Hydropower Sustainability Assessment Protocol

Official Assessment

Program Sava d.o.o.

Program Sava

Croatia

Final

25/09/2014

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Assessment Date: 30/06/2014 to 04/07/2014

Project stage: Early Stage

Project size: 151-156 MW

Project type: Program of water management infrastructure and a range of run-of-river hydropower projects.

Cover page photo: The River Sava in Zagreb near the Jarun Lake recreational area, with high waters reaching the flood protection levees.

Acronyms

Acronym	Full Text
AWMPZ	Amendments to the Water Management Plan for the City of Zagreb 1992
CBA	Cost-Benefit Analysis
CBCSD	Croatian Business Council for Sustainable Development
CEI	Centre for Monitoring Business Activities in the Energy Sector and Investments
CSO	Civil Society Organisation
d.o.o.	Ltd.
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EIA	Environmental Impact Assessment
EIHP	Energy Institute Hrvoje Požar
EPZ	Elektroprojekt Zagreb
ESIA	Environmental and Social Impact Assessment
EU	European Union
DAZ	Zagreb Architects Association
FASRB	Framework Agreement on the Sava River Basin
FS	Feasibility Study
FS/CBA/SEA	Feasibility Study, Cost-Benefit Analysis and Strategic Environmental Assessment Study
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GoC	Government of Croatia
HDZ	Croatian Democratic Union
HEP	Hrvatska Elektroprivreda
HERA	Croatian Energy Regulatory Agency
HNS	Croatian People's Party
HPP	Hydro Power Plant
HSS	Croatian Peasant's Party
ICOLD	International Commission on Large Dams
IFI	International Financial Institution
IHA	International Hydropower Association
IPF	Infrastructure Projects Facility
ISRBC	International Sava River Basin Commission
MEA	Multilateral Environmental Agreements
MCA	Multi-Criteria Analysis
MSBFCS	Middle Sava Basin Flood Control System

NPV	Net Present Value
PPP	Public-Private Partnership
RBMP	River Basin Management Plan
SDP	Social Democratic Party
SEA	Strategic Environmental Assessment
SLAP	Association for the Protection of Croatian Sea and Waters
SPV	Special Purpose Vehicle
TOR	Terms of Reference
WBIF	Western Balkans Investment Framework
WFD	Water Framework Directive
WMPZ	Water Management Plan for the City of Zagreb 1982

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Executive Summary

This report presents an official assessment conducted in accordance with the Early Stage tool of the Hydropower Sustainability Assessment Protocol. The Early Stage tool concerns the strategic environment from which proposals for hydropower projects emerge and the early identification of project risks and opportunities.

This assessment is the first application of the Early Stage tool, with the aim of providing guidance for development of *Program Sava*, a multipurpose scheme planned on the Sava River in Croatia. The programme would incorporate up to seven hydropower schemes, totalling between 151 and 156 MW, and it would complete a flood protection scheme which was constructed in the 1970's but left unfinished. Currently, an area along the Sava in Zagreb between flood protection levees is regularly flooded, and the entire stretch of the Sava in Croatia is vulnerable to flooding, as occurred in eastern Croatia in May 2014. Programme objectives include: flood protection and control; replenishment of groundwater aquifers; stabilization of the riverbed and riverbanks; power generation; urban regeneration; transport; and irrigation and drainage. It is a high-profile programme, with significant implications for the long term development of Croatia's capital city.

The Government of Croatia (GoC) is considering two main options that incorporate hydropower. Both options include the re-profiling and extension of a flood diversion channel that is situated to the south of Zagreb (the Sava-Odra channel), flood control structures linking the river and channel to two retention basins, a shipping lock on the HPP furthest downstream at the city of Sisak, and bridge and road reconstruction. The principal differences between the two options are:

- Option 1 would include a total of five HPPs, whilst Option 2 would include a total of seven HPPs;
- Option 1 would encompass two larger HPPs on the Sava within the city of Zagreb, rather than four smaller HPPs in Option 2.
- HPP Prečko, which would be located immediately upstream of Zagreb and which would be used to divert flows into the Sava-Odra channel, would be larger in Option 2.

ES-1 Demonstrated Need

The need for renewable power generation is established in Croatia's National Renewable Energy Action Plan, the need for flood control is established through a number of targets and plans including the National Plan for Flood Protection, and the need for groundwater protection in general is established in Croatian Waters' Water Management Strategy. The capability of either programme option to contribute to these needs is very clear.

Both options will make a significant contribution to regeneration of the area around the river within Zagreb, and enabling cargo shipping to a port to the south of the city. However these objectives are not well-established in broadly-agreed objectives, policies or plans in Croatia.

ES-2 Options Assessment

GoC is conducting an options assessment process that compares the above two options, and a third, 'Option 0' that focuses on water management infrastructure only, without HPPs. The process consists of multi-disciplinary experts applying multi-criteria analysis to the three options, but has not involved wider stakeholders.

Assessment of a wider range of alternatives has been undertaken for energy generation, urban regeneration, and transport and navigation. Programme options are amongst the highest priorities for renewable generation and urban regeneration. Enabling navigation for category II vessels on the Sava up to Zagreb is a priority.

An assessment of wider range of alternatives to meet the objectives of flood control and groundwater replenishment is needed for the programme to be considered one of the highest priorities for these objectives.

ES-3 Policies and Plans

An initial assessment of the legal and regulatory framework has identified shortfalls in the policy context in some areas. The assessment does not cover all policies and plans, for example multi-lateral environmental

agreements. However, the programme is likely to be able to manage any shortfalls through adherence to international financer's standards, and international tendering in the selection of developers or operators of the HPPs. A broader analysis of how the programme and its individual components contribute to key policies and plans is needed, although a Strategic Environmental Assessment (SEA) process will provide part of this.

ES-4 Political Risks

The programme will face significant political risks, and is therefore trying to develop consensus across political parties and amongst civil society, through an inter-institutional Steering Board, an Expert Council, broad stakeholder involvement, and public relations activities. A more thorough political risks analysis and strategy is required to build widespread local and national support.

ES-5 Institutional Capacity

Although there is an assessment of specific capacities and some relevant institutions, there is no comprehensive assessment of capacities with reference to this programme. Program Sava is addressing some shortfalls in capacity through the Steering Board and Expert Council, stakeholder consultation, and the use of international standards. However, a fuller assessment of institutional capacity is needed if the programme is to manage critical shortfalls, gaps or complexities.

ES-6 Technical Issues and Risks

Technical issues and risks have been assessed through pre-feasibility studies carried out in 2003 and 2013, and the adaptation and development of these in a Feasibility Study including a multi-criteria analysis. This includes all possible technical risks and issues relevant to hydropower development, providing a high level of confidence that the programme can fully manage these. However it is too early to determine whether the programme, or the companies that will develop and operate the individual HPPs, can manage all technical risks and issues under a broad range of circumstances.

ES-7 Social Issues and Risks

Social issues and risks will be assessed through the SEA process. However, assessments conducted to date have not identified specific affected communities and the significance of the impacts, or covered all social risks.

To date, the programme has planned only to compensate for social impacts, with no planned measures that will go beyond compensation to ensure that affected communities experience a net benefit, and no plans to address opportunities or enhancements, for example amongst specific project-affected communities.

ES-8 Environmental Issues and Risks

Environmental issues and risks will continue to be assessed through the SEA process and the technical analyses of the Feasibility Study. However, assessments conducted to date have not identified certain issues such as invasive species, migration of fish, and downstream flow regimes.

There is no assessment of environmental opportunities or enhancements in the locality of all components.

ES-9 Economic and Financial Risks

Economic and financial evaluation is underway, and will be used to contribute to the design of a financially and economically viable programme. However it is not clear how the analysis of the financial viability of the individual components will relate to the Project Implementation Plan, Financing Plan and Procurement Plan.

In addition, the costs of environmental and social mitigation measures are not yet included in the analysis. Economic valuation of the full range of programme benefits is yet to be done, and the scope of the analysis does not encompass environmental and social externalities.

Table of Key Issues

ES-1 Demonstrated Need	➢ There is no broad agreement on the need for regeneration of the area around the river within the city of Zagreb; ➢ The need for cargo shipping to reach Zagreb is not demonstrated in the context of Croatia's Strategy for Inland Waterways Transport; ➢ There is no assessment or communication of the separate contribution of individual HPPs and programme components to programme objectives, especially flood control.
ES-2 Options Assessment	➢ Options assessment for flood control does not encompass 'greener' solutions, and for groundwater replenishment does not encompass all options; ➢ There is an opportunity to involve a wider range of stakeholders in options assessment, especially civil society groups with regard to greener alternatives and Croatian Waters with regard to groundwater replenishment.
ES-3 Policies and Plans	➢ There is a risk that the SEA process does not comprehensively identify (i) fit with policies and plans, and (ii) gaps or shortfalls in the policy and regulatory context. ➢ There is no assessment of the fit of each HPP or programme component with the policy and planning context.
ES-4 Political Risks	➢ There is no thorough political risks analysis, which would be necessary prior to the selection of the preferred option; ➢ There is an opportunity to draw upon international experience, by seeking the views of potential financers on political risk at an early stage, third party review of the analysis of political risk and anti-corruption procedures, or identification of lessons learned from publicly-popular programmes in other cities; ➢ There is an opportunity to adopt anti-corruption policies encompassing procurement procedures, whistleblowing, and human resources policies.
ES-5 Institutional Capacity	➢ There are no plans to conduct a full assessment of institutional capacities related to this programme at an early stage. ➢ There is an opportunity to build institutional strengthening into the programme and seek additional funding for this.
ES-6 Technical Issues and Risks	➢ Some technical issues are not identified in the technical assessment, specifically erosion and sedimentation resulting from the new HPPs, and the supply of materials.
ES-7 Social Issues and Risks	➢ Gaps in the SEA including loss or change of livelihood, loss of or restricted access to areas currently used for informal recreation, impacts to vulnerable groups, and community-level stakeholder engagement and support ➢ There is no assessment of enhancements beyond compensation amongst specific project-affected communities.
ES-8 Environmental Issues and Risks	➢ Gaps in the Feasibility Study and SEA concerning invasive species, migration of fish, and downstream flow regimes, and weak baseline data. ➢ There is no assessment of environmental opportunities or enhancements at the level of each HPP as part of the SEA.
ES-9 Economic and Financial Issues and Risks	➢ There is an opportunity to delineate the components as early as possible, in order that the most financially viable combination of projects can be identified. ➢ Gaps in the financial and economic analysis, concerning the full range of programme benefits, the costs of environmental and social mitigation measures, and environmental and social externalities. ➢ There is an opportunity to use independent third party review of the financial and economic analysis, and involve potential financers as early as possible.

Introduction

The Hydropower Sustainability Assessment Protocol

The Hydropower Sustainability Assessment Protocol ('the Protocol') is a framework to assess the performance of hydropower projects according to a defined set of sustainability topics, encompassing environmental, social, technical, and financial issues.

Developed by the International Hydropower Association (IHA) in partnership with a range of government, civil society and private sector stakeholders, the Protocol is a product of intensive and transparent dialogue concerning the selection of sustainability topics and the definition of good and best practice in each of these topics. Important reference documents that informed the development of the Protocol include World Bank safeguards policies, the Performance Standards of the International Finance Corporation, and the report of the World Commission on Dams. To reflect the different stages of hydropower development, the Protocol includes four assessment tools that are designed to be used separately, corresponding to the Early Stage, and Preparation, Implementation and Operation stages of a project.

Applying the Protocol delivers an evidence-based assessment of performance in each topic. Assessments rely on evidence to provide findings for each topic that are factual, reproducible, objective and verifiable. Key attributes of the Protocol are: (i) global applicability, i.e. it can be used on all types and sizes of hydropower, anywhere in the world; and (ii) consistency, i.e. the consistency of its application is carefully governed by a system of quality control encompassing accredited assessors, terms and conditions for use, and the Protocol Council[1].

The Protocol provides an effective mechanism to continuously improve sustainability performance because results identify issues that can be addressed, and the findings provide a consistent basis for dialogue with stakeholders.

Early Stage Tool

The Early Stage assessment tool is a preliminary screening tool, to assess the strategic environment from which proposals for hydropower projects emerge. An assessment using the tool will identify project risks and opportunities at an early stage, and the associated management responses. The assessment will inform a proponent on whether there is a strategic basis to move forward with a proposal, or proceed with more detailed investigations. The tool may also be useable for broader purposes, such as the identification of opportunities to improve the sustainability context of hydropower investments. The objective is to encourage better early stage analysis and identification of knowledge gaps. It is recognised that the results of such an assessment may carry a high level of confidentiality.

The Early Stage assessment tool includes nine topics related to the strategic environment, as follows:

- ES-1: Demonstrated Need;
- ES-2: Options Assessment;
- ES-3: Policies and Plans;
- ES-4: Political Risks;
- ES-5: Institutional Capacity;
- ES-6: Technical Issues and Risks;
- ES-7: Social Issues and Risks;
- ES-8: Environmental Issues and Risks; and
- ES-9: Economic and Financial Issues and Risks.

[1] Full details of the Protocol and its governance, are available on www.hydrosustainability.org.

The Early Stage assessment tool differs from the other three assessment tools because it is an assessment guide but is not a scoring protocol. This is because there may not be a clearly formulated project at this stage or a strong basis of information from which to derive sustainability scores. As soon as detailed technical, environmental, social and financial feasibility studies are undertaken, the use of the Preparation assessment tool will be appropriate.

Assessment Objectives

This assessment is the first application of the Early Stage tool, with the aim of guiding the development of *Program Sava*. Program Sava d.o.o. has defined the following objectives for the assessment:

- To understand the overall sustainability of the programme;
- To indicate where the programme performs well and where the programme presents opportunities for improvement;
- To build institutional capacity (internal and external) by adopting the Protocol as a programme audit tool and development guideline; and
- To forge new and reinforce existing alliances.

The assessment may be repeated towards the end of the programme's early stage, to provide an updated appraisal prior to detailed programme preparation.

Project Description

Program Sava is a multipurpose scheme planned on the Sava River in Croatia, from the border with the Republic of Slovenia through the capital city of Zagreb to the town of Sisak. Programme objectives include: flood protection and control; replenishment of groundwater aquifers; stabilization of the riverbed and riverbanks; power generation; urban regeneration; transport; and irrigation and drainage. The programme will consist of: the development of up to seven hydropower projects, ranging in capacity from 9 to 43 MW, with associated reservoirs and shoreline embankments in some cases; reconstruction and completion of an existing flood diversion channel (the Sava–Odra channel, to become the Sava-Sava channel) with the capacity to divert high waters from central Zagreb; a number of flood gates and sluice gates; and ship locks for navigational purposes.

The Sava River

The Sava is a tributary of the Danube, flowing through Slovenia, Croatia, along the northern border of Bosnia and Herzegovina, through Serbia, and discharging into the Danube in Belgrade. With a catchment of 97,713 km^2 and length of 990 km, the Sava is the largest tributary of the Danube by volume of water and the second largest by catchment area. The population in the Sava River basin is estimated at 8,176,000, and it connects three state capitals, Ljubljana, Zagreb and Belgrade.

The lowest recorded discharge in the period between 1926 and 1995 in Zagreb was 46.5 m^3/s and the highest 3,126 m^3/sec. The mean discharge is approximately 320 m^3/s. Figure 1 shows the location of the Sava River.

Historical Developments on the Sava River

Historically, Zagreb developed at the base of a range of hills to the north of the Sava, and expanded into the floodplains of the river Sava only in the last 100 years. In 1964, high waters flooded approximately 6,000 ha of Zagreb and the settlements of Zaprešić, Samobor, Dugo Selo, and Velika Gorica. The floods resulted in 20 fatalities, huge material damage, and the loss of tens of thousands of homes, and required the evacuation of 150,000 people.

In response, a study completed in 1973 recommended a scheme encompassing a 51 km flood diversion channel (Sava-Odra-Sava). Only 33 km of the channel was completed and flood waters currently would be dispersed at the end of the channel into surrounding farmland. In addition, protection embankments were constructed along the river in Zagreb forming a river section 100 m wide with about 200 m width of floodplain.

After the construction of the flood protection system, the city rapidly expanded in an area south of the river (the area of New Zagreb), so that the river now dissects a large metropolitan area.

Hydropower projects developed on the Sava since that time, upstream in Slovenia, have exacerbated the erosion of the riverbed of the Sava such that the spillway into the Sava-Odra diversion channel is too high. It was envisaged that the spillway would be used every three years on average when it was designed, however it has been used only six times: twice in 1979 and once in 1980, 1990, 1998 and in 2010.

Currently, the city of Zagreb is protected from a 1-in-1000 year flood. However the area between the embankments is regularly flooded, as occurred in the early part of 2014. In addition, some areas upstream and downstream in Zagreb County are not properly protected. In May 2014, with the highest recorded flows for 100 years, protection embankments downstream of Zagreb broke in two locations flooding much of eastern Croatia. This resulted in two fatalities, the flooding of 4,400 houses, and the evacuation of 17,500 people in Croatia. Impacts downstream were even more severe, with 23 fatalities in Bosnia and Herzegovina and at least 51 in Serbia.

Current Developments

In 2012, the Minister of the Economy announced that the Government of Croatia (GoC) would seek to complete the flood protection works and thereby allow the full spatial development of Zagreb by enabling development between the flood protection embankments and the riverbanks within Zagreb, thereby unifying the city. GoC asked the state-owned electricity utility, Hrvatska Elektroprivreda Group d.d. (HEP group) to establish a special purpose vehicle (SPV) to develop the concept further. Program Sava d.o.o. is this SPV, and currently consists of a team of 6-7 personnel, encompassing technical, spatial planning, financial, legal, and public relations expertise.

GoC has established an agreement governing the programme amongst the following partners: HEP, Croatian Waters (the state-owned water utility), City of Zagreb, Zagreb County, Sisak-Moslavina County, Ministry of Agriculture, Ministry of Construction and Physical Planning, Ministry of the Economy, Ministry of Environmental and Nature Protection, Ministry of Foreign and European Affairs, Ministry of Maritime Affairs, Transport, and Infrastructure, Ministry of Regional Development and European Funds, Centre for Monitoring Business Activities in the Energy Sector and Investments (CEI), and the Agency for Inland Waterways. These institutions form a Steering Board which governs Program Sava d.o.o, and is chaired by the Ministry of the Economy. In addition, Program Sava d.o.o. has established an Expert Council, consisting of a multi-disciplinary range of 26 experts, including civil society organisations, to provide guidance.

Program Sava d.o.o. contracted a conceptual study in 2012, which was completed by Elektroprojekt d.d. in February 2013, and won financing of € 1.55 million from the European Commission-financed Western Balkans Investment Framework (WBIF) for a € 2 million study comprised of a Feasibility Study (FS), Strategic Environmental Assessment (SEA) and Cost-Benefit Analysis (CBA) (the 'FS/CBA/SEA study'). Mott MacDonald and WYG consultants, as WBIF Infrastructure Project Facility (IPF) consortium members, are conducting this study using a range of subcontractors. The study is now underway, with estimated completion by August 2015. The consultants have delivered a draft 'Conceptual Solutions Report' (June 2014), which will be finalised on the basis of comments from the Expert Council and Croatian Waters by the end of September 2014. The consultants will ultimately deliver a feasibility analysis and CBA for one preferred programme option. On the basis of the consultants' conclusions, the Steering Board will decide which option to promote, and how the programme will be managed, i.e. whether Program Sava d.o.o. will continue, and which agencies (HEP, Croatian Waters, City of Zagreb, or government agencies) will manage each component, in August 2015. At this point, the Preliminary Design of the chosen option, which is not included in the scope of the FS/CBA/SEA study, will begin.

Options

The study began by defining and investigating three options for the programme, based on a series of hydropower project (HPP) proposals set out in the Water Management Plan for the City of Zagreb 1982 (WMPZ or the Croatian abbreviation VOGZ) and Amendments to the Water Management Plan for the City of Zagreb 1992 (AWMPZ or the Croatian abbreviation IDVOGZ). The IPF consultants will identify a preferred option in relation to these three options, though it may not be exactly equal to any, and the Steering Board will select a preferred option in September 2014.

