hydrology baseline, water-management by country and by river basin with transboundary issues and Task 7, Environmental, Biodiversity and Climate Change Analysis.

5.1.1.6 Indicator: Water flow continuity

Definition: Potential influence of the HPP on the continuity/disruption of water flow.

Rationale: Water flow disruption has a direct impact on river hydrology with its ecological conditions and an indirect impact on the level and chemical/physical characteristics of groundwater.

Table 5.6 MCA Level 2 Environmental acceptability – River flow continuity

Answer	**Score**
No disruption of water flow continuity (HPP with lateral water intake)	5
Significant change of water flow – reservoir formation	3
Disruption of water flow continuity	1

Data Source: geo-referenced database containing the environmental data developed in Task 7. Assessment of longitudinal continuity and impacts on migrating fish species provided in task 7 of this project.

5.1.1.7 Indicator: Transfer of water between rivers

Description: Transfer of water from one river or river basin to another is discouraged.

Rationale: The transfer of water from one river to another may alter biological communities and their interactions and thus the ecosystem balance of the recipient river. Such changes may be devastating for the species inhabiting the river and could diminish the ecosystem services provided by the recipient river.

Table 5.7 MCA Level 2 Environmental acceptability – Transfer of river water scoring system

Transfer of water between rivers/water basins	Score
No water transfer needed	5
Water transfer foreseen	1

Data Source: Task 4. Assessment of hydrology baseline, water-management by country and by river basin with transboundary issues.

5.1.1.1 Indicator: Land occupation by the HPP (flooding)

Description: Natural/semi-natural forests, wetland and agricultural land occupied by the HPP.

Final Draft 3

Rationale: The construction of a HPP commonly entails flooding of a certain land area, thus degrading its ecosystem services and making it unusable for other purposes. The level of degradation depends on the size and ecological value of the flooded area. The land cover classes can be used as indicators for the ecosystem services (i.e. provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits) provided by the flooded area.

Landcover classes natural/semi-natural forests, wetlands and agricultural land are used as a proxy for evaluating the potential reduction of ecosystem services due to HPP construction.

Table 5.8 MCA Level 2 Environmental acceptability – Land occupation scoring system

Landcover classes flooded	Score
Less than 10% of flooded area is covered with natural/semi-natural forests, wetlands and/or agricultural land	5
10-20% of flooded area is covered natural/semi-natural forests, wetlands and/or agricultural land	4
20-30% of flooded area is covered natural/semi-natural forests, wetlands and/or agricultural land	3
30-50% of flooded area is covered natural/semi-natural forests, wetlands and/or agricultural land	2
More than 50% of flooded area is covered with natural/semi-natural forests, wetlands and/or agricultural land	1

Data Source: Task 7. Environmental, Biodiversity and Climate Change Analysis.

5.1.1.1 Weighting factors of the Environmental acceptability indicators

The weighting factors of indicators within this criteria group were determined through expert consultation. The guiding principle in defining the weighting factor of a particular indicator was its comparative importance within the criteria group.

Each indicator in this criteria group is valued as of more-or-less the same importance, having a weighting factor of 10% or 15%. Though, the indicator of the potential impacts on a protected area was considered as more important than the other indicators and was allocated a weighting factor of 20%. Specifically, is considered that protected areas represent areas of high ecological value and that impacts on such areas could have a higher environmental cost than if such impacts were to occur in an area of lower ecological importance.

Table 5.9 Weighting factors of the indicators within the Environmental Acceptability Criteria Group

Indicator	I-WF within CG
Protected areas location	10%
Potential impact on protected area	20%
Importance of habitat for fish fauna	10%
Level of potential impact on target species	15%
Lateral connectivity with wetlands	15%
Water-flow continuity	15%
Transfer of water between rivers	5%
Land occupation by the HPP	10%

5.1.2 Social viability

The assessment of social viability aims to assess the social acceptance of new HPP projects through the evaluation of their potential impacts on the existing uses of natural resources (i.e. water, land) and cultural heritage in the HPP impact area. In reality, there are numerous factors relevant for the social acceptability of a project. Due to limitations of the available environmental and social baseline data, in this MCA methodology only a selection of factors are considered and assessed, through four indicators.

After screening of the effects a new HPP may cause, each indicator was scored with ratings between 1 and 5. In the scoring system, 1 indicates the possibility of negative impacts, while a score of 5 indicates potentially positive impacts on the livelihoods of people living in and/or using the HPP surrounding area.

Final Draft 3

5.1.2.1 Indicator: Multipurpose use of HPP

Definition: Rationality of natural resources use.

Rationale: A HPP providing more services than only electricity generation, e.g. flood prevention, transportation infrastructure and/or water storage, should be given preference over a HPP constructed for electricity generation only, due to the rational use of natural resources, lower specific environmental impacts and the arising social benefits.

Table 5.10 MCA Level 2 Social viability – Multipurpose HPP use scoring system

Use of HPP	Score
HPP has multipurpose use	5
HPP does not have multipurpose use	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning.

5.1.2.2 Indicator: Land use/livelihoods

Definition: Compatibility of the HPP with current land use in the HPP impact area.

Rationale: Construction of a new HPP may impact the livelihoods of local communities by affecting the manner in which they use the HPP impact area. These impacts may be positive if the HPP provides opportunities for land use enhancement (e.g. new infrastructure), negative if the HPP diminishes the value of land or land use opportunities (e.g. the decrease of landscape values in a tourist area), or neutral if the communities continue to use the surrounding land in the same manner as before or as planned.

Table 5.11 MCA Level 2 Social viability – Land use impact scoring system

Land use impact	Score
HPP will have positive effects on existing land use and livelihoods	5
HPP will not have effects on existing land use and livelihoods	3
HPP will have negative effects on existing land use and livelihoods	1

Date Source: Task 7. Environmental, Biodiversity and Climate Change Analysis.

5.1.2.3 Indicator: Cultural heritage sites in the impact area

Definition: Potential impacts of the HPP construction on cultural heritage in the HPP impact area.

Rationale: Construction of a HPP may diminish the value of a cultural heritage site located within the HPP impact area. The significance of potential impacts will depend on the type of cultural heritage site (e.g. built or natural environment), the temporal duration of the impact (short-term, long-term) and the feasibility of mitigating the impact (mitigation possible or irreversible). This indicator does not assess the significance, but only the possibility of impact occurrence.

Table 5.12 MCA Level 2 Social viability – Cultural heritage sites scoring system

Cultural heritage sites	Score
No cultural heritage sites in the impact area	5
Cultural heritage site of local importance in the impact area	3
Cultural heritage site of national/international importance in the impact area	1

Date Source: Task 7. Environmental, Biodiversity and Climate Change Analysis.

5.1.2.4 Indicator: Resettlement

Definition: This indicator evaluates if the construction of a HPP may require resettlement of people.

Final Draft 3

Rationale: To avoid undesired impacts on livelihoods when designing a HPP, (involuntary) resettlement should be avoided or at least minimised wherever feasible by exploring alternative project designs. However, if this is not possible the affected people should be fairly compensated. (It is assumed that, in case of resettlement, the resettlement action plan will be developed and implemented in accordance with best practices and in line with the provisions of the environmental and social standards of IFIs, e.g. EBRD, EIB, WB, IFC.)

Table 5.13 MCA Level 2 Social viability – Resettlement scoring system

Resettlement requirement	Score
Construction will not require resettlement	5
Construction of the HPP may require resettlement and/or expropriation	1

Date Source: Task 7. Environmental, Biodiversity and Climate Change Analysis.

5.1.2.1 Weighting factors of the Social viability indicators

The weighting factors of indicators within this criteria group were determined through expert consultation. The guiding principle in defining the weighting factor of a particular indicator was its comparative importance within the criteria group.

Between the indicators used in this group, Resettlement is considered as the most important indicator for assessing the social acceptability of a project. Therefore, its weighting factor is 55%. The other indicators in the groups are evaluated as equally important. The multipurpose use of the HPP generally provides benefits for society, while the indicator on land use / livelihoods addresses local communities and their quality of life. Finally, cultural heritage may be valued on local, national and/or international levels. These three indicators each have a weighting factor of 15%.

Table 5.14 Weighting factors of the indicators within the Social Viability Criteria Group

Indicator	I-WF within CG
Multipurpose use of HPP	15%
Land use / Livelihoods	15%
Cultural heritage sites in the impact area	15%
Resettlement	55%

5.1.3 Technical adequacy

The assessment of technical adequacy aims to evaluate the significance of the assessed candidate HPP for the power system in terms of installed capacity and expected generation, contribution to system adequacy, diversification potential and impact on potential RES penetration in the country, etc.

It comprises of seven indicators. Following the defined scoring system, each assessed HPP candidate was screened against each indicator based on the provided HPP-specific data. The scores obtained were multiplied by the indicator-weighting factor to reach the Technical adequacy score, which was then summed with the scores obtained in other criteria groups to get the final MCA Level 2 score of the HPP candidate.

5.1.3.1 Indicator: Type of HPP candidate

Definition: Three types of hydropower facilities are differentiated: pump storage, storage and run-of-river.

Rationale: Pump storage hydropower plants are assessed with the highest score, due to their ability to store surplus electricity in the form of water that can be converted to electricity when needed. Pumped storage hydropower schemes use off-peak electricity to pump water from a reservoir located after the tailrace to the upper reservoir, so that the pumped storage plant can generate at peak times and provide grid stability and flexibility services. Due to this ability, they, together with conventional storage HPPs, can support RES penetration into the system. On the other hand, run-of-river hydropower plants have no, or rather small storage

Final Draft 3

capacity behind the dam, as they use the natural water elevation gradient to generate electricity. Thus, their generation depends on water-flow timing and volumes.

Table 5.15 MCA Level 2 Technical adequacy – Type pf HPP candidate scoring system

HPP type	Score
Pump storage	5
Storage	3
Run-of-river	1

Data Source: Task 6: Identification of HPP projects inventory and investment planning - HPP classification by type.

5.1.3.2 Indicator: Contribution to generation adequacy

Definition: Ratio of the expected generation, expressed in GWh, to the country's electricity demand in 2015, expressed in GWh.

Rationale: The expected generation of a HPP *per se* does not reveal the project's effect on the fulfilment of national electricity demand. This indicator shows the portion of demand covered by the assessed HPP candidate. The higher the contribution, the higher the score allocated to the HPP candidate.

Table 5.16 MCA Level 2 Technical adequacy – Contribution to generation adequacy scoring system

Contribution to generation adequacy	Score
GC > 4.5%	5
2 % < GC ≤ 4.5%	4
1% < GC ≤ 2%	3
0.4% < GC ≤ 1%	2
GC ≤ 0.4%	1

Data Source: Task 1. Hydropower role (past and future) in the regional and national context and Task 6. Identification of HPP projects inventory and investment planning.

5.1.3.3 Indicator: Contribution to capacity adequacy

Definition: Ratio between the installed capacity (MW) of the assessed HPP and peak load (MW) of the country in 2015.

Rationale: This indicator analyses the contribution of the HPP project to satisfy the peak electrical demand of the country. It provides information about the HPP project's potential to meet the country's peak demand. HPP projects with the highest capacity contribution are assessed with the highest score.

Table 5.17 MCA Level 2 Technical adequacy – Contribution to capacity adequacy scoring system

	Score
CC > 5.7%	5
2% < CC ≤ 5.7%	4
1% < CC ≤ 2%	3
0.3% < CC ≤ 1%	2
≤ 0.3%	1

Data Source: Task 1. Hydropower role (past and future) in the regional and national context - total generation capacity (MW) of the country in 2015. Task 6. Identification of HPP projects inventory and investment planning - installed capacity (MW) of the HPP.

Final Draft 3

5.1.3.4 Indicator: Diversification potential

Definition: Difference between the Herfindahl-Hirschman Index[4] (HHI) before and after the new HPP capacity is installed. (HHI index is calculated by summing the squares of percentage-share of each generation capacity in the country.)

Rationale: Energy diversification ensures energy security as a country with a diversified energy portfolio is less vulnerable to energy disruptions from any specific energy source. The diversification potential of each HPP project is evaluated through the change of HHI. The HHI is a commonly accepted measure not only of market concentration, but also of energy diversification. It ranges from close to zero to 10,000, where lower values mean higher diversification. With any new installed capacity, the HHI can increase or decrease, depending on the existing structure of energy sources in the country. Therefore, a larger decrease of HHI is ranked higher, reflecting the contribution of the assessed HPP to the energy portfolio diversification of the country.

Table 5.18 MCA Level 2 Technical adequacy – Diversification potential scoring system

Diversification potential	Score
decrease of HHI > 1,000	5
35 < decrease of HHI ≤ 1,000	4
8 < decrease of HHI ≤ 35	3
1 < decrease of HHI ≤ 8	2
decrease of HHI ≤ 1	1

Data Source: Task 1. Hydropower role (past and future) in the regional and national context - generation capacities by technology (coal, gas, nuclear, hydro, RES) in MW for each country in 2015. Task 6. Identification of HPP projects inventory and investment planning and installed capacity (MW) of the HPP.

5.1.3.5 Indicator: Utilisation of hydropower potential

Definition: Ratio between the installed capacity (MW) of the HPP candidate and the intake water flow (m^3/s).

Rationale: The indicator is expressed in electrical power per unit of water flow through the turbine. This indicator assesses the efficiency of water flow transformation into electricity. The indicator is closely related to the designed water head (m) of the HPP, but also addresses HPP efficiency.

Table 5.19 MCA Level 2 Technical adequacy – Utilisation of hydropower potential scoring system

Utilisation of hydropower potential	Score
HGE > 1 MW/m^3s^{-1}	5
0.2 < HGE ≤ 1 MW/ m^3s^{-1}	3
HGE ≤ 0.2 MW/ m^3s^{-1}	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning - maximal capacity (MW) and maximal water flow (m^3/s).

5.1.3.6 Indicator: Capacity factor

Definition: Ratio of actual energy produced by the energy generating unit or system in one year, to the hypothetical maximum (i.e. the energy produced by continuous operation at full rated power).

[4] Herfindahl-Hirschman index (HHI) is a commonly-accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers, and can range from close to zero to 10,000. Find more on: http://www.investopedia.com/terms/h/hhi.asp

Final Draft 3

Rationale: The capacity factor shows the amount of electricity a HPP actually produces, compared to what it could potentially produce if the plant ran at full capacity over the entire year, expressed as a percentage. It is used to determine the capacity utilisation expected at the HPP. A very high capacity factor of a hydropower plant may indicate that the installed capacity is not adequate to use the hydro potential efficiently. Hydropower projects with a very high capacity factor operate in baseload regime, with less flexibility to follow demand and present a higher risk of spilling the water. The optimal range of the capacity factor is therefore lower for hydro than for thermal power plants and is determined based on best practices.

Table 5.20 MCA Level 2 Technical adequacy – Capacity factor scoring system

Capacity factor	Score
30% < CF ≤ 60%	5
20% < CF ≤ 30% or 60% < CF ≤ 80%	3
CF ≤ 20% or CF> 80%	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning - expected generation of the HPP in GWh and installed capacity in MW of the HPP.

5.1.3.7 Indicator: Size of storage

Definition: Ratio of usable reservoir storage (in MWh) and installed capacity of the HPP (MW) or ratio of usable reservoir storage (in m^3) and installed discharge of the HPP (m^3/s) divided by 3600 seconds / hour.

Rationale: in accordance with the storage size, hydropower systems are typically classified as HPPs with daily, weekly or annual accumulation. Hydropower plants with large-scale storage can utilise their capacity more efficiently throughout the year, optimising production and avoiding spills. Larger water storage reservoirs provide more flexibility to the power system. Therefore, HPPs with a capacity for annual accumulation are assessed with the highest score.

Table 5.21 MCA Level 2 Technical adequacy – Size of storage scoring system

Size of storage (SS)	Score
SS > 500 h	5
24 h < SS ≤ 500 h	3
SS ≤ 24 h	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning - installed capacity (MW) and usable water storage (MWh) or max discharge (m^3/s) and usable water storage (m^3).

5.1.3.8 Weighting factors of the Technical adequacy indicators

The weighting factors of indicators within this criteria group were determined through expert consultation. The guiding principle in defining the weighting factor of a particular indicator was its comparative importance within the criteria group.

The type of hydropower plant and its contribution to generation adequacy are considered the most important indicators of technical adequacy. This is followed by its contribution to capacity adequacy and the potential for diversification of energy sources, as additional indicators of the security of electricity supply of a country. The capacity factor indicator is also weighted with 15%.

Table 5.22 Weighing factors of the indicators within the Technical adequacy Criteria Group

Indicator	I-WF within CG
Type of HPP	20%
Contribution to generation adequacy	20%
Contribution to capacity adequacy	15%
Diversification potential	15%

Final Draft 3

Indicator	I-WF within CG
Utilisation of hydropower potential	10%
Capacity factor	15%
Size of storage	5%

5.1.4 Realisation readiness

The Realisation readiness criteria group encompasses seven indicators, each relating to a different aspect of HPP development. The candidates graded higher by this group are at a higher stage of project development and have gone through certain evaluation procedures prescribed by national legislation, thus reflecting the soundness of technical data used in this assessment.

5.1.4.1 Indicator: Technical readiness

Definition: Technical readiness is evaluated based on the current level of development of the proposed HPP technical solution (i.e. design documentation).

Rationale: This indicator considers the current development phase of the project, whereby the HPP candidate is evaluated according to the available project documentation.

Table 5.23 MCA Level 2 Realisation readiness – Technical readiness scoring system

Status of technical documents	Score
Tendering procedure for equipment is initiated	5
Main design or detailed/executive design is finalised	3
Preliminary design is finalised	2
Conceptual design/Site investigation is finalised	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning.

5.1.4.2 Indicator: Financing readiness

Description: This indicator considers the maturity of the project from a financing point of view. Through its scoring system (grades 1 – 5), this indicator distinguishes projects based on the level of detail (contained in available data) that give insights into the planned costs of the projects (CAPEX and OPEX), revenue generating capacity, as well as their level of development and projected ease of closure of the financing mechanism/scheme.

Table 5.24 MCA Level 2 Realisation readiness – Financing readiness scoring system

Financing provision / available studies	Score
Project is in advanced development stage from financing point of view. Many details regarding cost structure and financing mechanics are known and project is obtaining financing.	5
Feasibility study is available	4
Prefeasibility study is available	3
Preliminary assessment report is available	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning.

5.1.4.3 Indicator: National Energy strategy

Definition: This indicator evaluates if the HPP candidate is included in the National Energy Strategy.

Rationale: It is considered that those HPP included in the respective National Energy strategy are also integrated, or are being integrated in other planning documents (spatial planning, water management, etc.). In

Final Draft 3

principle, for such projects this shortens the time required to obtain all necessary permits and legal requirements for realisation.

Table 5.25 MCA Level 2 Realisation readiness –National Energy Strategy scoring system

Spatial planning status	Score
HPP project in National Energy Strategy	5
HPP project not included in National Energy Strategy	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning.

5.1.4.4 Indicator: Land ownership

Definition: This indicator evaluates the status of construction rights on, or land ownership of, the HPP location.

***Rationale*:** Land use status needs to be settled to obtain the construction permit for a proposed HPP project. If the land use agreements have been initiated or the construction rights have been obtained according to national procedures, the candidate is scored with 3 or 5, respectively.

Table 5.26 MCA Level 2 Realisation readiness – Land ownership scoring system

Land ownership / construction rights status	Score
Land ownership (construction rights) obtained	5
Administrative procedure for obtaining land ownership (construction rights) initiated and in progress	3
Land ownership or construction rights not obtained	1

Data Source: Task 3. Comparative flowcharts for the HPP project development and implementation in all WB6 countries and Task 6. Identification of HPP projects inventory and investment planning.

5.1.4.5 Indicator: Water use concession

Definition: This indicator evaluates the HPP project status in relation to the required water use concession or water use guidelines.

***Rationale*:** Water use concession is a prerequisite for obtaining construction and energy related permits in most WB6 countries, except in Serbia and Republika Srpska. Even there, in Serbia and Republika Srpska, some documents are obligatory for obtaining all necessary permits and are defined as water guidelines, water conditions, water approvals or water consents.

Table 5.27 MCA Level 2 Realisation readiness – Water use concession scoring system

Water use concession status	Score
Water use concession or equivalent document (water guidelines, water conditions, water approval or water consent- SER, RS) has been obtained	5
Administrative procedure for obtaining water use concession or equivalent document (water guidelines, water conditions, water approval or water consent- SER, RS) has been initiated	3
Water use concession or equivalent document (water guidelines, water conditions, water approval or water consent- SER, RS) still remains to be obtained	1

Data Source: Task 3. Comparative flowcharts for the HPP project development and implementation in all WB6 countries and Task 6. Identification of HPP projects inventory and investment planning.

5.1.4.6 Indicator: Location permitting

Definition: This indicator evaluates the HPP status related to the required location permitting process.

Final Draft 3

Description: Location conditions (SER, RS) or urban-technical conditions (MNE) or urban conditions (FBIH) or development permit (ALB) or zoning permit (KOS) or preliminary location conditions (MKD) are required before applying for a construction permit throughout the WB6, which is a general prerequisite for HPP construction. If the construction of a HPP is subject to an EIA (which is the case for HPP above 10 MW, in most WB6 countries), it is a prerequisite for the location permit. This indicator evaluates readiness of the HPP for construction.

Table 5.28 MCA Level 2 Realisation readiness – Location/construction permit scoring system

Location/construction permit status	Score
Location permit obtained	5
Location permit administrative procedure is in process	3
Location permit administrative procedure not initiated	1

Data Source: Task 3. Comparative flowcharts for the HPP project development and implementation in all WB6 countries and Task 6. Identification of HPP projects inventory and investment planning.

5.1.4.7 Indicator: Grid connection

Definition: This indicator evaluates readiness of HPP to be connected to the grid.

Rationale: The connection of a newly constructed HPP to an existing or new grid connection point and the respective transmission / distribution line is conditioned by their capacity and routes, which are defined by the transmission / distribution system operator.

Table 5.29 MCA Level 2 Realisation readiness – Grid connection scoring system

Grid connection status	Score
Grid connection approval obtained	5
Preliminary connection approval obtained	4
Design documentation for grid connection finalized	3
Preliminary connection application is submitted	2
No data available or no activities have been initiated	1

Data Source: Task 3. Comparative flowcharts for the HPP project development and implementation in all WB6 countries and Task 6. Identification of HPP projects inventory and investment planning.

5.1.4.8 Weighting factors of the Realisation readiness indicators

The weighting factors of indicators within this criteria group were determined through expert consultation. The guiding principle in defining the weighting factor of a particular indicator was its comparative importance within the criteria group.

Among the seven indicators included in this criteria group, the Location permit is valued the most with a weighting factor of 25%. The reason for the allocation of such a high weighting factor lies in the fact that a project which has obtained a location permit is at a highly developed stage. In addition, in all the WB6 countries, the EIA and a number of other permits are a prerequisite for the location permit, meaning that the project has been positively evaluated through several administrative procedures. Weighting factors of the other indicators are 10% or 15%, indicating their similar importance to the overall realisation readiness of the project.

Table 5.30 Weighting factors of the indicators within the Environmental Acceptability Criteria Group

Indicator	I-WF within CG
Technical readiness	15%
Financing readiness	10%
Energy Strategy	15%
Land ownership	10%

Final Draft 3

Indicator	I-WF within CG
Water use concession	10%
Location permit	25%
Grid connection	15%

5.1.5 Economic viability

The assessment of economic feasibility aims to evaluate cost-effectiveness and the potential competitiveness of the analysed HPP candidates.

From an economic point of view, in addition to meeting the vitally important availability of generated electricity criteria, the project must also be cost-effective. Cost-effectiveness of a project is equally important to all stakeholders involved in the project implementation: governments as project sponsors, representing societies and end – users' wellbeing, private investors whose returns and competitive position in the market are secured with the higher cost effectiveness of the project and (long term debt) financiers, whose funds are secured and risks mitigated if a project has lower cost profile over its lifetime. To capture the overall cost effectiveness of a project, four indicators were selected: (specific) CAPEX (€/kW) and (specific) CAPEX per unit of electricity produced (€/kWh) both reflecting investment cost effectiveness, the breakeven sales price of electricity and the levelised cost of energy (LCOE).

Rationale: From the economic point of view, a critical presumption for a project to be considered for implementation is its overall economic feasibility. The economic feasibility of a project signals to all stakeholders (potentially) interested in taking part in a project's implementation, whether to go forward with exploring the opportunity or to reject it – all based on a set of indicators which reflect whether the project makes economic sense or not. Private investors and bankers/financiers will certainly explore each project in greater detail in the due diligence phase, but a necessary presumption is that the project under consideration is economically feasible.

5.1.5.1 Indicator: Specific Capital Expenditure (CAPEX) (€/kW)

Definition: Total capital expenditure divided by the total installed capacity and total capital expenditure divided by annual electricity generation. CAPEX does not include the capitalised cost of financing.

Rationale: The specific CAPEX per unit of installed power indicates the incremental cost effectiveness of an investment enabling a comparative analysis of different projects, as well as indicating the overall capital intensity of a project at a unit level.

Table 5.31 MCA Level 2 Economic viability – Specific Capital Expenditure scoring system

Specific Capital Expenditure (SCE)	Score
SCE ≤ 899 €/kW	5
900 < SCE ≤ 1,499 €/kW	4
1,500 < SCE ≤ 3,999 €/kW	3
4,000 < SCE ≤ 5,999 €/kW	2
SCE > 6,000 €/kW	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning

5.1.5.2 Indicator: Specific investment per unit of electricity generated (€/MWh)

Definition: Ratio of the estimated capital expenditure, expressed in EUR, to the expected annual electricity generation, expressed in MWh.

Rationale: The specific investment per unit electricity generated is the best proxy for cost-effectiveness of the investment, since it indicates how much capital is required to generate a unit of produced electricity and it enables a comparative assessment of projects on the same scale with regard to the capital intensity of its

Final Draft 3

electricity production. It is easily calculated with a limited set of data, as is the case in this Study, where considerable data are outdated or missing.

Table 5.32 MCA Level 2 Economic viability – Specific investment scoring system

Specific investment (SI)	Score
SI < 200 €/MWh	5
201 ≤ SI < 450 €/MWh	4
451 ≤ SI < 800 €/MWh	3
801 ≤ SI < 1200 €/MWh	2
1,201 ≤ SI €/MWh	1

Data Source: Task 6. Identification of HPP projects inventory and investment planning.

5.1.5.3 Indicator: Breakeven (sales) price of electricity produced (€/MWh)

Definition: The minimum sales price of electricity produced, expressed in EUR/MWh, which makes the investment economically feasible (indicating economic breakeven sales price) which is calculated as the sales price that makes the NPV of the project equal to 0 (being the critical value of economic feasibility).

The breakeven price is calculated in reverse, using an iterative calculation approach (with known CAPEX as input and assumed OPEX where data are missing (2.5% of CAPEX based on literature review and expert judgment)) minimum sales price of electricity (breakeven price) which makes the NPV of the incremental (economic) cash flow of the investment equal to 0 with a discount rate of 10% (This discount rate accounts for the early stage of project development and the risks associated with this).

Rationale: sales price reflects the price competitiveness of a HPP in a single number indicator which can be easily put into context by comparing it with prevailing market trends in terms of the current and forward (future) trading prices of electricity, as well as making it easy to compare different HPPs operating on the same market foreground.