"**Option 0** (Base Option)" is not a complete flood protection scheme and excludes hydropower development. It consists of separate projects to be prepared and implemented by Croatian Waters. This option includes: completion of embankments upstream of Zagreb; construction of weirs along the Sava to stabilise the river bed; lowering the spillway at the junction of the Sava and the Sava-Odra channel (the Jankomir spillway) and deepening of the channel further downstream; reprofiling of the Sava-Odra channel and its embankments; flood control structures including perimeter dykes around Lonskjo and Odrnasko retention basins, a transversal dyke crossing Odransko polje ('field' or 'land'), and a floodgate at Palanjek spillway to improve flood control into to Lonskjo polje; and bridge and road reconstruction.

Option 1 is based on a 2002 study, the 'Prefeasibility Study for Regulation and Utilisation of the Sava River from the Republic of Slovenia to Sisak' conducted by Elektroprojekt d.d. This has been updated through the IPF study using the University of Zagreb Faculty of Construction. It consists of five HPPs (HPP Podsused, HPP Prečko, HPP Drenje and HPP Zagreb, as in AWMPZ 1992, plus HPP Strelečko); re-profiling of the Sava-Odra channel and its embankments to provide increased flow capacity; extension of the existing Sava-Odra channel by 5km to join the Sava River at Stružec Posavski; embankments retaining the reservoir for HPP Podsused will also provide improved flood protection upstream of Zagreb; flood control structures including perimeter dykes around Lonskjo and Odransko retention basins, and a floodgate at Palanjek spillway to improve flood control into to Lonskjo polje; a ship lock included within HPP Strelečko; and bridge and road reconstruction.

Option 2 is based on the 2013 conceptual study. It consists of: seven hydropower plants, of which four are small hydro plants (SHPPs) – HPP Podsused, HPP Prečko, SHPP Jarun, SHPP Sanci, SHPP Petrusevec, SHPP Ivanja Reka, and HPP Sisak; construction of a new floodgate to replace the Jankomir spillway (the Lučko floodgate); re-profiling of the Sava-Odra channel and its embankments to provide increased flow capacity; extension of the existing Sava Canal by 5 km to re-join the river Sava at Stružec Posavski; embankments retaining the reservoir for HPP Podsused will also provide improved flood protection upstream of Zagreb; flood control structures including a floodgate at Palanjek spillway to improve flood control into to Lonskjo polje; a ship lock included within HPP Sisak; and bridge and road reconstruction.

The following table summarises the components of each option. The table generally lists the components from upstream at the top of the table to downstream at the end of the table. The principal differences between Options 1 and 2 are:

- HPP Prečko is larger in Option 2, providing for greater restriction of flows through Zagreb, allowing 350 ha of floodplain to be used for other purposes, and possibly greater groundwater replenishment;
- Option 2 encompasses four smaller HPPs in the Zagreb stretch, rather than four larger HPPs in Option 1.

	Option 0	**Option 1**	**Option 2**
Based on:	*Completion of the original project and additional measures to enable it to operate as originally envisaged.*	*Elektroprojekt 2002 Prefeasibility Study for Regulation and Utilisation of the Sava River from the Republic of Slovenia to Sisak*	*Elektroprojekt 2013 Conceptual Study, using updated discharges from Flood Control System Mathematical Model for the Central Sava River Basin Area*
HPP Podsused	No HPPs, but weirs to be constructed for riverbed stabilisation, and	Capacity of 44 MW, generating 172 GWh/year, with 9.6 m head, at cost of € 226 million. Two alternative layouts considered: powerhouse on the dam and power house in a	

	embankments upstream of Zagreb will be completed	diversion canal.	
HPP Prečko		Capacity of 27 MW, 4.3 m head, 11.7 km length of reservoir, operating level of 115 m ASL.	Capacity of 45 MW, generating 170 GWh/yr, 9.5 m head, 9.5 km length of reservoir, operating level of 123 m ASL, cost of € 164 million.
Jankomir spillway	Lowering of the spillway	Removal of the existing spillway, and construction of a new floodgate. This would be a 150 m-wide, gated structure, the Lučko flood gate, providing improved control of flow distribution between the river and the Sava-Odra channel.	
Sava-Odra channel	Reconstruction and rehabilitation of existing embankments	Reprofiling and deepening by 1 or 2 m, to be able to accommodate an extreme flow of up to 2500 m^3 / sec. A five kilometre extension to link the channel to the Sava river.	Reprofiling and deepening to accommodate an extreme flow of up to 4500 m^3 / sec. A five kilometre extension to link the channel to the Sava river.
HPP Medvednica	Not included	Not included	The larger HPP Prečko creates conditions that would allow water to be pumped to a potential pump storage project, HPP Medvednica, of up to 500 MW.
Zagreb HPPs	Not included	HPP Zagreb (23 MW) and HPP Drenje (35 MW). The 2002 study also examined variants of weirs instead of HPP Zagreb and differing embankments and protection from seepage.	SHPP Jarun (9.3 MW, € 38 million), SHPP Šanci (9.3 MW, € 43 million), SHPP Petruševec (9.3 MW, € 43 million), and SHPP Ivanja Reka (9.3 MW, € 43 million).
Odra pump station and sluice gate	Not included	Pump station and sluice gate at the confluence of Odra River and Sava-Sava channel, to divert flows into the Odrnasko polje.	
Palanjek sluice gate	Not included	A sluice gate to limit flows in the Sava downstream of Palanjek to 2,200 m^3/sec, by discharging flows into the Lonjsko polje.	
HPP Sisak / Strelečko	Not included	HPP Strelečko (27 MW, 4.9 m head, operating level 100 m ASL, 70 km length of reservoir). Upstream of Sisak, near the settlement of Strelečko, cutting off a meander of the Sava River. Includes a pump station to divert water to the Lonskjo retention basin, and a ship lock for navigational purposes. The reservoir will be within the existing embankments of the Sava river.	HPP Sisak (27 MW, generating 85 GWh / yr, 6.7 head, operating level 97 m ASL, ? length of reservoir € 213 million). Downstream of the town of Sisak, below the confluence with the Kupa River, and including a ship lock for navigational purposes. Reservoir will inundate 19.7 km^2 of Odransko polje. A pump station and sluice gate will be used to pump water from the Odra river into the Kupa, or regulate flows into the Odransko polje during fooding.
Flood diversion properties	*For a 1000-yr flood of 4,533 m3/s at the Lučko flood gate, discharge through Zagreb will be 3,195 m3/s and through the Sava-Odra channel 1,338 m3/s.* *For a 100-yr flood of 3,616 m3/s at the Lučko flood gate, discharge through Zagreb will be 2924 m3/s and through the Sava-Odra channel 692 m3/s.*	*For a 1000-yr flood of 5,433 m3/s at the Lučko flood gate, discharge through Zagreb will be 3250 m3/s and through the Sava-Sava channel 2,183 m3/s.* *For a 100-yr flood of 4,228 m3/s at the Lučko flood gate, discharge through Zagreb will be 2650 m3/s and through the Sava-Sava channel 1578 m3/s.*	*For a 1000-flood at the Lučko flood gate of 5237 m3/s, the discharge through Zagreb will be 737 m3/s and through the Sava-Sava channel 4500 m3/s.* *For a 100-flood at the Lučko flood gate of 4161 m3/s, the discharge through Zagreb will be 661 m3/s and through the Sava-Sava channel 3500 m3/s.*

Total MW	*Zero*	*156 MW capacity, 699 GWh/year generation*	*151 MW capacity, 636 GWh/year generation*
Transport	*No navigational benefits. Weirs would restrict navigation.*	*Not clearly defined, but would be similar to benefits of Option 2 including class IV navigation.*	*Zagreb HPPs raise water levels that enable navigation of tourist ships (classes II and III). HPP Sisak raises water levels allowing navigation of class IV (cargo) vessels to the Sava-Odra canal, allowing the development of a river port at Velika Gorica, so cargo can connecting downstream to Bosnia-Herzegovina and Serbia, and via a railway from Sisak to a potential new sea port at Rijeka.*

Terminology

Throughout this report, *Program Sava*, i.e. the programme itself, is referred to as 'the programme'. The SPV, Program Sava d.o.o., is referred to as the 'Program Sava Ltd', referring to the company and its Steering Board and Expert Council. 'Program Sava team' is used to refer to staff working in the Program Sava Ltd office. The Feasibility Study, Strategic Environmental Assessment and Cost-Benefit Analysis study is referred to as the FS/SEA/CBA study. Mott MacDonald and WYG consultants undertaking the FS/SEA/CBA study are referred to as 'the IPF consultants'.

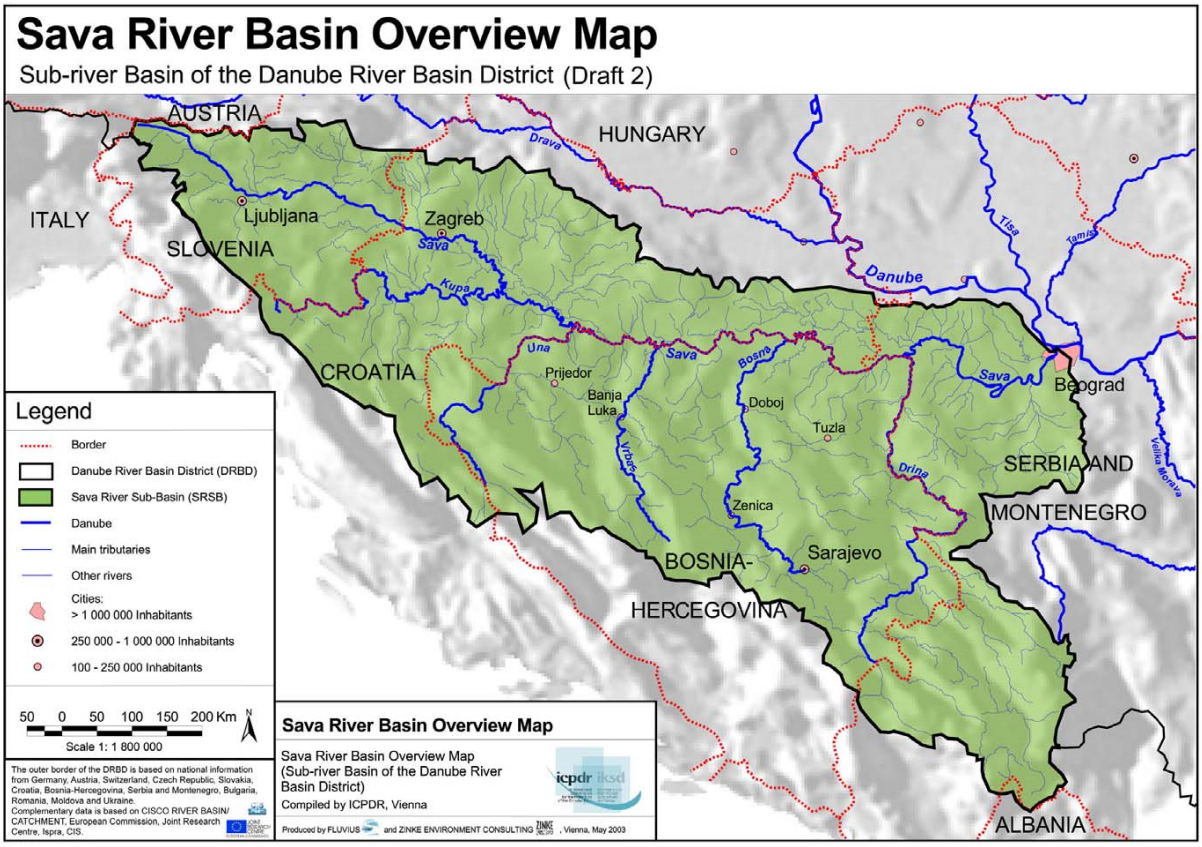


Figure 1. The Sava River Basin (map prepared by the International Commission for the Protection of the Danube River)

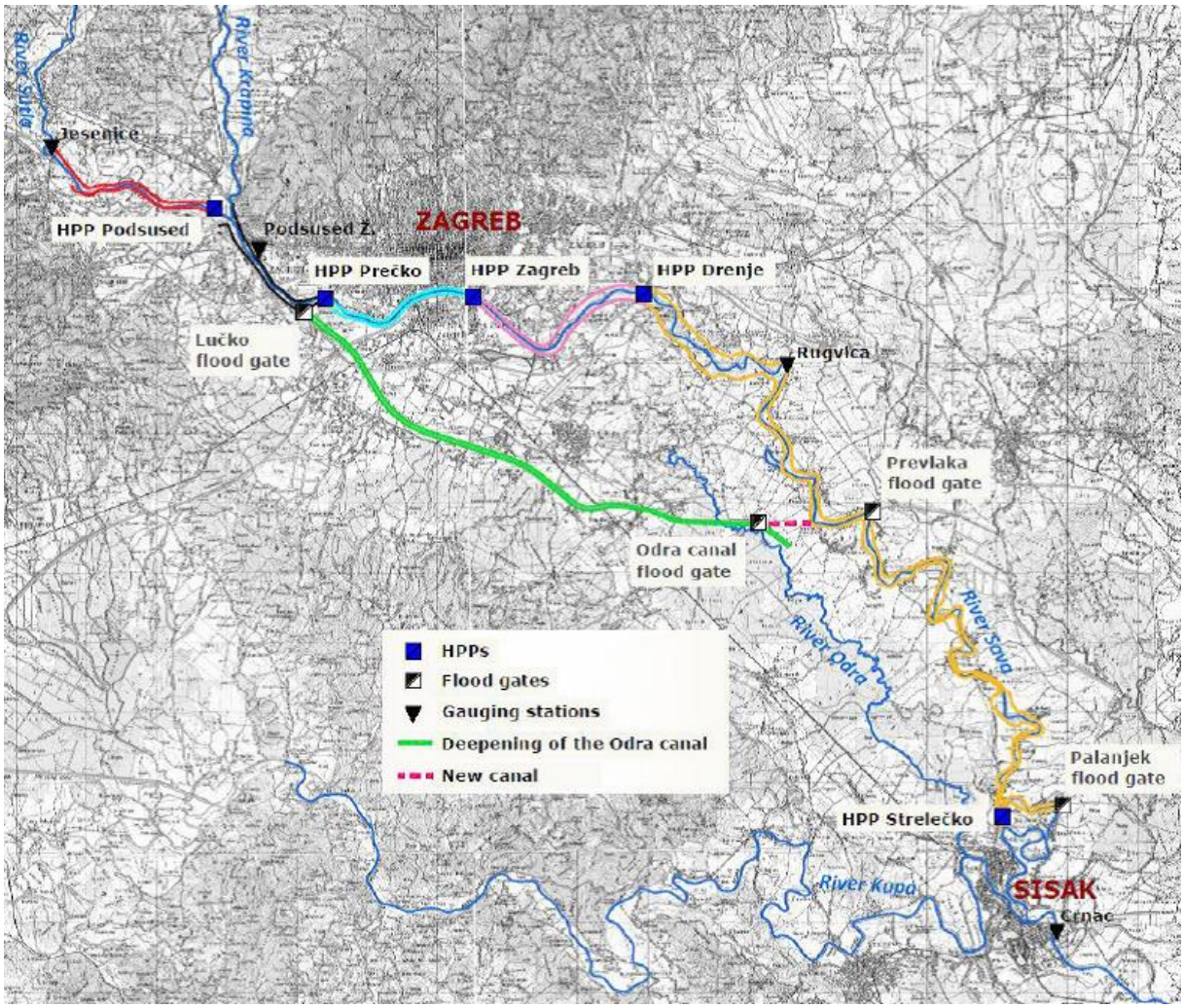


Figure 2. Main components of Option 1

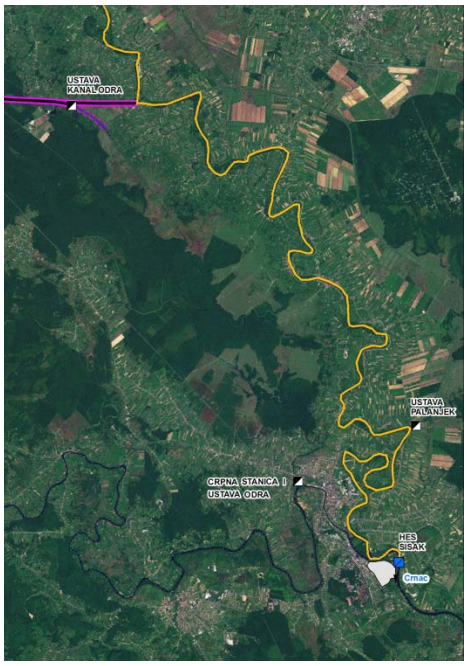


Figure 3. Components of Option 2, from Palanjek floodgate to Sisak (main components in Figure 4)

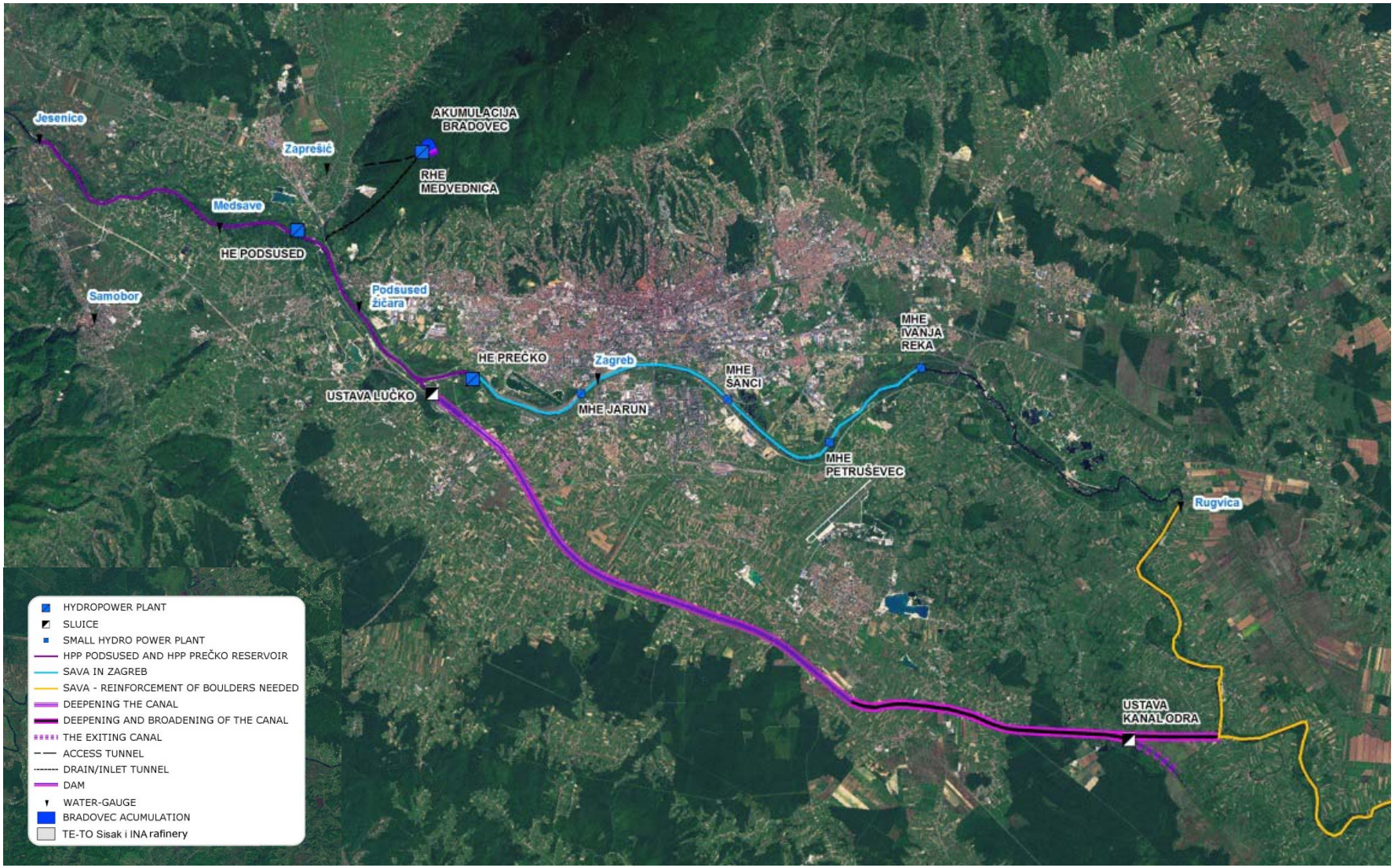
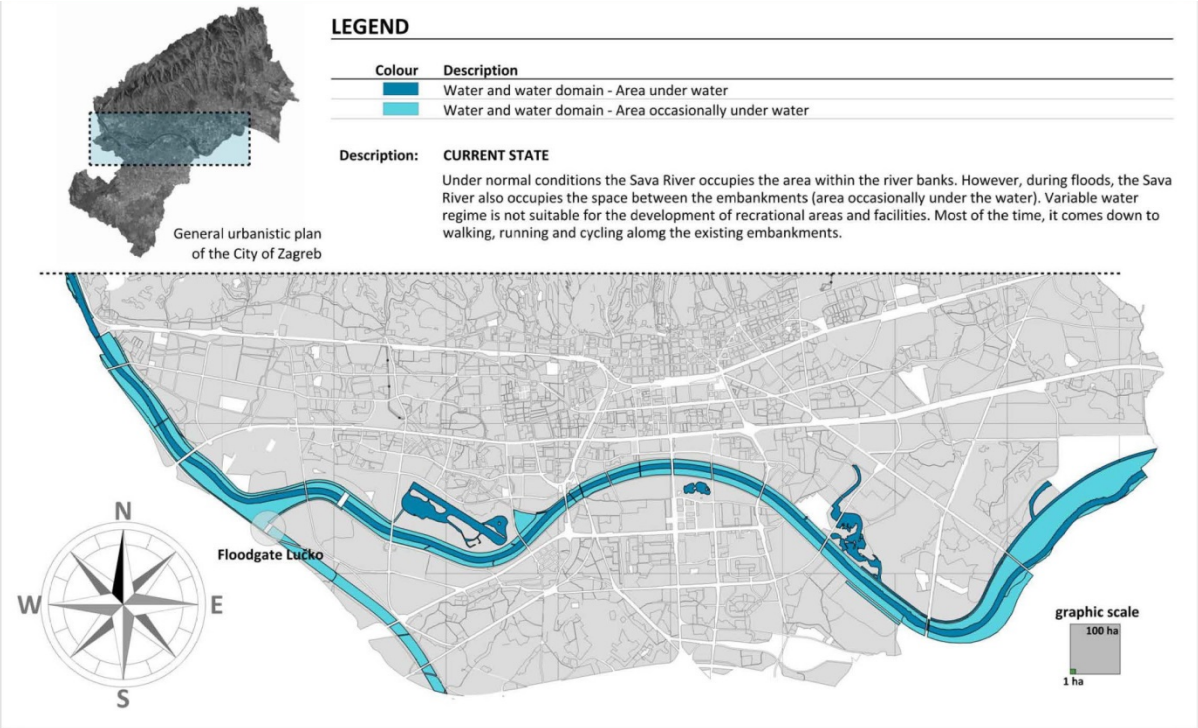


Figure 4. Main components of Option 2 as far as Palanjek floodgate.

Current state



Option 0

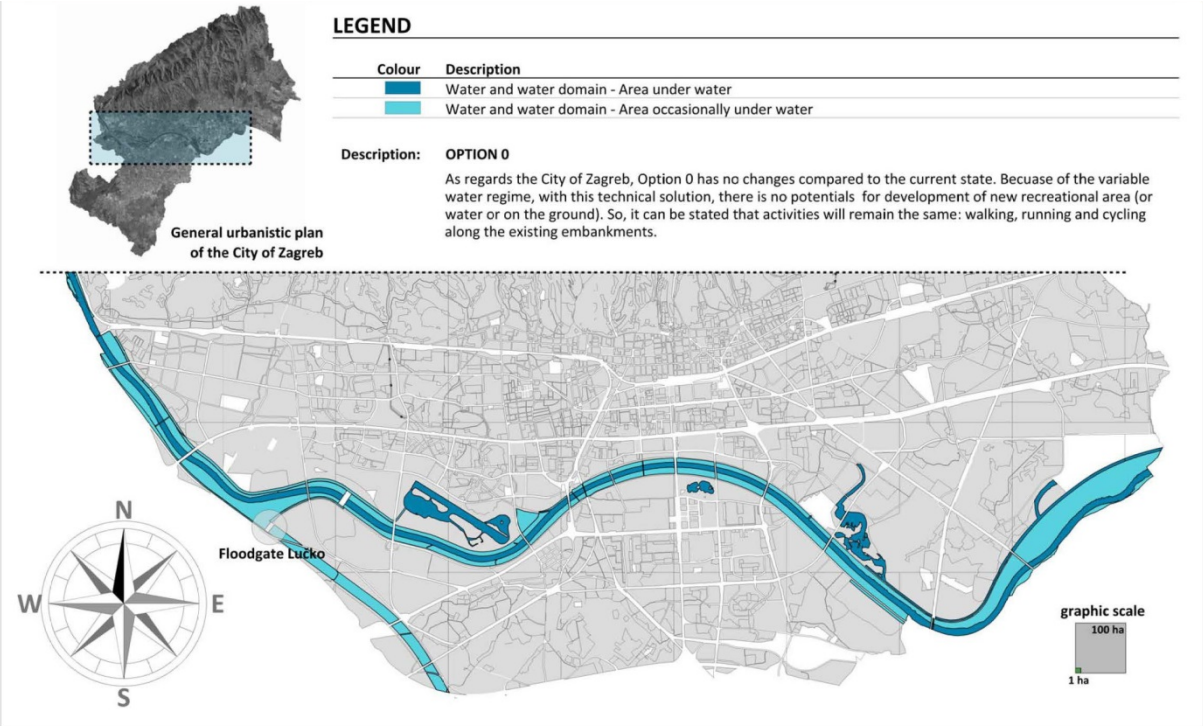
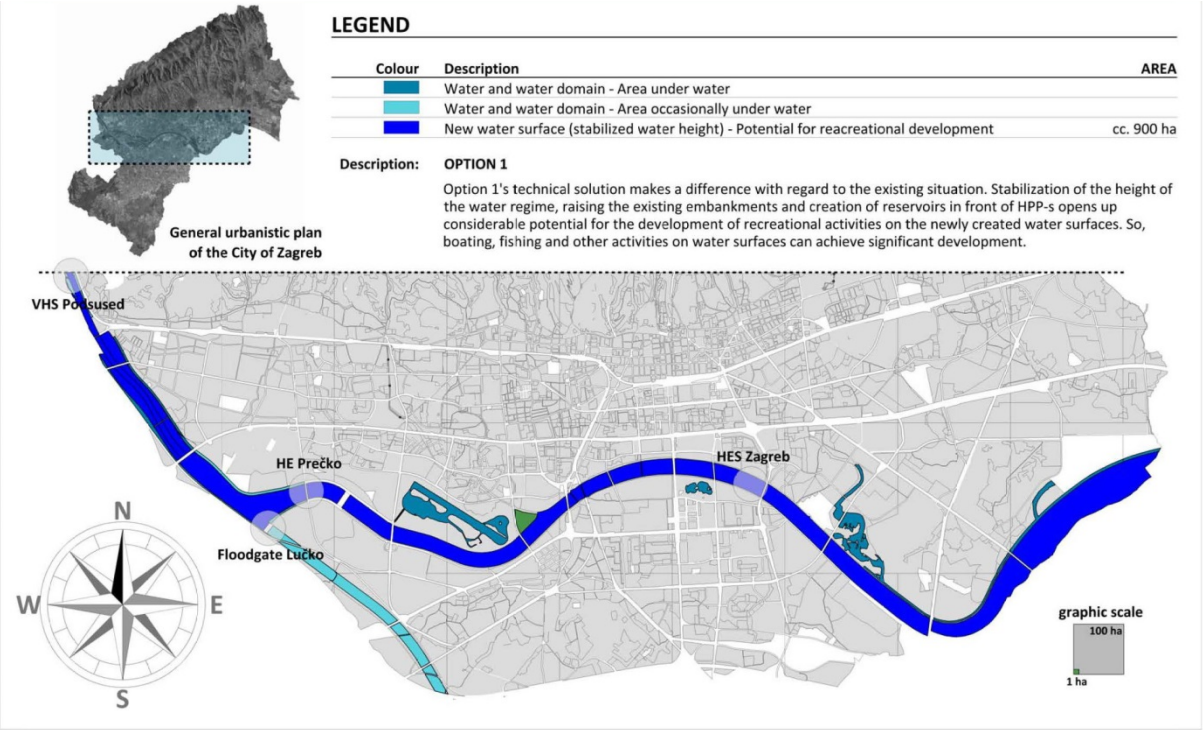
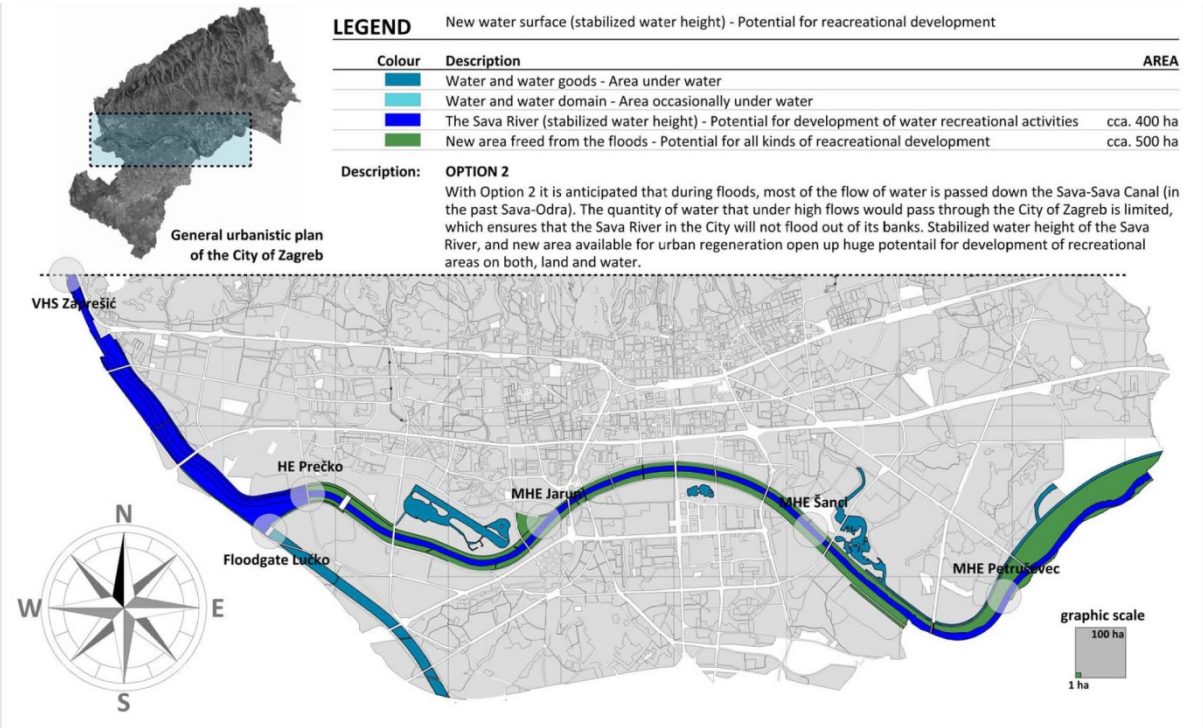


Figure 5. Comparison of options with regard to the areas of inundation within Zagreb (source: IPF3 Consultants, 2014, Conceptual Solutions Report)

Option 1



Option 2



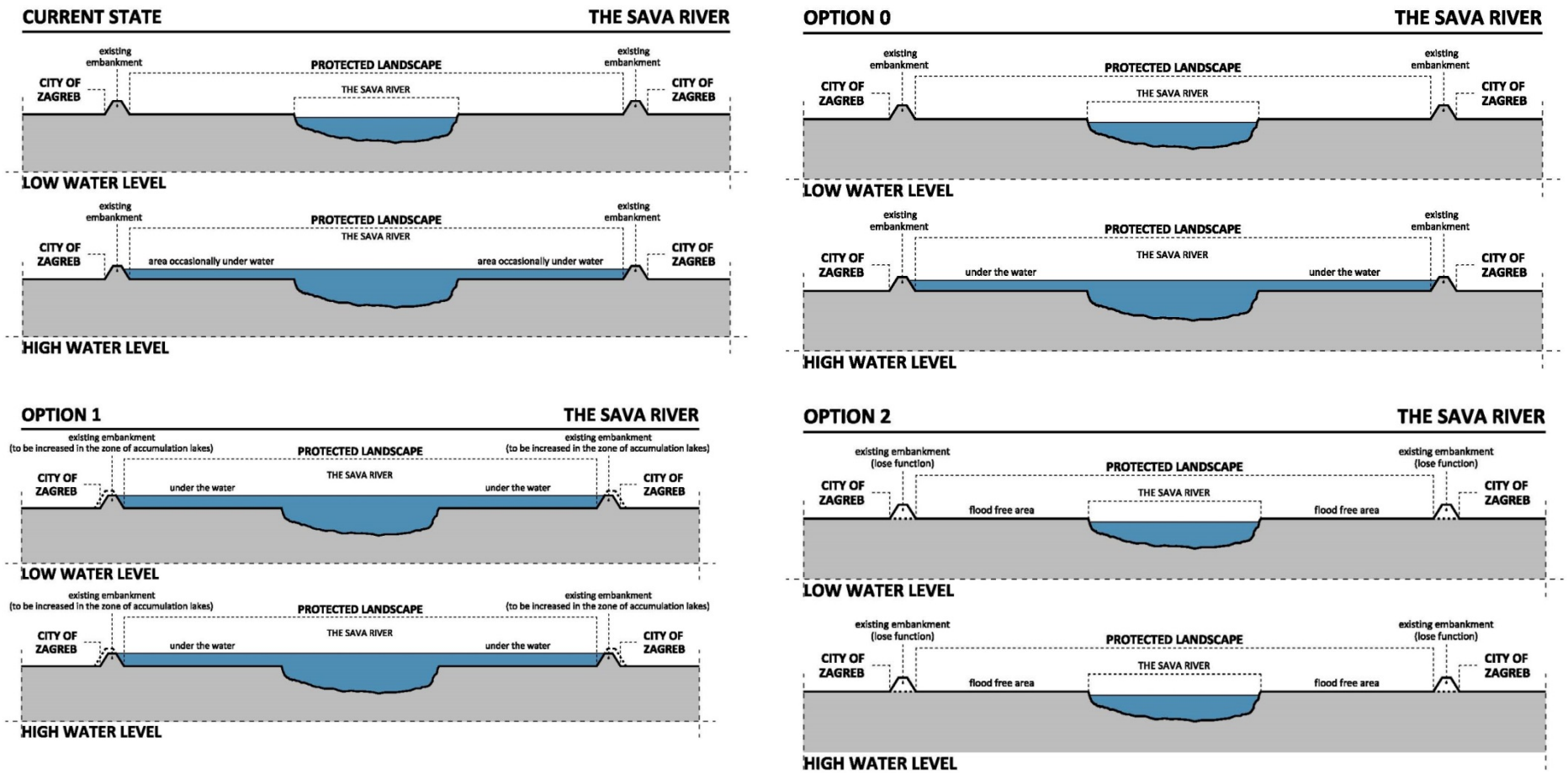


Figure 6. Comparison of options with regard to the flooding of the riverbanks and floodplain within Zagreb. Option 0 is no improvement on the current state (source: IPF3 Consultants, 2014, Conceptual Solutions Report)

Scope of the Assessment

The scope of this assessment is *Program Sava*, i.e. the entire programme. The assessors carefully considered providing separate reports for Options 0, 1 and 2, and for individual HPPs within the programme. However:

- Options 1 and 2 are so similar that findings for topics ES-1 to ES-5 would be similar for both options. If findings for topics ES-6 to ES-9 were to differ between the options, they would be better presented in a single report. It would be challenging to produce a separate report for Option 0 as it does not encompass hydropower.
- The individual components are linked in a cascade, and institutionally and financially. Findings for topics ES-1 to ES-5 would be similar for all components. If findings for topics ES-6 to ES-9 were to differ between the components, they would be better presented in a single report.

For these reasons, the scope of the assessment and the report is the entire programme. Within each topic, findings are presented for options 1 and 2, and if meaningful, option 0 and individual components. In addition, ES-2 directly addresses the question of options assessment, including option 0 and the 'do nothing' option.

Assessment Process

The assessment was conducted using the Early Stage assessment tool, which contains 9 individual topics as described above. This was the very first assessment conducted using the Early Stage tool.

The assessment was conducted as part of the Hydro4Life project, which is financed by the European Commission Life+ Programme, and aims to promote the use of the Protocol in the EU.

The on-site phase was conducted in the period 30/06/2014 to 04/07/2014, and comprised of site visits and interviews held in Zagreb.

This is an official assessment. The assessment team are accredited by the Protocol Governance Committee of the Hydropower Sustainability Assessment Council, and the assessment was conducted with the full support of Program Sava Ltd, as demonstrated by their written support, shown in Appendix A.

There was one observer of the assessment. Gerrit Bodenbender, Policy Advisor of GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH) observed the assessment to improve his understanding of the process and conduct of Protocol assessments.

Assessment Experience

Program Sava Ltd identified and arranged interviews with a large range of interviewees, ranging from the Program Sava team, to Expert Council members, ministries, Croatian Waters, HEP, the City of Zagreb administration, IPF consultants, and civil society. A total of over 45 stakeholders were interviewed, through over 40 interviews. A small number of interviews were conducted by telephone after 04/07/2014. A large amount of documentation was made available.

The Assessment Team would like to thank all of the Program Sava staff involved for organising and assisting the team during the assessment process. It is our impression that the programme is prepared by a very dedicated group of people, with a strong commitment to stakeholder relations and sustainability. We would also like to thank all the internal and external interviewees for providing their time to gather and provide a wealth of evidence, both in documentary and in verbal form.

Layout and Assessment Findings

This report consists of nine sections numbered in direct correspondence with the nine topics of the Protocol's Early Stage tool. Four appendices are provided, including the written letter of support of the project developer (required for an official Protocol assessment), and detailing the items of visual, verbal and documentary evidence referred to under each topic.

For each topic, findings are provided according to the 'Basic Expectations' and 'Advanced Expectations' used in the Early Stage Tool. A summary of the key issues concerning this topic is presented at the close of each topic section.

1 Demonstrated Need (ES-1)

This topic addresses the needs that justify management and infrastructure investments in water and energy services, as identified through broadly agreed local, national, and regional development objectives and in national and regional policies and plans. The intent is that the capability of a particular hydropower project under consideration to contribute to established needs can be demonstrated.

This topic is important in order to support sustainable development objectives at the local, national and regional levels; and avoid over-or under-investment in energy and water services. It is also important as it seeks a balanced approach between water management and needs and energy management needs.

1.1 Background Information

The programme's objectives are flood control, hydropower generation, groundwater replenishment, urban regeneration, and transport including navigation. This topic will address whether these are established needs and whether the programme will contribute to them, in turn.

Broadly agreed objectives, policies and plans setting out the need for flood control in Croatia include the Framework Agreement on the Sava River Basin (between Slovenia, Croatia, Bosnia and Herzegovina, and Serbia; FASRB), with an associated Protocol on Flood Protection, Action Plan for 2011-2015 for the implementation of the Framework Agreement, the National Plan for Flood Protection (84/2010), Croatian Waters' objective to increase the area protected from flooding from 75% to 87% by 2023, and to 100% by 2038, and the EU Floods Directive 2007/60/EC.

The National Renewable Energy Action Plan, which was adopted in October 2013 and complies with the requirements of the EU Renewables Directive 2009/28/EC is a broadly agreed plan. It sets a 20% target of renewables in energy consumption by 2020, and aims for capacity in hydropower to increase to 2,456 MW by 2020, from 2,158 MW in 2014, an increase of 298 MW (50 MW in small hydro, and 248 MW in hydro of more than 10 MW). Hydropower already provides the majority of Croatia's electricity generation, and the planned increase will contribute around 25% of the increase in renewable electricity generation. In addition, the Energy Strategy of the Republic of Croatia (Official Gazette 130/09) has three objectives of security of energy supply, competitiveness of the energy system, and sustainable energy development.