Table 5.33 MCA Level 2 Economic viability – Breakeven price scoring system

Breakeven Sales Price (BSP)	Score
BSP < 29 €/MWh	5
30 ≤ BSP < 49 €/MWh	4
50 ≤ BSP < 89 €/MWh	3
90 ≤ BSP < 119 €/MWh	2
120 ≤ BSP €/MWh	1

Data Source: EIHP calculation based on Task 6. Identification of HPP projects inventory and investment planning.

5.1.5.4 Levelised Cost of Energy - LCOE (€/MWh)

Definition: The sum of total costs (investment costs and operating expenditure) over the project lifetime (excluding the cost of financing which will be reflected in the discount rate of 10% to reflect the early stage of project development and the associated risks) divided by the sum of the electricity produced over the HPP's lifetime (40 years).

Rationale: The LCOE allocates the costs of an energy plant across its useful life, to give an effective price for each unit of energy (kWh). In other words, it averages the up-front costs across production over the lifetime of the project. That is why the LCOE gives a single metric that can be used to compare different types of systems and comparable projects. Furthermore, LCOE can be easily compared against the current (trading) market price of electricity and other competing energy sources.

Final Draft 3

Table 5.34 MCA Level 2 Economic viability – Levelised cost of energy

	Score
LCOE< 39	5
40 ≤ LCOE < 59 €/MWh	4
60 ≤ LCOE < 99 €/MWh	3
100 ≤ LCOE < 139 €/MWh	2
140 ≤ LCOE €/MWh	1

Data Source: EIHP calculation based on Task 6. Identification of HPP projects inventory and investment planning.

5.1.5.5 Weighting factors of the Economic viability indicators

The weighting factors of indicators within this criteria group were determined through expert consultation. The guiding principle in defining the weighting factor of a particular indicator was its comparative importance within the criteria group.

Among the four indicators included within this criteria group, the Levelised Cost of Electricity and Breakeven sales price of electricity have been valued the most, with equal weights of 30%. The sales price reflects the price competitiveness of HPP in a single number indicator which can be easily put into context by comparing it with prevailing market trends in terms of the current and forward (future) trading price of electricity, while the LCOE allocates the costs of an energy plant across its useful life, to give an effective price per each unit of energy. Thus, both indicators represent a single number for the comparable level of competitiveness of the HPP given the limited set of data on investment and operation costs needed for a HPP to come into operation. Investment theory and practice, especially in case of large, competing, power and infrastructure projects show that the most market competitive projects come to realization since the market risk of these projects (for each of the stakeholders involved – being developer, investor or operator) is considered to be the lowest and the probability of these HPPs to operate safely financially-speaking in a volatile market environment is the highest. The remaining two indicators are weighted equally at 20% since they represent the same specific value expressed in different units of measure, and are less indicative from an investment point of view than the two previously elaborated indicators.

Table 5.35 Weighting factors of the indicators within the Economic Viability Criteria Group

Indicator	I-WF within CG
Specific capital investment (CAPEX) per unit of installed capacity (€/kW)	20%
Specific capital investment (CAPEX) per unit of generated electricity (€/MWh)	20%
Levelised Cost of Electricity (in 40 yrs. lifetime) €/MWh	30%
Breakeven sales price of electricity (which makes project feasible) €/MWh	30%

5.2 Weighting factors

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

In the MCA level 2, the Environmental criteria group contributes 0.25, and the Social criteria group 0.15 to the total MCA Level 2 score. Thus, jointly, the Environmental and Social criteria weight is 0.4. The Technical adequacy criteria group is allocated 0.3, as it reflects the technical soundness of the project. Finally, the weighting factors for the Realisation readiness and Economic viability criteria groups were set at 0.2 and 0.1, respectively. The Economic viability group has the lowest weighting factor because of the limited availability and potentially high uncertainty of the data about economic performance of the assessed HPP candidates.

Final Draft 3

The weighting factors of the Criteria groups (CG-WF) and indicator weighting factors used within the Criteria groups (I-WF) within the CGI are summarised in Table 5.36. The table also includes the overall weight of each indicator in the total score of HPP candidate (Overall IW).

Table 5.36 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%
		Levelised Cost of Electricity (in 40 yrs. lifetime) €/MWh	30%	3%
		Breakeven sales price of electricity (which makes project feasible) €/MWh	30%	3%

Final Draft 3

The MCA Level 2 score of the assessed HPP candidates is calculated by summing the multiplications of the 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 the respective indicator-weighting factor within the Criteria group. To present the rank order list of the MCA Level 2 results on the 1-100 scale, the total score of each HPP was reduced by one and multiplied by 25. An example of the MCA Level 2 score calculation is given in Text Box 5.1.

5.3 Dealing with data uncertainty

Due to differences in project development phases and different data sources among the HPP candidates, the 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).

Text Box 5.1 Example for calculation of MCA Level 2 score

Calculation of a MCA Level 2 score for an example Project B

Project B scores per Criteria group:

1. Technical adequacy – CG WF = 0.3
   - Type of HPP – 3; Contribution to generation adequacy – 5; Contribution to capacity adequacy – 5; Diversification potential – 5; Utilisation of hydropower potential – 5; Capacity factor – 3; Size of storage – 3.

$$Tech.\ adequacy\ score = \sum Indicator\ score \times Indicator\ Weighting\ factor$$

$$Tech.\ adequcy\ score = 3 \times 0.2 + 5 \times 0.2 + 5 \times 0.15 + 5 \times 0.15 + 5 \times 0.15 + 3 \times 0.15 + 3 \times 0.05 = 4.2$$

$$Tech. adequacy\ in\ Total\ MCA\ Level\ 2\ score = Technical\ adequacy\ score \times CG\ WF$$

$$Tech. adequacy\ in\ Total\ MCA\ Level\ 2\ score = 4.2 \times 0.3 = 1.26$$

2. Financial viability – CG WF = 0.1

$$Financial\ viability\ score = 3.2$$

$$Financial\ viability\ in\ Total\ MCA\ Level\ 2\ score = 3.2 \times 0.1 = 0.32$$

3. Social viability – CG WF = 0.15

$$Social\ viablity\ score = 3$$

$$Social\ viability\ in\ Total\ MCA\ Level\ 2\ score = 4 \times 0.15 = 0.60$$

4. Environmental acceptability viability – CG WF = 0.25

$$Environmental\ acceptablity\ score = 3.8$$

$$Environmental\ acceptability\ in\ Total\ MCA\ Level\ 2\ score = 3.8 \times 0.25 = 0.95$$

5. Realisation readiness – CG WF = 0.2

$$Realisation\ readiness\ score = 2.7$$

$$Realisation\ readiness\ in\ Total\ MCA\ Level\ 2\ score = 2.7 \times 0.3 = 0.54$$

$$MCA\ Level\ 2\ Total\ score = \sum Criteria\ group\ score$$

$$MCA\ Level\ 2\ Total\ score = 1.26 + 0.32 + 0.60 + 0.95 + 0.54 = 3.67$$

$$Score\ in\ the\ MCA\ Level\ \ Rank\ order\ list = (total\ score - 1) \times 25 = 2.67 \times 25 = 66.75$$

6 Final Expert Assessment

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

1. Input data was collected from available sources and not produced through a unified methodology; potential problems with the 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, including staff from the WB6 countries. Particular emphasis was given to the projects ranked highly within the MCA. The aspects assessed in this step can be grouped as follows:

- **Non-energy effects of projects**, which 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.

  These 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
    - CSO/public acceptance of the project

  These aspects were generally considered as negative for the individual project ranking, 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 an obvious underestimation of investment costs or other apparently questionable data.

  Such aspects were considered as negative for the project ranking, 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 an estimated LCOE above 90 €/MWh were considered as not feasible in the near

Final Draft 3

term. Provided an 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).

Project specific comments and considerations identified according to the considered aspects are provided in Tables 7.4 – 7.8.

To mitigate the shortcomings of the MCA methodology, the projects ranked in accordance with the MCA 2 results were scrutinized on a project by project basis and the final lists of projects produced with additional expert intervention. Thereby, for 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.

The Final Expert Assessment was performed to **comparatively distinguish projects according to their assessed potential for successful development and implementation**. Grouping and scoring of the projects as presented in this study does not replace the necessary development steps that will need to be undertaken for each HPP candidate. With respect to that, the groups of projects should be considered as provisional. As project development progresses, some of the projects may turn out to be comparatively more or less attractive then assessed with the information available within this study. Thus, the project groups may need to be revised, as more information becomes available.

7 Assessment of HPP projects

7.1 Step 1: Screening

In Task 6., Identification of HPP projects inventory and investment planning, 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, respectively. Of 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. The distribution of the screened HPP candidates is shown in Figure 7.1.

Final Draft 3

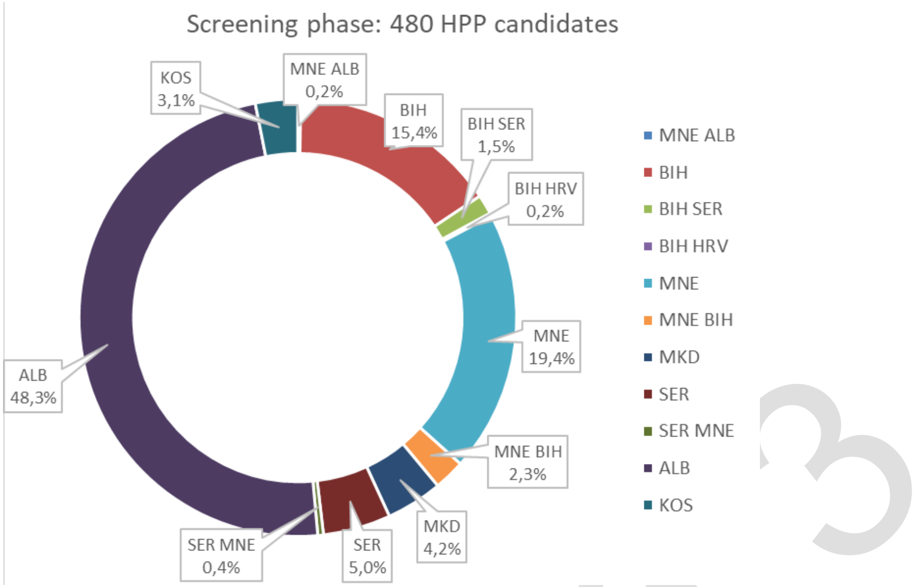


Figure 7.1 Distribution of the screened HPP candidates per country

The identified candidates were screened against the “deal-breaking” criterion to identify candidates without any technical documentation and/or the 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*.

7.2 Step 2: MCA Level 1

7.2.1 The assessment process

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 6.1 and Figure 6.2 show the distribution of the Shortlisted candidates per country.

Table 7.1 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**

Final Draft 3

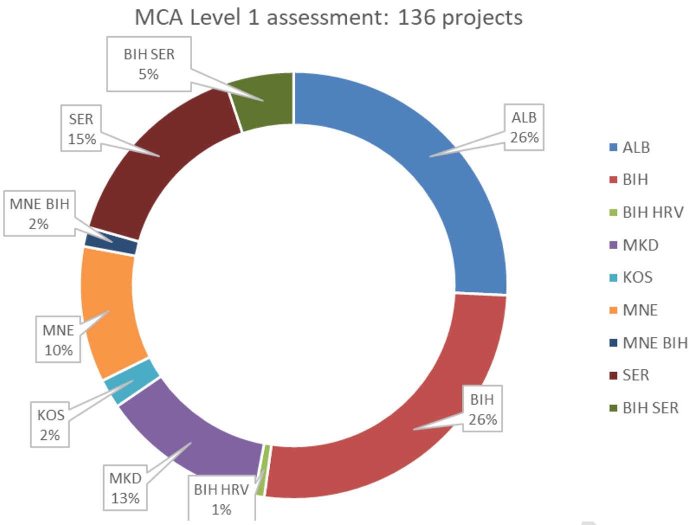


Figure 7.2 Distribution of the *Short listed* HPP candidates per country

The HPP candidates were screened against the MCA Level 1 indicators: four key criteria in respect to Environmental, Technical, Realisation readiness and Financial aspects. The overall performance of the assessed candidates per each indicator is presented in Figures 6.3 to 6.7.

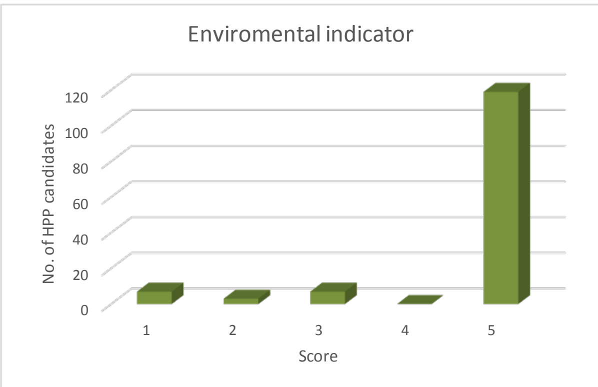


Figure 7.3 Performance of the HPP candidates per Environmental indicator

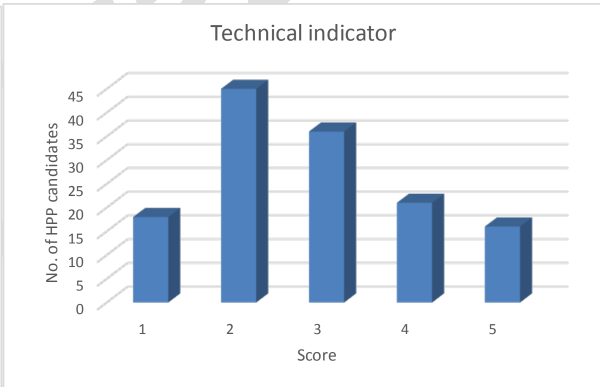


Figure 7.4 Performance of the HPP candidates per Technical indicator

As shown in Figure 7.3, 119 of the screened HPP candidates are located outside protected areas, 7 are located in or across national parks, strict nature reserve, Ramsar site and/or biosphere reserve; 3 candidates are located in or cross wilderness area, areas of important habitats/species, nature monuments, and/or nature parks and 7 candidates are located in proposed Natura 2000 or Emerald Network sites.

The overall technical performance shows that most of the assessed HPP candidates contribute to generation adequacy between 0.4% and 2%. Accordingly, 45 candidates obtained score 2 and 36 candidates scored 3. Of the remaining 55 candidates, 16 scored 5, 21 scored 4 and 18 scored 1 (Figure 7.4).

Final Draft 3

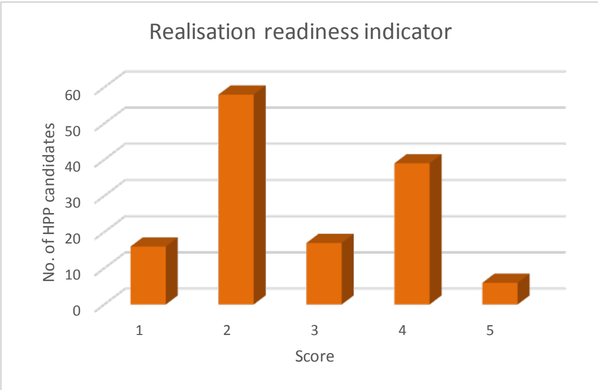


Figure 7.5 Performance of HPP candidates per Realisation readiness indicator

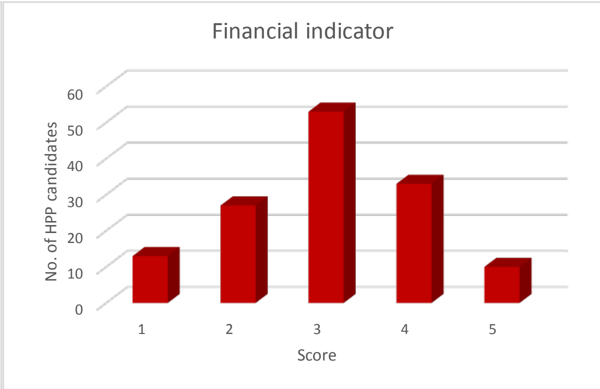
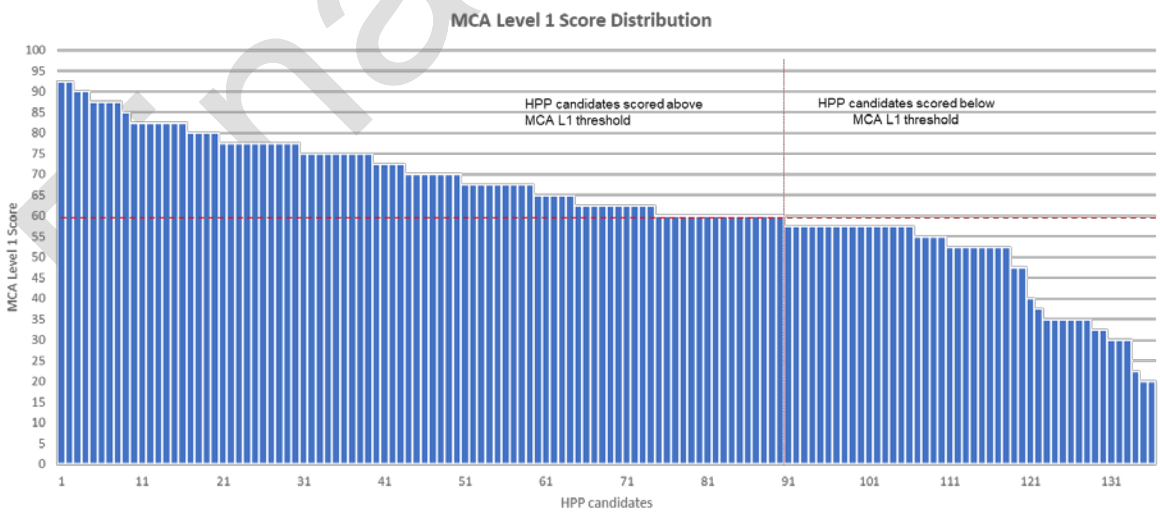


Figure 7.6 Performance of HPP candidates per Financial indicator

The assessment against the key indicator for realisation readiness shows that the majority of screened candidates are in an early stage of development: for 16 candidates, only a preliminary assessment has been conducted and 58 candidates have a prefeasibility study. The main design or detailed/executive design is finalised for 6, preliminary design is finalised and/or environmental permitting has been initiated for 39 candidates, while 17 candidates have a feasibility study (Figure 7.5).

The screening of specific capital investments per expected annual electricity generation (SI), shows that for the majority of candidates, in total 53 (score 3), SI ranges between 451 and 800 EUR/MWh. The SI of the best performing candidates, the 10 candidates that scored 5, is below 200 EUR/MWh. For 33 candidates, which scored 4, the SI ranges between 201 and 450 EUR/MWh. For the remaining 40 candidates, of which 27 scored 2 and 13 scored 1, the SI is higher than 801 EUR/MWh (Figure 7.6).

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. Most 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.



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 7.7 MCA Level 1 score distribution

Final Draft 3

The candidates which obtained less than 60 points in the MCA L1 are designated as *Group C* projects. 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*. A detailed presentation of the MCA Level 1 results is given in Annex 1.

7.3 Step 3: MCA Level 2

7.3.1 The assessment process

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. Among the transboundary candidates, 7 are located between BIH and Serbia, one between Montenegro and BIH and one between BIH and Croatia.

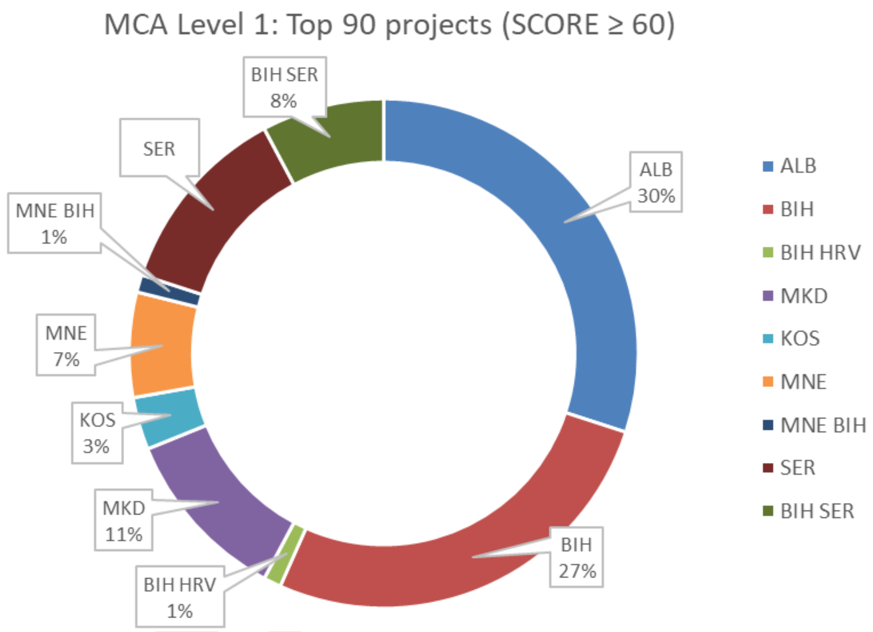


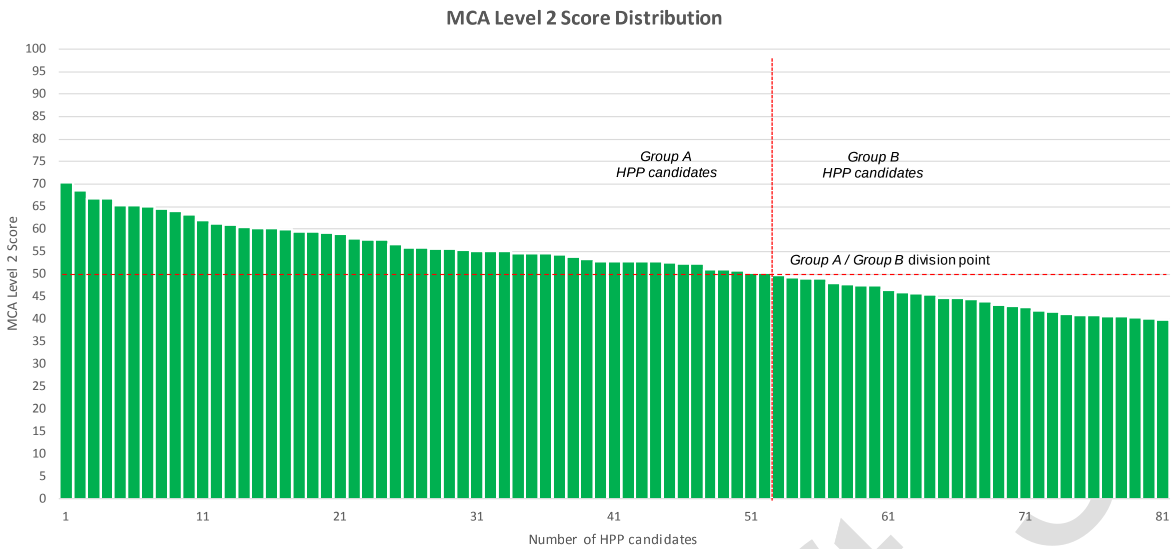
Figure 7.8 Distribution of the HPP candidates assessed in MCA Level 2 per country

Table 7.2 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 screened and scored against the 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 6.9.

A detailed presentation of the MCA Level 1 results is given in Annex 2.



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

Figure 7.9 MCA Level 2 score distribution

7.4 Step 4: Final Expert Assessment

7.4.1 The assessment process

The projects ranked in accordance with MCA 2 results were scrutinized on a project by project basis and the final lists of projects produced with additional expert intervention. Thereby, for 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, cascade and individual HPP, were then assessed against the criteria (aspects) described in the Section 6 and categorised into five groups:

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

Table 7.3 below summarises the results of the expert assessment process as described in Chapter 6.1. HPP candidate projects are grouped according to their assessed potential for successful development and implementation. Note that all per country statistics and totals are made assuming the cross-border HPPs are shared 50-50% between the two involved countries.

Table 7.3: Key figures of the HPP-DB and results

	Recommended projects	Reeasonably 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

Final Draft

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 following Table 7.4 -Table 7.8 present the HPP projects grouped as described above. A column "LCOE" has been added to indicate the project's financial efficiency. A LCOE higher than 90 €/MWh has been marked red; as the recent IRENA study on Cost-Competitive Renewable Power Generation (January 2017) indicated that projects with a LCOE lower than 90 €/MWh are expected to be cost competitive.In the case of projects ranked highly (projects in A and possibly B group), but with a high LCOE, a CBA analysis should be conducted to test the economic feasibility of the projects and to propose a possible financing model.

In line with the MCA methodology, in addition to a MCA2 score, an uncertainty relating to that scoring is listed, reflecting the deficiencies in input data provided by promoters.

The following lists are based on the results of the methodology applied; however, concerning the issues described above these lists should be considered as preliminary. As future work, indicated in the recommendations section, will be undertaken, the level of uncertainty related to the recommended projects will decrease.

Note that there are some small HPPs listed below because those HPPs that exist as an integral part of the concept for a cascade, and are not the same as sHPPs that we have excluded elsewhere. In these circumstances, those projects – eventhough below 10MW, are listed (*) below.