Broadly agreed objectives, policies and plans concerning water resources in Croatia include the Sava River Basin Management Plan, developed according to the requirements of the EU Water Framework Directive 2000/60/EC (WFD), and the Water Management Strategy developed and implemented by Croatian Waters.

The City of Zagreb Development Strategy for the Period Ending 2013 (ZagrebPlan) was developed by the City Office for Strategic Planning and Development of the City through an extensive participative process. It identifies broadly agreed strategic goals and development priorities concerning the urban regeneration of Zagreb. The City of Zagreb is preparing a new ZagrebPlan for the period up to 2020.

Broadly agreed objectives, policies and plans setting out needs for transport and navigation in Croatia include the Development Strategy for Inland Waterway Transport in the Republic of Croatia (2008-2018), developed to support the implementation of the Integrated European Action Programme for Inland Navigation Transport, and the Protocol on Navigation under the FASRB.

The Sava River Basin Management Plan (RBMP) has been developed according to the requirements of the EU WFD which establishes a legal framework to protect and enhance the status of all waters and protected areas including water dependent ecosystems, prevent their deterioration and ensure long-term, sustainable use of water resources. The FASRB coordinated by the International Sava River Basin Commission (ISRBC) has created

the conditions for the preparation of the Sava RBMP according to the WFD. As the first step of this process the Sava River Basin Analysis (SRBA) was developed and published in 2009.

Our findings are presented below for the programme in general, distinguishing between Options 1 and 2 and individual components or HPPs where necessary. Findings on the assessment of a wider range of options that may meet these needs is provided under ES-2 Options Assessment. Findings on the 'fit' of the programme with policies and plans are provided under ES-3 Policies and Plans, whilst findings on whether the programme addresses the needs set out in the plans are presented here.

1.2 Detailed Topic Evaluation

1.2.1 Basic Expectations

Assessment

Statement: *An assessment of identified needs for water and energy services has been undertaken that includes environmental, social and economic considerations.*

The capability of the programme to contribute the needs of flood control, power generation, water resources protection, urban regeneration and navigation has been assessed on a number of occasions in recent decades. The need for flood control identified following the floods of 1964 led directly to the construction of the water management infrastructure that the programme would now complete. The Water Management Plan for the City of Zagreb 1982 (WMPZ), amended in 1992 (AWMPZ) concerning flood control provide the basis for conceptual designs underlying **both Options 1 and 2**.

Elektroprojekt Zagreb (EPZ), a Croatian company of consulting engineers, developed the designs that have evolved into the programme in order to meet the above needs, firstly through the 'Prefeasibility Study for the Regulation and Utilisation of the Sava River from the Slovenian Border to Rugvica' in 2002, and recently through the "Multifunctional Water Engineering System for Regulation of the Sava River and the Area behind its Banks from the Border of Slovenia to Sisak" (commonly described as "the conceptual study") in 2013.

Recently, as part of the FS/SEA/CBA study, IPF consultants have carried out more detailed studies, and have presented findings in the Conceptual Solutions Report according to a series of objectives that were identified by the Program Sava Expert Council. Most objectives relate directly to the above needs, including:

- An adequate hydro-technical solution that achieves flood control of areas along the river from the border with Slovenia to Sisak;
- Utilise hydropower potential of the river Sava from the border with Slovenia to Sisak;
- Securing the long-term water supply requirements of Zagreb and Velika Gorica by increasing the capacities and quality of drinking water (resulting from groundwater replenishment);
- Releasing the existing urban corridor of the river Sava which is now reserved for high waters, and which allows the "Zagreb on Sava" concept; and
- Enabling the navigability of the river to Prevlaka and beyond via the drainage channel Sava-Sava to Velika Gorica.

The IPF consultants have facilitated multicriteria analysis of how **both Options 1 and 2** meet these objectives, through a multi-stakeholder workshop held in June 2014.

These assessments have included environmental, social and economic considerations, through (i) the inherent environmental and social objectives of flood control, water protection etc., and (ii) specific analyses of environmental and social risks and economic aspects of the options. Please refer to ES-7, ES-8, and ES-9 for details.

Outcomes

Statement: *Needs for energy and water service projects have been demonstrated.*

Needs for flood control and power generation are well established, and the capability of the programme to contribute to these needs has been demonstrated. Needs for groundwater replenishment, urban regeneration and transport and navigation are less well established, but the programme can contribute to these needs. The contribution of individual HPPs or components within the programme to these needs has not been demonstrated, at least not for all needs.

The need for flood control on the Sava is very well established. In May 2014, as a result of heavy rainfall over only three days, severe flooding affected 1.6 million people on the Sava in Serbia, Bosnia and Herzegovina, and Croatia, with numerous fatalities. In addition, the Sava in Zagreb flooded the full width between the levees. The programme would avoid or manage these events. The Conceptual Solutions Report shows that **Option 2** will keep river flows through Zagreb City within the river channel, whilst **Option 1** will keep river flows within the levees. This is due to the larger size and capacity of the Zagreb HPPs in Option 1. Option 2 frees 500 ha from flood risk in the City of Zagreb, compared with only 12 ha under Option 1. However, the report does not clearly describe the effectiveness of flood control further downstream towards and beyond Sisak (the stretch worst affected by flooding this year), and it does not distinguish the effectiveness of Options 1 and 2, or the effectiveness of the lower infrastructure (Odra Pump Station, Palanjek Sluice Gate and HPP Strelečko or HPP Sisak). It does not separately distinguish the role or effectiveness of the other components, such as HPP Podsused, in flood control.

The need for renewable power generation is well established. The programme will deliver renewable power, up to 160 MW under **both Options 1 and 2**, providing approximately half of Croatia's additional renewable capacity planned by 2020. All HPP components would contribute to the needs for renewable power set out in the National Renewable Energy Action Plan. All HPPs will be run-of-river, so the programme would increase Croatia's renewable base-load capacity by 50%, reducing reliance on thermal generation, oil and gas imports, and electricity imports.

Regarding water protection, the Conceptual Solutions Report shows that **both Options 1 and 2** halt the decline in groundwater levels, generally increase groundwater levels (by too much in some areas in Option 1) and increase the area of aquifers available for wellfields. The Sava RBMP identifies the need to address the depletion of the Zagreb aquifer and that it results from the lowering of the Sava riverbed. Whilst Croatian Waters' Water Management Strategy identifies the Zagreb aquifer system as a strategic groundwater resource of national interest, and more broadly identifies groundwater protection as an objective, it does not explicitly identify the replenishment of the Zagreb aquifers as a need or proposed action.

ZagrebPlan does not refer directly to the regeneration of the river zone, although it identifies 'Sustainable Use of the Entire City Space' as a priority. **Both Options 1 and 2** stabilise the height of the water regime in the city, creating reservoirs associated with HPPs potentially available for recreational activities - approximately 900 ha of water surfaces under Option 1, and 400 ha under Option 2. However, Option 2 additionally enables the land area between the river channel and the levees to be used for recreation or other development.

Regarding transport and navigation, the programme will provide additional crossings over the Sava River and the Sava-Odra channel, and navigability upstream of Sisak for class IV vessels, contributing to greater regional connectivity. There is little to distinguish the options regarding transport and navigation. However, the Development Strategy for Inland Waterway Transport does not refer to the upgrading of the Sava-Odra channel to category IV (focusing instead on attaining category IV from Belgrade to Sisak), although it does refer to the objective to upgrade Sisak to Zagreb to category II. The Protocol on Navigation under the FASRB does not refer to specific projects.

1.2.2 Advanced Expectations

Statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence supported by objective evidence that a project can make a significant contribution to demonstrated needs, or can contribute to many demonstrated needs; or

- a broad interpretation of water and energy services with respect to considering environmental and social dimensions.

Owing to the detailed development of the programme to date, and especially the recent conceptual solutions studies, there is a high level of confidence that the programme will address many needs. Needs for flood control and renewable power generation are most well established, and the programme will make a significant contribution to these needs. There is a high level of confidence that the programme would significantly contribute to needs of groundwater replenishment, regeneration of the Sava zone in Zagreb, and improving navigation to category IV to Velika Gorica, but these needs are less well demonstrated.

Both Options 1 and 2, or at least some of their components, will significantly alter flows in the Sava River, significantly improving flood control. (For a discussion of whether they are the only or preferred options, please refer to ES-2). The entire length of the Sava in Croatia is identified as of significant flood risk in a recently-released ISRC Flood Risk Assessment. However, the flood control benefits of the HPPs in the Zagreb stretch and HPP Strelečko / Sisak and its associated facilities could be better demonstrated.

Both Options 1 and 2 would significantly contribute to Croatia's additional renewable capacity planned by 2020, providing approximately half of additional capacity. It would contribute significantly to the ZagrebPlan objective to increase the proportion of sustainable energy sources in the city.

Both Options 1 and 2 would make a significant contribution to reversing declining groundwater levels, which are predicted to affect the City of Zagreb's water supplies in future decades, unless action is taken. There are wider benefits, as the Zagreb aquifer is of basin-wide importance, as stated in the Sava RBM Plan.

The programme is the only means available for freeing up additional areas for recreational development along the river in Zagreb, with **Option 2** providing a more substantial contribution than **Option 1**. ZagrebPlan does not refer directly to the river zone, but it includes an objective of the sustainable use of the entire city space, and a measure on the evaluation, protection and sustainable management of the Sava.

The programme is the only means available for navigational improvements that would allow category IV vessels to reach Velika Gorica. Both **Options 1 and 2** meet this need. ZagrebPlan also includes an objective on improving regional transport connections, which both options address.

Regarding 'a broad interpretation', the assessment of the programme's contribution to needs and objectives that was carried out in the preparation of the Conceptual Solutions Report encompassed a very broad interpretation of water and energy services, including environmental and social dimensions. Additional objectives were the development of transportation and tourist / recreational facilities along the river, developing modern agriculture with irrigation, maintaining the existing hydrological regime beyond Sisak, maintaining or improving water management regimes in retention areas; and climate change resilience. Some examples of the indicators or approaches used are: a range of groundwater indicators (levels, potential of contamination, area of valuable aquifer, flow directions); navigational indicators of the length of waterways in both categories II and IV; increase of both land and water recreational area; acceptability of landscape and amenity in Zagreb; levels of floods, lows flows and sediment transport downstream of Sisak; hectares of potentially irrigated area; area of surface water habitats as well as Natura 2000 and bird areas; job creation; households to be resettled; and resilience to climate change.

The programme's contribution to meeting the objectives of the WFD, which would encompass a broad range of water services, and its contribution to the objectives of the Sava RBM will be addressed in the SEA. This is discussed further in ES-3 Policies and Plans.

1.3 Summary of Key Issues

- The capability of the programme to contribute to the needs set out in broadly agreed objectives, policies and plans concerning flood control and renewable power generation is amply demonstrated. Both Options 1 and 2 will make a significant contribution to meeting these needs.
- Options 1 and 2 will also make a significant contribution to groundwater replenishment, regeneration of the Sava zone within Zagreb, and enabling category IV navigation to Velika Gorica, but these needs are not set out in broadly agreed objectives, policies and plans.
- Option 2 addresses the needs for urban regeneration (and possibly groundwater protection) more effectively than Option 1.
- The contribution of individual HPPs and components within the options to meeting each of these needs could be more clearly described and assessed.
- The effectiveness of the options and their individual components in flood control could be more clearly described, indicating which components (or which combinations of components) are most important for flood control.
- There is no separate objective documented analysis of how the programme or Options 1 and 2 or their individual components contribute to meeting the objectives and requirements of the key policies and plans, at local, Croatian and EU levels, for example encompassing the WFD etc. This analysis would more clearly guide the ongoing development of the programme, and assist with securing finance in future.

1.4 Relevant Evidence

Interview:	1, 4, 6, 7, 8, 9, 10, 15, 17, 24, 25, 28, 30, 31, 33, 34, 35
Document:	1, 2, 3, 8, 13, 16, 18, 30, 34, 44, 45, 46, 47, 49, 54, 55, 57, 90, 91, 92, 93, 94, 96, 97, 98, 121
Photo:	-

2 Options Assessment (ES-2)

This topic addresses the fit of a hydropower project under consideration amongst the options available to a region to meet energy and water needs, as well as the early stage process undertaken for considering project siting and design alternatives. The intent is that a hydropower project under consideration is supported as one of the priority options for addressing the need for energy and water services, and siting and design alternatives are considered at an early stage.

This topic is important because it compares hydropower options with other options such as other resources types and/or energy and water conservation. It adopts a sustainability perspective to ensure a realistic and comprehensive comparison of options across a range of economic, technical, environmental and social factors.

2.1 Background Information

The programme's objectives are flood control, hydropower generation, groundwater replenishment, urban regeneration, and transport including navigation. Whilst topic ES-1 Demonstrated Need addresses whether these objectives are established needs and the capability of the programme to meet them, this topic, ES-2 addresses the options and design alternatives that have been considered for meeting these objectives. Note that in cases where we have concluded in ES-1 that the objective does not meet an established need, we still have included, in ES-2, analysis of how options to meet the objective have been assessed.

This topic considers the full range of alternative options, including policy and institutional approaches as well as technical options. However, we also consider the options and design alternatives encapsulated in Options 0, 1 and 2, as described over pages 3-5 of this report, and the 'do nothing' option.

Alternative options for **flood control**, as set out in a 2011 note by the EU DG Environment 'Towards Better Environmental Options for Flood Risk Management' might include: natural water retention measures to slow down or reduce the flow of water downstream; management of well-structured soils with organic matter to increase water retention capacity; preserving landscapes and forests and promote agricultural uses that increase water retention capacity; creation of natural wetlands; and the creation of dams, dykes and weirs.

Alternative options for **energy** generation might include small and large hydropower, solar, biomass, wind, and geothermal projects. According to studies conducted under the National Energy Program GEOEN, the potential for power generation from geothermal sources is 48 MW. Croatia is also a partner of the Kraško nuclear plant in Slovenia, and 50% of the energy is available to Croatia. A further option may be improved efficiency: Energy Institute Hrvoje Požar (EIHP) data show that losses in energy supply, transmission and distribution increased by 5.8 %, energy conversion losses increased by 5.3 %, and final energy consumption increased only by 0.1 % in 2010.

Alternative options for **groundwater replenishment** might include: aquifer storage and recovery, aquifer storage transfer and recovery, river bank filtration and soil aquifer treatment. In addition, the efficiency of the water supply system in Croatia could be improved, as approximately 46% of water extracted is lost in distribution.

Alternative options, or at least siting and design alternatives, for **urban regeneration** might include the development of the waterfront with leisure facilities, green corridors, housing, commercial and business areas, and recreational paths as seen in other cities such as Vienna.

Alternative options for **transport and navigation**, would concern the use of road or rail freight from Sisak rather than shipping to Velika Gorica, and siting and design alternatives would concern the location of ports, connections to the main rail and road corridors, and bridges etc.

2.2 Detailed Topic Evaluation

2.2.1 Basic Expectations

Assessment

Statement: *An assessment has been undertaken of the options available to meet demonstrated energy and water needs that considers a range of planning approaches and a range of siting and design alternative options with respect to the project under consideration.*

Assessments have been undertaken of the options to meet some of the above objectives, but not all.

No agency has undertaken an assessment of wider options for **flood control** other than the three programme options. Other options might use greener methods for flood retention and control. Options 0, 1 and 2 are all 'hard' engineering solutions.

The Croatian Government has undertaken an assessment of the options available to meet demonstrated **renewable energy** needs. The Croatian National Energy Action Plan includes an assessment of direct energy consumption and targets for each energy source. It considers a range of energy sources and considers a range of planning approaches, as set out in the Energy Act (Official Gazette 120/12), the Regional Development Act (Official Gazette 153/09), County Development Strategies, the Development Strategy for the City of Zagreb, and county's draft strategies for sustainable energy use. Trends of energy consumption are also considered in the plan. The plan also refers to energy efficiency measures, meeting Energy Services Directive 2006/32/EC). It concludes that that hydropower capacity must increase by 400 MW by 2020, including 300 MW from new or increased capacity of existing large hydropower and 100 MW from new small hydropower, an increase of 16.3%.

No agency has undertaken an assessment of potential **groundwater replenishment** options other than the three programme options. Other options might include the measures referred to in the Background section above, or improved efficiency in water supply systems to lower demand.

Numerous agencies have assessed options for **urban regeneration** since the 1970s as concepts for the programme were developed. This continues through the involvement of the City of Zagreb (City Office of Strategic Planning and Development of the City), the County of Zagreb and Sisak-Moslavina County in the Steering Board, and an urban regeneration competition for students to propose possible options for the development of the waterfront, organised by the Zagreb Architects Association (DAZ) and the University of Zagreb. Program Sava Ltd is discussing ways to utilize the proposals with the winners and DAZ / University of Zagreb. The city of Zagreb is considering various developments e.g. Savica Eco-park, Zagreb geothermal spa and a transport interchange terminal combining natural and public spaces with real estate development. In addition, the International Sava River Commission (ISRC) is currently developing master plans for river tourism development, and intends to develop a concept of spatial development.

The Croatian Government has undertaken an assessment of the options available to meet **transport and navigation** objectives through the preparation of the Strategy for Inland Waterways Transport for Croatia (2008-2018). One of the strategy's principles is to 'establish a balance in developing different means of transport', and foresees the Sava river navigable to class II between Zagreb and Sisak. However, the strategy does not indicate needs for new ports or refer to the upgrading of the Sava-Odra channel to enable category IV navigation. Some interviewees indicated that the proposal for a new port at Velika Gorica must be assessed further. The programme transport study included in the Conceptual Solutions Report (2013) addressed three key topics: connectivity potential, accessibility options, and transport and recreational potential. The study considered all existing physical planning documentation, analysed the efficiency of existing transport infrastructure projects, evaluated the relevance of individual transport projects, defined transport needs; and proposed transport facilities. The Feasibility Study and Project Documentation for the Rehabilitation and

Development of Transport and Navigation on the Sava River Waterway prepared by ISRBC identifies the potential for tourism and recreational activities upstream of Sisak and road and rail transport links from there to Zagreb. An assessment of navigation capacity for each option is included in the Conceptual Solution Report. In addition, Program Sava Ltd is preparing a workshop with stakeholders to fine-tune program objectives especially with regard to navigability objectives.

Program Sava Ltd has recently assessed Options 0, 1 and 2 using **Multi-Criteria Analysis** (MCA) drawing on the technical analysis of the IPF consultants and opinions of the Expert Council. The MCA encompassed: identifying programme objectives and purpose, identifying criteria and indicators, assigning weights for each of the objectives to reflect their relative importance, scoring the options, combining the weights and scores for each of the options, and selection of the preferred option. The 13 criteria grouped by their weighting were: water supply, with the highest weighting; environment, and flood protection; agriculture, downstream effects, hydropower and urban regeneration; transportation, social inclusion and financial results; and climate change, navigability and tourism and recreational facilities with the lowest weighting. This options assessment has considered a range of planning approaches. The mobilisation report lists key plans and policies to be considered in the optimisation of the preferred solution. This will continue through the detailed review of plans and policies that will be undertaken during the Strategic Environmental Assessment (SEA) process.

A number of further siting and design alternatives were assessed through the earlier conceptual studies, for example: the original Middle Sava Basin Flood Control System (MSBFCS), on which Option 0 is based, included the option of incorporating 3 HPPs; the 2002 study, on which Option 1 is based, also examined variants of weirs instead of HPP Zagreb and differing embankments and protection from seepage, with as many as 6 variations; alternative powerhouse and dam layouts; and the option of including HPP Medvednica.

The 'no development' option or current state has been described in the Conceptual Solutions Report (2013), and the current state of the environment and water resources will be further described in the Strategic Environmental Assessment (SEA) as the 'do nothing' option.

However, to date no agency has assessed the alternative options of individual components within the programme, based on the need for each individual HPP to meet the above demonstrated needs. For example, there may be many alternative options for increasing capacity by 36 MW other than the Zagreb SHPPs, or the contribution of each HPP to flood control has not been separately assessed - HPP Prečko is the priority option for flood control and water protection. It is not clear whether or when options assessment of each component will take place.

Outcomes

Statement: *The project is one of the priority options for addressing the need for energy and water services.*

Options 1 and 2 are priority options for meeting objectives of flood control, power generation, urban regeneration, and some aspects of navigation, and, out of these, **Option 2** is the higher priority option. The programme is the only option for meeting urban regeneration objectives. It is impossible to determine whether the programme is a priority option for groundwater replenishment.

Although there is no assessment of wider options for **flood control** other than these options, the programme is considered a priority to address these objectives, as indicated by all of the government-level interviewees and experts interviewed during this assessment. This is driven by the history of the development and the unfinished existing infrastructure.

The Conceptual Solutions Report shows that both Options 1 and 2 would contribute to renewable **energy** needs by increasing capacity by 156 MW and 151 MW respectively. There are few siting and design alternative options for increasing base-load electricity generation from renewables, and the programme would increase the base-load supplied by hydropower by 50%.

As there has been no assessment of the range of options, it is uncertain whether the programme is one of the priorities for **groundwater replenishment**.

The programme is the only option for addressing the objective of **urban regeneration** which can only be achieved with flood control measures to secure land at risk of flooding.

Regarding **transport and navigation**, enabling class II navigation in the Sisak to Zagreb stretch is a priority, but enabling class IV navigation in the Sava-Odra channel and the development of the port at Velika Gorica are not priorities, in comparison to rail and road alternatives. The ISRC, UNECE and the Strategy for Inland Waterways Transport for Croatia foresee the Sisak to Zagreb stretch of the river as class II or for recreational use. No plans identify future needs to upgrade the Sava-Odra channel to class IV. The need and priority for a new port is not mentioned in the strategy. The Croatian Operational Programme for Transport (2007-2013) and the Trans-European Transport Network (TENT-T) identify the upgrading of the Rijeka – Zagreb – Budapest railway, and interconnections at Rijeka port. as priorities, and the EU is already providing funds for these.

Amongst the options assessed in the MCA, Option 2 is considered to be of higher priority by the Experts Council which participated in the workshop on 5th June 2014. They concluded: Option 2 is the highest priority option for flood control; Option 1, generating 699 GWh/yr, would be the priority option for power generation, compared to Option 2, generating 644 GWh/yr; Option 2 is the highest priority option for water supply; Option 2 is the highest priority option for urban regeneration; and Options 1 and 2, are of equal priority for transport and navigation.

It is not demonstrated that all individual HPP components are priority options for meeting established needs, as individual components have not been assessed.

2.2.2 Advanced Expectations

Statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence supported by objective evidence that a project is one of the highest priority options; or

- a high quality approach taken to the options assessment, for example through the breadth of planning approaches considered, or the engagement of stakeholders in the analysis of options, or the criteria utilised for the analysis of options strongly emphasising sustainability or regional/basin-wide considerations.

There is no evidence to provide a higher level of confidence that the programme is one of the priority options for **flood control**. This because there is no assessment of alternative flood control methods and options other than the programme options.

The National Renewable Energy Action Plan provides a higher level of confidence that the programme is one of the priority options to meet **renewable energy** objectives. In addition, specific HPPs are included in a number of plans: the Physical Plan of the City of Zagreb and the Master Urban Development Plan of the City of Zagreb refer to Prečko HPP, the Physical Plan of Sisak-Moslavina County refers to Strelečko HPP, the Physical Plan of the Zagreb County refers to HPP Podsused and HPP Prečko, and the National Physical Planning Programme refers to HPPs Drenje, Zagreb and Strelečko). Some of these plans would be updated to refer to the HPPs in the preferred option, after it has been selected.

There is no evidence to provide higher level of confidence that the programme is one of the priority options for **groundwater replenishment.** This is because there is no assessment of alternative aquifer recharge methods and options other than the programme options.

Although there is no documentary evidence to provide a higher level of confidence that the programme is one of the priority options for **urban regeneration** - spatial plans and the ZagrebPlan do not refer to the programme or the need to regenerate the areas proposed in the programme – it is the only option for meeting this objective.

There is no evidence to provide a higher level of confidence that the programme is one of the priority options for **transport and navigation**. A Manual on Good Practices in Sustainable Waterway Planning (2010, prepared by PLATINA and funded by the EU DG on Mobility and Transport under the 7th Framework Programme for Research and Technological Development) recommends identifying the needs, and considering other plans, economic activities and uses early in the planning stage. The assessments described above meet these requirements, but mention only the upgrading of the Sisak-Zagreb stretch to category II and do not mention the need for a new port in Velika Gorica or upgrading the Sava-Odra channel to category IV.

Whilst public support for a programme addressing flood control can be expected, there is no evidence that the public see the programme options as priorities for meeting this and other objectives. Some NGOs express disquiet that 'greener' options have not been considered, and have previously objected at the level of the EC to upgrading of the Sisak-Ravčinovci stretch on that basis. Some interviewees indicated that, currently, the programme is not a priority for the government (national or regional), and more work needs to be done to establish the programme as a priority for development. Some interviewees expressed views that the programme should better account for the priorities of the Zagreb and Sisak-Moslavina Counties. One interviewee noted that the conclusions of the above-mentioned competition could have been integrated in a better way.

The programme options assessment took a high quality approach in assessing the options through the MCA process. The MCA involved the expertise of independent experts and consultants and a participatory process. The MCA used 34 indicators of impact that strongly emphasised sustainability, for example: the change in surface water habitats lost in the project area, change in the areas of significance for habitats and species, Natura 2000, level of change of the river sediment regime, deforestation, jobs, households to be resettled, hectares of new space freed from flood risk, and financial results. The MCA workshop only involved the Expert's Council and the consultants, and no members of the Steering Board or external stakeholders were involved.

The indicators did not strongly emphasize regional/basin-wide considerations, other than downstream effects. One interviewee indicated that the number of hectares at flood risk should also account for areas in Sisak and not only in Zagreb. Other in-country and basin-wide considerations presented by the ISRC in the Sava River Management Plan have not been assessed by any organisation to date, for example the links between flood management and best environmental options and overriding public interest, or an integrated approach to evaluating which sections of the river require development on the basis of ecological status. However, the SEA provides an opportunity to assess these wider considerations.

2.3 Summary of Key Issues

- Assessments that encompass a range of options have been undertaken for the needs of energy generation, urban regeneration, and transport and navigation, but not for the needs of flood control and groundwater replenishment. Programme Options 1 and 2 include a range of siting and design alternatives for hydropower plants, and spatial planning documents include design alternatives for urban regeneration.
- Although there has been no assessment of wider options for flood control, the programme is a priority option for addressing this need. However, the absence of an assessment of wider options precludes greater confidence that the programme is one of the highest priority options.
- There is greater confidence that the programme is one of higher priority options for the needs of renewable power generation, because of Croatia's National Renewable Energy Action Plan, and urban regeneration, because it is the only option that will free up space for urban regeneration. There is no evidence that the programme is one of the priority options for groundwater replenishment or for transport and navigation.

2.4 Relevant Evidence

Interviews:	1, 3, 5, 6, 14, 15, 16, 18, 22, 26, 27, 29, 32, 33

Documents:	1-3, 5, 7-16, 18, 21, 25, 34, 36-37, 40, 44-52, 59-62, 64, 67, 72, 75-77, 79, 85, 87, 89-94, 97-100, 108, 121, 125, 127-132, 134
Photos:	All

3 Policies and Plans (ES-3)

This topic addresses the context set by national and/or regional policies and plans for hydropower project planning, implementation and operations. The intent is that shortfalls, gaps or complexities in national and regional policies and plans can be managed with respect to development and operation of a particular hydropower project under consideration.

This topic is important because the sustainability of hydropower development can be influenced by the quality of integrated planning for resource development, and if the planning context is weak compensation measures on the part of the developer will be required (for example through corporate policies).

3.1 Background Information

This topic concerns policies and plans throughout the preparation, implementation and operation of hydropower projects. In any context, these are broad-ranging, including national policies and plans, local plans, and international conventions and agreements that govern: energy and resource use development (energy, water resources, integrated water resource management); river basin planning; economic and regional development; infrastructure planning and the letting of contracts and concessions for infrastructure project construction and management; procurement; emissions reduction and climate change adaptation; environmental and social impact assessment, management and permitting; stakeholder engagement, disclosure and grievance mechanisms; land use planning including the designation of areas for nature conservation; water use and water quality permitting; property ownership and transactions, land acquisition and involuntary resettlement; human rights; sharing of additional benefits; occupational health and safety and human resources; and dam safety.

Croatia has comprehensive laws, policies and plans addressing much of the above. Croatia joined the European Union (EU) on 1 July 2013, which required fully transposing EU regulations into national law and resulted in the creation of new programmes, strategies and other policy documents.

Relevant national policies and plans are: the Physical Planning Act and the National Physical Planning Programme; the Energy Act (2012); Electricity Market Act (2013); the Strategy of Physical Development of Croatia (revised 2013, and a new one under preparation); Physical Plan of Croatia (under preparation); the National Renewable Energy Action Plan; Technical Standards for Seismic Observation of Large Dams; Ordinance on Technical Observation of High Dams; the Environmental Protection Act (2007) and the Strategic Environmental Assessment (SEA) Regulations (2007); the Strategy for Sustainable Development of the Republic of Croatia (2009); the Water Act (2013); the Nature Protection Act (2005); the Law on the Protection and Preservation of Cultural Heritage; the Building Act (2013); the Expropriation Act (2014); the Land Registry Act (2013); the Social Welfare Act (2010); the Air Protection Act (2011) and a legal framework for the implementation of the EU climate-energy package adopted for 2008 – 2020; the National Strategic Reference Framework 2013; the Regional Development Strategy of the Republic of Croatia 2013; the Strategic Investments Law (2013); the Concession Act (2012); the Public-Private Partnership (PPP) Act (2012); the Anti-corruption Strategy (2008); and the Public Procurement Act (2013).

The most relevant national policies concerning environmental permitting include: regulations on EIA, SEA and information and participation of the public and public concerned in environmental matters; and regulations on permission to conduct activities for the protection and preservation of cultural heritage and archaeological excavations. Note that EIA is mandatory for HPPs over 100 MW, or at the discretion of the Ministry of Environmental Protection, Physical Planning and Construction for HPPs between 5 MW and 100 MW.

The most relevant municipal and local plans are: the Development Strategy for the County of Zagreb 2013; the Physical Plan of Zagreb County; the Development Strategy for Sisak-Moslavina County 2013; the Physical Plan of the Sisak-Moslavina County; the City of Zagreb Development Strategy for the Period Ending 2013 (ZagrebPlan), the Master Urban Development Plan of the City of Zagreb; the Physical Plan of the City of Zagreb; the City of Sisak Development Strategy Framework; the Physical Plan of Medvednica Nature Park, the Physical Plan of Lonjsko Polje Nature Park, the Physical Plan of Žumbrak - Samoborsko Gorje Nature Park (under preparation), and (for transport issues) the Spatial Plan of Sisak-Moslavina County, the Spatial Plan of the City of Velika Gorica and the Spatial Plan of the City of Zaprešić.

The most relevant EU policies are: the EU Floods Directive; Groundwater Directive; Drinking Water Directive; EU Renewables Directive; EU Water Framework Directive (WFD); EU SEA Directive; Environmental Impact Assessment (EIA) Directive; Habitat Directive; Birds Directive; and the Europe 2020 Strategy concerning smart, sustainable and inclusive growth, and targets on poverty reduction, social exclusion and employment.

Relevant international or transboundary policies and plans are: the Framework Agreement on the Sava River Basin, with associated protocols on navigation, prevention of pollution by navigation, and flood protection; the Sava River Basin Action Plan; the Joint Statement on Guiding Principles for the Development of Inland Navigation and Environmental Protection in the Danube River Basin, and multilateral environmental agreements (MEAs). MEAs ratified by Croatia that are of most relevance are: the Danube River Protection Convention; MEAs concerning EIA and public participation (Espoo and Aarhus Conventions); and MEAs concerning nature conservation (Bern and Bonn Conventions). It is notable that the UNECE (United Nations Economic Commission for Europe) has indicated that implementation of MEAs at municipal and local levels is low due to a lack of awareness and knowledge.

3.2 Detailed Topic Evaluation

3.2.1 Basic Expectations

Assessment

Statement: *An assessment of the most relevant policies and plans has been undertaken, including any basin development or integrated water resource management plans.*

The IPF consultants have assessed the most relevant policies and plans, and will continue to assess policies and plans through the SEA. These assessments are equally applicable to **both Options 1 and 2**. Hydropower and energy-related regulations and policies will not be relevant to Option 0. The SEA will compare the option of 'no development' and the three programme options against the objectives of identified applicable legislation, plans and policies to identify any potential contradictions.

Using appropriate legal expertise, the IPF consultants carried out a legal and regulatory assessment in June 2014, and their analysis is provided in the mobilisation report. This assessment expanded on a list of existing and available documentation in their terms of reference (TOR). It covers: national and EU water legislation; groundwater legislation; water management plans; the Sava River Basin Management Plan; national legislation on expropriation, concessions, PPPs, public procurement, and land registry; national and EU legislation on environmental protection; national and EU legislation on nature protection; national legislation on air pollution prevention; licencing procedures; connection and electricity distribution; physical planning; dam safety; and energy legislation. The transport and navigation assessment included in the conceptual solutions report (2014) identified relevant legislation related to transport and navigation.

The legal assessment identifies applicable construction and water use permits as required by the Water Act and the regulations for obtaining concessions on water and public water, and the Building Act. For example: the use of water for electricity production requires a concession right or water permit; water rights permits are required for wastewater discharge and for usage of waters, including water usage in electricity production,

except for the usage of waters that is regulated as concession. The assessment does not clearly identify environmental and social permitting requirements such as the EIA process in Croatia and national or transboundary consultation requirements, but this will be done through the SEA.

There are additional relevant policies and plans that are not yet included in the assessment, for example: international treaties and conventions, other basin level plans under development and papers (e.g. Sava River Basin Management Plan - Invasive Alien Species Background Paper No 7), the Croatian Operational Programme Transport (2007-2013), and other national policies related to social inclusion (e.g. Social Welfare Act 2010, the Strategy of Social Welfare Development in the Republic of Croatia 2011-2016 and the Europe 2020 Strategy), labour and occupational health and safety, cultural heritage, and public health and safety. However, it is assumed that all of these policies will be identified and analysed in the SEA.

A European Bank for Reconstruction and Development (EBRD) assessment of commercial laws (2013) indicates that PPP/Concessions laws (2012) are in compliance with the best international standards, and public procurement procedures do not have major weaknesses. However, it identifies some weak areas: these laws do not provide for possible government support or guarantee or offer comfort to lenders with respect to financial security; and the Croatian framework is considered to be of medium effectiveness. These issues have not been considered in the assessment.

The SEA is currently in its scoping stage, and will include an additional review of applicable laws, policies and plans, including:

- all development plans for new neighbouring HPP developments and flood management to assess cumulative effects;
- all national, regional, local strategies, plans, programmes concerning the Sava River;
- all relevant national and EU environmental laws, regulations, directives, including national laws on compensation for the loss of land and assets, resettlement, economic displacement, EIA procedures, environmental protection, labour, and occupational health and safety; and
- required public consultation processes in Croatia and its compliance with EU SEA legislation and EBRD Performance Requirements (PR).

In addition, the IPF consultants have undertaken a screening for the Natura 2000 network in preparation for the SEA process. A decision of the Ministry of Environment and Nature (issued on 10 February 2014) established the need for an Appropriate Assessment (AA) in accordance with the Habitats Directive as part of the SEA..

The SEA will include a preliminary gap analysis report that will outline potential risks, liabilities and/or discrepancies in relation to national and EU regulatory requirements and the requirements of the international financers (EBRD). According to the IPF proposal for the SEA, this assessment will comply with:

- EBRD's Environmental and Social Policy (2008) and Performance Requirements;
- EBRD's Public Information Policy (2008);
- All relevant EC legislation, specifically including that relating to Habitats, Birds and the protection of established or planned Nature Conservation and Natura 2000 sites;
- The EU SEA Directive;
- Croatian national legislation; and
- Transboundary aspects, in line with the Protocol on SEA to the ESPOO Convention on Environmental Impact Assessment in a Transboundary Context.

Outcomes

Statement: *The project fits with existing policies and plans, and any gaps or shortfalls can be managed.*

Overall, the programme – both Options 1 and 2 – fits well with some of the most relevant policies and plans, such as the National Renewable Energy Action Plan; and Croatian Waters' targets to increase the area

protected from floods and protect groundwater resources. In addition, some plans are developing concurrently with the programme, and there may be an opportunity for the plans to accommodate components of the preferred option. However, policies and plans have not been fully assessed to date, so it is impossible to state whether the programme fits all of the most relevant plans.

Some components of Option 1 (e.g. HPP Drenje) that are not included in Option 2 (the preferred option in the MCA analysis) are included in current physical plans of the City of Zagreb, Sisak-Moslavina and Zagreb County, and the National Physical Planning Programme. The implementation of the programme will require the incorporation of the components of the selected option into the spatial plans. This process may take years because the new plans will need to be applicable for a period of 20 years to comply with EU long-term planning frameworks, compared to 4 years in previous plans.

In several areas, the programme does not fit with policies and plans. Spatial plans for Zagreb do not set out the development of the river area or navigability as an objective. It is not clear whether the programme or its components will fit with the ZagrebPlan or the objectives of the Sisak-Moslavina County. The ZagrebPlan does not refer explicitly to the need for these components and even refers to hydropower developments upstream of Zagreb as a threat. However, it does refer to 'Sustainable Use of the Entire City Space' as a priority, and 'Holistic Spatial Development Planning' as a measure. The development of a new port in Velika Gorica may have an impact on Sisak-Moslavina County's development plans. This county is planning to further develop Sisak Port to attract businesses and the County Development Strategy (2007-2013) seeks to integrate the port with current rail and road network development proposals. The Sisak City Development Strategy (2012-2014) is aligned with those objectives. Although, Sisak-Moslavina County is involved in the programme's Steering Board, it appears that Sisak City has had very little involvement.

It is impossible to judge with certainty whether the programme can manage gaps and shortfalls, because, policies and plans have not been fully assessed to date. A further gap analysis will be undertaken as part of the SEA. Since the accession of Croatia in the EU, many national and regional plans and policies were developed, but secondary legislation is yet to be harmonised and/or adopted accordingly. For example, physical planning documents at state, municipal and local levels are not yet amended, and new plans with potentially significant environmental impacts will have to go through the SEA process.

However, owing to the involvement of international financers and the use of international competitive bidding in the procurement of contractors and concessions, it is likely that the gaps or shortfalls in the most relevant regulations, for example concerning social impacts, resettlement and dam safety, can be managed.

Although the EIA regulations require a description of the effects on population, there are no national requirements or regulations to address social impacts, such as public health impacts or resettlement planning, other than issues related to land acquisition and economic displacement. This shortfall can be managed by ensuring compliance with the EBRD Environmental and Social Policy, in particular PR1 Environmental and Social Appraisal and Management, and PR5 on Land Acquisition, Involuntary Resettlement and Economic Displacement.

There are no national regulations on dam safety in Croatia. This shortfall will be managed by ensuring compliance with International Commission on Large Dams (ICOLD) standards, and World Bank Operational Policy 4.37 on Dam Safety, as indicated in the IPF consultants' TOR, and recommendations of the IPF consultants to prepare a dam safety management plan. Although it cannot be predicted whether HEP would develop the facilities, HEP is a member of ICOLD.

3.2.2 Advanced Expectations

Statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence supported by objective evidence that a project fits with the policy and planning context, and that gaps or shortfalls can be managed; or

- a broad approach taken with identification and analysis of relevant policies and plans, including social and environmental; or

- an analysis undertaken of strengths, weaknesses, opportunities and threats of a project with respect to managing gaps or shortfalls in the policy and planning context.