Final Draft 3

Table 7.4 Results: *Recommended projects*

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
1		**Gornja Neretva HPS**		**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.	**54.6**		**87.4**
	WB6.HMP.175	*Bjelimici*	*BIH*	*Neretva*	*100.0*	*219.4*	*DAM*	*165.7*	*A*		*55.8*	*±6*	*90.6*
	WB6.HMP.202	*Glavaticevo*	*BIH*	*Neretva*	*28.5*	*108.3*	*ROR*	*72.9*	*A*		*50.2*	*±6*	*80.9*
2		**Mati cascade**		**Mat**	**29.5**	**108.6**	**CAS**	**37.3**			**53.9**		**41.8**
	WB6.HMP.917	*Mati 1*	*ALB*	*Mat*	*14.7*	*50.0*	*DER*	*18.2*	*A*		*54.5*	*±1.5*	*44.2*
	WB6.HMP.918	*Mati 2*	*ALB*	*Mat*	*14.8*	*58.6*	*DER*	*19.1*	*A*		*53.3*	*±1.5*	*39.7*
3		**Gornja Drina**		**Sava**	**225.0**	**770.7**	**HPS**	**574.6**			**51.8**		**89.5**
	WB6.HMP.208	*Foca*	*BIH*	*Sava*	*44.2*	*175.9*	*DAM*	*117.8*	*A*		*52.3*	*±0*	*80.5*
	WB6.HMP.199	*Paunci*	*BIH*	*Sava*	*43.2*	*166.9*	*DAM*	*124.4*	*A*		*55.9*	*±0*	*89.4*
	WB6.HMP.198	*Buk Bijela*	*BIH*	*Sava*	*93.5*	*332.3*	*DAM*	*194.4*	*A*	*"Small" (lower level) Buk Bijela with lower dam height to avoid transboundary issues with MNE.*	*52.5*	*±0*	*70.4*
	WB6.HMP.200	*Sutjeska*	*BIH*	*Sava*	*44.1*	*95.6*	*DER*	*138.1*	*B*	*Not to be confused with sHPP Sutjeska within national park Sutjeska..*	*45.8*	*±0*	*172.3*
4	**WB6.HMP.367**	**Tenovo**	**MKD**	**Vardar**	**35.0**	**140.0**	**ROR**	**55.0**	**A**	Ongoing tender for Prefeasibility Study. Additional generation on the existing HPPs on Treska river cca 140 GWh and possible installation of new HPP with annual generation of 74-92 GWh.	**52.4**	**±3.4**	**47.6**
5		**Morača cascade**		**Morača**	**238.0**	**616.0**	**CAS**	**498.4**		MoUs signed with potential strategic partners. Negotiations ongoing. Possible redesign.	**51.1**		**97.0**
	WB6.HMP.264	*Zlatica (var 2)*	*MNE*	*Morača*	*37.0*	*151.0*	*DAM*	*98.1*	*A*		*60.6*	*±0*	*78.1*
	WB6.HMP.262	*Raslovici (var 2)*	*MNE*	*Morača*	*37.0*	*106.9*	*DAM*	*85.2*	*A*		*58.8*	*±0*	*95.6*
	WB6.HMP.263	*Milunovici*	*MNE*	*Morača*	*37.0*	*117.2*	*DAM*	*89.3*	*B*		*49.3*	*±0*	*91.4*

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
		(var 2)											
	WB6.HMP.261	*Andrijevo (var 2)*	*MNE*	*Morača*	*127.0*	*240.9*	*DAM*	*225.8*	*B*	*Existing project documentation (PFS) is developed for HPP Andrijevo Var 1 (285 m a.s.l.). This variant (Andrijevo 2) is 250 m a.s.l.*	*46.6*	*±0*	*112.2*
6	**WB6.HMP.278**	**Komarnica (var 2)**	**MNE**	**Sava**	**172.0**	**227.0**	**DAM**	**178.3**	**A**	Field investigations ongoing in cooperation between EPCG and EPS.	**57.6**	**±0**	**94.2**
7		**Drini cascade**		**Drin-Bune**	**181.0**	**673.0**	**CAS**	**509.9**		Tender on concession cancelled. Intention is for KESH to develop the project with strategic partner.	**48.9**		**90.9**
	WB6.HMP.112	*Skavica 385*	*ALB*	*Drin-Bune*	*132.0*	*467.0*	*DAM*	*255.0*	*A*	*Tender has been cancelled. Seems that the project will be developed by KESH with foreign partner (to be selected).*	*51.0*	*±0*	*65.8*
	WB6.HMP.111	*Katundi i Ri*	*ALB*	*Drin-Bune*	*49.0*	*206.0*	*DAM*	*255.0*	*B*	*Turkish company won concession tender. However, the tender was cancelled. Concession still not issued.*	*43.1*	*±0*	*147.8*
	Total				***1,009***	***2,863***		***2,092***					

Table 7.5 Results: *Reasonably good projects*

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
1	**WB6.HMP.181**	**Kovanici**	**BIH**	**Sava**	**13.3**	**65.7**	**ROR**	**38.8**	**B**	Candidate for construction within long term development plan of EP BiH.	**39.0**	**±0**	**71.1**
2	**WB6.HMP.180**	**Janjici**	**BIH**	**Sava**	**13.3**	**68.3**	**ROR**	**55.0**	**B**	Candidate for construction within long term development plan of EP BiH.	**41.0**	**±0**	**96.6**
3	**WB6.HMP.183**	**Babino selo**	**BIH**	**Sava**	**11.5**	**59.9**	**DER**	**30.3**	**B**	Candidate for construction within long term development plan of EP BiH. Planned unification of design for Babino Selo and Vinac HPPs.	**32.8**	**±0**	**61.0**

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
4	**WB6.HMP.184**	**Vinac**	**BIH**	**Sava**	**11.5**	**61.3**	**ROR**	**25.1**	**B**	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).	**33.3**	**±1.5**	**49.6**
5		**Ibar cascade**		**Velika Morava**	**121.5**	**456.6**	**CAS**	**345.4**		JV of EPS & SECI. Unclear continuation of cooperation. Likely redesign of the cascade.	**37.9**		**90.7**
	WB6.HMP.388	*Bela Glava*	*SER*	*Velika Morava*	*14.6*	*55.5*	*ROR*	*34.2*	*B*		*40.6*	*±0*	*74.1*
	WB6.HMP.387	*Dobre Strane*	*SER*	*Velika Morava*	*14.5*	*55.9*	*ROR*	*39.9*	*B*		*41.9*	*±0*	*85.6*
	WB6.HMP.390	*Cerje*	*SER*	*Velika Morava*	*13.2*	*50.1*	*ROR*	*36.1*	*B*		*40.6*	*±0*	*86.3*
	WB6.HMP.393	*Gokcanica*	*SER*	*Velika Morava*	*11.0*	*38.2*	*ROR*	*33.3*	*C*				*104.2*
	WB6.HMP.385	*Lakat*	*SER*	*Velika Morava*	*13.5*	*54.4*	*ROR*	*38.3*	*B*		*37.9*	*±0*	*84.4*
	WB6.HMP.391	*Glavica*	*SER*	*Velika Morava*	*9.7*	*37.2*	*ROR*	*30.0*	*C*	(*)			*96.7*
	WB6.HMP.394	*Bojanici*	*SER*	*Velika Morava*	*10.2*	*36.0*	*ROR*	*32.0*	*C*				*106.4*
	WB6.HMP.386	*Maglic*	*SER*	*Velika Morava*	*13.4*	*52.2*	*ROR*	*41.2*	*B*		*32.9*	*±0*	*94.8*
	WB6.HMP.392	*Usce*	*SER*	*Velika Morava*	*9.8*	*35.2*	*ROR*	*29.8*	*C*	(*)			*101.3*
	WB6.HMP.389	*Gradina*	*SER*	*Velika Morava*	*11.7*	*41.8*	*ROR*	*30.8*	*B*		*32.4*	*±0*	*88.3*
6		**Srednja Drina HPS**		**Sava**	**321.5**	**1,197.0**	**HPS**	**878.5**		Transboundary issues. Positive effect for downstream HPPs & water management.	**39.8**		**88.1**
	WB6.HMP.196	*Rogacica*	*BIH SER*	*Sava*	*113.3*	*413.4*	*ROR*	*245.6*	*B*		*44.6*	*±1.5*	*71.5*
	WB6.HMP.190	*Tegare*	*BIH SER*	*Sava*	*120.9*	*448.1*	*ROR*	*284.6*	*B*		*38.5*	*±1.5*	*76.4*
	WB6.HMP.191	*Dubravica*	*BIH SER*	*Sava*	*87.2*	*335.5*	*ROR*	*348.2*	*B*		*35.5*	*±1.5*	*124.2*
7		**Donja Drina HPS**		**Sava**	**365.0**	**1,588.6**	**HPS**	**1,346.5**		Transboundary issues. Positive effect for water management and flood protection.	**43.6**		**101.6**
	WB6.HMP.192	*Kozluk*	*BIH SER*	*Sava*	*88.5*	*376.0*	*DAM*	*303.2*	*B*		*42.8*	*±1.5*	*96.7*

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
	WB6.HMP.194	*Drina 2*	*BIH SER*	*Sava*	*87.8*	*379.8*	*DAM*	*329.0*	*B*		*44.5*	*±1.5*	*103.8*
	WB6.HMP.193	*Drina 1*	*BIH SER*	*Sava*	*87.7*	*363.7*	*DAM*	*287.1*	*B*		*43.0*	*±1.5*	*94.7*
	WB6.HMP.195	*Drina 3*	*BIH SER*	*Sava*	*101.0*	*469.1*	*DAM*	*427.2*	*B*		*44.0*	*±1.5*	*109.1*
8	**WB6.HMP.176**	**Skakala**	**BIH**	**Neretva**	**26.4**	**124.3**	**ROR**	**82.3**	**B**	Border area between "jurisdictions" of EPHZHB and EP BiH	**39.8**	**±1.5**	**79.6**
9	**WB6.HMP.201**	**Ustikolina**	**BIH**	**Sava**	**60.5**	**236.8**	**ROR**	**139.9**	**B**	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.	**47.9**	**±1.5**	**71.1**
10	**WB6.HMP.237**	**Gorazde**	**BIH**	**Sava**	**37**	**169.9**	**ROR**	**56.3**	**B**	Strong opposition from local public. Candidate for construction within long term development plan of EP BiH.	**41.8**	**±1.5**	**40.3**
11	**WB6.HMP.396**	**Ribarice**	**SER**	**Velika Morava**	**46.7**	**76.1**	**DER**	**97.3**	**B**		**41.2**	**±0**	**152.8**
	Total				***1,028***	***4,104***		***3,095***					

Table 7.5 Results: *Underperforming projects*

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
1	**WB6.HMP.267**	**Donje Krusevo**	**MNE BIH**	**Sava**	**120.0**	**321.9**	**DAM**	**119.1**	**C**	Option in case of "small" Buk Bijela.			**44.9**
2	**WB6.HMP.215**	**Krusevo**	**BIH**	**Sava**	**10.7**	**30.8**	**DER**	**33.3**	**C**	Candidate for construction within long-term development plan of EP BiH.			**129.5**
3	**WB6.HMP.423**	**Doboj**	**BIH**	**Sava**	**8.4**	**36.8**	**ROR**	**36.4**	**C**	Multipurpose project (flood protection, irrigation). Inactivitiy of the concessionaire. Possibly redesign needed to adjust for higher dikes (flood protection). Possible spatial conflicts with other infrastructure (5C highway) at Cijevna 4.			**121.0**
4		**Lim cascade**		**Sava**	**86.7**	**276.3**	**CAS**	**353.5**		Ongoing renewal of studies to determine possible technical solution; due to land use conflicts related to previous	**0.0**		**152.8**

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
										solutions.			
	WB6.HMP.432	*Navotina (var 3)*	*MNE*	*Sava*	*15.0*	*42.2*	*DER*	*31.6*	*C*				*89.9*
	WB6.HMP.272	*Plav (var 2)*	*MNE*	*Sava*	*13.1*	*48.8*	*DER*	*57.2*	*C*				*140.2*
	WB6.HMP.275	*Mostine (var 2)*	*MNE*	*Sava*	*12.9*	*36.9*	*DER*	*56.4*	*C*				*182.2*
	WB6.HMP.428	*Murino (var 3)*	*MNE*	*Sava*	*11.2*	*43.4*	*DER*	*57.5*	*C*				*158.2*
	WB6.HMP.426	*Sutjeska (var 2)*	*MNE*	*Sava*	*12.0*	*37.0*	*DER*	*52.4*	*C*				*169.1*
	WB6.HMP.276	*Jagnjilo (var 2)*	*MNE*	*Sava*	*11.4*	*33.5*	*DER*	*49.8*	*C*				*177.4*
	WB6.HMP.320	*Tresnjevo (var 2)*	*MNE*	*Sava*	*11.1*	*34.5*	*ROR*	*48.5*	*C*				*167.8*
5		**Velika Morava cascade**		**Velika Morava**	**147.7**	**645.5**	**CAS**	**355.4**		*JV between EPS and RWE. Unclear continuation of cooperation.*	***0.0***		***66.3***
	WB6.HMP.450	*Trnovce*	*SER*	*Velika Morava*	*29.3*	*128.1*	*ROR*	*75.7*	*C*				*71.1*
	WB6.HMP.453	*Varvarin*	*SER*	*Velika Morava*	*28.9*	*122.9*	*ROR*	*69.7*	*C*				*68.3*
	WB6.HMP.449	*Ljubicevo*	*SER*	*Velika Morava*	*30.6*	*137.1*	*ROR*	*72.7*	*C*				*63.9*
	WB6.HMP.451	*Svilajnac*	*SER*	*Velika Morava*	*28.8*	*128.0*	*ROR*	*68.7*	*C*				*64.6*
	WB6.HMP.452	*Mijatovac*	*SER*	*Velika Morava*	*30.1*	*129.4*	*ROR*	*68.7*	*C*				*64.0*
6	**WB6.HMP.368**	**Shpilje 2 (Spilje 2)**	**MKD**	**Drin-Bune**	**28.0**	**20.0**	**DAM**	**22.0**	**C**	Currently the development is halted as FS showed negative results due to electricity market conditions.			**131.5**
7	**WB6.HMP.227**	**Han Skela**	**BIH**	**Sava**	**12.0**	**52.0**	**DAM**	**24.4**	**C**				**56.7**
8	**WB6.HMP.213**	**Vrletna kosa**	**BIH**	**Sava**	**11.2**	**23.3**	**DAM**	**7.4**	**C**	Border between "jurisdictions" of EP HZHB and ERS.			**38.9**
9	**WB6.HMP.236**	**Ivik**	**BIH**	**Sava**	**11.2**	**21.9**	**DAM**	**7.4**	**C**	Border between "jurisdictions" of EP HZHB and ERS.			**41.3**

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
10	**WB6.HMP.214**	**Ugar-Usce**	**BIH**	**Sava**	**11.6**	**33.2**	**DAM**	**13.4**	**C**	Border between "jurisdictions" of EP HZHB and ERS.			**48.9**
11	**WB6.HMP.235**	**Caplje**	**BIH**	**Sava**	**12.0**	**56.8**	**ROR**	**31.7**	**C**	Candidate for construction within long term development plan of EP BiH. Development stalled due to lack of support from municipality.			**67.2**
12	**WB6.HMP.252**	**Ljutica (var 1)**	**MNE**	**Sava**	**250.0**	**533.0**	**DAM**	**333.3**	**C**	Project development difficult due to protected area & Tara protection declaration of MNE.			**75.2**
13		**Valbona cascade**		**Drin-Bune**	**51.0**	**244.0**	**CAS**	**60.8**		Concession granted 2013. Data to be verified. Further analysis required.	**53.8**		**28.2**
	WB6.HMP.933	*15*	*ALB*	*Drin-Bune*	*13.8*	*66.5*	*ROR*	*15.1*	*A*		*53.8*	*±0*	*27.9*
	WB6.HMP.926	*9A*	*ALB*	*Drin-Bune*	*12.8*	*60.3*	*ROR*	*14.0*	*C*				*28.6*
	WB6.HMP.927	*9B*	*ALB*	*Drin-Bune*	*1.2*	*6.0*	*ROR*	*1.6*	*0*	(*)			
	WB6.HMP.928	*10*	*ALB*	*Drin-Bune*	*1.3*	*6.3*	*ROR*	*1.7*	*0*	(*)			
	WB6.HMP.929	*11*	*ALB*	*Drin-Bune*	*8.4*	*40.2*	*ROR*	*10.9*	*0*	(*) *Does not have detailed design.*			
	WB6.HMP.930	*12*	*ALB*	*Drin-Bune*	*4.5*	*21.8*	*ROR*	*5.9*	*0*	(*)			
	WB6.HMP.931	*13*	*ALB*	*Drin-Bune*	*4.1*	*19.7*	*ROR*	*5.3*	*0*	(*) *Does not have detailed design.*			
	WB6.HMP.932	*14*	*ALB*	*Drin-Bune*	*2.8*	*13.4*	*ROR*	*3.6*	*0*	(*)			
	WB6.HMP.934	*16*	*ALB*	*Drin-Bune*	*2.1*	*9.8*	*ROR*	*2.7*	*0*	(*)			
14		**Cem cascade**		**Morača**	**52.8**	**213.1**	**CAS**	**37.3**		Data to be verified. Further analysis required.	**49.1**		**13.0**
	WB6.HMP.937	*Tamare*	*ALB*	*Morača*	*22.6*	*103.0*	*ROR*	*10.4*	*B*		*49.1*	*±0*	*13.0*
	WB6.HMP.936	*Kozhnje*	*ALB*	*Morača*	*4.5*	*20.3*	*ROR*	*3.8*	*0*	(*)			
	WB6.HMP.938	*Selce*	*ALB*	*Morača*	*5.4*	*23.5*	*ROR*	*4.4*	*0*	(*)			
	WB6.HMP.939	*Selce Osoje*	*ALB*	*Morača*	*6.6*	*29.5*	*ROR*	*4.6*	*0*	(*)			
	WB6.HMP.940	*Dobrinje*	*ALB*	*Morača*	*3.8*	*17.7*	*ROR*	*3.7*	*0*	(*)			
	WB6.HMP.941	*Broje*	*ALB*	*Morača*	*9.9*	*19.1*	*ROR*	*10.4*	*0*	(*)			

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
15		**Zalli i Qarrishtes cascade**		**Shkumbin**	**37.5**	**149.0**	**CAS**	**45.0**		Concession granted 2013.	**0.0**		**36.8**
	WB6.HMP.037	*HPP-3*	*ALB*	*Shkumbin*	*13.1*	*52.8*	*ROR*	*15.7*	*C*				*37.1*
	WB6.HMP.036	*HPP-2*	*ALB*	*Shkumbin*	*10.1*	*39.8*	*ROR*	*12.1*	*C*				*36.3*
	WB6.HMP.035	*HPP-1*	*ALB*	*Shkumbin*	*6.9*	*26.7*	*ROR*	*8.3*	*0*	(*)			
	WB6.HMP.038	*HPP-4*	*ALB*	*Shkumbin*	*7.4*	*29.7*	*ROR*	*8.9*	*0*				
16		**Osumi cascade**		**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.	**57.2**		**61.3**
	WB6.HMP.010	*Peshtan*	*ALB*	*Seman*	*16.0*	*43.2*	*DER*	*20.3*	*C*				*56.8*
	WB6.HMP.011	*Polican*	*ALB*	*Seman*	*22.5*	*60.7*	*DER*	*24.6*	*A*		*59.1*	*±1.5*	*49.1*
	WB6.HMP.014	*Lapanj*	*ALB*	*Seman*	*24.0*	*64.7*	*DER*	*30.0*	*C*				*56.0*
	WB6.HMP.015	*Nikollare*	*ALB*	*Seman*	*27.0*	*72.8*	*DER*	*43.3*	*A*		*55.6*	*±1.5*	*71.5*
	WB6.HMP.012	*Bogove*	*ALB*	*Seman*	*24.0*	*64.7*	*DER*	*30.7*	*C*				*57.2*
	WB6.HMP.016	*Radovice*	*ALB*	*Seman*	*22.5*	*60.7*	*DER*	*37.6*	*C*				*74.4*
	WB6.HMP.013	*Spathare*	*ALB*	*Seman*	*9.0*	*24.3*	*DER*	*10.3*	*0*	(*)			
	WB6.HMP.017	*Mosicke*	*ALB*	*Seman*	*7.2*	*19.4*	*DER*	*23.0*	*0*	(*)			
17		**HPPs on Vrbas HPS**		**Sava**	**85.7**	**367.2**	**HPS**	**452.6**		Project development stopped in 2010. No activities since. Water management, flood protection & irrigation role.	**0.0**		**147.3**
	WB6.HMP.219	*Kosjerevo*	*BIH*	*Sava*	*21.4*	*93.1*	*ROR*	*130.4*	*C*				*167.2*
	WB6.HMP.217	*Trn*	*BIH*	*Sava*	*21.4*	*89.1*	*ROR*	*73.0*	*C*				*98.2*
	WB6.HMP.218	*Laktasi*	*BIH*	*Sava*	*21.4*	*93.0*	*ROR*	*104.3*	*C*				*134.1*

Final

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
	WB6.HMP.220	*Razboj*	*BIH*	*Sava*	*21.4*	*92.0*	*ROR*	*144.9*	*C*				*187.9*
18	**WB6.HMP.347**	**Boskov Most**	**MKD**	**Drin-Bune**	**68.2**	**117.0**	**DER**	**156.2**	**C**	Within NP Mavrovo. In 2017 EBRD cancelled the loan for the project.			**159.4**
19	**WB6.HMP.229**	**Unac (Rmanj Manastir/Monastir)**	**BIH**	**Sava**	**72.0**	**250.0**	**DAM**	**87.0**	**C**	Area in zone of protection according to IUNC; NP Una.			**42.3**
20	**WB6.HMP.124**	**Seke**	**ALB**	**Mat**	**12.7**	**55.7**	**DER**	**8.5**	**A**	Concession granted 2013. Recheck input data.	**66.9**	**±0**	**19.3**
21		**Kiri cascade**		**Drin-Bune**	**25.2**	**98.1**	**CAS**	**19.1**		Concession granted 2013. Recheck input data.	**65.4**		**20.6**
	WB6.HMP.913	*Kiri 1*	*ALB*	*Drin-Bune*	*19.2*	*77.4*	*DER*	*12.8*	*A*	*Concession granted 2013.*	*65.4*	*±0*	*20.6*
	WB6.HMP.914	*Kiri 2 (Kashec)*	*ALB*	*Drin-Bune*	*6.0*	*20.7*	*DER*	*6.4*	*0*	(*) *Concession granted 2013.*			
22	**WB6.HMP.060**	**Suha**	**ALB**	**Vjose**	**24.0**	**97.7**	**ROR**	**12.3**	**A**	No activities. Concession granted 2011.	**6.,3**	**±0**	**15.9**
23		**Shala cascade**		**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.	**61.3**		**14.8**
	WB6.HMP.947	*Vajvisht*	*ALB*	*Drin-Bune*	*60*	*220.8*	*ROR*	*31.8*	*A*		*63.1*	*±1.5*	*18.1*
	WB6.HMP.945	*Lekaj*	*ALB*	*Drin-Bune*	*22.2*	*101.8*	*ROR*	*9.8*	*A*		*59.5*	*±1.5*	*12.4*
	WB6.HMP.944	*Nderlyse*	*ALB*	*Drin-Bune*	*19.5*	*101.4*	*ROR*	*8.3*	*A*		*58.0*	*±1.5*	*10.8*
	WB6.HMP.943	*Grunas*	*ALB*	*Drin-Bune*	*10.4*	*45.7*	*ROR*	*4.6*	*C*				*13.1*
	WB6.HMP.942	*Theth*	*ALB*	*Drin-Bune*	*7.2*	*32.4*	*ROR*	*6.9*	*0*	(*)			
	WB6.HMP.946	*Breg Lumi*	*ALB*	*Drin-Bune*	*8.3*	*32.8*	*ROR*	*8.2*	*0*	(*)			
	Total				***1,418***	***4,588***		***2,505***					

Table 7.6 Results: *Tentative projects*

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
1		**Fani cascade**		**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.	**62.0**		**41.9**
	WB6.HMP.031	*Peshqesh*	*ALB*	*Mat*	*34.0*	*118.4*	*ROR*	*40.8*	*A*		*62.0*	*±0*	*41.9*
	WB6.HMP.030	*Gjegjan*	*ALB*	*Mat*	*7.9*	*33.6*	*ROR*	*9.5*	*0*	(*)			
	WB6.HMP.032	*Ura e Fanit*	*ALB*	*Mat*	*1.1*	*7.4*	*ROR*	*1.3*	*0*	(*) *In construction*			
	WB6.HMP.033	*Fangu*	*ALB*	*Mat*	*74.6*	*221.4*	*ROR*	*177.0*	*0*	*In construction*			
	WB6.HMP.034	*Gojan*	*ALB*	*Mat*	*10.5*	*39.5*	*ROR*	*12.6*	*0*				
2	**WB6.HMP.352**	**Galiste**	**MKD**	**Vardar**	**193.5**	**262.5**	**DAM**	**235.7**	**A**	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.	**55.0**	**±0**	**107.5**
3		**Gornji Horizonti HPS**		**Trebišnjica**	**252.2**	**487.6**	**HPS**	**327.4**			**42.8**		**82.9**
	WB6.HMP.207	*Bileca*	*BIH*	*Trebišnjica*	*33.0*	*116.4*	*DER*	*49.3*	*B*	Tunnel Fatnicko field - Bileca is completed.	*47.8*	*±0*	*51.3*
	WB6.HMP.206	*Nevesinje*	*BIH*	*Trebišnjica*	*60.0*	*100.6*	*DER*	*100.5*	*B*	Positive effects on downstream HPPs.	*40.1*	*±0*	*119.5*
	WB6.HMP.205	*Dabar*	*BIH*	*Trebišnjica*	*159.2*	*270.6*	*DER*	*177.6*	*0*	Under construction. Reservations have been expressed on the project, due to the inadequate consideration of the transboundary environmental impacts under the ESPOO convention.			

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
4	**WB6.HMP.189**	**Dubrovnik 2**	**BIH HRV**	**Trebišnjica**	**304**	**318.0**	**DER**	**173.1**	**A**	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.	**51.1**	**±1.5**	**65.6**
5	**WB6.HMP.444**	**Risan-Boka (var 1)**	**MNE BIH**	**Trebišnjica**	**225.4**	**661.0**	**DER**	**290.2**	**B**	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.	**47.6**	**±1.5**	**53.1**
6		**Zhur HPS**		**Drin-Bune**	**305**	**397.6**	**HPS**	**335.9**		Transboundary issues. Water use conflicts with several SHPPs in ALB. Feasibility study needs to be revised.	**53.3**		**101.2**
	WB6.HMP.373	*Zhur 1*	*KOS*	*Drin-Bune*	*262*	*342.2*	*DER*	*288.5*	*A*		*54.3*	*±2.9*	*101.0*
	WB6.HMP.374	*Zhur 2*	*KOS*	*Drin-Bune*	*43*	*55.4*	*DER*	*47.4*	*B*		*47.5*	*±2.9*	*102.4*
7	**WB6.HMP.408**	**Pocem**	**ALB**	**Vjose**	**102**	**366.8**	**DER**	**66.3**	**A**	In 2016, a 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.	**60.3**	**±1.5**	**22.4**
8	**WB6.HMP.404**	**Kupinovo**	**SER**	**Sava**	**140**	**530.0**	**ROR**	**250.0**	**B**	Project seems dormant. Need to verify & confirm the development plans.	**49.1**	**±9.4**	**57.0**
9	**WB6.HMP.260**	**Kostanica**	**MNE**	**Sava**	**552**	**1,254.0**	**DER**	**383.2**	**B**	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.	**45.9**	**±0**	**37.3**
10		**Brodarevo HPS**		**Sava**	**59.1**	**232.1**	**HPS**	**144.5**		Environmental permit cancelled.	**38.7**		**74.9**
	WB6.HMP.401	*Brodarevo 2*	*SER*	*Sava*	*33.1*	*129.1*	*ROR*	*73.4*	*B*		*38.7*	*±0*	*68.4*
	WB6.HMP.397	*Brodarevo 1*	*SER*	*Sava*	*26.0*	*103.0*	*ROR*	*71.1*	*C*				*83.0*

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
11		**Vardar cascade**		**Vardar**	**324.5**	**1,310.2**	**CAS**	**1,141.6**		Ongoing tender for Prefeasibility Study. Expected change of technical solution. Storage overflows existing railway. Necessary dislocation.	**52.6**		**104.4**
	WB6.HMP.359	*Kukuricani*	*MKD*	*Vardar*	*16.9*	*77.5*	*ROR*	*63.0*	*A*		*50.4*	*±1.5*	*97.4*
	WB6.HMP.364	*Gjavato (Gavato)*	*MKD*	*Vardar*	*16.7*	*81.8*	*ROR*	*113.7*	*B*		*49.8*	*±1.5*	*165.8*
	WB6.HMP.363	*Miletkovo*	*MKD*	*Vardar*	*16.7*	*79.7*	*ROR*	*92.2*	*A*		*50.9*	*±1.5*	*138.3*
	WB6.HMP.351	*Veles*	*MKD*	*Vardar*	*93.1*	*310.4*	*DAM*	*159.5*	*A*		*56.6*	*±0*	*62.0*
	WB6.HMP.349	*Gradec*	*MKD*	*Vardar*	*55.2*	*243.4*	*DAM*	*178.1*	*A*		*55.3*	*±0*	*87.8*
	WB6.HMP.365	*Gevgelija*	*MKD*	*Vardar*	*16.6*	*84.1*	*ROR*	*79.9*	*B*		*41.0*	*±1.5*	*113.7*
	WB6.HMP.360	*Krivolak*	*MKD*	*Vardar*	*16.9*	*77.6*	*ROR*	*65.4*	*C*				*101.0*
	WB6.HMP.362	*Demir Kapija*	*MKD*	*Vardar*	*24.4*	*112.1*	*ROR*	*130.5*	*C*				*139.1*
	WB6.HMP.356	*Babuna*	*MKD*	*Vardar*	*17.3*	*52.0*	*ROR*	*40.1*	*C*				*92.5*
	WB6.HMP.361	*Dubrovo*	*MKD*	*Vardar*	*16.9*	*77.5*	*ROR*	*86.1*	*B*		*40.3*	*±1.5*	*132.9*
	WB6.HMP.358	*Gradsko*	*MKD*	*Vardar*	*16.9*	*63.7*	*ROR*	*66.2*	*C*				*124.3*
	WB6.HMP.357	*Zgropolci*	*MKD*	*Vardar*	*16.9*	*50.3*	*ROR*	*66.8*	*C*				*158.5*
12		**Gomsiqe cascade**		**Drin-Bune**	**21.6**	**65.3**	**CAS**	**32.9**		Project status not clear. Further investigation needed.	**64.0**		**45.0**
	WB6.HMP.064	*Gomsiqe 1*	*ALB*	*Drin-Bune*	*13.3*	*62.0*	*DER*	*23.0*	*A*		*64.0*	*±0*	*45.0*
	WB6.HMP.065	*Gomsiqe 2*	*ALB*	*Drin-Bune*	*8.3*	*3.3*	*ROR*	*9.9*	*0*	(*)			
13		**Curraj cascade**		**Drin-Bune**	**97.6**	**456.2**	**CAS**	**114.2**		No activities on the project. Project status not clear. Concession granted 2011.	**57.5**		**30.5**
	WB6.HMP.022	*Curraj 4*	*ALB*	*Drin-Bune*	*32.0*	*153.6*	*ROR*	*37.1*	*A*		*59.3*	*±1.5*	*29.7*
	WB6.HMP.021	*Curraj 3*	*ALB*	*Drin-Bune*	*17.4*	*81.1*	*ROR*	*20.2*	*A*		*57.6*	*±1.5*	*30.5*
	WB6.HMP.019	*Curraj 1*	*ALB*	*Drin-Bune*	*10.5*	*48.9*	*ROR*	*12.2*	*A*		*55.0*	*±1.5*	*30.5*
	WB6.HMP.020	*Curraj 2*	*ALB*	*Drin-Bune*	*13.0*	*57.0*	*ROR*	*15.1*	*A*		*55.0*	*±1.5*	*32.4*
	WB6.HMP.023	*Marash*	*ALB*	*Drin-Bune*	*2.6*	*12.0*	*ROR*	*3.1*	*0*	(*)			
	WB6.HMP.024	*Peraj*	*ALB*	*Drin-Bune*	*7.0*	*33.0*	*ROR*	*8.4*	*0*	(*)			
	WB6.HMP.025	*Gjonpepaj*	*ALB*	*Drin-Bune*	*9.0*	*43.3*	*ROR*	*10.8*	*0*	(*)			
	WB6.HMP.026	*Lekbibaj*	*ALB*	*Drin-Bune*	*2.0*	*9.3*	*ROR*	*2.4*	*0*	(*)			
	WB6.HMP.027	*Livadhet e Medha*	*ALB*	*Drin-Bune*	*1.3*	*5.5*	*ROR*	*1.5*	*0*	(*)			

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
	WB6.HMP.028	*Vrana e Madhe*	*ALB*	*Drin-Bune*	*2.2*	*9.8*	*ROR*	*2.6*	*0*	(*)			
	WB6.HMP.029	*Qerec Mulaj*	*ALB*	*Drin-Bune*	*0.6*	*2.8*	*ROR*	*0.7*	*0*	(*)			
14		**Qukes cascade**		**Shkumbin**	**65.5**	**340.8**	**CAS**	**83.2**		No activities on the project. Project status not clear. Concession granted 2011. Concession granted 2011.	**45.1**		**32.5**
	WB6.HMP.115	*hec-I Nr.5*	*ALB*	*Shkumbin*	*10.8*	*50.4*	*ROR*	*14.7*	*B*		*45.5*	*±1.5*	*35.9*
	WB6.HMP.119	*hec-I Nr.9*	*ALB*	*Shkumbin*	*15.0*	*84.5*	*ROR*	*20.9*	*B*		*44.8*	*±1.5*	*30.5*
	WB6.HMP.113	*hec-I Nr.3*	*ALB*	*Shkumbin*	*2.9*	*12.5*	*ROR*	*3.5*	*0*	(*)			
	WB6.HMP.114	*hec-I Nr.4*	*ALB*	*Shkumbin*	*2.9*	*13.2*	*ROR*	*3.5*	*0*	(*)			
	WB6.HMP.116	*hec-I Nr.6*	*ALB*	*Shkumbin*	*4.9*	*24.4*	*ROR*	*5.9*	*0*	(*)			
	WB6.HMP.117	*hec-I Nr.7*	*ALB*	*Shkumbin*	*6.6*	*32.5*	*ROR*	*7.9*	*0*	(*)			
	WB6.HMP.118	*hec-I Nr.8*	*ALB*	*Shkumbin*	*8.6*	*41.7*	*ROR*	*10.3*	*0*	(*)			
	WB6.HMP.120	*hec-I Nr.10*	*ALB*	*Shkumbin*	*5.0*	*29.8*	*ROR*	*6.0*	*0*	(*)			
	WB6.HMP.121	*hec-I Nr.11*	*ALB*	*Shkumbin*	*5.4*	*31.5*	*ROR*	*6.5*	*0*	(*)			
	WB6.HMP.122	*hec-I Nr.12*	*ALB*	*Shkumbin*	*3.4*	*20.1*	*ROR*	*4.0*	*0*	(*)			
15	**WB6.HMP.165**	**Begaj**	**ALB**	**Drin-Bune**	**24.8**	**131.0**	**ROR**	**20.0**	**A**	Concession granted 2014. Data on project status not clear.	**65.0**	**±0**	**19.1**
16		**Shkopet cascade**		**Mat**	**23.968**	**95.3**	**CAS**	**28.8**		Concession granted 2013. Court investigation on concession tender.	**52.8**		**36.80**
	WB6.HMP.061	*Shkopet 2*	*ALB*	*Mat*	*13.356*	*53.3*	*ROR*	*16.0*	*A*		*52.8*	*±0*	*36.7*
	WB6.HMP.062	*Shkopet 3*	*ALB*	*Mat*	*10.612*	*42.1*	*ROR*	*12.7*	*A*		*52.8*	*±0*	*36.9*
17		**Thane and Mollas cascade**		**Seman**	**17.5**	**85.0**	**CAS**	**21.2**		Need to clarify the input data. Concession for Thane has been cancelled. Status of the project not clear.	**60.3**		**30.7**
	WB6.HMP.071	*Mollas*	*ALB*	*Seman*	*13.6*	*80.0*	*DER*	*17.7*	*A*	*Seems the developer is looking for further financing. Concession granted 2009.*	*60.3*	*±0*	*30.7*
	WB6.HMP.072	*Thane*	*ALB*	*Seman*	*3.9*	*5.0*	*DAM*	**3.5**	*0*	(*) *Concession for Thana has been cancelled.*			
18		**Cijevna cascade**		**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	**54.6**		**72.8**

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
										conflicts with other infrastructure (5C highway) at Cijevna 4. Project status not clear. Various companies hold concessions on the individual HPP projects, challenging to optimally develop the scheme.			
	WB6.HMP.233	*Cijevna 3*	*BIH*	*Sava*	*13.9*	*69.0*	*ROR*	*42.4*	*A*		*59.9*	±0	*73.9*
	WB6.HMP.231	*Cijevna 1*	*BIH*	*Sava*	*14.1*	*67.7*	*ROR*	*36.5*	*A*		*54.6*	±0	*64.9*
	WB6.HMP.232	*Cijevna 2*	*BIH*	*Sava*	*14.2*	*69.6*	*ROR*	*35.7*	*A*		*54.6*	±0	*61.9*
	WB6.HMP.234	*Cijevna 4*	*BIH*	*Sava*	*13.9*	*69.9*	*ROR*	*42.4*	*A*		*52.8*	±0	*73.0*
	WB6.HMP.410	*Cijevna 5*	*BIH*	*Sava*	*13.2*	*62.4*	*ROR*	*42.0*	*A*		*52.8*	±0	*80.9*
	WB6.HMP.411	*Cijevna 6*	*BIH*	*Sava*	*12.9*	*63.1*	*ROR*	*44.0*	*A*		*52.8*	±0	*83.7*
	Total				*2,843*	*7,587*		*3,954*					

Table 7.7 Results: *Reversible HPP candidates*

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
1	**WB6.HMP.350**	**Cebren**	**MKD**	**Vardar**	**332.8**	**840.3**	**REV**	**380.6**	**A**	Project dependent on realization of HPP Galiste. Concerns have been expressed related on the Čebren-Gališe system specifically the sustainability of the Cebren HPP project.	**70.3**	**±0**	**54.7**
2	**WB6.HMP.245**	**RHE Bjelimici**	**BIH**	**Neretva**	**500**	**1,029.0**	**REV**	**232.9**	**A**	Project is a part of Gornja Neretva hydropower system.	**66.8**	**±6**	**27.9**
3	**WB6.HMP.447**	**RHE Bistrica**	**SER**	**Sava**	**680**	**1,550.0**	**REV**	**551.1**	**A**		**68.7**	**±0**	**43.2**
4	**WB6.HMP.448**	**Djerdap 3 - Phase 2**	**SER**	**Danube**	**1,200**	**1,100.0**	**REV**	**638.1**	**A**	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	**61.2**	**±0**	**69.8**

SN	Project ID/number	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised investment cost (mil. EUR)	MCA	Comments	MCA2 score	Uncertainty	LCOE
										the NP.			
5	**WB6.HMP.409**	**RHE Buk Bijela**	**BIH**	**Sava**	**600**	**1,164.9**	**REV**	**376.1**	**A**	Part of Gornja Drina hydropower system	**64.6**	**±1.5**	**39.3**
6	**WB6.HMP.225**	**CHE Vrilo**	**BIH**	**Neretva**	**66**	**196.1**	**REV**	**95.9**	**A**		**55.6**	**±1**	**59.0**
7	**WB6.HMP.383**	**PSHP Vërmica**	**KOS**	**Drin-Bune**	**480**	**765.0**	**REV**	**308.6**	**A**		**61.0**	**±4.4**	**48.9**
	Total				***3,859***	***6,645***		***2,583***					

Final Draft

7.4.2 Analysis of project grouping by river basin, sub-river basin and rivers

If we distribute the projects from the previous section by river basin (RB), sub-river basin (SRB) and selected main rivers in accordance with the adopted classification of hydrography used throughout the whole Study, we obtain the results shown in Table 7.9. When Recommended projects are observed only, the Drina SRB participates most (770.7 GWh), followed by the Drini SRB, the Morača RB, the Neretva RB, etc. When all projects except REV HPPs are considered, then the Drina SRB also takes the lead (3,963 GWh), followed by the Tara RB (1,787 GWh), the Vardar RB (1,712.7 GWh), etc. (Note: There are no REV HPPs in Table 7.9.)

Table 7.8: Distribution of HPP candidates by RB, SRB and selected main rivers and Groups (GWh)

SN	River Basin	Sub-River Basin	*River*	Recommended projects	Reasonably good projects	Underperforming projects	Tentative projects	Group total
1	**Danube /SER part only/**							0
2	**Velika Morava /SER/**					**645.5**		**645.5**
3		Zapadna Morava /KOS, SER/			532.7			532.7
4		Juzna Morava /SER/						0
5	**Timok /SER/**							0
6	**Temistica /SER/**							0
7	**Sava /BIH, CRO, MNE, SLO, SER/**						**530**	**530**
8		Drina /BiH, MNE, SER/		770.7	3,192.3			3,963
9			*Drina(Lim)*			*276.3*	*232.1*	*508.4*
10			*Piva*	*227*		*321.9*		*548.9*
11			*Tara*			*533*	*1,254*	*1,787*
12		Bosna /BiH/			134	67.6	401.7	603.2
13		Vrbas /BiH/			121.2	497.5		618.7
14		Una /BIH, CRO/				306.8		306.8
15	**Trebisnjica /BIH, MNE, CRO/**						**1,466.6**	**1,466.6**
16	**Neretva /BIH, CRO/**			**327.7**	**124.3**			**452**
17	**Moraca /MNE/**			**616**		**213.1**		**829.1**
18	**Drin-Bune /ALB/**							0
19		Bune/Bojana /ALB/						0
20		Drini/ALB/		673		98.1	587.2	1,358.3
21		White Drin, Drini i Berthe /ALB, KOS/					397.6	397.6
22		Black Drin, Drini i Zi /ALB, MKD/				915.9	65.3	981.2
23	**Mat /ALB/**			**108.6**		**55.7**	**286.8**	**451.1**
24	**Ishem /ALB/**							**0**
25	**Erzen /ALB/**							**0**
26	**Shkumbin /ALB/**					**149**	**340.8**	**489.7**
27	**Seman /ALB/**					**410.5**	**85**	**495.5**
28	**Vjose /ALB, GRE/**					**97.7**	**366.8**	**464.5**
29	**Bistrice /ALB/**							**0**

Final Draft 3

SN	River Basin	Sub-River Basin	River	Recommended projects	Reasonably good projects	Underperforming projects	Tentative projects	Group total
30	**Vardar /MKD, GRE/**			**140**			**1,572.7**	**1,712.7**
31	**Strumica /MKD, BUL/**							**0**
32	**Other**							**0**
			Sub-totals	**2,863**	**4,104.4**	**4,588.4**	**7,586.7**	**19,142.4**

Note: Without REV HPPs.

7.4.3 Analysis of project candidate grouping by country

Distributions by country of projects included in all Groups are presented in Tables 7.14 to 7.18.

Table 7.9: Distribution of Recommended projects by country

Country	List entries (cascades + single projects)	Individual projects	Capacity (MW)	Generation (GWh)	Investment (mln €)
ALB	2	4	211	781.6	547
BiH	2	6	353	1,098.4	813
MKD	1	1	35	140	55
MNE	2	5	410	843	677
KOS	0	0	0	0	0
SER	0	0	0	0	0

Table 7.10: Distribution of Reasonably good projects by country

Country	List entries (cascades + single projects)	Individual projects	Capacity (MW)	Generation (GWh)	Investment (mln €)
ALB	0	0	0	0	0
BiH	9 (7+2)*	14 (7+7)*	517	2,178.9	1,540
MKD	0	0	0	0	0
MNE	0	0	0	0	0
KOS	0	0	0	0	0
SER	4 (2+2)*	18 (11+7)*	511	1,925.5	1,555

**Srednja Drina HPS and Donja Drina HPS are transboundary projects between BIH and SER.*

Table 7.11: Distribution of Underperforming projects by country

Country	List entries (cascades + single projects)	Individual projects	Capacity (MW)	Generation (GWh)	Investment (mln €)
ALB	8	37	483	1,803	472
BiH	10 (9+1)*	13 (12+1)*	295	1,032.8	753
MKD	2	2	96	137	178
MNE	3 (2+1)*	9 (8+1)*	397	970.3	746
KOS	0	0	0	0	0
SER	1	5	148	645.5	355

**Donje Krusevo is transboundary project between BIH and MNE.*

Final Draft 3

Table 7.12: Distribution of Tentative projects by country

Country	List entries (cascades + single projects)	Individual projects	Capacity (MW)	Generation (GWh)	Investment (mln €)
ALB	8	34	405	1,732	429
BiH	4 (2+2)*,**	11 (9+2)*,**	599	1,379	802
MKD	2	13	518	1,573	1,377
MNE	2 (1+1)*	2 (1+1)*	665	1,585	528
KOS	1	2	305	398	336
SER	2	3	199	762	395

**Risan-Boka is transboundary project between BIH and MNE.; **Dubrovnik 2 is transboundary project between BIH and CRO.*

Table 7.13: Distribution of Reversible hydropower projects by country

Country	List entries (cascades + single projects)	Individual projects	Capacity (MW)	Generation (GWh)	Investment (mln €)
ALB	0	0	0		0
BiH	3	3	1,166		705
MKD	1	1	333		381
MNE	0	0	0		0
KOS	1	1	480		309
SER	2	2	1,880		1,189

Albania, Montenegro, the former Yugoslav Republic of Macedonia, and Bosnia and Herzegovina have candidate projects in the group of Recommended projects. The absence of projects from Serbia in this group is interpreted as result of a generally well-developed hydro sector in Serbia where the best projects have been already implemented. However, Serbia has several representatives among the Reversible and Tentative projects.

The ranking and scoring of a number of Albanian projects (generally developed by the private investors) is considered less reliable compared to other WB6 projects, where most projects have been developed by the state-owned utility companies. Therefore, several Albanian projects' scores should be taken with a degree of reserve. This is particularly obvious when analysing the very low LCOE of Albanian projects, most probably caused by the underestimated investment figures and possibly overestimated generation figures. Therefore, a number of Albanian projects have been placed in the Tentative projects group despite their high MCA score; since the consultant had serious doubts regarding the reliability of data for the HPP projects in question.

Final Draft 3

MOTT MACDONALD IPF CONSORTIUM

8 Proposals for concrete follow-up actions

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 in this Task, we propose a set of follow-up actions which can be implemented as regional collaboration or on national levels (Table 8.1).

Table 8.1 Proposed actions at the regional WB6 level and national levels

SN	Brief description of proposed Action	Assumed implementing agent	Anticipated timeframe
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
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.
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
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
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
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 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	Government / Ministry of Energy and Ministry of Environment	6 months

Final Draft 3

	stakeholder involvement. An example of a more detailed assessment of financial viability is presented in Annex 4 of BR-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	**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

Final Draft 3

9 Conclusions, recommendations and final remarks

The aim of the MCA methodology developed within this Study was to facilitate the identification of greenfield HPP candidates which can contribute to the sustainable and rational development of the technical hydropower potential throughout the WB6 region. Considering the aim of the MCA for the assessment of HPPs in the WB6 and the best practices of the existing methodologies, on the one hand, and the limited data and time available for the assessment on the other, the Energy Institute Hrvoje Požar (EIHP) developed a “tailor-made” methodology. The MCA Methodology for Assessment of HPP Sustainability in Western Balkan Region builds on principles used in the HSAP (IHA, 2012) and EBRD’s and EIB’s guidelines on environmental and social requirements (EBRD, 2014a; EBRD, 2014b; EIB, 2013) and includes also The ICPDR "Guiding Principles on Sustainable Hydropower Development in the Danube Basin", which were developed and endorsed by the countries of the Danube basin, including BA, RS and ME. It is easily applicable and gives sound results without prejudice to the country of implementation, HPP size, promotor, etc. while compliance with EU legislation requirements should also be ensured.

The assessment was conducted with a step-wise approach: *Step 1 – Screening; Step 2 - MCA Level 1; Step 3 – MCA Level 2.* The Screening aimed to eliminate projects without a minimal set of information necessary for the assessment. Therefore, projects with no documentation providing (at least) a minimal level of information, were designated as *Group 0* and excluded from further evaluation. In total 480 HPP candidates were screened in this first step, of which 136 were “short-listed” for the MCA.

In the MCA Level 1, the “short-listed” projects were assessed against four indicators, each representing the key indicator of the environmental, technical, realisation readiness and economic criteria groups: Location of HPP candidate with respect to protected areas, Contribution to generation adequacy, Readiness for project realisation, Specific investment per unit of electricity generated (€/GWh). The HPP candidates that scored below the threshold of 60 points, i.e. underperformed against the key MCA indicators, were perceived as less credible investments under the prevailing (environmental, regulatory and market) conditions, and were therefore designated as *Group C*. The assessed candidates that scored above the threshold were further analysed and assessed in the MCA Level 2 process.

The MCA Level 1 process was applied to 136 HPP candidates: 35 in Albania, 36 in BIH, 21 in Serbia, 17 the former Yugoslav Republic of Macedonia, 14 in Montenegro and 3 in Kosovo, and 10 transboundary candidates. Among the transboundary candidates, seven are located between BIH and Serbia, two between Montenegro and BIH and one between BIH and Croatia. In total 90 candidates passed the threshold of 60 points, and were further assessed in the MCA Level 2, while the remaining 46 candidates are designated as *Group C.*

In the MCA Level 2, 88 HPP candidates were subjected to a detailed assessment against 30 indicators classified into five criteria groups (*Environmental acceptability, Social viability, Technical adequacy, Realisation readiness and Financial viability*). The HPP candidates which scored above 50 points, i.e. the candidates that were within the top 30 percent scores, are considered as the candidates with a good comparative performance among the assessed HPPs. They were designated as *Group A candidates*. The remaining other candidates evaluated in the MCA Level 2 process were designated as *Group B.* They are considered as the HPPs with a moderate comparative performance against the MCA indicators. The summary of MCA results indicating the performance group (Groups A, B and C) and country is presented in Table 9.1. Table 9.2 shows the summary of group A – with and without reversible HPPs.

Table 9.1 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

Table 9.2 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**

The multi-criteria assessment of HPP projects in the WB6 conducted through this Study is the first such exercise conducted in the Region. Review of the data collected showed that there are many HPP candidates in the region in very different project development phases and that in some cases the documentation is outdated and requires review, verification and update. It is also important to emphasise that the environmental baseline data in the Region is limited and not always easily available from the public domain. Therefore, we recommend follow up actions which will lead to the development of a regional HPP catalogue, built on the national catalogues, together with a comprehensive database and then to re-run the MCA analysis in order to refine the results and consequently use them for the development of a Sustainable Hydropower Development Action Plan.

In order to address the shortcomings of the MCA methodology, the last step of the analysis was the Final Expert Assessment. In this process, the projects were grouped in accordance with their assessed potential for successful development and implementation;

- **Recommended projects** for future development activities. Comparatively the best potential for successful development and implementation. Total 1,009 MW of capacity.
- **Reasonably good projects** with average potential for successful development and implementation. Total 1,028 MW of capacity.
- **Underperforming projects**, which are not suitable for priority development efforts. Lowest potential for successful development and implementation. Total 1,418 MW of capacity.
- **Tentative projects** with possibly good potential, high MCA score, but with one or several significant issues identified that could not be captured within MCA. Potential for successful development and implementation largely subject to resolution of those identified issues. Total 2.843 MW of capacity.
- **Reversible HPP projects.** Their implementation depends on system wide considerations. Generally, it is considered that additional reversible capacity is required in the region. Additional work needs to be undertaken to determine actual needs and optimal candidates. Total 3,859 MW of capacity.

  Details of grouped projects are given in Table 9.3 - Table 9.7.

The Recommended projects may be considered as priority for future development activities, and particularly to demonstrate a transparent and sustainable approach to project development in accordance with EU best practices, subject to countires' further designation of Natura 200 sites and no-go zones. Such an approach by project developers may be motivated and catalysed by EU-sourced technical and other assistance.

Final Draft 3

Table 9.3 Summary of the Results: *Recommended projects/cascades*

SN	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (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 cca 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***	*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***	

Final

Table 9.4 Summary of the Results: *Reasonably good projects/cascades*

SN	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (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 9.5 Summary of the Results: *Underperforming projects/cascades*

SN	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (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.

SN	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (mil. EUR)	Comments
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.*
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 IUNC; 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***	

Final

Table 9.6 Summary of the Results: *Tentative projects/cascades*

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 regarding this project. Concession granted in 2011.
2	Galiste	MKD	Vardar	193.5	262.5	DAM	235.7	Concerns have been expressed related to Čebren-Galište system on the sustainability of this project. Ongoing tender for concession for Cebren-Galiste HPS: 11 bids received. Each bid with different conceptual solution. Tender for PS to determine optimum solution. Project in conjunction with HPP Cebren. Potential irrigation of Tikveš polje. Downstream HPP Tikveš.
3	Gornji Horizonti HPS	BIH	Trebišnjica	252.2	487.6	HPS	327.4	Reservations have been expressed on the project due to inadequate consideration of the transboundary environmental impacts under the ESPOO convention. Possible negative effects due to drying out of Neretva.
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.

SN	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (mil. EUR)	Comments
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.*
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 floods 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 9.7 Summary of the Results: *Reversible projects/cascades*

SN	Project name	Country	River basin	Capacity (MW)	Electricity output (GWh)	Plant type	Normalised total investment cost for reference year (mil. EUR)	Comments
1	Cebren	MKD	Vardar	332.8		REV	380.6	Project dependent on realization of HPP Galiste. Concerns expressed related to the Čebren-Galište system regarding the sustainability of this project.
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	

Final

Annex 1: Results of the MCA Level 1

Table A1.1 outlines the MCA Level 1 rank list. For each candidate, basic information about the country of HPP location, type of HPP, installed capacity and expected annual electricity output is included in the table. The MCA Level 1 score obtained is also shown. In total 90 candidates passed the threshold of 60 points, and were further assessed in the MCA Level 2. The remaining 46 candidates are designated as *Group C - the HPP candidates which underperformed against the key MCA indicators* ().