A higher level of confidence that a project fits with the policy and planning context may be achieved after the SEA process. However there are a number of risks concerning the fit of the programme with the policy and planning context, including:

- If the program is declared a 'strategic investment project' under the Strategic Investment Projects Act (2013) on the basis that it complies with all physical planning documents, it may not necessarily fit with other national, regional or local plans and regulations.
- If the programme is implemented under the public powers of Croatian Waters or local and regional government as listed under the Water Act, the State Water Rights Inspectorate will not be required to supervise compliance with the Water Act and regulations; and
- If the programme does not involve local government to a greater extent, the programme may not fit with their development objectives.

A higher level of confidence that gaps or shortfalls can be managed would be achieved if the programme responds to the SEA gap analysis. The programme should use the SEA to identify measures to address gaps, including to ensure conformance with MEAs and international standards that would have to be demonstrated when seeking international finance. For example, a specific area in which to identify measures would be in public-private partnerships or concessions, in response to the weaknesses and effectiveness of PPPs/concessions laws identified by EBRD, as described under Assessment.

The assessors do not consider that a broad approach has been taken to date in the identification and analysis of relevant policies and plans. A broad analysis would refer to the range of areas cited in the opening paragraph under 'Background' above. For example, international treaties and conventions, social policies and laws related to social inclusion, labour and occupational health and safety, cultural heritage, and public health and safety, and other basin-level plans under development, have not yet been identified.

Program Sava Ltd has undertaken an analysis that draws strengths, weaknesses, opportunities and threats out of existing plans and participative processes (including the National Strategic Reference Framework 2013, Regional Development Strategy of the Republic of Croatia 2013, ZagrebPlan 2011-2013, Development Strategy for the County of Zagreb 2013, Development Strategy for Sisak-Moslavina County 2013, and the Program Sava logical framework). They have identified 8 strengths, 14 weaknesses, 16 opportunities, and 10 threats related to policies and plans. Key remarks from this analysis indicate that: some plans are obsolete; different institutions develop their plans in different ways; and there is potential for improvement through the development of new plans.

3.3 Summary of Key Issues

- The IPF consultants have carried out an initial assessment of the legal and regulatory framework. Key shortfalls and gaps in the planning context identified include: (i) an absence of regulations on dam safety in Croatia; and (ii) an absence of specific regulations on social impacts. These shortfalls can be managed if the programme demonstrates compliance with international standards.
- The initial assessment does not cover international treaties and conventions, basin level plans under development, or legislation on issues such as social inclusion, cultural heritage and environmental permitting. The IPF will undertake a broader analysis of the programme's alignment with international, national, regional and local laws, plans and policies as part of the SEA process.

- The planning context is weak in that national strategies, and municipal / local physical and spatial plans are outdated in some cases and undergoing harmonisation with EU legislation, and there is potential for improving the integration of the programme with other local plans.
- The identification and management of shortfalls, gaps or complexities in the policy and regulatory context will be supported by international tendering in the selection of the HPP developer and operator, which is likely to bring corporate-level practices that meet international standards, and by the dependence on international financing, which would require adherence to standards such as EBRD's Environmental and Social Policy.

3.4 Relevant Evidence

Interview:	1, 3, 5, 7, 12, 14, 15, 16, 18, 27, 29, 32, 35
Document:	1-3, 5, 7-16, 18, 21, 32, 44, 46-54, 56-58, 60-67, 73, 75, 81, 86-88, 97-101, 112-113, 120, 131
Photo:	-

4 Political Risks (ES-4)

This topic addresses political risks of a region that may have implications for hydropower project development and operations. The intent is that political risks influencing development and management of a hydropower project under consideration are understood and can be managed.

This topic is important because the risk that a government may unilaterally repudiate its obligations or prevent others in its jurisdiction from honouring their obligations may affect the level and lending terms of financing for hydroelectric projects in its jurisdiction, as well as long term sustainability of the projects themselves.

4.1 Background Information

Croatia elects a president as the head of state for 5 year terms, and a parliament (the Sabor) for 4 year terms. There are two main political parties in Croatia, the Croatian Democratic Union (HDZ) on the right, and the Social Democratic Party (SDP) on the left. As a result of the parliamentary elections of December 2011, the HDZ lost power after 8 years of governing majorities, and the SDP formed a coalition government of centre-left parties with a majority of 53% in parliament, led by Prime Minister Zoran Milanović. The next elections for the Sabor are to be held no later than February 2016. The current president, Ivo Josipović, formerly of the SDP but now independent, was elected in February 2010.

The establishment of the programme was announced by the First Deputy Prime Minister and Minister of Economy, Radimir Čačić, of the Croatian People's Party (HNS; the second largest party in the coalition) in 2012. However the Minister was sentenced by a Hungarian court in 2012 for his involvement in a car accident in Hungary in early 2011 in which two people died. He was ultimately forced to resign, but was released after serving 11 months and seeks to return to politics. Mr Čačić is a long-standing entrepreneur in the construction industry.

Croatia became the 28th member state of the European Union (EU) on 1st July 2013, following the completion of negotiations in June 2011. EU membership lessens the commercial risk of short term political changes and exchange rate instability, and brings eligibility for EU structural and cohesion funds. There is cross-party support for EU membership.

Croatia, with Bosnia and Herzegovina, Serbia and Slovenia, agreed the Framework Agreement on the Sava River Basin (FASRB) in 2002, and an International Sava River Basin Commission (ISRBC) was established in 2005 to coordinate the implementation of the agreement. Protocols to the agreement concerning navigation, water pollution caused by navigation, and flood protection, were also agreed by the parties. In addition, Croatia has bilateral agreements with Slovenia and with Bosnia and Herzegovina concerning the Sava River.

Croatian local government consists of twenty counties and the Zagreb City administration. Counties are further divided into over 500 cities and municipalities. County prefects, city and municipal mayors are directly elected for four-year terms, and county, city and municipal councils or assemblies are elected for four-year terms through proportional representation.

The programme is located within:

- the City of Zagreb, with Milan Bandić as mayor (one of Croatia's major political figures, elected for a fifth term in 2013, previously SDP but now an independent) and there is no majority party in the assembly;
- Zagrebačka County (surrounding Zagreb), where a Croatian Peasant's Party (HSS) candidate is prefect, and there is no majority party in the assembly;
- Sisak – Moslavina (downstream), where an SDP candidate is prefect, and there is no majority party in the assembly.

Corruption in public institutions has received significant attention since 2009, with numerous officials prosecuted, the most notable being the former Prime Minister Ivo Sanader, indicted six times for accepting

bribes, including bribes for ensuring HEP sold electricity at below-market prices to two light metal manufacturers. Public awareness of corruption is high, and there is widespread public dissatisfaction with corruption, political patronage and nepotism, contributing to protests in Zagreb in 2011. The Ministry of Justice has adopted an Anti-Corruption Strategy, and a new Public Procurement Act came into force in 2012, which is completely harmonised with EU public procurement directives, and there is greater supervision of spending in public institutions. The law requires politicians to give up their private sector interests on entering office to avoid a conflict of interest, but this has been difficult to enforce, as there are no sanctions for violators.

Civil society institutions are widespread in Croatia, and there is an increasing awareness of environmental issues. Proposed hydropower developments have received political attention in recent years, with Mirela Holy, then SDP Minister for Environmental Protection, clashing with Radimir Čačić in 2012 over the Ombla hydroelectric plant, near Dubrovnik. The European Bank for Reconstruction and Development (EBRD) ultimately cancelled a loan to HEP for the construction of the project, following NGO protests and a review of environmental impacts which indicated impacts on a biodiversity-rich cave.

The Croatian Government has recently passed a law concerning 'strategic investment', which enables projects of strategic importance to benefit from faster permitting procedures.

4.2 Detailed Topic Evaluation

4.2.1 Basic Expectations

Assessment

Statement: *An assessment has been undertaken of political risks most relevant to the project, including transboundary issues.*

The Program Sava team has developed an initial analysis of political risks on a pilot basis, directly in response to this Protocol topic. This identifies 'macro' and 'micro' political risks. Public debt, the rule of law, corruption, and social unrest are identified as macro risks. Micro risks, i.e. those specific to the programme, in order of highest to lowest risk, as determined by probability and severity of impact, are: repeal, denial or cancellation of permits; regulatory changes; politically-induced breach of contract, corruption and bribes; tenure claims; social or environmental opposition; complex new environmental or labour standards; and the misappropriation of (i.e. abuse of) position and resources. This was drawn out of a generic list of political risks. The analysis further provides a number of scenarios, related to the identified risks, specifically:

- Government instability / Frequent elections;
- Delays due to permitting procedures;
- Quality of regulations;
- Politically-caused breach of contract;
- Infeasibility due to the cost of corruption;
- Property disputes; and
- Weak cohabitation (i.e. little cooperation amongst local government).

The assessment does not identify any transboundary issues as risks, but proposes embedding the programme in transboundary programmes and securing EU funds as measures to manage government instability and frequent elections.

This draft assessment is an initial effort to identify political risks, and related strategies to minimise political risk for the programme. However, a more thorough analysis of political risk and strategies for their management will be required. Political risks will be influenced by the programme options, the structure of components for financing or procurement, and the geographical breadth of the programme. The clearest risks appear to be:

- Association of the programme, or components within it, with one political party or particular individuals, resulting in a halt to the programme or certain components, following elections or political changes;
- Political interference in the selection of the preferred option, for reasons of patronage or corruption;
- Political interference in procurement processes and staffing of the Program Sava team for reasons of patronage or corruption;
- Divergence in political endorsement of the programme between counties, the city of Zagreb and the national government, or within them (as prefects and mayors are directly elected and not accountable to assemblies) owing to political differences;
- Widespread public opposition to the selected option, or widespread public opposition to a particular component arising from a divergence in the distribution of costs and benefits of the programme or a perception of corruption; and
- Opposition of minority interest groups to the selected option or components within it, resulting in delays in permitting.

The Program Sava team's analysis is, as yet, an internal draft, and is not shared outside of the Program Sava team, for example with the Expert Council, stakeholders on the Steering Board, or stakeholders invited to the MCA workshop. The assessment does not make any reference to **either Options 1 or 2**. No attempt has been made to differentiate political risks for the options, although there may indeed be differing implications for social or environmental opposition, or cooperation amongst local government, for example. The team's analysis is further discussed under 'Advanced Expectations' below.

The terms of reference for the FS/SEA/CBA study, include reference to political risks as an element in the risk and sensitivity analysis of the financial and economic assessment (subtask 3.4.4). The mobilisation report of the IPF consultants does not include any reference to this requirement, though it does refer to macroeconomic risks. The analysis is yet to be carried out, political risk is a very minor part of the analysis, and it is likely to focus more on macroeconomic risks, as part of the financial and economic assessment.

Outcomes

Statement: *The project can manage identified political risks.*

Although not in response to the above or any other political risks analysis, Program Sava Ltd is working to develop and maintain consensus across political parties and amongst civil society. The Steering Board and Expert Council are mechanisms for doing this, in addition to general stakeholder involvement. The members of the Steering Board have signed an agreement concerning the programme, and key members (HEP, Croatian Waters, City of Zagreb, Zagreb County and Sisak-Moslavina County) jointly finance Program Sava Ltd. In addition, a separate inter-ministerial board is guiding the implementation of the SEA.

The team has focused on shifting external perceptions of the programme away from one of commercial development on the banks of the Sava in Zagreb, i.e. the initial vision of Radimir Čačić, towards one of Zagreb's spatial development for social and environmental, as well as economic purposes. The recent name-change, from HEP Razvoj Visenamjenskih Nekretninskih Projekata (HEP-RVNP, meaning 'development of selected real estate projects') to Program Sava Ltd reflects this shift. Therefore the team has involved a broad range of academics in spatial planning, and a broad range of stakeholders. In addition, Program Sava Ltd has appointed a public relations officer to raise the profile of the programme, so far mainly amongst energy, water and planning professionals, but with the intention of extending activities to the wider public in the future. It has developed a PR Plan and a Communications Plan, and is planning to meet municipal-level stakeholders once the preferred option for the programme is identified. It is also involved in conferences arranged by the NGO 'SLAP' to gather stakeholder opinions, and has joined the Croatian Business Partnership for Sustainable Development. During this assessment, some interviewees remarked that this is the first time in Croatia that decisions are being taken with an appropriate level of participation and transparency.

These measures are important for managing political risks. However, Program Sava Ltd will need to adopt a broader range of measures for the ongoing preparation and implementation of the programme. The above-mentioned political risks analysis identifies a wide range of measures including: embedding the programme in transboundary programmes (FASRB and the Danube River Basin Agreement); targeting public relations activities on public officials within ministries who are less likely to be subject to frequent changes in position compared to the ministerial level; incorporating local elements of the programme into local planning documents; incorporating local needs into the priorities and objectives of the programme; financial structuring to minimise the risk of relying on Croatian government financing; implementation of EU procurement procedures; and developing a system for the early identification of conflicts between parts of local government. The programme has developed an initial stakeholder analysis (see ES-7 Social Risks and Opportunities) which could also be strengthened and combined with the political risk analysis, to improve the programme's prospects of managing political risks.

The programme is likely to be able to manage transboundary risks through the FASRB and the ISRBC, and through adherence to bilateral agreements. The agreements commit the upstream parties to maintain flow regimes that are similar to natural flows, and all parties to share information.

Program Sava Ltd's current measures for managing political risk are applicable to **both Options 1 and 2**. The above proposed measures are not based on one option or another, and would be applicable to both.

4.2.2 Advanced Expectations

Statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence supported by objective evidence that a project can manage a broad range of political risks; or

- opportunities for the project to contribute to or cooperate with measures that encourage reduction or mitigation of political risks; or

- an analysis undertaken of strengths, weaknesses, opportunities and threats of a project with respect to managing political risks.

The programme will face significant political risks within Croatia – it is a politically-driven programme with highly significant implications for the long term development of Croatia's capital city and the surrounding region which has a pivotal location within Croatia's territory. Public support may be more critical to the programme's success than financial and institutional issues. The programme requires a strategy that would not only manage political risks, but would use the public and political interest in the programme to identify and successfully build a programme that can deliver an optimum balance of economic, social and environmental objectives, with widespread public support.

To achieve this, the programme will need a deeper analysis of political risks and opportunities. The initial analysis described above is just a beginning, the macro-level analysis is very limited, and the micro-level analysis is a combination of political, regulatory, financial and social risks. An analysis and strategy that would provide a higher level of confidence that the programme can manage a broad range of political risks might include:

- Differentiation of the political risks of the programme options, prior to the selection of the preferred option;
- Identification of risks that are specific to each component within its locality, for both options, and the risks associated with specific civil society or minority interest groups;
- Involvement of potential financers at an early stage to gather their views on politically-exposed persons, political risks and their effective management;
- Third party review of the analysis of political risk;

- Third party development of the procurement procedures, whistleblowing, and human resources policies that will be required to avoid corruption risk;
- Identification of these risks across all stages of the development of the programme, from now, through preparation, implementation, and operation; and
- Identification of lessons learned from successful, publicly-popular urban planning programmes of this scale from other cities around the world.

The assessment carried out to date does not attempt to consider opportunities for the project to contribute to wider measures concerning political risk management. These opportunities might include:

- Involvement in the work of the ISRBC, promoting the role of the programme in implementing the FASRB and the Protocol on Flood Protection;
- Proactive use of civil society initiatives that promote transparency and public involvement in decision-making, such as SLAP and the Croatian Business Council for Sustainable Development;
- Cooperation with initiatives of the Croatian Government, for example the Ministry of Justice's Anti-Corruption Strategy, and its Anti-Corruption Programme for State-Majority Owned Companies, and
- Cooperation with the Regional Anti-Corruption Initiative, an intergovernmental, non-profit organisation, with nine member states across the Balkans including Croatia (http://www.anticorruption-croatia.org/).

A comprehensive description of governmental and private anti-corruption initiatives is provided on http://www.business-anti-corruption.com/country-profiles/europe-central-asia/croatia/snapshot.aspx.

Program Sava Ltd has undertaken an analysis that draws strengths, weaknesses, opportunities and threats out of existing plans and participative processes (including the National Strategic Reference Framework 2013, Regional Development Strategy of the Republic of Croatia 2013, ZagrebPlan 2011-2013, Development Strategy for the County of Zagreb 2013, Development Strategy for Sisak-Moslavina County 2013, and the Program Sava logical framework). They have identified a range of issues related to political risks, including:

Strengths	*Weaknesses*	*Opportunities*	*Threats*
• Liberalised access to the EU market • Good experience of regional cooperation	• Weak synergy between city representatives / executive bodies and city-owned companies • Weak enforcement of the law	• Economic cooperation with the City of Zagreb	• Lack of political will and support for structural reforms • Centralisation at the national level in the management of infrastructure and environmental protection, and • No effective public policy for regional and local development.

4.3 Summary of Key Issues

- Program Sava Ltd is developing consensus across political parties and amongst civil society, through an inter-institutional Steering Board and an Expert Council, stakeholder involvement, and public relations activities, to shift external perceptions of the programme away from initial impressions of a programme focused on commercial office developments. Assessment of political risks has begun, through an initial analysis of political risks.
- Owing to the central importance of the programme to Zagreb and Croatia, a more thorough political risks analysis and strategy is required. An analysis should be developed prior to the selection of the preferred option.

- The programme's strategy to manage political risks should seek to use the public and political interest in the programme to identify and successfully build widespread local and national support for the programme.
- The identification of risks should identify risks that are specific to each programme component within its locality, risks associated with specific civil society or minority interest groups, and risks through the programme's preparation, implementation, and operation.
- The programme would benefit from drawing upon international experience, by seeking the views of potential financers on political risk at an early stage, third party review of the analysis of political risk and anti-corruption procedures, and identification of lessons learned from publicly-popular programmes in other cities.
- The programme will need to avoid public perceptions of corruption through the adoption of a transparent anti-corruption policy encompassing procurement procedures, whistleblowing, and human resources policies.

4.4 Relevant Evidence

Interview:	2, 6, 7, 8, 13, 15, 17, 19, 23, 25, 29, 30, 34, 35,36
Document:	33, 38, 39, 40, 53, 67, 74, 78, 104, 105, 106, 110
Photo:	-

5 Institutional Capacity (ES-5)

This topic addresses the capacities of the institutions that have a role in the development and operation of hydropower projects. The intent is that institutional capacity requirements and the existing capacity with respect to the hydropower project under consideration have been evaluated, and capacity shortfalls can be addressed.

This topic is important because the development of water and energy services in general, and of a hydropower project in particular, requires a comprehensive and balanced set of capacities amongst a range of stakeholders, namely governments/regulators, developers, financial institutions, contractors, suppliers, labour force, civil society and affected people. Where such skills are lacking in any of these sectors, such shortfalls may be mitigated by drawing on externally available resources, with the eventual objective of developing local capacity by transferring skills and technology.

5.1 Background Information

The institutional capacities addressed by this topic encompass: coordination and decision-making amongst national and local government; the planning of the overall programme; the planning of individual components of the programme, both the hydropower facilities and water management infrastructure; the financing of the programme and its individual components; compliance with EU Directives; the licencing of each component and compliance and monitoring of licence requirements; the letting of construction contracts and/or concessions for hydropower project development and operation; construction of each component; management, mitigation and compensation for social and environmental impacts; the operation of individual hydropower facilities to meet programme objectives, for example of flood control; public involvement, disclosure and stakeholder engagement through all stages; and use of appropriate human resources, expertise, and independent review mechanisms.

The institutions that have or that will have a role in the programme range from international to local levels and are relevant for different stages of its development of the programme. The most relevant institutions are:

- *The Ministry of Economy, Directorate for Energy*, which is the chair of the Steering Board and legally in charge of the programme. They administrate the grant contribution from WBIF, are legally in charge of the programme and will be responsible for all decisions.
- *Hravatska Elektroprivreda* (HEP Group). HEP owns Program Sava d.o.o, is its largest single financial contributor, and is a member of the Steering Board. As Croatia´s national electricity company, it may be involved in the development or operation of the HPPs within the programme, depending on the outcome of the procurement of construction contracts or concessions.
- *Croatian Waters* (Hrvatske vode), the *City of Zagreb*, *Zagreb County* and *Sisak–Moslavina County*, and *the Agency for Inland Waterways*. They also contribute financially to Program Sava Ltd, and are members of the Steering Board. Croatian Waters is a state-owned agency responsible for water supplies and water resource management.
- A series of Croatian Ministries that are also members of the Steering Board, but make no financial contribution. The *Ministry of Regional Development and EU Funds* and is in charge of an ongoing process to update Croatia´s to update regional development policy and adaption to the EU Cohesion Policy. T*he Ministry of Environment and Nature Protection* has a supporting and advising role during the preparation of the ESIA and would be the environmental licencing authority for separate programme components. The *Ministry of Physical Planning and Construction* is responsible for the coordination of the regional infrastructure development. The *Ministry of Maritime Affairs transport and Infrastructure* is responsible for waterways transport and ports, and the *Agency of Inland Waterways* is an agency of this ministry. The *Ministry of Agriculture* is responsible for agriculture and rural development, and is the regulator of water management.