Table A1.1 Results of MCA Level 1 process – *Shortlisted HPP candidates*

SHORTLISTED HPP CANDIDATES							
MCA L1 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
1	WB6.HMP.447	RHE Bistrica	SER	680.0	1,550.0	REV	92.5
2	WB6.HMP.260	Kostanica	MNE	552.0	1,254.0	DER	92.5
3	WB6.HMP.264	Moraca / Zlatica (var 2)	MNE	37.0	151.0	DAM	90.0
4	WB6.HMP.112	Skavica / Skavica 385	ALB	132.0	467.0	DER	90.0
5	WB6.HMP.165	Begaj	ALB	24.8	131.0	ROR	87.5
6	WB6.HMP.245	Gornja Neretva / RHE Bjelimici	BIH	500.0	1,029.0	REV	87.5
7	WB6.HMP.409	Gornja Drina / RHE Buk Bijela	BIH	600.0	1,164.9	REV	87.5
8	WB6.HMP.261	Moraca / Andrijevo (var 2)	MNE	127.0	240.9	DAM	87.5
9	WB6.HMP.408	Vjosa / Pocem	ALB	102.0	366.8	DER	85.0
10	WB6.HMP.373	Zhur / Zhur 1	KOS	262.0	342.2	DER	82.5
11	WB6.HMP.071	Thane and Mollas / Mollas	ALB	13.6	80.0	DER	82.5
12	WB6.HMP.031	Fani / Peshqesh	ALB	34.0	118.4	ROR	82.5
13	WB6.HMP.448	Djerdap 3 - Phase 2	SER	1,200.0	1,100.0	REV	82.5
14	WB6.HMP.262	Moraca / Raslovici (var 2)	MNE	37.0	106.9	DAM	82.5
15	WB6.HMP.263	Moraca / Milunovici (var 2)	MNE	37.0	117.2	DAM	82.5
16	WB6.HMP.198	Gornja Drina / Buk Bijela	BIH	93.5	332.3	DAM	82.5
17	WB6.HMP.913	Kiri / Kiri 1 (Gjuraj)	ALB	19.2	77.4	DER	80.0
18	WB6.HMP.351	Vardar / Veles	MKD	93.1	310.4	DAM	80.0
19	WB6.HMP.350	Cebren	MKD	332.8	840.3	REV	80.0
20	WB6.HMP.937	Cem / Tamare	ALB	22.6	103.0	ROR	80.0
21	WB6.HMP.947	Shala / Vajvisht	ALB	60.0	220.8	ROR	77.5
22	WB6.HMP.111	Skavica / Katundi i Ri	ALB	49.0	206.0	DER	77.5
23	WB6.HMP.383	PSHP Vërmica	KOS	480.0	765.0	REV	77.5
24	WB6.HMP.124	Seke	ALB	12.7	55.7	DER	77.5
25	WB6.HMP.175	Gornja Neretva / Bjelimici	BIH	100.0	219.4	DAM	77.5
26	WB6.HMP.201	Ustikolina	BIH	60.5	236.8	ROR	77.5
27	WB6.HMP.207	Gornji Horizonti / Bileca	BIH	33.0	116.4	DER	77.5
28	WB6.HMP.189	Dubrovnik 2	BIH HRV	304.0	318.0	DER	77.5
29	WB6.HMP.933	Valbona / 15	ALB	13.8	66.5	ROR	77.5
30	WB6.HMP.444	Risan-Boka (var 1)	MNE BIH	225.4	661.0	DER	77.5
31	WB6.HMP.367	Tenovo	MKD	35.0	140.0	ROR	75.0

Final Draft

SHORTLISTED HPP CANDIDATES							
MCA L1 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
32	WB6.HMP.060	Suha	ALB	24.0	97.7	ROR	75.0
33	WB6.HMP.225	CHE Vrilo	BIH	66.0	196.1	REV	75.0
34	WB6.HMP.064	Gomsiqe / HPP 1	ALB	13.3	62.0	DER	75.0
35	WB6.HMP.278	Piva / Komarnica (var 2)	MNE	172.0	227.0	DAM	75.0
36	WB6.HMP.176	Skakala	BIH	26.4	124.3	ROR	75.0
37	WB6.HMP.022	Curraj / Curraj 4	ALB	32.0	153.6	ROR	75.0
38	WB6.HMP.199	Gornja Drina / Paunci	BIH	43.2	166.9	DAM	75.0
39	WB6.HMP.208	Gornja Drina / Foca	BIH	44.2	175.9	DAM	75.0
40	WB6.HMP.233	Cijevna 3	BIH	13.9	69.0	ROR	72.5
41	WB6.HMP.349	Vardar / Gradec	MKD	55.2	243.4	DAM	72.5
42	WB6.HMP.196	Srednja Drina / Rogacica	BIH SER	113.3	413.4	ROR	72.5
43	WB6.HMP.190	Srednja Drina / Tegare	BIH SER	120.9	448.1	ROR	72.5
44	WB6.HMP.202	Gornja Neretva / Glavaticevo	BIH	28.5	108.3	ROR	70.0
45	WB6.HMP.944	Shala / Nderlyse	ALB	19.5	101.4	ROR	70.0
46	WB6.HMP.945	Shala / Lekaj	ALB	22.2	101.8	ROR	70.0
47	WB6.HMP.194	Donja Drina / Drina 2	BIH SER	87.8	379.8	DAM	70.0
48	WB6.HMP.195	Donja Drina / Drina 3	BIH SER	101.0	469.1	DAM	70.0
49	WB6.HMP.192	Donja Drina / Kozluk	BIH SER	88.5	376.0	DAM	70.0
50	WB6.HMP.352	Galiste	MKD	193.5	262.5	DAM	70.0
51	WB6.HMP.374	Zhur / Zhur 2	KOS	43.0	55.4	DER	67.5
52	WB6.HMP.404	Kupinovo	SER	140.0	530.0	ROR	67.5
53	WB6.HMP.231	Cijevna 1	BIH	14.1	67.7	ROR	67.5
54	WB6.HMP.232	Cijevna 2	BIH	14.2	69.6	ROR	67.5
55	WB6.HMP.234	Cijevna 4	BIH	13.9	69.9	ROR	67.5
56	WB6.HMP.410	Cijevna 5	BIH	13.2	62.4	ROR	67.5
57	WB6.HMP.411	Cijevna 6	BIH	12.9	63.1	ROR	67.5
58	WB6.HMP.021	Curraj / Curraj 3	ALB	17.4	81.1	ROR	67.5
59	WB6.HMP.119	Qukes / hec-I Nr.9	ALB	15.0	84.5	ROR	67.5
60	WB6.HMP.206	Gornji Horizonti / Nevesinje	BIH	60.0	100.6	DER	65.0
61	WB6.HMP.061	Shkopet / Shkopet 2	ALB	13.4	53.3	ROR	65.0
62	WB6.HMP.062	Shkopet / Shkopet 3	ALB	10.6	42.1	ROR	65.0
63	WB6.HMP.015	Osumi / Nikollare	ALB	27.0	72.8	DER	65.0
64	WB6.HMP.193	Donja Drina / Drina 1	BIH SER	87.7	363.7	DAM	65.0
65	WB6.HMP.181	Kovanici	BIH	13.3	65.7	ROR	62.5
66	WB6.HMP.401	Brodarevo 2	SER	33.1	129.1	ROR	62.5
67	WB6.HMP.183	Babino selo	BIH	11.5	59.9	ROR	62.5
68	WB6.HMP.363	Vardar / Miletkovo	MKD	16.7	79.7	ROR	62.5
69	WB6.HMP.237	Gorazde	BIH	37.0	169.9	ROR	62.5
70	WB6.HMP.361	Vardar / Dubrovo	MKD	16.9	77.5	ROR	62.5
71	WB6.HMP.365	Vardar / Gevgelija	MKD	16.6	84.1	ROR	62.5

Final Draft 2

SHORTLISTED HPP CANDIDATES							
MCA L1 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
72	WB6.HMP.200	Gornja Drina / Sutjeska	BIH	44.1	95.6	DER	62.5
73	WB6.HMP.359	Vardar / Kukuricani	MKD	16.9	77.5	ROR	62.5
74	WB6.HMP.191	Srednja Drina / Dubravica	BIH SER	87.2	335.5	ROR	62.5
75	WB6.HMP.180	Janjici	BIH	13.3	68.3	ROR	60.0
76	WB6.HMP.364	Vardar / Gjavato (Gavato)	MKD	16.7	81.8	ROR	60.0
77	WB6.HMP.011	Osumi / Polican	ALB	22.5	60.7	DER	60.0
78	WB6.HMP.019	Curraj / Curraj 1	ALB	10.5	48.9	ROR	60.0
79	WB6.HMP.020	Curraj / Curraj 2	ALB	13.0	57.0	ROR	60.0
80	WB6.HMP.917	Mati / Mati 1	ALB	14.7	50.0	DER	60.0
81	WB6.HMP.115	Qukes / hec-I Nr.5	ALB	10.8	50.4	ROR	60.0
82	WB6.HMP.184	Vinac	BIH	11.5	61.3	ROR	60.0
83	WB6.HMP.918	Mati / Mati 2	ALB	14.8	58.6	DER	60.0
84	WB6.HMP.396	Ribarice	SER	46.7	76.1	DER	60.0
85	WB6.HMP.385	Ibar / Lakat	SER	13.5	54.4	ROR	60.0
86	WB6.HMP.386	Ibar / Maglic	SER	13.4	52.2	ROR	60.0
87	WB6.HMP.387	Ibar / Dobre Strane	SER	14.5	55.9	ROR	60.0
88	WB6.HMP.388	Ibar / Bela Glava	SER	14.6	55.5	ROR	60.0
89	WB6.HMP.389	Ibar / Gradina	SER	11.7	41.8	ROR	60.0
90	WB6.HMP.390	Ibar / Cerje	SER	13.2	50.1	ROR	60.0
Total 90 HPP candidates (47 ROR, 20 DER, 16 DAM, 7 REV)				***8,417[5]***	***20,719***		
Total reversible (7 HPPs)				***3,859***	***6,645***		
Total without reversible: 83 HPP candidates (47 ROR, 20 DER, 16 DAM)				***4,559***	***14,074***		

* ALB – Albania, BIH – Bosnia and Herzegovina, MKD – the former Yugoslav Republic of Macedonia, KOS – Kosovo, MNE-Montenegro, SER – Serbia

** ROR – run-of-river, RES (DAM/DER) – reservoir (dam, derivation), REV – reversible

Table A1.2 Results of MCA Level 1 process – *Group C HPP candidates*

GROUP C HPP CANDIDATES							
MCA L1 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
91	WB6.HMP.453	Velika Morava / Varvarin	SER	28.9	122.9	ROR	57.5
92	WB6.HMP.227	Han Skela	BIH	12.0	52.0	DAM	57.5
93	WB6.HMP.449	Velika Morava / Ljubicevo	SER	30.6	137.1	ROR	57.5

[5] HPP Dubrovnik 2, a trasboundary candidate between BiH and Croatia (non-WB6 country), is included in Total for WB6 with 50% of its installed capacity (MW) and 50% in average annual output (GWh), while in the row with a HPP code of WB6.HMP.189 it is shown with its 100% capacity and output.

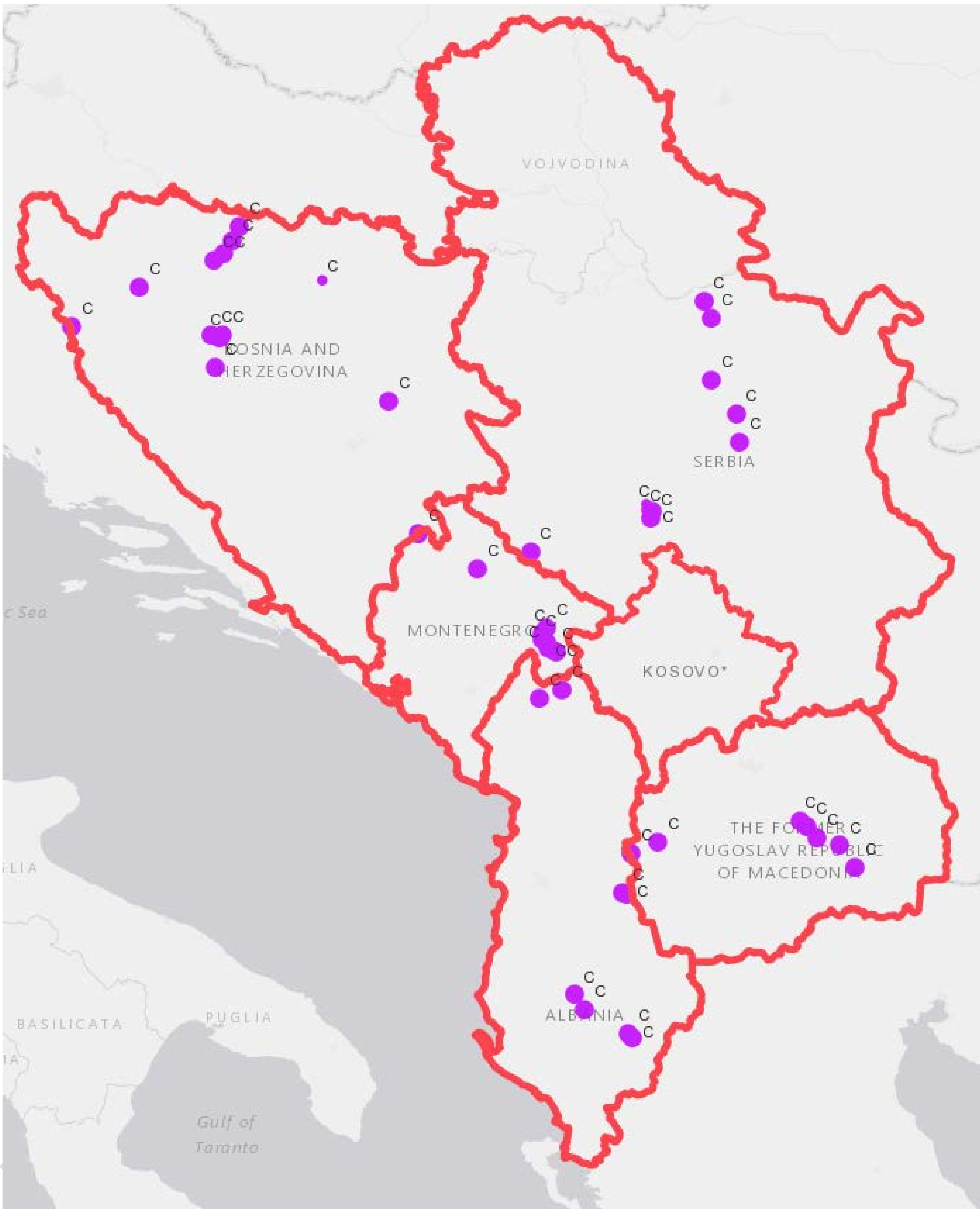
Final Draft

GROUP C HPP CANDIDATES							
MCA L1 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
94	WB6.HMP.450	Velika Morava / Trnovce	SER	29.3	128.1	ROR	57.5
95	WB6.HMP.451	Velika Morava / Svilajnac	SER	28.8	128.0	ROR	57.5
96	WB6.HMP.452	Velika Morava / Mijatovac	SER	30.1	129.4	ROR	57.5
97	WB6.HMP.010	Osumi / Peshtan	ALB	16.0	43.2	DER	57.5
98	WB6.HMP.014	Osumi / Lapanj	ALB	24.0	64.7	DER	57.5
99	WB6.HMP.016	Osumi / Radovice	ALB	22.5	60.7	DER	57.5
100	WB6.HMP.356	Vardar / Babuna	MKD	17.3	52.0	ROR	57.5
101	WB6.HMP.012	Osumi / Bogove	ALB	24.0	64.7	DER	57.5
102	WB6.HMP.423	Doboj	BIH	8.4	36.8	ROR	57.5
103	WB6.HMP.391	Ibar / Glavica	SER	9.7	37.2	ROR	57.5
104	WB6.HMP.392	Ibar / Usce	SER	9.8	35.2	ROR	57.5
105	WB6.HMP.393	Ibar / Gokcanica	SER	11.0	38.2	ROR	57.5
106	WB6.HMP.394	Ibar / Bojanici	SER	10.2	36.0	ROR	57.5
107	WB6.HMP.358	Vardar / Gradsko	MKD	16.9	63.7	ROR	55.0
108	WB6.HMP.217	Trn	BIH	21.4	89.1	ROR	55.0
109	WB6.HMP.218	Laktasi	BIH	21.4	93.0	ROR	55.0
110	WB6.HMP.397	Brodarevo 1	SER	26.0	103.0	ROR	55.0
111	WB6.HMP.235	Caplje	BIH	12.0	56.8	ROR	52.5
112	WB6.HMP.219	Kosjerevo	BIH	21.4	93.1	ROR	52.5
113	WB6.HMP.220	Razboj	BIH	21.4	92.0	ROR	52.5
114	WB6.HMP.357	Vardar / Zgropolci	MKD	16.9	50.3	ROR	52.5
115	WB6.HMP.368	Shpilje 2 (Spilje 2)	MKD	28.0	20.0	DAM	52.5
116	WB6.HMP.213	Vrletna kosa	BIH	11.2	23.3	DAM	52.5
117	WB6.HMP.236	Ivik	BIH	11.2	21.9	DAM	52.5
118	WB6.HMP.214	Ugar-Usce	BIH	11.6	33.2	DAM	52.5
119	WB6.HMP.215	Krusevo	BIH	10.7	30.8	DER	47.5
120	WB6.HMP.267	Donje Krusevo	MNE BIH	120.0	321.9	DAM	47.5
121	WB6.HMP.432	Lim / Navotina (var 3)	MNE	15.0	42.2	DER	40.0
122	WB6.HMP.272	Lim / Plav (var 2)	MNE	13.1	48.8	DER	37.5
123	WB6.HMP.275	Lim / Mostine (var 2)	MNE	12.9	36.9	DER	35.0
124	WB6.HMP.276	Lim / Jagnjilo (var 2)	MNE	11.4	33.5	DER	35.0
125	WB6.HMP.426	Lim / Sutjeska (var 2)	MNE	12.0	37.0	DER	35.0
126	WB6.HMP.320	Lim / Tresnjevo (var 2)	MNE	11.1	34.5	ROR	35.0
127	WB6.HMP.428	Lim / Murino (var 3)	MNE	11.2	43.4	DER	35.0
128	WB6.HMP.252	Tara / Ljutica (var 1)	MNE	250.0	533.0	DAM	35.0
129	WB6.HMP.360	Vardar / Krivolak	MKD	16.9	77.6	ROR	32.5
130	WB6.HMP.362	Vardar / Demir Kapija	MKD	24.4	112.1	ROR	32.5
131	WB6.HMP.926	Valbona / 9A	ALB	12.8	60.3	ROR	30.0
132	WB6.HMP.229	Unac (Rmanj Manastir/Monastir)	BIH	72.0	250.0	DAM	30.0
133	WB6.HMP.347	Boskov Most	MKD	68.2	117.0	DER	30.0

Final Draft 2

GROUP C HPP CANDIDATES							
MCA L1 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
134	WB6.HMP.943	Shala / Grunas	ALB	10.4	45.7	ROR	22.5
135	WB6.HMP.037	Zalli i Qarrishtes / HPP-3	ALB	13.1	52.8	ROR	20.0
136	WB6.HMP.036	Zalli i Qarrishtes / HPP-2	ALB	10.0	39.8	ROR	20.0
Total 46 HPP candidates (26 ROR, 12 DER, 8 DAM)				***1,227.2***	***3,822.8***		

Final Draft 2

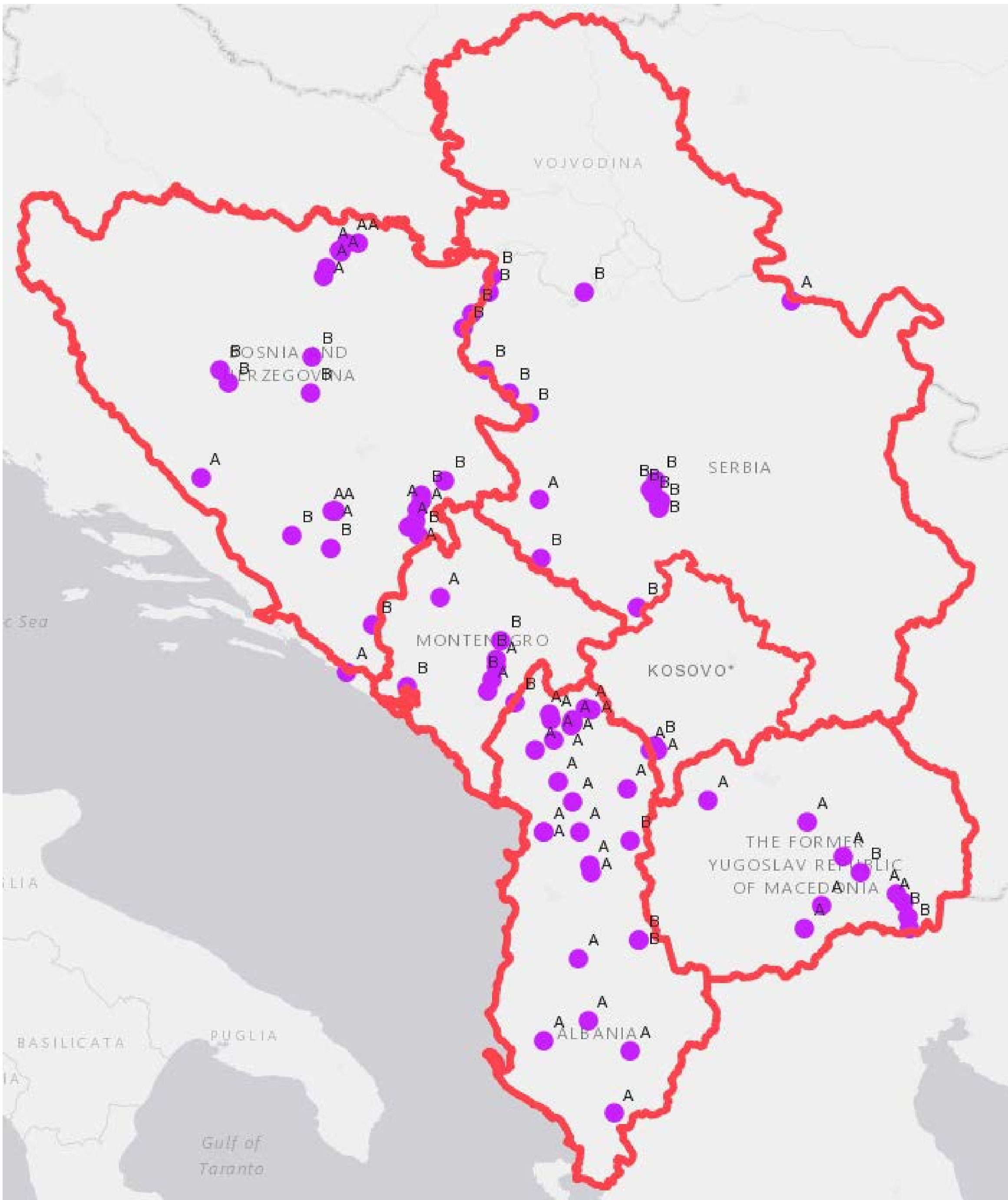


Source: WBEC-REG-ENE-01 HDS-GIS

Figure A1.1 Results of MCA Level 1 process – Locations of Group C HPP candidates

Annex 2: Results of the MCA Level 2: Group A and Group B candidates

The results of the MCA Level 2 process, indicating the rank list of the assessed HPP candidates, their location, planned capacity and annual electricity output, as well as the obtained total score and score per each MCA Level 2 Criteria group are presented with the following tables. The locations of Group A and Group B candidates are presented in Figures A 2.1 – A2.3, respectively.



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

Figure A2.1 MCA Level 2 Results – Locations of Group A and Group B candidates

Table A2.1 Results of the MCA Level 2: *Group A candidates*

Group A HPP candidates (Intermediate assessment results)														
MCA L2 Rank	**Project ID/number**	**Project name**	**Country***	**Installed capacity** *Pmax (MW)*	**Avg. annual output** *Wmax (GWh)*	**HPP** Type**	**MCA Level 2 Score**							
							Total score	**Uncert -ainty**	*Environ mental Group*	*Social Group*	*Technical Group*	*Readiness Group*	*Financial Group*
1	WB6.HMP.350	Cebren #1)	MKD	332.8	840.3	REV	70.3	±0	3.4	4.7	4.55	2.7	3.5
2	WB6.HMP.447	RHE Bistrica #2)	SER	680.0	1,550.0	REV	68.7	±0	3.75	4.1	4.45	2.2	4.2
3	WB6.HMP.124	Seke #1)	ALB	12.7	55.7	DER	66.9	±0	3.9	4.7	2.75	3.35	5
4	WB6.HMP.245	Gornja Neretva / RHE Bjelimici #2)	BIH	500.0	1,029.0	REV	66.8	±6	3.45	2.5	4.45	3.1	4.8
5	WB6.HMP.913	Kiri / Kiri 1 (Gjuraj) #1)	ALB	19.2	77.4	DER	65.4	±0	3.6	4.7	3.1	2.9	5
6	WB6.HMP.060	Suha #1)	ALB	24.0	97.7	ROR	65.3	±0	3.7	4.7	2.7	3.35	5
7	WB6.HMP.165	Begaj #1)	ALB	24.8	131.0	ROR	65.0	±0	3.5	4.7	2.6	3.7	5
8	WB6.HMP.409	Gornja Drina / RHE Buk Bijela #2)	BIH	600.0	1,164.9	REV	64.6	±1.5	3.1	4.7	4.45	1.75	4.2
9	WB6.HMP.064	Gomsiqe / HPP 1 #1)	ALB	13.3	62.0	DER	64.0	±0	3.6	4.7	2.75	3.75	3.8
10	WB6.HMP.947	Shala / Vajvisht #1)	ALB	60.0	220.8	ROR	63.1	±1.5	3.9	4.7	2.85	2.45	5
11	WB6.HMP.031	Fani / Peshqesh	ALB	34.0	118.4	ROR	62.0	±0	3.4	4.7	2.65	3.65	4
12	WB6.HMP.448	Djerdap 3 - Phase 2 #2)	SER	1,200.0	1,100.0	REV	61.2	±0	3.35	4.7	3.85	2.05	3.4
13	WB6.HMP.383	PSHP Vërmica #2)	KOS	480.0	765.0	REV	61.0	±4.4	4.1	2.5	4.2	1.8	4.2
14	WB6.HMP.264	Moraca / Zlatica (var 2)	MNE	37.0	151.0	DAM	60.6	±0	3.05	4.4	4.3	2.05	3
15	WB6.HMP.408	Vjosa / Pocem #1)	ALB	102.0	366.8	DER	60.3	±1.5	3.9	2.5	4	1.8	5
16	WB6.HMP.071	Thane and Mollas / Mollas #1)	ALB	13.6	80.0	DER	60.3	±0	3.6	4.7	2.55	3.15	4.1
17	WB6.HMP.233	Cijevna 3 #1)	BIH	13.9	69.0	ROR	59.9	±0	4.2	4.7	2.1	3.55	3
18	WB6.HMP.945	Shala / Lekaj #1)	ALB	22.2	101.8	ROR	59.5	±1.5	3.5	4.7	2.7	2.45	5
19	WB6.HMP.022	Curraj / Curraj 4 #1)	ALB	32.0	153.6	ROR	59.3	±1.5	3.25	4.7	3.05	2.55	4.3
20	WB6.HMP.011	Osumi / Polican #1)	ALB	22.5	60.7	DER	59.1	±1.5	3.6	4.7	2.7	2.75	4

Note: #1) After Final Expert Assessment this HPP is not included in a group of Recommended projects (for detail, see Table 7-8; #2) A HPP, finally included in a group of Reversible HPP projects.

Final Draft

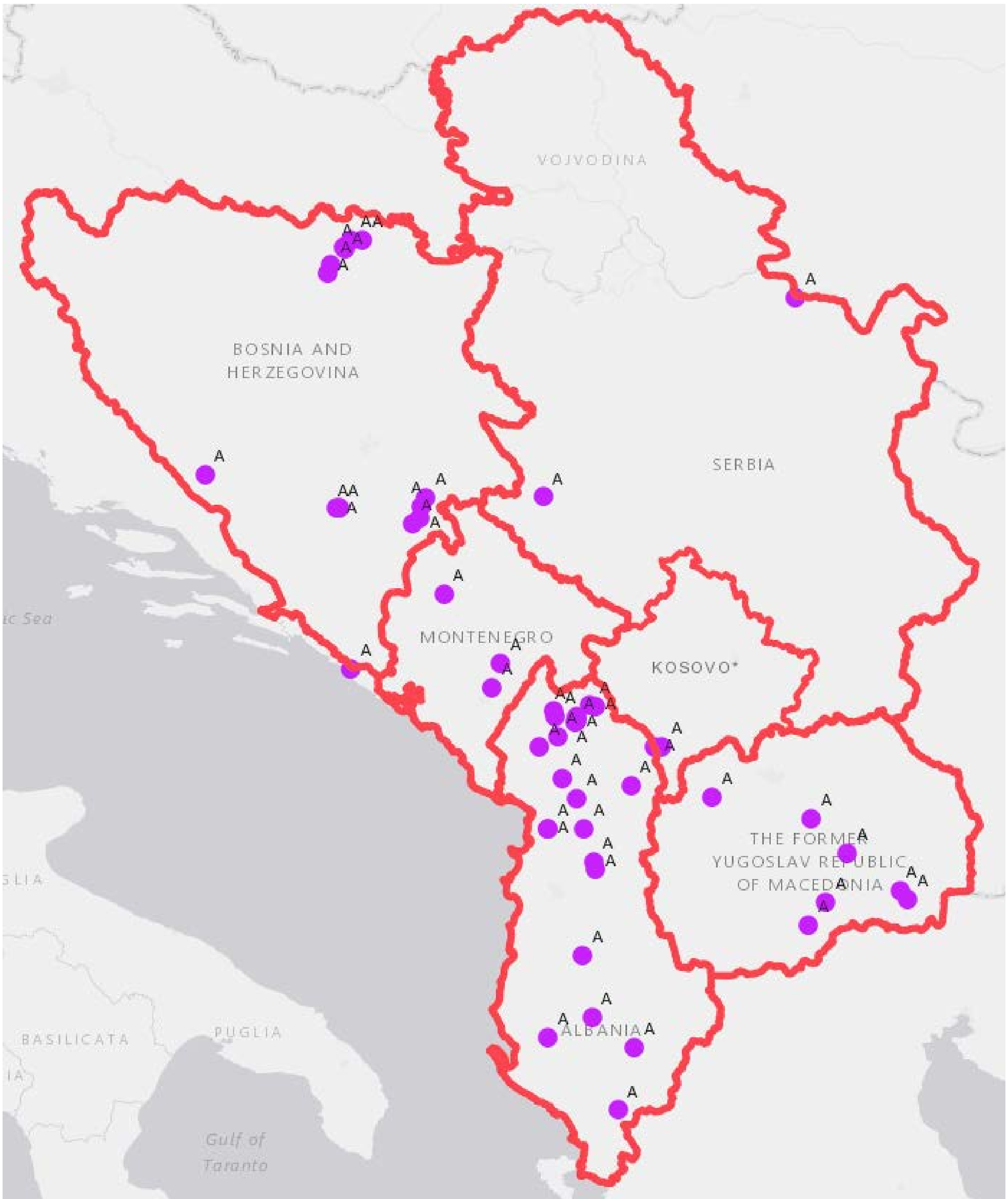
Group A HPP candidates (Intermediate assessment results)														
MCA L2 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score							
							Total score	Uncert -ainty	*Environ mental Group*	*Social Group*	*Technical Group*	*Readiness Group*	*Financial Group*
21	WB6.HMP.262	Moraca / Raslovici (var 2)	MNE	37.0	106.9	DAM	58.8	±0	3.25	4.4	4	2.05	2.7
22	WB6.HMP.944	Shala / Nderlyse #1)	ALB	19.5	101.4	ROR	58.0	±1.5	3.5	4.7	2.5	2.45	5
23	WB6.HMP.021	Curraj / Curraj 3 #1)	ALB	17.4	81.1	ROR	57.6	±1.5	3.4	4.7	2.7	2.55	4.3
24	WB6.HMP.278	Piva / Komarnica (var 2)	MNE	172.0	227.0	DAM	57.6	±0	3.45	4.4	3.9	1.6	2.9
25	WB6.HMP.351	Vardar / Veles #1)	MKD	93.1	310.4	DAM	56.6	±0	3.4	2.2	4.15	2.7	3
26	WB6.HMP.199	Gornja Drina / Paunci	BIH	43.2	166.9	DAM	55.9	±0	3.2	4.7	3	2.8	2.7
27	WB6.HMP.175	Gornja Neretva / Bjelimici	BIH	100.0	219.4	DAM	55.8	±6	3.85	2.5	3.35	3.1	2.7
28	WB6.HMP.225	CHE Vrilo #2)	BIH	66.0	196.1	REV	55.6	±1	3.6	1.6	3.95	2.75	3.5
29	WB6.HMP.015	Osumi / Nikollare #1)	ALB	27.0	72.8	DER	55.6	±1.5	3.2	4.7	2.9	2.75	3
30	WB6.HMP.349	Vardar / Gradec #1)	MKD	55.2	243.4	DAM	55.3	±0	3.6	2.2	3.8	2.7	3
31	WB6.HMP.352	Galiste	MKD	193.5	262.5	DAM	55.0	±0	2.6	4.7	3.55	2.7	2.4
32	WB6.HMP.019	Curraj / Curraj 1 #1)	ALB	10.5	48.9	ROR	55.0	±1.5	3.4	4.7	2.35	2.55	4.3
33	WB6.HMP.020	Curraj / Curraj 2 #1)	ALB	13.0	57.0	ROR	55.0	±1.5	3.4	4.7	2.35	2.55	4.3
34	WB6.HMP.231	Cijevna 1 #1)	BIH	14.1	67.7	ROR	54.6	±0	4.2	4.7	2.1	2.5	3
35	WB6.HMP.232	Cijevna 2 #1)	BIH	14.2	69.6	ROR	54.6	±0	4.2	4.7	2.1	2.5	3
36	WB6.HMP.917	Mati / Mati 1	ALB	14.7	50.0	DER	54.5	±1.5	3.2	4.7	2.55	2.55	4
37	WB6.HMP.373	Zhur / Zhur 1 #1)	KOS	262.0	342.2	DER	54.3	±2.9	3.5	2.5	4	2.4	2.4
38	WB6.HMP.933	Valbona / 15 #1)	ALB	13.8	66.5	ROR	53.8	±0	3.2	4.7	2.35	2.4	4.6
39	WB6.HMP.918	Mati / Mati 2	ALB	14.8	58.6	DER	53.3	±1.5	3	4.7	2.55	2.55	4
40	WB6.HMP.061	Shkopet / Shkopet 2 #1)	ALB	13.4	53.3	ROR	52.8	±0	3.2	4.7	2.15	2.65	4.3
41	WB6.HMP.062	Shkopet / Shkopet 3 #1)	ALB	10.6	42.1	ROR	52.8	±0	3.2	4.7	2.15	2.65	4.3
42	WB6.HMP.234	Cijevna 4 #1)	BIH	13.9	69.9	ROR	52.8	±0	3.9	4.7	2.1	2.5	3
43	WB6.HMP.410	Cijevna 5 #1)	BIH	13.2	62.4	ROR	52.8	±0	3.9	4.7	2.1	2.5	3

Final Draft

Group A HPP candidates (Intermediate assessment results)													
MCA L2 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score						
							Total score	Uncert -ainty	*Environ mental Group*	*Social Group*	*Technical Group*	*Readiness Group*	*Financial Group*
44	WB6.HMP.411	Cijevna 6 #1)	BIH	12.9	63.1	ROR	52.8	±0	3.9	4.7	2.1	2.5	3
45	WB6.HMP.198	Gornja Drina / Buk Bijela	BIH	93.5	332.3	DAM	52.5	±0	2.6	2.5	3.55	3.55	3
46	WB6.HMP.367	Tenovo #1)	MKD	35.0	140.0	ROR	52.4	±3.4	3.9	2.2	3.3	2.1	3.8
47	WB6.HMP.208	Gornja Drina / Foca	BIH	44.2	175.9	DAM	52.3	±0	2.9	4.7	3	2.3	3
48	WB6.HMP.189	Dubrovnik 2 #1)	BIH HRV	304.0	318.0	DER	51.1	±1.5	3.35	4.1	3	1.75	3.4
49	WB6.HMP.112	Skavica / Skavica 385	ALB	132.0	467.0	DER	51.0	±0	2.5	2.5	3.7	3.15	3
50	WB6.HMP.363	Vardar / Miletkovo #!)	MKD	16.7	79.7	ROR	50.9	±1.5	3.6	4.7	2.8	2.1	1.7
51	WB6.HMP.359	Vardar / Kukuricani #1)	MKD	16.9	77.5	ROR	50.4	±1.5	3.2	4.7	2.8	2.1	2.5
52	WB6.HMP.202	Gornja Neretva / Glavaticevo	BIH	28.5	108.3	ROR	50.2	±6	3.85	2.2	2.65	3.1	3
Total 52 HPP candidates (23 ROR, 12 DER, 10 DAM, 7 REV)				***5,988[6]***	***12,774***								
Total reversible (7 HPPs)				***3,859***	***6,645***								
Total without reversible: 45 HPP candidates (23 ROR, 12 DER, 10 DAM)				***2,129***	***6,129***								
Transboundary candidates: 1 HPP													

Final Draft

[6] HPP Dubrovnik 2, a trasboundary candidate between BiH and Croatia (non-WB6 country), is included in Total for WB6 with 50% of its installed capacity (MW) and 50% in average annual output (GWh), while in the row with a HPP code of WB6.HMP.189 it is shown with its 100% capacity and output.in installed capacity.



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

Figure A2.2 MCA Level 2 Results – Locations of Group A candidates

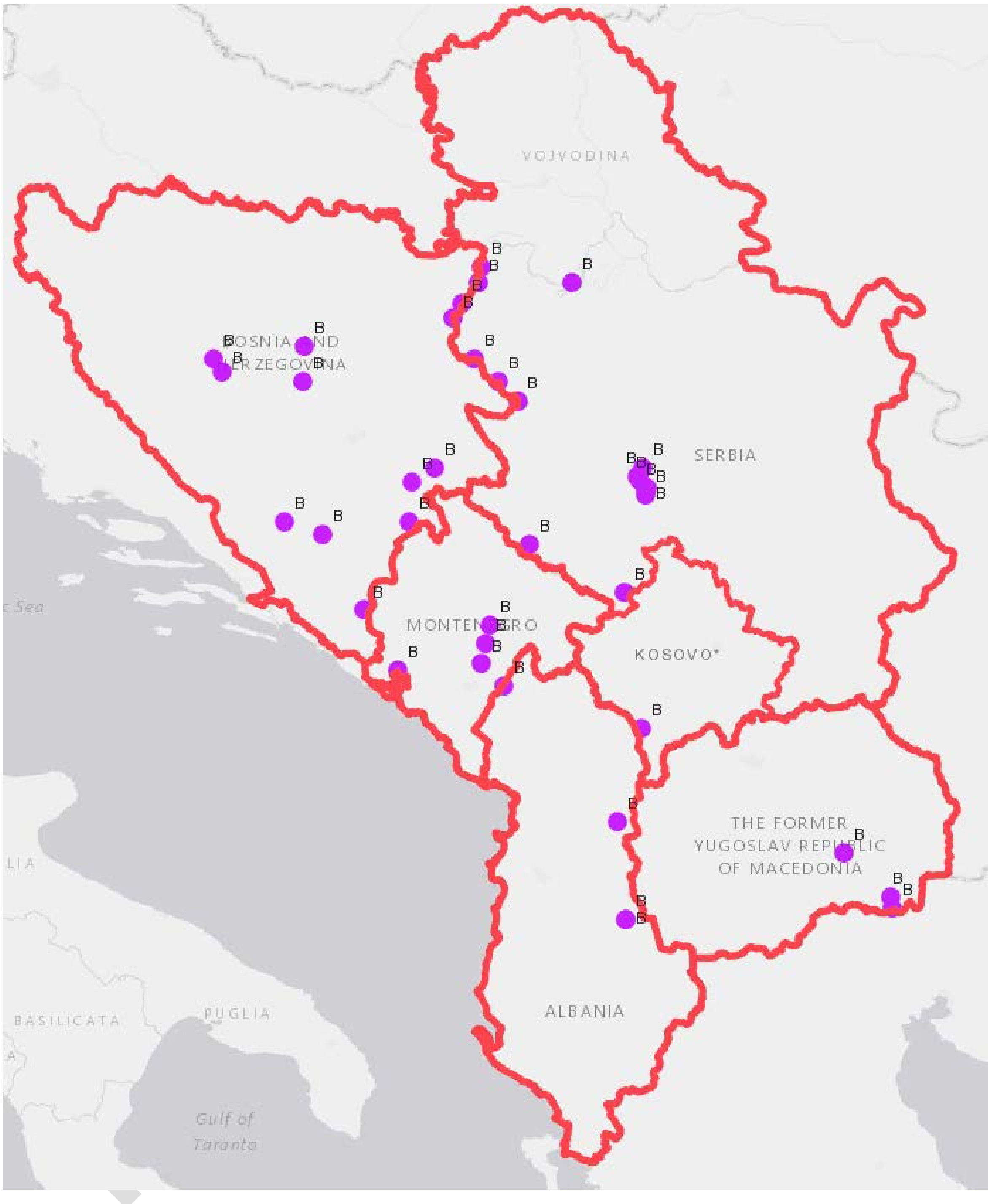
Table A2.2 Results of the MCA Level 2: *Group B candidates*

Group B HPP candidates (Intermediate assessment results)														
MCA L2 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score							
							Total score	Uncert -ainty	*Environ mental Group*	*Social Group*	*Technical Group*	*Readiness Group*	*Financial Group*
53	WB6.HMP.364	Vardar / Gjavato (Gavato)	MKD	16.7	81.8	ROR	49.8	±1.5	3.7	4.7	2.8	2.1	1
54	WB6.HMP.263	Moraca / Milunovici (var 2)	MNE	37.0	117.2	DAM	49.3	±0	3.05	2.2	4	2.05	2.7
55	WB6.HMP.404	Kupinovo	SER	140.0	530.0	ROR	49.1	±9.4	3.5	2.5	3.15	2.2	3.3
56	WB6.HMP.937	Cem / Tamare	ALB	22.6	103.0	ROR	49.1	±0	3.2	2.5	2.7	2.4	5
57	WB6.HMP.201	Ustikolina	BIH	60.5	236.8	ROR	47.9	±1.5	3.5	1.9	2.95	2.85	3
58	WB6.HMP.207	Gornji Horizonti / Bileca	BIH	33.0	116.4	DER	47.8	±0	3.4	2.2	3.2	2	3.7
59	WB6.HMP.444	Risan-Boka (var 1)	MNE BIH	225.4	661.0	DER	47.6	±1.5	3.15	1.9	4	1.3	3.7
60	WB6.HMP.374	Zhur / Zhur 2	KOS	43.0	55.4	DER	47.5	±2.9	3.5	2.5	3.1	2.4	2.4
61	WB6.HMP.261	Moraca / Andrijevo (var 2)	MNE	127.0	240.9	DAM	46.6	±0	2.75	1.9	4.2	2.05	2.2
62	WB6.HMP.260	Kostanica	MNE	552.0	1,254.0	DER	45.9	±0	2.45	1.3	4.3	1.45	4.5
63	WB6.HMP.200	Gornja Drina / Sutjeska	BIH	44.1	95.6	DER	45.8	±0	3.3	4.7	2.8	1.6	1.4
64	WB6.HMP.115	Qukes / hec-I Nr.5	ALB	10.8	50.4	ROR	45.5	±1.5	3.2	2.5	2.15	2.85	4.3
65	WB6.HMP.119	Qukes / hec-I Nr.9	ALB	15.0	84.5	ROR	44.8	±1.5	3.2	2.5	2.05	2.85	4.3
66	WB6.HMP.196	Srednja Drina / Rogacica	BIH SER	113.3	413.4	ROR	44.6	±1.5	3.1	2.5	2.95	2.25	3
67	WB6.HMP.194	Donja Drina / Drina 2	BIH SER	87.8	379.8	DAM	44.5	±1.5	3.4	2.5	3.35	1.65	2.2
68	WB6.HMP.195	Donja Drina / Drina 3	BIH SER	101.0	469.1	DAM	44.0	±1.5	3.4	2.5	3.35	1.65	2
69	WB6.HMP.111	Skavica / Katundi i Ri	ALB	49.0	206.0	DER	43.1	±0	2.5	2.5	3.25	3.15	1.2
70	WB6.HMP.193	Donja Drina / Drina 1	BIH SER	87.7	363.7	DAM	43.0	±1.5	3.2	2.5	3.15	1.65	2.7
71	WB6.HMP.192	Donja Drina / Kozluk	BIH SER	88.5	376.0	DAM	42.8	±1.5	3	2.5	3.35	1.65	2.5
72	WB6.HMP.387	Ibar / Dobre Strane	SER	14.5	55.9	ROR	41.9	±0	3.2	4.4	1.75	1.95	3
73	WB6.HMP.237	Gorazde	BIH	37.0	169.9	ROR	41.8	±1.5	3.5	2.5	2.6	1.3	3.8

Final Draft

MCA L2 Rank	Project ID/number	Project name	Country*	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score						
							Total score	Uncert -ainty	*Environ mental Group*	*Social Group*	*Technical Group*	*Readiness Group*	*Financial Group*
Group B HPP candidates (Intermediate assessment results)													
74	WB6.HMP.396	Ribarice	SER	46.7	76.1	DER	41.2	±0	2.95	4.7	2.15	2.1	1.4
75	WB6.HMP.180	Janjici	BIH	13.3	68.3	ROR	41.0	±0	3.6	2.2	2.1	2.75	2.3
76	WB6.HMP.365	Vardar / Gevgelija	MKD	16.6	84.1	ROR	41.0	±1.5	3.4	2.2	2.8	2.1	2
77	WB6.HMP.388	Ibar / Bela Glava	SER	14.6	55.5	ROR	40.6	±0	3	4.4	1.75	1.95	3
78	WB6.HMP.390	Ibar / Cerje	SER	13.2	50.1	ROR	40.6	±0	3	4.4	1.75	1.95	3
79	WB6.HMP.361	Vardar / Dubrovo	MKD	16.9	77.5	ROR	40.3	±1.5	3.4	2.2	2.8	2.1	1.7
80	WB6.HMP.206	Gornji Horizonti / Nevesinje	BIH	60.0	100.6	DER	40.1	±0	3.4	2.2	2.95	1.6	2.2
81	WB6.HMP.176	Skakala	BIH	26.4	124.3	ROR	39.8	±1.5	3.4	2.5	2.65	1.35	3
82	WB6.HMP.181	Kovanici	BIH	13.3	65.7	ROR	39.0	±0	3.7	2.5	2.1	1.65	3
83	WB6.HMP.401	Brodarevo 2	SER	33.1	129.1	ROR	38.7	±0	2.95	1.9	2.45	2.45	3
84	WB6.HMP.190	Srednja Drina / Tegare	BIH SER	120.9	448.1	ROR	38.5	±1.5	2.6	2.5	2.95	1.65	3
85	WB6.HMP.385	Ibar / Lakat	SER	13.5	54.4	ROR	37.9	±0	3.4	2.2	1.75	2.55	3
86	WB6.HMP.191	Srednja Drina / Dubravica	BIH SER	87.2	335.5	ROR	35.5	±1.5	2.8	2.5	2.75	1.65	1.9
87	WB6.HMP.184	Vinac	BIH	11.5	61.3	ROR	33.3	±1.5	3	2.2	2	1.5	3.5
88	WB6.HMP.386	Ibar / Maglic	SER	13.4	52.2	ROR	32.9	±0	3.2	2.2	1.75	1.95	2.7
89	WB6.HMP.183	Babino selo	BIH	11.5	59.9	ROR	32.8	±0	2.8	2.2	2.3	1.45	3
90	WB6.HMP.389	Ibar / Gradina	SER	11.7	41.8	ROR	32.4	±0	3	2.2	1.75	1.95	3
Total 38 HPP candidates (24 ROR, 8 DER, 6 DAM, 0 REV)				***2,430***	***7,945***								
Transboundary candidates: 8 HPPs													

Final Draft



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

Figure A2.3 MCA Level 2 Results – Locations of Group B candidates

Annex 3: Rank list of assessed HPP candidates by country

1 Albania

Table A3.1 Results for Albania

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
				Recommended projects				
1		***Mati cascade***	***Mat***	***29.5***	***108.6***	***37.3***		***41.8***
	WB6.HMP.917	*Mati 1*	*Mat*	*14.7*	*50.0*	*18.2*		*44.2*
	WB6.HMP.918	*Mati 2*	*Mat*	*14.8*	*58.6*	*19.1*		*39.7*
2		***Drini cascade***	***Drin-Bune***	***181.0***	***673.0***	***509.9***	***Tender on concession cancelled. Intention is for KESH to develop the project with strategic partner.***	***90.9***
	WB6.HMP.112	*Skavica 385*	*Drin-Bune*	*132.0*	*467.0*	*255.0*	*Tender has been cancelled. Seems that the project will be developed by KESH with foreign partner (to be selected).*	*65.8*
	WB6.HMP.111	*Katundi i Ri*	*Drin-Bune*	*49.0*	*206.0*	*255.0*	*Turkish company won concession tender. However, the tender was cancelled. Concession still not issued.*	*147.8*
				Underperforming projects				
1		***Valbona cascade***	***Drin-Bune***	***51.0***	***244.0***	***60.8***	***Concession granted 2013. Data to be verified. Further analysis required.***	***28.2***
	WB6.HMP.933	*15*	*Drin-Bune*	*13.8*	*66.5*	*15.1*		*27.9*
	WB6.HMP.926	*9A*	*Drin-Bune*	*12.8*	*60.3*	*14.0*		*28.6*
	WB6.HMP.927	*9B*	*Drin-Bune*	*1.2*	*6.0*	*1.6*		
	WB6.HMP.928	*10*	*Drin-Bune*	*1.3*	*6.3*	*1.7*		
	WB6.HMP.929	*11*	*Drin-Bune*	*8.4*	*40.2*	*10.9*	*Does not have detailed design.*	
	WB6.HMP.930	*12*	*Drin-Bune*	*4.5*	*21.8*	*5.9*		
	WB6.HMP.931	*13*	*Drin-Bune*	*4.1*	*19.7*	*5.3*	*Does not have detailed design.*	
	WB6.HMP.932	*14*	*Drin-Bune*	*2.8*	*13.4*	*3.6*		
	WB6.HMP.934	*16*	*Drin-Bune*	*2.1*	*9.8*	*2.7*		
2		***Cem cascade***	***Morača***	***52.8***	***213.1***	***37.3***	***Data to be verified. Further analysis required.***	***13.0***
	WB6.HMP.937	*Tamare*	*Morača*	*22.6*	*103.0*	*10.4*		*13.0*
	WB6.HMP.936	*Kozhnje*	*Morača*	*4.5*	*20.3*	*3.8*		
	WB6.HMP.938	*Selce*	*Morača*	*5.4*	*23.5*	*4.4*		
	WB6.HMP.939	*Selce Osoje*	*Morača*	*6.6*	*29.5*	*4.6*		
	WB6.HMP.940	*Dobrinje*	*Morača*	*3.8*	*17.7*	*3.7*		

Draft

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
	WB6.HMP.941	Broje	Morača	9.9	19.1	10.4		
3		**Zalli i Qarrishtes cascade**	**Shkumbin**	**37.5**	**149.0**	**45.0**	**Concession granted 2013.**	**36.8**
	WB6.HMP.037	HPP-3	Shkumbin	13.1	52.8	15.7		37.1
	WB6.HMP.036	HPP-2	Shkumbin	10.1	39.8	12.1		36.3
	WB6.HMP.035	HPP-1	Shkumbin	6.9	26.7	8.3		
	WB6.HMP.038	HPP-4	Shkumbin	7.4	29.7	8.9		
4		**Osumi cascade**	**Seman**	**152.2**	**410.5**	**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.**	**61.3**
	WB6.HMP.010	Peshtan	Seman	16.0	43.2	20.3		56.8
	WB6.HMP.011	Polican	Seman	22.5	60.7	24.6		49.1
	WB6.HMP.014	Lapanj	Seman	24.0	64.7	30.0		56.0
	WB6.HMP.015	Nikollare	Seman	27.0	72.8	43.3		71.5
	WB6.HMP.012	Bogove	Seman	24.0	64.7	30.7		57.2
	WB6.HMP.016	Radovice	Seman	22.5	60.7	37.6		74.4
	WB6.HMP.013	Spathare	Seman	9.0	24.3	10.3		
	WB6.HMP.017	Mosicke	Seman	7.2	19.4	23.0		
5	**WB6.HMP.124**	**Seke**	**Mat**	**12.7**	**55.7**	**8.5**	**Concession granted 2013. Recheck input data.**	**19.3**
6		**Kiri cascade**	**Drin-Bune**	**25.2**	**98.1**	**19.1**	**Concession granted 2013. Recheck input data.**	**20.6**
	WB6.HMP.913	Kiri 1	Drin-Bune	19.2	77.4	12.8	Concession granted 2013.	20.6
	WB6.HMP.914	Kiri 2 (Kashec)	Drin-Bune	6.0	20.7	6.4	Concession granted 2013.	
7	**WB6.HMP.060**	**Suha**	**Vjose**	**24.0**	**97.7**	**12.3**	**No activities. Concession granted 2011.**	**15.9**
8		**Shala cascade**	**Drin-Bune**	**127.6**	**534.9**	**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.**	**14.8**
	WB6.HMP.947	Vajvisht	Drin-Bune	60	220.8	31.8		18.1
	WB6.HMP.945	Lekaj	Drin-Bune	22.2	101.8	9.8		12.4
	WB6.HMP.944	Nderlyse	Drin-Bune	19.5	101.4	8.3		10.8
	WB6.HMP.943	Grunas	Drin-Bune	10.4	45.7	4.6		13.1
	WB6.HMP.942	Theth	Drin-Bune	7.2	32.4	6.9		
	WB6.HMP.946	Breg Lumi	Drin-Bune	8.3	32.8	8.2		
Tentative projects								
1	**WB6.HMP.408**	**Pocem**	**Vjose**	**102**	**366.8**	**66.3**	**In 2016, a Turkish company won the tender, however it has been cancelled. Initiative to stop further development on**	**22.4**