- *Municipalities* within Zagreb County and Sisak-Moslavina County.
- Potential financiers of the programme, i.e. the *European Bank for Re-construction and Development* (EBRD) and the *European Commission* (EC) Structural Funds.
- *Croatian academic expertise and civil society organisations* (CSOs). This includes the range of experts on the Expert Council, and CSOs such as the Association for the Protection of Croatian Sea and Waters (SLAP), the Croatian Business Council for Sustainable Development, Croatian Academy of Sciences and Arts (HAZU), Croatian Association of Urban Planners, Croatian Association of Energetics, Zagreb Society of Architects (DAZ), Croatian Chamber of Construction, Croatian Association for Project Management, Croatian Chamber of Architects, Croatian Forestry Society, Croatian Society for Bird and Nature Protection, State Institute for Nature Protection, Croatian Academy of Engineering (HATZ), University of Zagreb. SLAP is tracking the development of the programme in order to provide its members and public with information.

Other important institutions include:

- The *International Sava River Basin Commission* (ISRBC), which was established to coordinate the implementation of the Framework Agreement on the Sava River Basin (FASRB), including protocols on navigation and flood control. They are a member of the Steering Board.
- The *Centre for Monitoring Business Activities in the Energy Sector and Investments* (CEI), which is appointed as implementing body for the government public-private partnerships (PPP) program and is also a member of the Steering Board.
- The *Croatian Energy Regulatory Agency* (HERA), which is an autonomous, independent and non-profit public institution which regulates energy activities in the Republic of Croatia.
- *Croatian Committee on Large Dams*, which is a member of ICOLD, in which one of the collective members is HEP.

The members of the Steering Board and the Expert Council are particularly relevant to the current preparation stage, as are Program Sava Ltd itself, and the IPF consultant team. Individual members of the Steering Board, whether they ultimately are the developers, operators or regulators of programme components will be most relevant for the later stages of permitting, implementation, and operation. Following the decision of the Steering Board in August 2015 on whether or how to continue the development of the programme, Program Sava Ltd may or may not continue to exist.

5.2 Detailed topic evaluation

5.2.1 Basic Expectations

Assessment

Statement: *An assessment of the capacities of institutions most relevant to the hydropower project has been undertaken.*

No agency has undertaken a full assessment of whether the above institutions have the above capacities with specific reference to this programme, and no such assessment is planned.

However, assessment has been or will be undertaken for specific capacities, and some international agencies have conducted institutional assessments of some of the relevant institutions without reference to this programme. These assessments can be grouped into three areas: (i) assessment being carried out as part of the FS/CBA/SEA study; (ii) assessment that is very likely to take place in the process of applying for international finance; and (iii) assessment by external agencies at a general level. Particular gaps in assessment are: capacities amongst local government, and the capacity of civil society and the public to meaningfully engage in programme development.

IPF consultants, in the mobilisation report of the FS/SEA/CBA study, have provided a legal and regulatory assessment. To a limited extent this includes an assessment of the institutional capacity of governmental stakeholders in relation to the harmonisation of Croatian legislation with EU requirements, and in relation to spatial planning, and dam safety. In relation to the financing plan, IPF consultants will assess HEP, Program Sava Ltd and the financing recipient´s capacity to manage a loan, provide security, make repayments etc. They will also assess gaps regarding environmental and social impact assessments procedures and public consultation processes and their conformance with EU-legislation and EBRD requirements.

All EBRD-financed projects undergo an assessment of environmental and social issues both to help EBRD decide if an activity should be financed and, if so, the way in which environmental and social issues should be addressed in planning, financing, and implementation. EBRD's social and environmental appraisal is integrated into the EBRD's overall project appraisal, including the assessment of financial and reputational risks and identification of potential environmental or social opportunities. The Infrastructure Projects Facility grant application process, involving screening of eligibility and consistency with EU pre-accession policies, sustainability, and technical and financial quality, by the IPF Project Financiers' Group, may have involved some institutional aspects. If EU Structural Funds are applied for, an assessment will be performed to determine whether the programme meets the agreed funding priorities determined for Croatia by the European Commission according to the Cohesion Policy 2014-2020.

An EC Position Paper on the development of the 'Partnership Agreement and Programmes in the Republic of Croatia for the period 2014-2020', published in 2013, includes an assessment of Croatia´s institutional capacities in relation to the requirements of the EU in financing large projects. EBRD's strategy for Croatia (2013) includes an assessment of institutional capacity in relation to harmonisation of EU environmental *acquis*. A number of other research papers concern harmonisation, for example: a University of Zagreb Faculty of Law paper on regional and cohesion policy in 2011; an LSEE-Ifri Research Programme analysis of the impact of EU accession and the prospect of territorial reorganisation; and the Bertelsmann Stiftung 2014 Croatia Report, part of the Sustainable Governance Indicators 2014 project, which includes an assessment of the institutional capacity of ministries during EU accession.

Additional assessments of relevance include: an assessment of the institutions and harbour master´s offices, implementing the Integrated European Programme for Inland Navigation Transport, which is part of the Strategy for Inland Waterway Transport prepared in 2008; a brief assessment for the institutional arrangements in Croatia for flood management, as part of an analysis of the Sava River Basin by ISRBC in 2009; and an assessment of ISRBC prepared by the EC-funded Analysis of Civil Security Systems in Europe (ANVIL) Project.

The Program Sava team's stakeholder analysis, which provides a comprehensive list of stakeholders and their responsibilities, may also provide a starting point for a fuller assessment of institutional capacity.

Outcomes

Statement: *The project can manage critical shortfalls, gaps or complexities in institutional capacities.*

Program Sava Ltd is addressing some shortfalls, gaps and complexities through: the formation of the Steering Board and Expert Council; the use of civil society organisations for stakeholder consultation; the design of the programme drawing upon aspects of the FS/CBA/SEA study that concern institutional capacity; and the use of international standards.

The programme is a complex and multifunctional project for which horizontal and vertical cooperation between stakeholders is critical. The range of stakeholders in the Steering Board and Expert Council indicates that they were selected according to their responsibilities and capacity to contribute to the development of the programme. The programme should be able to manage shortfalls in coordination and inter-ministerial decision-making through the Steering Board. Key project stakeholders – Croatian Waters, HEP, Program Sava Ltd,

Ministries, EBRD and EU as interested potential financers, municipal and planning authorities and HERA have signed an agreement that governs the Steering Board.

Croatian law does not require public consultation at the pre-feasibility stage of a programme, although it does require public consultation during the preparation of the feasibility study, as part of the SEA. Program Sava Ltd has sought to involve academic experts and civil society as early as possible in design in order to build broad support. The Expert Council includes a multidisciplinary range of expertise, and the Zagreb Society of Architects (DAZ), Croatian Academy of Sciences and Arts (HAZU), and the Croatian Association of Urban Planners, for example. Program Sava Ltd has worked with SLAP (the Association for the Protection of Croatian Sea and Waters) to convene consultation events.

IPF consultant's legal and regulatory assessment identifies frequent adoption of new laws and regulations since the accession of Croatia to the EU. For example this means that there is no well-established environmental and social assessment methodology. This weakness is also identified in the EU position paper. The IPF consultants will manage the lack of a well-established methodology by using EBRD, World Bank, WWF and UNECE guidelines in the performance of the SEA.

The Croatian Committee on Large Dams and HEP are members of ICOLD. A gap in capacities to ensure dam safety can be managed through the application of ICOLD standards and the World Bank safeguard policy.

Bureaucratic and administrative obstacles are common in the process of obtaining a building permit, with the legal deadline of 30 days from submission of a request lasting up to a year. Program Sava Ltd is considering the option of using the new law on strategic investments to overcome this weakness in capacity.

Both **Options 1 and 2** will require similar institutional capacities. Although the inclusion of the HPPs in existing spatial plans varies slightly between the two options, institutional risks are similar because all spatial planning documents are now being revised and a major overhaul of the Croatian physical planning system is on-going.

5.2.2 Advanced Expectations

Statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence supported by objective evidence that a project can manage critical shortfalls, gaps or complexities; or

- a rigorous and broad approach taken to identification and assessment of institutions and capacities; or

- opportunities for the project to contribute to or cooperate with measures that encourage strengthening of institutional capacities; or

- an analysis undertaken of strengths, weaknesses, opportunities and threats of a project with respect to managing critical shortfalls, gaps or complexities in institutional capacities.

Without a fuller assessment of institutional capacity, there cannot be higher confidence that the programme can manage critical shortfalls, gaps or complexities. The assessments carried out to date either have not been made with specific reference to the programme, or are very narrow in scope and do not take a rigorous and broad approach.

Gaps or complexities that the programme would have to manage, as identified in the assessments listed above, are: inefficient public governance at central and local levels; weak involvement of civil society and social partners; weak policy capacity within the public administration (a major restraining factor particularly for strategic planning of regional development); horizontal and vertical coordination for regional policy management across various line of ministries and different levels of government; and largely unchanged institutional arrangements of governing despite EU accession.

Although the Steering Board is a mechanism for consensus-building and coordinated decision-making, to date it has met only twice.

In addition, it is not clear how the programme might manage weak capacity at an international level. For example, the ISRBC is most effective in coordinating navigation only, and the Sava River Basin Management Plan is not yet agreed (though it may be at a Meeting of the Parties to the FASRB expected in December 2014).

With a complete assessment of institutional capacity, Program Sava Ltd could prepare a component of the programme that would address shortfalls directly, and develop local capacity by transferring skills and technology. One of the agreed EU funding priorities is to enhance institutional capacity and an efficient public administration with a view to reforms, better regulation and good governance. This is an important opportunity for the programme. An opportunity to strengthen the capacity of Program Sava Ltd has been taken, by including training on project financing in the scope of the IPF consultants' scope of work.

Program Sava Ltd has undertaken an analysis that draws strengths, weaknesses, opportunities and threats out of existing plans and participative processes (including the National Strategic Reference Framework 2013, Regional Development Strategy of the Republic of Croatia 2013, Zagreb Plan 2011-2013, Development Strategy for the County of Zagreb 2013, Development Strategy for Sisak-Moslavina County 2013, and the Program Sava logical framework). They have identified a range of issues related to institutional capacity, including:

Strengths

- Membership in numerous international associations and networks of European cities
- Increase in the green and renewable energy awareness of the society

Weaknesses

- Lack of preparedness for EU funds
- Inadequate training of employees in the county, especially in local governments to manage development
- Underdeveloped interregional and cross-border cooperation on specific development projects of mutual interest
- Lack of planning policy to control new development in areas at risk of flooding

Opportunities

- Strengthening the capacity of county and local governments to manage development

Threats

- Lack of political will and support for the necessary structural reforms
- Inefficient cooperation with neighbouring counties to protect water sources
- Water and other resources, centralization at the national level in the management of infrastructure, environmental protection, education and public services, etc.,
- Inadequate and slow implementation of the National Competition Policy.

5.3 Summary of Key Issues

- An assessment of institutional capacities is required at an early stage, to inform the work of the IPF consultants in the preparation of the Project Implementation Plan and Financing Plan.
- An objective of the programme is to 'build institutional capacity' but this cannot be met without a comprehensive assessment of the capacity of the relevant institutions in managing complex infrastructure and capacity to enforce new Croatian regulations driven by EU *acquis*.
- There is an opportunity to build institutional strengthening into the programme and either integrate this into the EBRD/Structural Funds financing plan or seek additional funds.

5.4 Relevant Evidence

Interviews:	1, 2, 4. 8, 10, 13, 17, 21, 31
Documents:	1, 2, 3, 33, 44, 49, 74, 80, 93, 108, 137, 138, 139
Photos:	-

6 Technical Issues and Risks (ES-6)

This topic addresses early identification and analysis of technical issues and risks that may influence decisions to invest in preparation of a hydropower project under consideration. The intent is that technical issues and risks have been evaluated at an early stage, and decisions to invest in project preparation are informed on these matters.

This topic is important because without an early stage analysis, technical issues and risks may be encountered after the developer has made significant investments into project preparation and it may be difficult to consider an alternative project.

6.1 Background Information

Technical issues and risks of most relevance to the programme are: reliability of hydrological flows for power generation; reliability of hydrological forecasts in relation to flood control; implications of climate change for hydrological flows; issues of dam construction and operation; infrastructure safety; erosion and sedimentation resulting from the new HPPs; groundwater replenishment; technical issues of navigation; supply of materials; and access to transmission. Our findings are presented in relation to these issues and risks below. This topic addresses risks during both implementation and operation.

In the current situation:

- Parts of the flood protection embankments are insufficiently high, without the required safety freeboard over calculated design flood levels, and sections of embankments unstable because of the construction method and material used;
- There are no embankments along the Kupa tributary, except in the Sisak area, and none long the most upstream part of the Sava near the Solvenian border;
- There is a mild decreasing trend in bed and suspended sediment load, resulting in the deepening of the Sava riverbed. This is due to upstream HPPs in Slovenia, erosion control works in the Sava catchment, training works in the Sava and its tributaries, and the construction of embankments. Gravel extraction is also contributing to the deepening of the riverbed.;
- Groundwater tables are lowering, due to the deepening of the Sava riverbed. There are three aquifers in the project area: Samobor – Zaprešić, Zagreb – Velika Gorica, and Odra-Lonja Polje aquifers. Groundwater is abstracted from the first two of these. The general groundwater flow direction is from west to east, i.e. parallel to the Sava and is therefore strongly dependent on water levels in the Sava.

Our findings are presented below for the programme in general, distinguishing between Options 1 and 2 and individual components or HPPs where necessary. Findings on the assessment of Social and Environmental issues and risks are provided under ES-7 and ES-8 even if they arise from technical aspects, for example the risk of groundwater contamination is addressed under ES-8. Findings are based mainly on interviews with IPF consultants and other stakeholders, the Conceptual Solution Report and its appendices, and the terms of reference of the IPF consultants.

6.2 Detailed Topic Evaluation

6.2.1 Basic Expectations

Assessment

Statement: *An assessment has been undertaken of technical issues and risks most relevant to the project.*

Technical issues and risks of the programme have been assessed through pre-feasibility studies carried out by Electroproject d.d. in 2003 and 2013, and the IPF consultants conducting the FS/SEA/CBA study have adapted

these studies and drawn upon additional studies to define three options for the programme. The IPF consultants have carried out a multi-criteria analysis with a substantial element of technical assessment, and will assess the technical feasibility of the Steering Board´s preferred option through 2014-2015. The strategic objective of the Feasibility Study is to establish feasibility and viability of the entire programme, in order to prepare the conditions for construction and financing. The study will cover all programme components, but full feasibility studies will be necessary at a later stage.

The scope of activities of the technical assessment is described in the terms of reference (TOR) of the FS/SEA/CBA study and will be delivered in two stages. The first stage, partly completed by June 2014, comprises an options study to determine the preferred option for further study under the second stage. Technical aspects of the scope include:

- Background research to prepare the basis for the technical assessment. This includes hydrological, meteorological, geodetic, geological, hydrogeological, geotechnical, geophysical, seismic research work, and technical background information including land access and spatial plans. This was finalised in June 2014;
- A technical assessment. The technical aspects of the 2003 and 2013 designs will be revised and where necessary elaborated to the level of Conceptual Solutions. The final Conceptual Solution will confirm basic parameters of the facilities (channel and dam profiles, elevation of backwaters, installed flow, number and type of units, water conditions of the facilities etc.);
- Options for the programme, relating to the number, sizing and location of HPPs and any options relating to the construction of the flood protection channel, and their assessment using a multivariate analysis; and
- A Project Implementation Plan (PIP).

Reliability of hydrological flows for power generation

Part of the technical assessment of **Options 1 and 2** was to consider if meteorology, hydrology and hydro generation data has sufficient quality for fully evaluating generation potential. A hydrological and meteorological assessment was carried out in order to propose the hydrological conditions to be used for the technical assessment. Data was used from 8 hydrological stations in Slovenia and 7 in Croatia from the periods 1961-1990 and 1971-2000. A hypothetical linear trend was used for various time series, e.g. of minimum and maximum annual discharges.

An assessment of power generation of each HPP in **Option 1** and **2** has been carried out by using: available inflow data defined in duration curves of the mean daily discharge during the measured period; the creation of rating curves of headwater and tailwater by calculation of water levels at the HPP reservoir area; power plant capacity duration curves using relevant duration curves of the mean annual discharges; and the efficiency factor curve of the power plant, depending on discharges and the net head curves.

Reliability of hydrological forecasts in relation to flood control

In order to determine maximum discharges at the Jankomir spillway, hydraulic model calculations were carried out using the return period procedure in the design of all options. **Option 0** has required significant hydraulic mode development and updating of the concept to make it applicable to the current situation, and the determinants for the analysis were agreed with Croatian Waters. Mathematic models were developed for **both Options 1 and 2** in order to obtain maximum water levels and discharges. Water levels and discharges were calculated for the entire program, for the theoretical 2-, 5-, 10-, 25-, 100- and 1000-year floods.

Implications of climate change for hydrological flows

A qualitative assessment of the capacity of water management systems to cope with impacts from weather and climate over the operational life of the programme was part of the first stage of the FS/SEA/CBA. The analysis resulted in two primary indicators of resilience to climate change, concerning water resource management (flood management, water supply and irrigation, hydropower) and wider impacts (environmental management, social and economic development), which were fed into the Multi-Criteria Analysis (MCA). The implications of

climate change for hydrological flows is going to be included in a revised Conceptual Solutions Report delivered in October 2014. The basis for the forecast is a regional climate model for 2011-2040 and 2041-2070.

Dam construction and hydropower operation

The technical assessment for **both Options 1 and 2** includes the assessment of conceptual designs of HPPs elaborated in previous studies. For **Option 1,** an assessment of the three main solutions of the 2003 study was carried out to develop one preferred solution. Regarding **Option 2**, the 2013 technical solution will be assessed and refined in terms of achieving programme objectives more closely. The assessment includes: dam size and type; storage capacity; flood operation; spillway capacity and design; power generation capacity; turbine type and suitability; and emergency stoppage and protection.

Efficiency and forecast demand will be assessed for the preferred option.

Infrastructure safety

Assessment of seismicity and geological stability is a part of the FS/SEA/CBA study and includes collection and analysis for all geology, geotechnical, geophysics and seismology characteristics relevant for the Sava River, canal and HPP sites. A report describing geology, geotechnical, geophysics and seismology has not yet been finalised.

The need for improvements of infrastructure related to flood protection in order to prevent flooding along the river, the reservoirs and the Odra canal has been assessed for all options based on the hydraulic modelling of water levels according to the 100-year return flood. The identified hazards included: hydrological events, such as flood peaks and flood hydrographs; reliability of protection systems; and human intervention as part of the operational flood management. In **Options 1 and 2** the need for reconstruction to increase flow capacity at the Jankomir spillway and the Sava-Odra channel has been assessed considering the updated calculation of 100 and 1000-year return floods.

Safety of assets, including structural, electrical and mechanical construction and operational aspects will be assessed during the preparation of the Project Implementation Plan. A plan for construction supervision and quality assurance of dam safety during operation will be prepared as a part of the Project Implementation Plan.

It is indicated in the TOR that ICOLD standards regarding dam safety should be followed and that Program Sava Ltd may establish an independent review panel to review and revise the conceptual solution in accordance with the requirements of EBRD to follow the World Bank safeguard on dam safety OP 4.37 / BP 4.37. An independent review panel regarding dam safety has not yet been established.