Draft

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
							Vjosa and its tributaries due to environmental concerns. Lawsuit filed contesting environmental permit.	
2		***Gomsiqe cascade***	***Drin-Bune***	***21.6***	***65.3***	***32.9***	***Project status not clear. Further investigation needed.***	***45.0***
	WB6.HMP.064	*Gomsiqe 1*	*Drin-Bune*	*13.3*	*62.0*	*23.0*		*45.0*
	WB6.HMP.065	*Gomsiqe 2*	*Drin-Bune*	*8.3*	*3.3*	*9.9*		
3		***Curraj cascade***	***Drin-Bune***	***97.6***	***456.2***	***114.2***	***No activities on the project. Project status not clear. Concession granted 2011.***	***30.5***
	WB6.HMP.022	*Curraj 4*	*Drin-Bune*	*32.0*	*153.6*	*37.1*		*29.7*
	WB6.HMP.021	*Curraj 3*	*Drin-Bune*	*17.4*	*81.1*	*20.2*		*30.5*
	WB6.HMP.019	*Curraj 1*	*Drin-Bune*	*10.5*	*48.9*	*12.2*		*30.5*
	WB6.HMP.020	*Curraj 2*	*Drin-Bune*	*13.0*	*57.0*	*15.1*		*32.4*
	WB6.HMP.023	*Marash*	*Drin-Bune*	*2.6*	*12.0*	*3.1*		
	WB6.HMP.024	*Peraj*	*Drin-Bune*	*7.0*	*33.0*	*8.4*		
	WB6.HMP.025	*Gjonpepaj*	*Drin-Bune*	*9.0*	*43.3*	*10.8*		
	WB6.HMP.026	*Lekbibaj*	*Drin-Bune*	*2.0*	*9.3*	*2.4*		
	WB6.HMP.027	*Livadhet e Medha*	*Drin-Bune*	*1.3*	*5.5*	*1.5*		
	WB6.HMP.028	*Vrana e Madhe*	*Drin-Bune*	*2.2*	*9.8*	*2.6*		
	WB6.HMP.029	*Qerec Mulaj*	*Drin-Bune*	*0.6*	*2.8*	*0.7*		
4		***Qukes cascade***	***Shkumbin***	***65.5***	***340.8***	***83.2***	***No activities on the project. Project status not clear. Concession granted 2011. Concession granted 2011.***	***32.5***
	WB6.HMP.115	*hec-I Nr.5*	*Shkumbin*	*10.8*	*50.4*	*14.7*		*35.9*
	WB6.HMP.119	*hec-I Nr.9*	*Shkumbin*	*15.0*	*84.5*	*20.9*		*30.5*
	WB6.HMP.113	*hec-I Nr.3*	*Shkumbin*	*2.9*	*12.5*	*3.5*		
	WB6.HMP.114	*hec-I Nr.4*	*Shkumbin*	*2.9*	*13.2*	*3.5*		
	WB6.HMP.116	*hec-I Nr.6*	*Shkumbin*	*4.9*	*24.4*	*5.9*		
	WB6.HMP.117	*hec-I Nr.7*	*Shkumbin*	*6.6*	*32.5*	*7.9*		
	WB6.HMP.118	*hec-I Nr.8*	*Shkumbin*	*8.6*	*41.7*	*10.3*		
	WB6.HMP.120	*hec-I Nr.10*	*Shkumbin*	*5.0*	*29.8*	*6.0*		
	WB6.HMP.121	*hec-I Nr.11*	*Shkumbin*	*5.4*	*31.5*	*6.5*		
	WB6.HMP.122	*hec-I Nr.12*	*Shkumbin*	*3.4*	*20.1*	*4.0*		
5	***WB6.HMP.165***	***Begaj***	***Drin-Bune***	***24.8***	***131.0***	***20.0***	***Concession granted 2014. Data on project status not clear.***	***19.1***
6		***Shkopet cascade***	***Mat***	***23.968***	***95.3***	***28.8***	***Concession granted 2013. Court investigation on concession tender.***	***36.80***
	WB6.HMP.061	*Shkopet 2*	*Mat*	*13.356*	*53.3*	*16.0*		*36.7*
	WB6.HMP.062	*Shkopet 3*	*Mat*	*10.612*	*42.1*	*12.7*		*36.9*
7		***Thane and Mollas cascade***	***Seman***	***17.5***	***85.0***	***21.2***	***Need to clarify the input data. Concession for Thane has been cancelled. Status of the project not clear.***	***30.7***
	WB6.HMP.071	*Mollas*	*Seman*	*13.6*	*80.0*	*17.7*	*Seems the developer is looking for further financing. Concession granted 2009.*	*30.7*
	WB6.HMP.072	*Thane*	*Seman*	*3.9*	*5.0*	*3.5*	*Concession for Thana has been cancelled.*	

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
8		***Fani cascade***	***Mat***	***52.4***	***191.5***	***62.9***	***Concession granted in 2011. Summary figures do not contain projects in construction.***	***41.9***
	WB6.HMP.031	*Peshqesh*	*Mat*	*34.0*	*118.4*	*40.8*		*41.9*
	WB6.HMP.030	*Gjegjan*	*Mat*	*7.9*	*33.6*	*9.5*		
	WB6.HMP.032	*Ura e Fanit*	*Mat*	*1.1*	*7.4*	*1.3*	*In construction*	
	WB6.HMP.033	*Fangu*	*Mat*	*74.6*	*221.4*	*177.0*	*In construction*	
	WB6.HMP.034	*Gojan*	*Mat*	*10.5*	*39.5*	*12.6*		

Table A3.2 Results of the MCA Analysis: *Group A* for Albania

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert -ainty
3	WB6.HMP.124	Seke	12.7	55.7	DER	66.88	±0
5	WB6.HMP.913	Kiri / Kiri 1 (Gjuraj)	19.2	77.4	DER	65.38	±0
6	WB6.HMP.060	Suha	24.0	97.7	ROR	65.25	±0
7	WB6.HMP.165	Begaj	24.8	131.0	ROR	65	±0
9	WB6.HMP.064	Gomsiqe / HPP 1	13.3	62.0	DER	64	±0
10	WB6.HMP.947	Shala / Vajvisht	60.0	220.8	ROR	63.125	±1.5
11	WB6.HMP.031	Fani / Peshqesh	34.0	118.4	ROR	62	±0
15	WB6.HMP.408	Vjosa / Pocem	102.0	366.8	DER	60.25	±1.5
16	WB6.HMP.071	Thane and Mollas / Mollas	13.6	80.0	DER	60.25	±0
18	WB6.HMP.945	Shala / Lekaj	22.2	101.8	ROR	59.5	±1.5
19	WB6.HMP.022	Curraj / Curraj 4	32.0	153.6	ROR	59.3125	±1.5
20	WB6.HMP.011	Osumi / Polican	22.5	60.7	DER	59.125	±1.5
22	WB6.HMP.944	Shala / Nderlyse	19.5	101.4	ROR	58	±1.5
23	WB6.HMP.021	Curraj / Curraj 3	17.4	81.1	ROR	57.625	±1.5
29	WB6.HMP.015	Osumi / Nikollare	27.0	72.8	DER	55.625	±1.5
32	WB6.HMP.019	Curraj / Curraj 1	10.5	48.9	ROR	55	±1.5
33	WB6.HMP.020	Curraj / Curraj 2	13.0	57.0	ROR	55	±1.5
36	WB6.HMP.917	Mati / Mati 1	14.7	50.0	DER	54.5	±1.5
38	WB6.HMP.933	Valbona / 15	13.8	66.5	ROR	53.75	±0
39	WB6.HMP.918	Mati / Mati 2	14.8	58.6	DER	53.25	±1.5
40	WB6.HMP.061	Shkopet / Shkopet 2	13.4	53.3	ROR	52.75	±0
41	WB6.HMP.062	Shkopet / Shkopet 3	10.6	42.1	ROR	52.75	±0
49	WB6.HMP.112	Skavica / Skavica 385	132.0	467.0	DER	51	±0
Total 23 HPP candidates (13 ROR, 10 DER)			***666.9***	***2,624.6***			

Final Draft 3

Table A3.3 Results of the MCA Analysis: *Group B* for Albania

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert -ainty
56	WB6.HMP.937	Cem / Tamare	22.6	103.0	ROR	49.13	±0
64	WB6.HMP.115	Qukes / hec-I Nr.5	10.8	50.4	ROR	45.50	±1.5
65	WB6.HMP.119	Qukes / hec-I Nr.9	15.0	84.5	ROR	44.75	±1.5
69	WB6.HMP.111	Skavica / Katundi i Ri	49.0	206.0	DER	43.13	±0
Total 4 HPP candidates (3 ROR, 1 DER)			***97.4***	***443.9***			

Table A3.4 Results of the MCA Analysis: *Group C* for Albania

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
97	WB6.HMP.010	Osumi / Peshtan	16.0	43.2	DER	57.5
98	WB6.HMP.014	Osumi / Lapanj	24.0	64.7	DER	57.5
99	WB6.HMP.016	Osumi / Radovice	22.5	60.7	DER	57.5
101	WB6.HMP.012	Osumi / Bogove	24.0	64.7	DER	57.5
131	WB6.HMP.926	Valbona / 9A	12.8	60.3	ROR	30
134	WB6.HMP.943	Shala / Grunas	10.4	45.7	ROR	22.5
135	WB6.HMP.037	Zalli i Qarrishtes / HPP-3	13.1	52.8	ROR	20
136	WB6.HMP.036	Zalli i Qarrishtes / HPP-2	10.0	39.8	ROR	20
Total 8 HPP candidates (4 ROR, 4 DER)			***132.8***	***431.9***		

Final Draft 3

2 Bosnia and Herzegovina

Table A3.5 Results for Bosnia and Herzegovina

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
Recommended projects								
1		***Gornja Neretva HPS***	***Neretva***	***128.5***	***327.7***	***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.***	***87.4***
	WB6.HMP.175	*Bjelimici*	*Neretva*	*100.0*	*219.4*	*165.7*		*90.6*
	WB6.HMP.202	*Glavaticevo*	*Neretva*	*28.5*	*108.3*	*72.9*		*80.9*
2		***Gornja Drina***	***Sava***	***225.0***	***770.7***	***574.6***		***89.5***
	WB6.HMP.208	*Foca*	*Sava*	*44.2*	*175.9*	*117.8*		*80.5*
	WB6.HMP.199	*Paunci*	*Sava*	*43.2*	*166.9*	*124.4*		*89.4*
	WB6.HMP.198	*Buk Bijela*	*Sava*	*93.5*	*332.3*	*194.4*	*"Small" (lower level) Buk Bijela with lower dam height to avoid transboundary issues with MNE.*	*70.4*
	WB6.HMP.200	*Sutjeska*	*Sava*	*44.1*	*95.6*	*138.1*	*Positive effects on downstream HPPs.*	*172.3*
Reasonably good projects								
1	***WB6.HMP.181***	***Kovanici***	***Sava***	***13.3***	***65.7***	***38.8***	***Candidate for construction within long term development plan of EP BiH.***	***71.1***
2	***WB6.HMP.180***	***Janjici***	***Sava***	***13.3***	***68.3***	***55.0***	***Candidate for construction within long term development plan of EP BiH.***	***96.6***
3	***WB6.HMP.183***	***Babino selo***	***Sava***	***11.5***	***59.9***	***30.3***	***Candidate for construction within long term development plan of EP BiH. Planned unification of design for Babino Selo and Vinac HPPs.***	***61.0***
4	***WB6.HMP.184***	***Vinac***	***Sava***	***11.5***	***61.3***	***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).***	***49.6***
5		***Srednja Drina HPS****	***Sava***	***321.5***	***1,197.0***	***878.5***	***Transboundary issues. Positive effect for downstream HPPs & water management.***	***88.1***
	WB6.HMP.196	*Rogacica**	*Sava*	*113.3*	*413.4*	*245.6*		*71.5*
	WB6.HMP.190	*Tegare**	*Sava*	*120.9*	*448.1*	*284.6*		*76.4*
	WB6.HMP.191	*Dubravica**	*Sava*	*87.2*	*335.5*	*348.2*		*124.2*
6		***Donja Drina HPS****	***Sava***	***365.0***	***1,588.6***	***1,346.5***	***Transboundary issues. Positive effect for water management and flood protection.***	***101.6***
	WB6.HMP.192	*Kozluk**	*Sava*	*88.5*	*376.0*	*303.2*		*96.7*
	WB6.HMP.194	*Drina 2**	*Sava*	*87.8*	*379.8*	*329.0*		*103.8*
	WB6.HMP.193	*Drina 1**	*Sava*	*87.7*	*363.7*	*287.1*		*94.7*

Draft

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
	WB6.HMP.195	Drina 3*	Sava	101.0	469.1	427.2		109.1
7	**WB6.HMP.176**	**Skakala**	**Neretva**	**26.4**	**124.3**	**82.3**	**Border area between "jurisdictions" of EPHZHB and EP BiH**	**79.6**
8	**WB6.HMP.201**	**Ustikolina**	**Sava**	**60.5**	**236.8**	**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.**	**71.1**
9	**WB6.HMP.237**	**Gorazde**	**Sava**	**37**	**169.9**	**56.3**	**Strong opposition from local public. Candidate for construction within long term development plan of EP BiH.**	**40.3**
Underperforming projects								
1	**WB6.HMP.267**	**Donje Krusevo****	**Sava**	**120.0**	**321.9**	**119.1**	**Option in case of "small" Buk Bijela.**	**44.9**
2	**WB6.HMP.215**	**Krusevo**	**Sava**	**10.7**	**30.8**	**33.3**	**Candidate for construction within long-term development plan of EP BiH.**	**129.5**
3	**WB6.HMP.423**	**Doboj**	**Sava**	**8.4**	**36.8**	**36.4**	**Multipurpose project (flood protection, irrigation). Inactivitiy of the concessionaire. Possibly redesign needed to adjust for higher dikes (flood protection). Possible spatial conflicts with other infrastructure (5C highway) at Cijevna 4.**	**121.0**
4	**WB6.HMP.227**	**Han Skela**	**Sava**	**12.0**	**52.0**	**24.4**		**56.7**
5	**WB6.HMP.213**	**Vrletna kosa**	**Sava**	**11.2**	**23.3**	**7.4**	**Border between "jurisdictions" of EP HZHB and ERS.**	**38.9**
6	**WB6.HMP.236**	**Ivik**	**Sava**	**11.2**	**21.9**	**7.4**	**Border between "jurisdictions" of EP HZHB and ERS.**	**41.3**
7	**WB6.HMP.214**	**Ugar-Usce**	**Sava**	**11.6**	**33.2**	**13.4**	**Border between "jurisdictions" of EP HZHB and ERS.**	**48.9**
8	**WB6.HMP.235**	**Caplje**	**Sava**	**12.0**	**56.8**	**31.7**	**Candidate for construction within long term development plan of EP BiH. Development stalled due to lack of support from municipality.**	**67.2**
9		**HPPs on Vrbas HPS**	**Sava**	**85.7**	**367.2**	**452.6**	**Project development stopped in 2010. No activities since. Water management, flood protection & irrigation role.**	**147.3**
	WB6.HMP.219	Kosjerevo	Sava	21.4	93.1	130.4		167.2
	WB6.HMP.217	Trn	Sava	21.4	89.1	73.0		98.2
	WB6.HMP.218	Laktasi	Sava	21.4	93.0	104.3		134.1
	WB6.HMP.220	Razboj	Sava	21.4	92.0	144.9		187.9
10	**WB6.HMP.229**	**Unac (Rmanj Manastir/ Monastir)**	**Sava**	**72.0**	**250.0**	**87.0**	**Area in zone of protection according to IUNC; NP Una.**	**42.3**
Tentative projects								
1	**WB6.HMP.189**	**Dubrovnik 2*****	**Trebišnjica**	**304**	**318.0**	**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.**	**65.6**

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
2	WB6.HMP.444	Risan-Boka (var 1)**	Trebišnjica	225.4	661.0	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.	53.1
3		Cijevna cascade	Sava	82.2	401.7	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. Project status not clear. Various companies hold concessions on the individual HPP projects, challenging to optimally develop the scheme.	72.8
	WB6.HMP.233	Cijevna 3	Sava	13.9	69.0	42.4		73.9
	WB6.HMP.231	Cijevna 1	Sava	14.1	67.7	36.5		64.9
	WB6.HMP.232	Cijevna 2	Sava	14.2	69.6	35.7		61.9
	WB6.HMP.234	Cijevna 4	Sava	13.9	69.9	42.4		73.0
	WB6.HMP.410	Cijevna 5	Sava	13.2	62.4	42.0		80.9
	WB6.HMP.411	Cijevna 6	Sava	12.9	63.1	44.0		83.7
4		Gornji Horizonti HPS	Trebišnjica	252.2	487.6	327.4		82.9
	WB6.HMP.207	Bileca	Trebišnjica	33.0	116.4	49.3	Tunnel Fatnicko field - Bileca is completed.	51.3
	WB6.HMP.206	Nevesinje	Trebišnjica	60.0	100.6	100.5	Positive effects on downstream HPPs.	119.5
	WB6.HMP.205	Dabar	Trebišnjica	159.2	270.6	177.6	Under construction.	
Reversible HPP canndidates								
1	WB6.HMP.245	RHE Bjelimici	Neretva	500	1,029.0	232.9	Project is a part of Gornja Neretva hydropower system.	27.9
2	WB6.HMP.409	RHE Buk Bijela	Sava	600	1,164.9	376.1	Part of Gornja Drina hydropower system	39.3
3	WB6.HMP.225	CHE Vrilo	Neretva	66	196.1	95.9		59.0

*Srednja Drina HPS and Donja Drina HPS are transboundary projects between BIH and SER.

**Donje Krusevo and Risan-Boka are transboundary projects between BIH and MNE.

***Dubrovnik 2 is transboundary project between BIH and CRO.

Final Draft

Table A3.6 Results of the MCA Analysis: *Group A* for Bosnia and Herzegovina

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert-ainty
4	WB6.HMP.245	Gornja Neretva / RHE Bjelimici	500.0	1,029.0	REV	66.81	±6
8	WB6.HMP.409	Gornja Drina / RHE Buk Bijela	600.0	1,164.9	REV	64.63	±1.5
17	WB6.HMP.233	Cijevna 3	13.9	69.0	ROR	59.875	±0
26	WB6.HMP.199	Gornja Drina / Paunci	43.2	166.9	DAM	55.875	±0

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert-ainty
27	WB6.HMP.175	Gornja Neretva / Bjelimici	100.0	219.4	DAM	55.8125	±6
28	WB6.HMP.225	CHE Vrilo	66.0	196.1	REV	55.625	±1
34	WB6.HMP.231	Cijevna 1	14.1	67.7	ROR	54.625	±0
35	WB6.HMP.232	Cijevna 2	14.2	69.6	ROR	54.625	±0
42	WB6.HMP.234	Cijevna 4	13.9	69.9	ROR	52.75	±0
43	WB6.HMP.410	Cijevna 5	13.2	62.4	ROR	52.75	±0
44	WB6.HMP.411	Cijevna 6	12.9	63.1	ROR	52.75	±0
45	WB6.HMP.198	Gornja Drina / Buk Bijela	93.5	332.3	DAM	52.5	±0
47	WB6.HMP.208	Gornja Drina / Foca	44.2	175.9	DAM	52.25	±0
48	WB6.HMP.189	Dubrovnik 2 *)	304.0	318.0	DER	51.0625	±1.5
52	WB6.HMP.202	Gornja Neretva / Glavaticevo	28.5	108.3	ROR	50.1875	±6
Total 15 HPP candidates (7 ROR, 1 DER, 4 DAM, 3 REV)			***1,709.6***	***3,953.4***			
Total reversible (3 HPP)			***1,166***	***2,390***			
Total without reversible: 12 HPP candidates			***543.6***	***1,563.4***			
Transboundary candidates: 1 HPP							

Table A3.7 Results of the MCA Analysis: *Group B* for Bosnia and Herzegovina

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert-ainty
57	WB6.HMP.201	Ustikolina	60.5	236.8	ROR	47.88	±1.5
58	WB6.HMP.207	Gornji Horizonti / Bileca	33.0	116.4	DER	47.75	±0
59	WB6.HMP.444	Risan-Boka (var 1) [7]*)	225.4	661.0	DER	47.56	±1.5
63	WB6.HMP.200	Gornja Drina / Sutjeska	44.1	95.6	DER	45.75	±0
66	WB6.HMP.196	Srednja Drina / Rogacica *)	113.3	413.4	ROR	44.63	±1.5
67	WB6.HMP.194	Donja Drina / Drina 2 *)	87.8	379.8	DAM	44.50	±1.5
68	WB6.HMP.195	Donja Drina / Drina 3 *)	101.0	469.1	DAM	44.00	±1.5
70	WB6.HMP.193	Donja Drina / Drina 1 *)	87.7	363.7	DAM	43.00	±1.5
71	WB6.HMP.192	Donja Drina / Kozluk *)	88.5	376.0	DAM	42.75	±1.5
73	WB6.HMP.237	Gorazde	37.0	169.9	ROR	41.75	±1.5
75	WB6.HMP.180	Janjici	13.3	68.3	ROR	41.00	±0
80	WB6.HMP.206	Gornji Horizonti / Nevesinje	60.0	100.6	DER	40.13	±0
81	WB6.HMP.176	Skakala	26.4	124.3	ROR	39.75	±1.5
82	WB6.HMP.181	Kovanici	13.3	65.7	ROR	39.00	±0

[7] *) Denotes transboundary candidates that are shared by two neighboring countries (for detail, see Tables 6.5-6.6).

Final Draft 3

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert-ainty
84	WB6.HMP.190	Srednja Drina / Tegare *)	120.9	448.1	ROR	38.50	±1.5
86	WB6.HMP.191	Srednja Drina / Dubravica *)	87.2	335.5	ROR	35.50	±1.5
87	WB6.HMP.184	Vinac	11.5	61.3	ROR	33.25	±1.5
89	WB6.HMP.183	Babino selo	11.5	59.9	ROR	32.75	±0
Total 18 HPP candidates (10 ROR, 4 DER, 4 DAM)			***766.5***[8]	***2,822.1***			
Transboundary candidates: 8 HPPs							

Table A3.8 Results of the MCA Analysis: *Group C* for Bosnia and Herzegovina

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
92	WB6.HMP.227	Han Skela	12.0	52.0	DAM	57.5
102	WB6.HMP.423	Doboj	8.4	36.8	ROR	57.5
108	WB6.HMP.217	Trn	21.4	89.1	ROR	55
109	WB6.HMP.218	Laktasi	21.4	93.0	ROR	55
111	WB6.HMP.235	Caplje	12.0	56.8	ROR	52.5
112	WB6.HMP.219	Kosjerevo	21.4	93.1	ROR	52.5
113	WB6.HMP.220	Razboj	21.4	92.0	ROR	52.5
116	WB6.HMP.213	Vrletna kosa	11.2	23.3	DAM	52.5
117	WB6.HMP.236	Ivik	11.2	21.9	DAM	52.5
118	WB6.HMP.214	Ugar-Usce	11.6	33.2	DAM	52.5
119	WB6.HMP.215	Krusevo	10.7	30.8	DER	47.5
120	WB6.HMP.267	Donje Krusevo *)	120.0	321.9	DAM	47.5
132	WB6.HMP.229	Unac (Rmanj Manastir/Monastir)	72.0	250.0	DAM	30
Total 13 HPP candidates (6 ROR, 1 DER, 6 DAM)			***294.8***	***1,032.8***		
Transboundary candidates: 1 HPP						

[8] Note: In the above summary tables showing the results of MCA analysis (Tables 6.5-6.6) and country tables (Tables 6.13-6.23) all transboundary HPP candidates are shown with their 100% installed capacity (MW) and average annual output (Wmax), while in Totals, such HPPs are counted with 50% of installed capacity and average annual output only. These shares represent indicative sharing and do no prejudice any final sharing of hydropower potential by the participating countries. Because all transboundary candidates are shown in tables of all participating countries, the total number of HPPs shown in Tables 6.13-6.23 is higher (148) than in Tables 6.5-6.6 (136), while the total installed capacities and average annual output values are the same.

Final Draft 3

3 The former Yugoslav Republic of Macedonia

Table A3.9 Results for the former Yugoslav Republic of Macedonia

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
Recommended projects								
1	***WB6.HMP.367***	***Tenovo***	***Vardar***	***35.0***	***140.0***	***55.0***	***Ongoing tender for Prefeasibility Study. Additional generation on the existing HPPs on Treska river cca 140 GWh and possible installation of new HPP with annual generation of 74-92 GWh.***	***47.6***
Underperforming projects								
1	***WB6.HMP.368***	***Shpilje 2 (Spilje 2)***	***Drin-Bune***	***28.0***	***20.0***	***22.0***	***Currently the development is halted as FS showed negative results due to electricity market conditions.***	***131.5***
2	***WB6.HMP.347***	***Boskov Most***	***Drin-Bune***	***68.2***	***117.0***	***156.2***	***Within NP Mavrovo. In 2017 EBRD cancelled the loan for the project.***	***159.4***
Tentative projects								
1		***Vardar cascade***	***Vardar***	***324.5***	***1,310.2***	***1,141.6***	***Ongoing tender for Prefeasibility Study. Expected change of technical solution. Storage overflows existing railway. Necessary dislocation.***	***104.4***
	WB6.HMP.359	*Kukuricani*	*Vardar*	*16.9*	*77.5*	*63.0*		*97.4*
	WB6.HMP.364	*Gjavato (Gavato)*	*Vardar*	*16.7*	*81.8*	*113.7*		*165.8*
	WB6.HMP.363	*Miletkovo*	*Vardar*	*16.7*	*79.7*	*92.2*		*138.3*
	WB6.HMP.351	*Veles*	*Vardar*	*93.1*	*310.4*	*159.5*		*62.0*
	WB6.HMP.349	*Gradec*	*Vardar*	*55.2*	*243.4*	*178.1*		*87.8*
	WB6.HMP.365	*Gevgelija*	*Vardar*	*16.6*	*84.1*	*79.9*		*113.7*
	WB6.HMP.360	*Krivolak*	*Vardar*	*16.9*	*77.6*	*65.4*		*101.0*
	WB6.HMP.362	*Demir Kapija*	*Vardar*	*24.4*	*112.1*	*130.5*		*139.1*
	WB6.HMP.356	*Babuna*	*Vardar*	*17.3*	*52.0*	*40.1*		*92.5*
	WB6.HMP.361	*Dubrovo*	*Vardar*	*16.9*	*77.5*	*86.1*		*132.9*
	WB6.HMP.358	*Gradsko*	*Vardar*	*16.9*	*63.7*	*66.2*		*124.3*
	WB6.HMP.357	*Zgropolci*	*Vardar*	*16.9*	*50.3*	*66.8*		*158.5*
2	***WB6.HMP.352***	***Galiste***	***Vardar***	***193.5***	***262.5***	***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. Project in conjunction with HPP Cebren.***	***107.5***
Reversible HPP candidates								
1	***WB6.HMP.350***	***Cebren***	***Vardar***	***332.8***	***840.3***	***380.6***	***Project dependent on realization of HPP Galiste.***	***54.7***

Final

Table A3.10 Results of the MCA Analysis: *Group A* for the former Republic of Macedonia

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert -ainty
1	WB6.HMP.350	Cebren	332.8	840.3	REV	70.25	±0
25	WB6.HMP.351	Vardar / Veles	93.1	310.4	DAM	56.63	±0
30	WB6.HMP.349	Vardar / Gradec	55.2	243.4	DAM	55.25	±0
31	WB6.HMP.352	Galiste	193.5	262.5	DAM	55	±0
46	WB6.HMP.367	Tenovo	35.0	140.0	ROR	52.375	±3.4
50	WB6.HMP.363	Vardar / Miletkovo	16.7	79.7	ROR	50.875	±1.5
51	WB6.HMP.359	Vardar / Kukuricani	16.9	77.5	ROR	50.375	±1.5
Total 7 HPP candidates (3 ROR, 3 DAM, 1 REV)			***743.2***	***1,953.8***			
Total reversible (1 HPP)			***332.8***	***840.3***			
Total without reversible (6 HPPs)			***410.4***	***1,113.5***			

Table A3.11 Results of the MCA Analysis: *Group B* for the former Republic of Macedonia

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert -ainty
53	WB6.HMP.364	Vardar / Gjavato (Gavato)	16.7	81.8	ROR	49.75	±1.5
76	WB6.HMP.365	Vardar / Gevgelija	16.6	84.2	ROR	41.00	±1.5
79	WB6.HMP.361	Vardar / Dubrovo	16.9	77.5	ROR	40.25	±1.5
Total 3 HPP candidates (3 ROR)			***50.2***	***243.5***			

Table A3.12 Results of the MCA Analysis: *Group C* for the former Republic of Macedonia

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
100	WB6.HMP.356	Vardar / Babuna	17.3	52.0	ROR	57.5
107	WB6.HMP.358	Vardar / Gradsko	16.9	63.7	ROR	55
114	WB6.HMP.357	Vardar / Zgropolci	16.9	50.3	ROR	52.5
115	WB6.HMP.368	Shpilje 2 (Spilje 2)	28.0	20.0	DAM	52.5
129	WB6.HMP.360	Vardar / Krivolak	16.9	77.6	ROR	32.5
130	WB6.HMP.362	Vardar / Demir Kapija	24.4	112.1	ROR	32.5
133	WB6.HMP.347	Boskov Most	68.2	117.0	DER	30
Total 7 HPP candidates (5 ROR, 1 DER, 1 DAM)			***188.6***	***492.7***		

Final Draft

4 Kosovo

Table A3.13 Results for Kosovo

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
Tentative projects								
1		***Zhur HPS***	***Drin-Bune***	***305***	***397.6***	***335.9***	***Transboundary issues. Water use conflicts with several SHPPs in ALB. Feasibility study needs to be revised.***	***101.2***
	WB6.HMP.373	*Zhur 1*	*Drin-Bune*	*262*	*342.2*	*288.5*		*101.0*
	WB6.HMP.374	*Zhur 2*	*Drin-Bune*	*43*	*55.4*	*47.4*		*102.4*
Reversible HPP candidates								
1	***WB6.HMP.383***	***PSHP Vërmica***	***Drin-Bune***	***480***	***765.0***	***308.6***		***48.9***

Table A3.14 Results of the MCA Analysis: *Group A* for Kosovo

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score: Total score	MCA Level 2 Score: Uncert-ainty
13	WB6.HMP.383	PSHP Vërmica	480.0	765.0	REV	61.00	±4.4
37	WB6.HMP.373	Zhur / Zhur 1	262.0	342.2	DER	54.25	±2.9
Total 2 HPP candidates (1 DER, 1 REV)			***742.0***	***1,107.2***			
Total reversible (1 HPP)			***480.0***	***765.0***			
Total without reversible (1 HPP)			***262.0***	***342.2***			

Table A3.15 Results of the MCA Analysis: *Group B* for Kosovo

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score: Total score	MCA Level 2 Score: Uncert-ainty
60	WB6.HMP.374	Zhur / Zhur 2	43.0	55.4	DER	47.50	±2.9
Total 1 HPP candidates (1 DER)			***43.0***	***55.4***			

Final Draft 3

5 Montenegro

Table A3.16 Results for Montenegro

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
Recommended projects								
1		***Morača cascade***	***Morača***	***238.0***	***616.0***	***498.4***	*MoUs signed with potential strategic partners. Negotiations ongoing. Possible redesign.*	***97.0***
	WB6.HMP.264	*Zlatica (var 2)*	*Morača*	*37.0*	*151.0*	*98.1*		*78.1*
	WB6.HMP.262	*Raslovici (var 2)*	*Morača*	*37.0*	*106.9*	*85.2*		*95.6*
	WB6.HMP.263	*Milunovici (var 2)*	*Morača*	*37.0*	*117.2*	*89.3*		*91.4*
	WB6.HMP.261	*Andrijevo (var 2)*	*Morača*	*127.0*	*240.9*	*225.8*	*Existing project documentation (PFS) is developed for HPP Andrijevo Var 1 (285 m a.s.l.). This variant (Andrijevo 2) is 250 m a.s.l.*	*112.2*
2	***WB6.HMP.278***	***Komarnica (var 2)***	***Sava***	***172.0***	***227.0***	***178.3***	*Field investigations ongoing in cooperation between EPCG and EPS.*	***94.2***
Underperforming projects								
1	***WB6.HMP.267***	***Donje Krusevo*****	***Sava***	***120.0***	***321.9***	***119.1***	*Option in case of "small" Buk Bijela.*	***44.9***
2		***Lim cascade***	***Sava***	***86.7***	***276.3***	***353.5***	*Ongoing renewal of studies to determine possible technical solution; due to land use conflicts related to previous solutions.*	***152.8***
	WB6.HMP.432	*Navotina (var 3)*	*Sava*	*15.0*	*42.2*	*31.6*		*89.9*
	WB6.HMP.272	*Plav (var 2)*	*Sava*	*13.1*	*48.8*	*57.2*		*140.2*
	WB6.HMP.275	*Mostine (var 2)*	*Sava*	*12.9*	*36.9*	*56.4*		*182.2*
	WB6.HMP.428	*Murino (var 3)*	*Sava*	*11.2*	*43.4*	*57.5*		*158.2*
	WB6.HMP.426	*Sutjeska (var 2)*	*Sava*	*12.0*	*37.0*	*52.4*		*169.1*
	WB6.HMP.276	*Jagnjilo (var 2)*	*Sava*	*11.4*	*33.5*	*49.8*		*177.4*
	WB6.HMP.320	*Tresnjevo (var 2)*	*Sava*	*11.1*	*34.5*	*48.5*		*167.8*
3	***WB6.HMP.252***	***Ljutica (var 1)***	***Sava***	***250.0***	***533.0***	***333.3***	*Project development difficult due to protected area & Tara protection declaration of MNE.*	***75.2***
Tentative projects								
1	***WB6.HMP.444***	***Risan-Boka (var 1)*****	***Trebišnjica***	***225.4***	***661.0***	***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.*	***53.1***
2	***WB6.HMP.260***	***Kostanica***	***Sava***	***552***	***1,254.0***	***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.*	***37.3***

***Donje Krusevo and Risan-Boka are transboundary projects between BIH and MNE.*

Final Draft

Table A3.17 Results of the MCA Analysis: *Group A* in Montenegro

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert -ainty
14	WB6.HMP.264	Moraca / Zlatica (var 2)	37.0	151.0	DAM	60.56	±0
21	WB6.HMP.262	Moraca / Raslovici (var 2)	37.0	106.9	DAM	58.81	±0
24	WB6.HMP.278	Piva / Komarnica (var 2)	172.0	227.0	DAM	57.5625	±0
Total 3 HPP candidates (3 DAM)			***246.0***	***484.9***			

Table A3.18 Results of the MCA Analysis: *Group B* in Montenegro

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert -ainty
54	WB6.HMP.263	Moraca / Milunovici (var 2)	37.0	117.2	DAM	49.31	±0
59	WB6.HMP.444	Risan-Boka (var 1) *)	225.4	661.0	DER	47.56	±1.5
61	WB6.HMP.261	Moraca / Andrijevo (var 2)	127.0	240.9	DAM	46.56	±0
62	WB6.HMP.260	Kostanica	552.0	1,254.0	DER	45.94	±0
Total 4 HPP candidates (2 DER, 2 DAM)			***828.7***	***1,942.6***			
Transboundary candidates: 1 HPP							

Table A3.19 Results of the MCA Analysis: *Group C* in Montenegro

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
120	WB6.HMP.267	Donje Krusevo *)	120.0	321.9	DAM	47.5
121	WB6.HMP.432	Lim / Navotina (var 3)	15.0	42.2	DER	40
122	WB6.HMP.272	Lim / Plav (var 2)	13.1	48.8	DER	37.5
123	WB6.HMP.275	Lim / Mostine (var 2)	12.9	36.9	DER	35
124	WB6.HMP.276	Lim / Jagnjilo (var 2)	11.4	33.5	DER	35
125	WB6.HMP.426	Lim / Sutjeska (var 2)	12.0	37.0	DER	35
126	WB6.HMP.320	Lim / Tresnjevo (var 2)	11.1	34.5	ROR	35
127	WB6.HMP.428	Lim / Murino (var 3)	11.2	43.4	DER	35
128	WB6.HMP.252	Tara / Ljutica (var 1)	250.0	533.0	DAM	35
Total 9 HPP candidates (1 ROR, 6 DER, 2 DAM)			***396.7***	***970.3***		
Transboundary candidates: 1 HPP						

Final Draft 3

6 Serbia

Table A3.20 Results for Serbia

SN	Project ID/number	Project name	River basin	Capacity (MW)	Electricity output (GWh)	Normalised total investment cost for reference year (mil. EUR)	Comments	LCOE
Reasonably good projects								
1		***Ibar cascade***	***Velika Morava***	***121.5***	***456.6***	***345.4***	***JV of EPS & SECI. Unclear continuation of cooperation. Likely redesign of the cascade.***	***90.7***
	WB6.HMP.388	*Bela Glava*	*Velika Morava*	*14.6*	*55.5*	*34.2*		*74.1*
	WB6.HMP.387	*Dobre Strane*	*Velika Morava*	*14.5*	*55.9*	*39.9*		*85.6*
	WB6.HMP.390	*Cerje*	*Velika Morava*	*13.2*	*50.1*	*36.1*		*86.3*
	WB6.HMP.393	*Gokcanica*	*Velika Morava*	*11.0*	*38.2*	*33.3*		*104.2*
	WB6.HMP.385	*Lakat*	*Velika Morava*	*13.5*	*54.4*	*38.3*		*84.4*
	WB6.HMP.391	*Glavica*	*Velika Morava*	*9.7*	*37.2*	*30.0*		*96.7*
	WB6.HMP.394	*Bojanici*	*Velika Morava*	*10.2*	*36.0*	*32.0*		*106.4*
	WB6.HMP.386	*Maglic*	*Velika Morava*	*13.4*	*52.2*	*41.2*		*94.8*
	WB6.HMP.392	*Usce*	*Velika Morava*	*9.8*	*35.2*	*29.8*		*101.3*
	WB6.HMP.389	*Gradina*	*Velika Morava*	*11.7*	*41.8*	*30.8*		*88.3*
2		***Srednja Drina HPS****	***Sava***	***321.5***	***1,197.0***	***878.5***	***Transboundary issues. Positive effect for downstream HPPs & water management.***	***88.1***
	WB6.HMP.196	*Rogacica**	*Sava*	*113.3*	*413.4*	*245.6*		*71.5*
	WB6.HMP.190	*Tegare**	*Sava*	*120.9*	*448.1*	*284.6*		*76.4*
	WB6.HMP.191	*Dubravica**	*Sava*	*87.2*	*335.5*	*348.2*		*124.2*
3		***Donja Drina HPS****	***Sava***	***365.0***	***1,588.6***	***1,346.5***	***Transboundary issues. Positive effect for water management and flood protection.***	***101.6***
	WB6.HMP.192	*Kozluk**	*Sava*	*88.5*	*376.0*	*303.2*		*96.7*
	WB6.HMP.194	*Drina 2**	*Sava*	*87.8*	*379.8*	*329.0*		*103.8*
	WB6.HMP.193	*Drina 1**	*Sava*	*87.7*	*363.7*	*287.1*		*94.7*
	WB6.HMP.195	*Drina 3**	*Sava*	*101.0*	*469.1*	*427.2*		*109.1*
4	***WB6.HMP.396***	***Ribarice***	***Velika Morava***	***46.7***	***76.1***	***97.3***		***152.8***
Underperforming projects								

Final Draft 3

1		***Velika Morava cascade***	***Velika Morava***	***147.7***	***645.5***	***355.4***	***JV between EPS and RWE. Unclear continuation of cooperation.***	***66.3***
	WB6.HMP.450	*Trnovce*	*Velika Morava*	*29.3*	*128.1*	*75.7*		*71.1*
	WB6.HMP.453	*Varvarin*	*Velika Morava*	*28.9*	*122.9*	*69.7*		*68.3*
	WB6.HMP.449	*Ljubicevo*	*Velika Morava*	*30.6*	*137.1*	*72.7*		*63.9*
	WB6.HMP.451	*Svilajnac*	*Velika Morava*	*28.8*	*128.0*	*68.7*		*64.6*
	WB6.HMP.452	*Mijatovac*	*Velika Morava*	*30.1*	*129.4*	*68.7*		*64.0*
Tentative projects								
1	***WB6.HMP.404***	***Kupinovo***	***Sava***	***140***	***530.0***	***250.0***	***Project seems dormant. Need to verify & confirm the development plans.***	***57.0***
2		***Brodarevo HPS***	***Sava***	***59.1***	***232.1***	***144.5***	***Environmental permit cancelled.***	***74.9***
	WB6.HMP.401	*Brodarevo 2*	*Sava*	*33.1*	*129.1*	*73.4*		*68.4*
	WB6.HMP.397	*Brodarevo 1*	*Sava*	*26.0*	*103.0*	*71.1*		*83.0*
Reversible HPP candidates								
1	***WB6.HMP.447***	***RHE Bistrica***	***Sava***	***680***	***1,550.0***	***551.1***		***43.2***
2	***WB6.HMP.448***	***Djerdap 3 - Phase 2***	***Danube***	***1,200***	***1,100.0***	***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.***	***69.8***

**Srednja Drina HPS and Donja Drina HPS are transboundary projects between BIH and SER.*

Table A 3.21 Results of the MCA Analysis: *Group A* in Serbia

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert-ainty
2	WB6.HMP.447	RHE Bistrica	680	1,550	REV	68.69	±0
12	WB6.HMP.448	Djerdap 3 - Phase 2	1,200	1,100	REV	61.19	±0
Total 2 HPP candidates (2 REV)			***1,880***	***2,650***			

Table A3.22 Results of the MCA Analysis: *Group B* in Serbia

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert-ainty
55	WB6.HMP.404	Kupinovo	140.0	530.0	ROR	49.13	±9.4
66	WB6.HMP.196	Srednja Drina / Rogacica *)	113.3	413.4	ROR	44.63	±1.5

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 2 Score	
						Total score	Uncert -ainty
67	WB6.HMP.194	Donja Drina / Drina 2 *)	87.8	379.8	DAM	44.50	±1.5
68	WB6.HMP.195	Donja Drina / Drina 3 *)	101.0	469.1	DAM	44.00	±1.5
70	WB6.HMP.193	Donja Drina / Drina 1 *)	87.7	363.7	DAM	43.00	±1.5
71	WB6.HMP.192	Donja Drina / Kozluk *)	88.5	376.0	DAM	42.75	±1.5
72	WB6.HMP.387	Ibar / Dobre Strane	14.5	55.9	ROR	41.88	±0
74	WB6.HMP.396	Ribarice	46.7	76.1	DER	41.19	±0
77	WB6.HMP.388	Ibar / Bela Glava	14.6	55.5	ROR	40.63	±0
78	WB6.HMP.390	Ibar / Cerje	13.2	50.1	ROR	40.63	±0
83	WB6.HMP.401	Brodarevo 2	33.1	129.1	ROR	38.69	±0
84	WB6.HMP.190	Srednja Drina / Tegare *)	120.9	448.1	ROR	38.50	±1.5
85	WB6.HMP.385	Ibar / Lakat	13.5	54.4	ROR	37.88	±0
86	WB6.HMP.191	Srednja Drina / Dubravica *)	87.2	335.5	ROR	35.50	±1.5
88	WB6.HMP.386	Ibar / Maglic	13.4	52.2	ROR	32.88	±0
90	WB6.HMP.389	Ibar / Gradina	11.7	41.8	ROR	32.38	±0
Total 16 HPP candidates (11 ROR, 1 DER, 4 DAM)			***643.9***	***2,437.9***			
Transboundary candidates: 7 HPPs							

Table A3.23 Results of the MCA Analysis: *Group C* in Serbia

MCA L2 Rank	Project ID/number	Project name	Installed capacity *Pmax (MW)*	Avg. annual output *Wmax (GWh)*	HPP** Type	MCA Level 1 Score
91	WB6.HMP.453	Velika Morava / Varvarin	28.9	122.9	ROR	57.5
93	WB6.HMP.449	Velika Morava / Ljubicevo	30.6	137.1	ROR	57.5
94	WB6.HMP.450	Velika Morava / Trnovce	29.3	128.1	ROR	57.5
95	WB6.HMP.451	Velika Morava / Svilajnac	28.8	128.0	ROR	57.5
96	WB6.HMP.452	Velika Morava / Mijatovac	30.1	129.4	ROR	57.5
103	WB6.HMP.391	Ibar / Glavica	9.7	37.2	ROR	57.5
104	WB6.HMP.392	Ibar / Usce	9.8	35.2	ROR	57.5
105	WB6.HMP.393	Ibar / Gokcanica	11.0	38.2	ROR	57.5
106	WB6.HMP.394	Ibar / Bojanici	10.2	36.0	ROR	57.5
110	WB6.HMP.397	Brodarevo 1	26.0	103.0	ROR	55
Total 10 HPP candidates (10 ROR)			***214.4***	***895.2***		

Final Draft 3

7 Annex 4: Example of a more detailed MCA Level 2 - Financial viability group

The assessment of financial viability and economic feasibility aims to evaluate the economic and financial performance of projects covering four main areas of the project's overall financial and economic viability:

- Cost effectiveness,
- Investability (i.e. economic feasibility),
- (private) Investor's returns and
- Bankability

These are transformed into 4 main indicators which comprise of a series of sub-indicators. All foreseen (sub)indicators can be calculated using the custom-made Discounted Cash Flows (DCF) financial model which will be developed for this exercise, assuming availability of inputs. **Inputs needed to perform financial modelling exercise are as follows**:

General Project data		
Project Name	Name	
Country	Country	
Location/River	XXXX	
Owner/Operator/Sponsor/Developer	XXXX	
Status	Operational / In construction / Planned	
Operational since (yrs.)	YYYY	
Technical Assumptions		
Total Installed Capacity	MW	0
PPA price	EUR/MWh	0
Load Factor	%	0,00%
Aux consumption	%	0%
Transmission losses	%	0%
Annual Produced Electricity	MWh	0
Specific CAPEX	EUR/MW	0
Average O&M Costs	% of CAPEX	0%
TOTAL Investment (CAPEX)	EUR	0
General Assumptions		
Inflation Rate	%	0%
PPA indexation rate	%	0%
PPA Duration	Years	0
Price after PPA expiration	EUR/MWh	0
Corporate income tax yrs. 1 – n	%	0%
Corporate income tax yrs. (n+1) - N	%	0%
Dividend withholding tax	%	0%
Concession fees and other community costs	% of CAPEX / annum	0%
Financing Assumptions		
Debt	%	0%
Equity	%	0%
Interest rate	%	0%
Loan Repayment Period	Years	0
Target Equity IRR	%	0%
Start of the operation	Date	DD.MM.YYYY

It is assumed that required inputs will be acquired with the implementation of Task 6 as per the ToR. Once the inputs for shortlisted projects are secured in line with the above given table, all crucial (sub)indicators can be calculated using the DCF-based model and then used as inputs into the scoring system of the Financial Viability part of the MCA.

After comprehensive analyses, each indicator and sub-indicator will be scored with ratings from 1 to 5, multiplied by weight and summed up with the indicators in the four remaining groups.

Rationale: The chosen indicators (Cost effectiveness, Investability, Investors returns and Bankability) capture and reflect crucial economic and financial indicators of the project's performance over its lifetime covering all involved stakeholder's interests: governments as project sponsors and representatives of societies in which projects will be built seeking the least cost of energy solutions for its end-users, private investors securing equity and the long-term debt financiers securing the dominant portion of capital required.

Indicator: Cost effectiveness

Definition: This indicator is used to evaluate overall cost effectiveness of the project. The indicator is comprised of three sub–indicators which cover three main cost categories of project development capturing the single-numbered cost reflective indicator over HPP's lifetime: Specific Capital Expenditure, Specific Operational Expenditure and Levelised Cost of Energy. Each of the sub-indicators will be given its unique weight corresponding to the importance of the sub-indicator, which will then be multiplied with the given score (0 – 5 grade) and summed up to derive the cumulative total value of the Cost Effectiveness indicator.

Rationale: From the financing point of view, to meet the vitally important availability of generated electricity criteria, project must be cost effective. The cost effectiveness of a project is equally important to all stakeholders involved in the project implementation: governments as the project sponsor representing societies and end-users, private investors whose returns and competitive position in the market are secured with the higher cost effectiveness of the project and (long term debt) financiers whose funds are secured and risks mitigated if a project has a lower cost profile over its lifetime. To capture the overall cost effectiveness of a project, three (sub)indicators have been chosen: (specific) CAPEX reflecting investment cost effectiveness, (specific) OPEX reflecting HPP's operational cost effectiveness, and the LCOE reflecting the project's total cost over lifetime including capitalised cost of financing.

Specific Capital Expenditure (CAPEX) (€/kW)

Definition: Total capital expenditure (civil works, equipment and other relevant cost) divided with total installed capacity. CAPEX does not include capitalized cost of financing.

Specific Operational Expenditure (OPEX) (€/kW/y)

Definition: Sum of variable and fixed costs divided with installed capacity

Levelised Cost of Energy - LCOE (€/MWh)

Definition: Sum of total cost over lifetime (including cost of financing) divided with sum of electricity produced over HPP's lifetime

Indicator: Investability (Economic Feasibility)

Definition: This indicator is used to evaluate the economic feasibility of a project reflecting its Investability properties – giving an overall picture of the economic soundness of the project's performance. This indicator is comprised of six sub-indicators: Net Present Value, Internal Rate of Return, Payback Period, Profitability Index, Benefit-Cost Ratio and Return on Investment. These sub-indicators are directly calculated using inputs derived from Task 6 deliverables (corresponding to the input request table given above). Investability, a.k.a. the Economic Feasibility indicator, is focused on the intrinsic economic performance of the project reflected in its incremental cash flows. Each of the sub-indicators will be given its unique weight corresponding to the

Final Draft 3

importance of the sub-indicator, which will then be multiplied with the given score (0 – 5 grade) and summed up to derive the cumulative total value of the Investability (Economic Feasibility) indicator.

Rationale: From the economic point of view, the critical presumption for a project to be considered for implementation is its overall Investability, i.e. its economic feasibility. The economic feasibility of a project signals to all stakeholders (potentially) interested in taking part in the project's implementation whether to go forward with exploring the opportunity or to reject it – all based on set of indicators which reflect whether the project makes economic sense or not.

Net Present Value – NPV (€)

Definition: The difference between the present value of cash inflows and the present value of cash outflows that the HPP generates through its lifetime.

Internal Rate of Return - IRR (%)

Definition: A discount rate that makes the net present value (NPV) of all cash flows from a project equal to zero. IRR can be considered as the rate of growth a project is expected to generate.

The payback period – PBP (years)

Definition: The length of time required to recover the cost of an investment (CAPEX) which the HPP project has required to be implemented.

Profitability Index

Definition: A ratio between present value of future cash flows of a HPP project and initial investment. It that attempts to identify the relationship between the costs and benefits of a proposed project.

7.1.1.1 *Benefit - Cost Ratio – BCR*

Definition: BCR attempts to identify the relationship between the cost and benefits of a proposed project. The BCR is calculated by dividing the total discounted value of the benefits by the total discounted value of the costs.

Return On Investment – ROI

Definition: Return on Investment (ROI) measures the amount of return on an investment relative to the project's cost. To calculate ROI, the benefit (or return) of an investment which is calculated as the difference of total gains from the investment and total costs of the investment, is divided by the cost of the investment, and the result is expressed as a percentage or a ratio.

Indicator: Private Investor Returns

Definition: This Indicator is comprised of six sub-indicators: Share of Equity, Net Present Value to Equity, Dividend IRR before withholding tax, Dividend IRR, Payback Period on Equity invested and Return on Equity. These sub-indicators are directly calculated using inputs derived from Task 6 deliverables (corresponding to the input request table given above). The Private Investor Returns Indicator is focused on equity's financial performance within the project reflected in equity cash flows and its returns. Each of the sub-indicators will be given its unique weight corresponding to the importance of the sub-indicator, which will then be multiplied with the given score (0 – 5 grade) and summed up to derive the cumulative total value of Private Investor Returns indicator.

Rationale: Assuming the high importance of private investments without which capital intensive HPP projects will hardly ever be implemented in the WB6 region, a specific indicator covering the equity side of investment has

Final Draft 3

been created – the Private Investor Returns Indicator. This indicator is used to evaluate the financial viability of a project from the (participating) equity side of the investment

Share of Equity (% of CAPEX)

Definition: Percentage share of Equity in the financing (capital) structure.

Net Present Value to Equity (€)

Definition: The difference between the present value of cash inflows and the present value of cash outflows that the HPP generates through its lifetime on the Equity portion of capital

Dividend Internal Rate of Return before withholding tax (%)

Definition: A discount rate that makes the net present value (NPV) of all cash flows from dividend (before tax) on equity invested in a project equal to zero.

Dividend Internal Rate of Return (%)

Definition: A discount rate that makes the net present value (NPV) of all cash flows from dividend after tax) on equity invested in a project equal to zero.

Payback Period (years)

Definition: The length of time required to recover the cost of equity invested in the HPP project.

Return On Investment - ROE (%)

Definition: The amount of net income returned as a percentage of shareholder's equity. The return on equity measures a project's profitability by revealing how much profit a project generates equity holders.

Indicator: Bankability

Definition: This Indicator is comprised of six sub-indicators: Minimal Cash Flow Available for Debt Service to Maximum Debt Ratio, Minimal Debt Service Coverage Ratio, Average Debt Service Coverage Ratio, Minimal Interest Service Coverage Ratio, Minimal Loan Life Coverage Ratio and Average Loan Life Coverage Ratio. These sub-indicators are directly calculated using inputs derived from Task 6 deliverables (corresponding to the input request table given above). The Bankability Indicator is focused on the overall project's financial performance and its debt service capacity and ability. Each of the sub-indicators will be given its unique weight corresponding to importance of the sub-indicator, which will then be multiplied with the given score (0 – 5 grade) and summed up to derive the cumulative total value of the Bankability indicator.

Rationale: Considering the fact that one of stakeholders of the RHMP are IFIs, as well as the fact that highly capital intensive HPP projects will hardly ever be implemented in the WB6 region if they do not meet financing institutions' requirements, a specific indicator covering the long term (debt) financing side of a particular investment has been created – the Bankability Indicator. This indicator is used to evaluate the long term debt financial viability of a project.

Min Cash Flow available for Debt Service (CFADS) to Max Debt

Definition: Ratio between minimal cash flow available for debt service (CFADS) and maximum debt expressed as the sum of interest and principal cost.

Final Draft 3

Minimal Debt-Service Coverage Ratio - DSCR Min

Definition: The minimal amount of cash flow available to pay current debt obligations in debt repayment period. The ratio states net operating income as a multiple of debt obligations due within one year, including interest, principal, sinking-fund and lease payments.

Average Debt-Service Coverage Ratio - Average DSCR

Definition: A measure of the average amount of cash flow available to pay current debt obligations in debt repayment period. The ratio states net operating income as a multiple of debt obligations due within one year, including interest, principal, sinking-fund and lease payments.

Minimal Interest-Service Coverage Ratio - Min ISCR

Definition: A measure of the minimal amount of cash flow available to pay current interest obligations in debt repayment period.

Minimal Loan Life Coverage ratio - Min LLCR

Definition: A financial ratio used to estimate minimum ability of the borrowing (project) company to repay an outstanding loan. The Loan Life Coverage Ratio (LLCR) is calculated by dividing the net present value (NPV) of the money available for debt repayment by the amount of senior debt owed by the (project) company.

Average Loan Life Coverage Ratio - Average LLCR

Definition: A financial ratio used to estimate average ability of the borrowing (project) company to repay an outstanding loan. The Loan Life Coverage Ratio (LLCR) is calculated by dividing the net present value (NPV) of the money available for debt repayment by the amount of senior debt owed by the (project) company.

Final Draft 3

Annex 5: List of used literature sources

International Hydropower Association, 2012: Hydropower Sustainability Assessment Protocol.

EBRD, 2014: Environmental and Social Policy (ESP)

EBRD, 2014a: Environmental and Social Guidance Note for Hydropower Projects of the European Bank for Reconstruction and Development

EIB, 2014: Environmental and Social Standards Handbook

IUCN, 2016: Protected Areas Categories. IUCN Official Web Site: https://www.iucn.org/theme/protected-areas/about/protected-areas-categories. Accessed: November 2016.

Final Draft 3