Erosion and sedimentation

A brief assessment of sediment load resulting from the HPPs in **Options 1 and 2** has been included in the technical assessment, but it does not include an assessment of morphological changes based on sediment load changes. This is because information on sediment input is not available for the last 30 years so that reliable mathematical analysis is not possible. Erosion resulting from new HPPs will be assessed in the SEA.

Groundwater replenishment

An analysis of groundwater levels was carried out in order to predict and quantify impacts of the built environment of the **three options**. Numerical models were created to simulate groundwater flow and contaminant transport in the three aquifers focussing on wellfields i.e. pumping sites for abstraction of drinking water. In addition, Program Sava Ltd has commissioned an additional study of the condition of aquifers.

Technical issues of navigation

Regarding, navigation, hydraulic calculations were performed for **both Options 1 and 2** considering requirements to upgrade the navigation class of the Sava River waterway to class IV considering the updating calculation results of the 1000-year flood.

The potential upgrading of navigation to class IV in the Sava-Odra channel was considered in the technical assessment of HPP Strelečko in **Option 1** and HPP Sisak in **Option 2,** and the upgrading of navigation to class II in Sava River was considered in the technical assessment of the small hydropower plants.

Supply and disposal of materials

Supply and disposal, and cost, of materials have been assessed in the FS/SEA/CBA Study for all three options in terms of volume and types of material (clay, silt, sand and gravel) that can be expected during the excavations for the construction of the main components. Mass balance of the options indicating if the material is sufficient and appropriate for construction has not been carried out and is not required in the ToR for the FS/SEA/CBA. Mass balance calculations will be made only at the main design stage and during the course of the Environmental Impact Assessments of each project component

Access to transmission

Previous studies will be reviewed to determine access to transmission lines for each hydropower station as a part of the technical assessment. The conditions for the assessment are presented in the Project Mobilisation Report stating the setting of the Grid Code, requirements and responsibility of the Transmission System Operator and appropriate connection point. An assessment of each HPP in the conceptual design of **Option 1** has been carried out. An assessment of the HPPs in **Option 2** was not finalised during this assessment but is described in the 2013 Study for all HPPs except for the small HPPs, and it will be finalised in the updated Conceptual Solutions Report.

Connection to the national transmission grid still needs to be analysed. HEP is developing new plans for the transmission network in Croatia and has recently received all details of the conceptual options regarding hydropower. According to the Energy Strategy Plan of Croatia the grid operator is obliged to develop its grid allowing more producers to connect to the grid.

Outcomes

Statement: *The project is likely to be able to manage technical issues and risks.*

The TOR for the FS/SEA/CBA study includes all possible technical risks and issues relevant for hydropower development, and therefore the programme is likely to be able to manage technical issues and risks.

Reliability of hydrological flows for power generation

The programme will be able to manage this issue, because it will be designed in accordance with an improved hydrological understanding. An important outcome of the hydrological and meteorological assessment was the modification of discharge duration curves for the Sava River near Podsused, Zagreb, Rugvica and Crnac. Hydropower generation assessments for each HPP will use these modified duration discharge curves to determine the efficiency curve of the power plant, duration curve for the power plant capacity, and the mean annual output.

Reliability of hydrological forecasts in relation to flood control

The programme is avoiding the risk of unreliable forecasts through the improvements in hydraulic model calculations. This has enabled improved estimates of 100-yr and 1000-yr flood discharges at Podsused, through Zagreb, in the Sava-Odra Canal, and near the Lučko flood gate for example, for all three options.

Implications of climate change for hydrological flows

The findings of the qualitative assessment of climate change are that **Options 0 and 2** will have a predominantly moderate capacity to provide an appropriate level of flood protection, water supply and irrigation, and hydropower in a changing climate, while **Option 1** will have a predominantly high capacity.

Infrastructure safety

Improved hydrological modelling has enabled the identification of hazards related to the failure of levees, floodgates, and dams. This has been used to inform designs in order that these hazards will be avoided or minimised, for example: parameters for the Lučko floodgate have been re-designed according to the 1000-year return flood; higher embankments; re-profiling of the Sava-Odra channel; and strengthening the embankments of the HPP Podsused reservoir; a transversal dike in the Odransko retention area; raising of existing dikes; and a new structure at the location of the existing Planjek spillway to improve flood control into Lonjsko retention area. Option 2 was considered by the Expert Council to have the lowest residual risk.

In addition, the project will avoid and be able to manage risks of dam failure through the application of ICOLD standards and the World Bank safeguard on dam safety.

Erosion and sedimentation

The brief assessment mentioned above concludes that **Option 0** will affect riverbed sediment transport but not suspended sediment transport. **Options 1 and 2** will significantly alter the sediment regime because there will be no continuous transport of bed load and sediment load. **Option 2** will also alter the sediment regime in Kupa River downstream of Sisak.

Groundwater replenishment

The construction of weirs in **Option 0** will have a generally positive effect on groundwater and stabilise the morphological changes in the river bed. The impact on groundwater levels is greater in **Options 1 and 2** depending on the proposed hydropower stations. In **Option 1** the analysis shows that impact on groundwater will raise groundwater levels higher than historically recorded, which could have potential adverse effects related to urban/municipal infrastructure and underground structures, while the groundwater level in **Option 2** will restore historically-recorded levels. The difference depends on effect of the small scale HPPs in **Option 2**.

Technical issues of navigation

Hydraulic calculations for the Sava-Odra channel shows that **Option 1** meets the requirements of navigability to category IV. Corresponding calculations for **Option 2** have not been carried out, but flows will be higher than in Option 1.

The ship lock at HPP Strelečko is situated on the right side of the meander cut off, divided from the dam with an earth filled island. The top holding basin is located in the reservoir area. The ship lock at Sisak HPP is located in the area of the left flood plain along an existing embankment meeting the requirements of navigability for class IV. For each small hydroelectric power plant in **Option 2** a ship lock for tourist ships is included in the design enabling navigation to class II in the Sava River.

Supply of materials

It is too early to determine whether there any risks related to the supply of materials can be managed, because mass balance analysis has not been carried out to date. However, the assessment provides calculations on the amounts of materials that will be extracted from construction sites and available for use.

Access to transmission lines

In the conceptual design of **Option 1,** connection to the power system is presented for each HHP in terms of the location of the 110 kV electric networks, how the HPP should be connected to the power system and the preparation required to make the connection possible. Regarding **Option 2,** a similar description of the connection to the power system is included in the 2013 study for Sisak HPP but not for the small HPPs yet. It is impossible to judge whether technical risks associated with the small HPPs can be managed until this is done.

6.2.2 Advanced Expectations

Statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence supported by objective evidence that a project can fully manage technical risks; or

- an analysis undertaken of strengths, weaknesses, opportunities and threats of a project with respect to managing technical risks.

The assessment described above is sufficiently detailed to provide a high level of confidence that the programme can fully manage several of technical issues and risks. However it is too early to determine whether the programme, or the companies that will develop and operate the individual HPPs, can manage all technical risks and issues under a broad range of circumstances.

A higher level of confidence is achieved in several technical areas, because:

- Hydropower generation is calculated by using proven methods for hydropower efficiency and duration based on long periods of hydraulic data series from several gauging stations;
- Calculations of 100- and 1000-year return floods are carried out with international proven hydrological modelling tools, and the implications of climate change for flood control will be included in an updated Conceptual Solutions Report;
- Groundwater replenishment has been analysed with proven numeric simulation models;
- Updated hydrological modelling has been applied to all programme objectives;
- The FS/SEA/CBA study requires the application of ICOLD standards and the World Bank safeguard on dam safety;
- The upgrading of navigation to category IV is considered for HPP Strelečko, HPP Sisak and the Sava- Odra channel, and to category II in Zagreb.

All reports of the FS/SEA/CBA study will be delivered to both Program Sava Ltd and EBRD for discussion and agreement. Program Sava Ltd's Expert Council provides independent review of the outputs of the study and is frequently available for consultation. The Expert Council consists of several technological experts in, among other areas, hydrology, hydraulics, geo-technics, waterways, hydrogeology and construction. EBRD would be expected to conduct technical due diligence prior to financing, but there was no confirmation of this, or what technical aspects would be evaluated, during this assessment.

There is less confidence in a number of other areas because:

- The FS/SEA/CBA study has not been able to address changes of sediment load and river morphology resulting from HPPs in detail;
- Mass balance analysis to determine the requirements for materials has not been carried out yet; and
- Access to transmission has not been assessed for the small HPPs.

Program Sava Ltd has undertaken an analysis that draws strengths, weaknesses, opportunities and threats out of existing plans and participative processes (including the National Strategic Reference Framework 2013, Regional Development Strategy of the Republic of Croatia 2013, ZagrebPlan 2011-2013, Development Strategy for the County of Zagreb 2013, Development Strategy for Sisak-Moslavina County 2013, and the Program Sava logical framework). This did not identify many issues related to technical issues and risks: one weakness (the lack of flood warning system and flood incident management measures); and one opportunity (the provision of flood warning systems). Strengths and threats were not identified.

6.3 Summary of Key Issues

- There is a comprehensive knowledge of the technical issues and risks of the project and the risks identified continue to be integrated into the design and optimisation of the preferred option.
- Owing to the detailed studies completed, the programme will be able to fully manage the following technical issues: the reliability of hydrological flows for power generation, reliability of hydrological forecasts in relation to flood control, issues of dam construction and operation, infrastructure safety, groundwater replenishment, technical issues of navigation, and access to transmission.

- However, not all technical risks and issues are identified in the technical assessment, or the TOR for the continuing FS/SEA/CBA study: erosion and sedimentation resulting from the new HPPs, and the supply of materials.
- Confidence in the programme's ability to manage technical risks is supported by the use of an Expert Council in the design stage, and the application of EBRD standards.

6.4 Relevant Evidence

Interviews:	1, 9, 15, 26, 33
Documents:	1, 2, 3, 4, 6, 7, 8, 11, 12, 13, 14, 15, 16, 18, 19, 33, 34, 36
Photos:	2, 3, 4, 5, 8, 13, 14

7 Social Issues and Risks (ES-7)

This topic addresses early identification and analysis of social issues and risks that may influence decisions to invest in preparation of a hydropower project under consideration. The intent is that social issues and risks have been evaluated at an early stage, and decisions to invest in project preparation are informed on these matters.

This topic is important because without an early stage analysis, social issues and risks may be encountered after the developer has made significant investments into project preparation and it may be difficult to consider an alternative project.

7.1 Background Information

The project area of both options 1 and 2 covers the City of Zagreb, 18 cities (urban administrative units) and 39 municipalities (rural administrative units) mainly in Zagrebačka and Sisak-Moslavina Counties, but also in Karlovačka, Krapinsko–Zagorska and Brodsko–Posavska Counties, totalling 1.3 million residents.

In Croatia, assessment and management of social issues and risks is embedded in SEA and environmental impact assessment (EIA) processes. These require:

- A Strategic Environmental Assessment (SEA) to be prepared and approved according to the Croatian Regulation on Strategic Environmental Assessment of Plans and Programmes. As a part of the process, an assessment regarding Natura 2000 areas will be conducted;
- An Environmental Screening (ES) to be prepared and approved for each component, including associated infrastructure such as road and bridges; and
- Where the ES determines that an EIA is required, an Environmental Impact Assessment (EIA) shall be prepared and approved for each component.

Programme objectives such as flood control, groundwater replenishment and electricity generation are expected to benefit communities within and beyond the programme area.

The most relevant social issues arising from the construction and operation of the programme for both options 1 and 2, include:

- Acquisition of state-owned and privately-owned land and resettlement resulting from the construction of HPPs, new roads and bridges, the Sava-Odra channel, and embankments;
- Loss or change of livelihood for communities that are economically displaced by the programme (i.e. they lose land or other economic assets but do not lose their homes);
- Loss of or restricted access to areas that are currently used for informal recreation (dog-walking, cycling, fishing, bird-watching etc.);
- Construction impacts, including traffic and transportation, community health and safety, and the influx of workers;
- Impacts on vulnerable groups such as poorer households, disadvantaged groups (for example those with impaired mobility), and ethnic minorities (the Serb minority is over 2% of the population, the Bosnian minority is over 1%, and a range of other groups, including Albanians and Roma are each less than 1%); and
- Community-level stakeholder engagement and support.

The negative social impacts of the two options differ mainly in the following respects:

- Option 1 will acquire more private land and resettle more households;

- The four larger Zagreb HPPs of Option 1 require construction of higher embankments, higher dams, larger HPPs, and more new roads and bridges. Negative social impacts arising from the construction will affect a greater population for a longer duration with a higher level of significance;
- Option 1 will result in the loss or restricted access to areas of levees and embankments that are currently used for informal recreation, whilst Option 2 will free those areas from flooding, allowing their use for other purposes; and
- Option 1 will require higher level of community-level stakeholder engagement because it will affect more project affected communities.

Project-affected communities that may experience adverse effects of the programme are mainly limited to the programme footprint, and comprise of:

- Owners or users of affected agricultural land, state-owned or privately-owned, who are economically displaced;
- Households to be resettled by the programme, who are physically displaced;
- Communities affected by project construction activities along the river and channel embankments, HPP sites, new roads and bridges, and material transportation routes etc.;
- Residents that may be affected by increased groundwater levels in urban areas, for example due to effects on building foundations;
- Communities that may be affected by changes in groundwater levels in rural areas, for example due to effects on agricultural production, irrigation, and water supply;
- Communities affected by loss of or altered access to affected land or water used for recreational purposes, for example people fishing on the river or in ponds in the Sava-Odra channel, and kayaking on the river course); and
- Downstream communities affected by the change of hydrological regime.

Findings presented under this topic are based on interviews with IPF consultants and other stakeholders, existing EIA reports, the Conceptual Solution Report, the terms of reference of the IPF consultants, and review of the legislative framework.

7.2 Detailed Topic Evaluation

7.2.1 Basic Expectations

Assessment

Statement: *An assessment has been undertaken of social issues and risks most relevant to the project.*

Social issues and risks have been assessed through three processes: two initial EIA reports for Option 1 HPPs; an MCA as part of the Conceptual Solution Report; and the SEA currently being undertaken by IPF consultants.

Elektroproject completed two EIA reports in 2006 for HPP Podsused (the most upstream HPP of **both Options 1 and 2**) and HPP Drenje (the most downstream HPP in the City of Zagreb of **Option 1**), based on the Prefeasibility Study developed in 2003. Since 2013, IPF consultants have carried out social studies as part of the FS/SEA/CBA assignment. In June 2014, IPF consultants drafted a Conceptual Solution Report based on a Multi-Criteria Analysis (MCA) that incorporated social considerations such as resettlement. The SEA is being undertaken in accordance with the EU SEA Directive, EU EIA Directive, and EBRD's Environmental and Social Policy and Performance Requirements, and is expected to be completed by May 2015.

Environmental Impact Assessments

The two HPP EIAs include assessment of the following social impacts:

- Construction: resettlement of residential households, relocation of public facilities (e.g. a football field); loss of agricultural land, change of land use, impacts of dust and noise emissions on neighbouring residents, increased traffic on access roads; and
- Operation: impacts to irrigation and agricultural production; impacts of increased groundwater levels on residential and public buildings; and loss of agricultural income resulting from restricted access to land and natural resources.

Multi-criteria Analysis (MCA)

The MCA workshop undertaken in June 2014 enables the incorporation of environmental and social risk and benefits into the programme design. The MCA encompasses the following risks and opportunities under 'social inclusion':

- Risk: number of households/facilities to be resettled (64 for **Option 1** and 52 for **Option 2**);
- Opportunities: newly created direct employment and improved community health and safety from flood protection.

However the MCA does not evaluate and compare all of the most relevant social issues and risks, for example loss of or restricted access to areas used for recreation, construction impacts, and impacts to vulnerable groups.

Strategic Environmental Assessment (SEA)

According to the TOR for the FS/SEA/CBA study, the IPF consultants will: establish an understanding of land availability and rights of way, a socio-economic inventory will be prepared to identify, assess and (where possible) quantify social benefits as part of the CBA. It also requires preparation of a Land Acquisition, Resettlement and Compensation Plan, but the IPF consultants state that this will be done at a later stage, once the exact location of structures is known. The SEA requires the scoping of socioeconomic impacts, including impacts on population and livelihood, agriculture, transport, settlements and houses, land use, public health and safety, and impacts on poverty and on gender.

The Program Sava team drafted a Stakeholder Analysis Report in June 2014 based on the framework developed for transport and urban development mega-projects in the EU. Stakeholders identified include national and county government, Croatia Waters, HEP, consultants, designers, professional associations, the public, media, "green" associations and NGOs. This report will be updated as the programme progresses. In addition, a Stakeholder Engagement Plan will be prepared as part of the SEA and consultation undertaken in compliance with EBRD's Environmental and Social Policy and Performance Requirements. This will include an assessment of communication and consultation.

The initial EIAs, MCA and the scoping of the SEA have identified some of the most relevant social issues such as land acquisition and resettlement for the programme. However they have not specifically identified communities that will be affected by the programme or quantified the significance of the impacts to them. The impact assessments to date have not covered all social risks, and gaps concern loss or change of livelihood, loss of or restricted access to areas currently used for informal recreation, impacts on vulnerable or disadvantaged groups, and community-level stakeholder engagement and support.

Outcomes

Statement: *The project is likely to minimise and manage negative social impacts and deliver net benefits to project-affected communities.*

The social assessments are still at an initial stage and not all social risks and project affected communities have been identified. However, none of the possible social impacts would be so significant that the programme would not be capable of mitigating and managing them.

Land acquisition and resettlement will be managed through the relevant legal process and through the development of the Land Acquisition, Resettlement and Compensation Plan at a later stage. Programme Sava will apply for permits and approvals for land access and work from the government to implement all planned activities. IPF consultants will obtain cadastral information for affected land and properties, and identify land parcels, determine the ownership of land, its purpose and land class. The cost of mitigation related to land acquisition and resettlement has been estimated and will be included in the programme budget. At a later stage, a Land Acquisition, Resettlement and Compensation Plan, will be prepared in adherence to EBRD's Environmental and Social Policyand PR5 on Land Acquisition, Involuntary Resettlement and Economic Displacement. This requires an inventory of project-affected land and properties, a census of project affected people, assessment of impacts on existing livelihoods, compensation at replacement cost and other assistances, and options for rehabilitation and restoration.

The SEA includes the development of an Environmental and Social Action Plan (ESAP) and an Environmental and Social Management and Monitoring Plan (ESMMP) for the Programme. In addition, IPF consultants will finalise a Project Implementation Plan to detail a roadmap for project construction and operation to ensure consistency of project implementation.

HEP, which may be the developer and operator of some or all of the HPPs, has established a Corporate Social Responsibility (CSR) program, through which HEP is committed to "respect cultural, religious, traditional and any other material or spiritual characteristics in cooperating with the local communities in which HEP is active, creating a friendly environment".

Regarding the delivery of net benefits to project-affected communities, the EIAs of HPP Podsused and HPP Drenje include basic cost-benefit analysis of the environmental and social impacts and benefits, concluding that these projects will bring net social benefits. However, this analysis addresses the general public and is not specific to project-affected communities (e.g. those to be resettled, or whose livelihood will be negatively-affected). In addition, the IPF consultants are conducting an overall cost-benefit analysis of the programme, but this is not focused on project-affected communities (for other concerns with the CBA, please refer to ES-9 Economic and Financial Issues and Risks). Therefore there is no evidence that the project is likely to deliver net benefits to project-affected communities. The programme appears to be planning to compensate for social impacts only – for example through the Land Acquisition, Resettlement and Compensation Plan – but there is no indication that it would go beyond the compensation of impacts to ensure that affected communities experience a net benefit through, for example, improved housing conditions or public services.

Between the two options, the MCA determines that **Option 2** has fewer negative social impacts (affecting less privately owned land (903 ha vs 986 ha) and fewer resettled households (52 vs 64) compared to **Option 1**.

7.2.2 Advanced Expectations

Statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence supported by objective evidence that a project can avoid, minimise, mitigate and/or fully compensate negative social impacts; or

- the assessment takes into account opportunities, and there is potential for some social opportunities or enhancements to existing social issues to be realised; or

- the assessment takes into account risks relating to legacy issues or cumulative impacts; or

- an analysis undertaken of strengths, weaknesses, opportunities and threats of a project with respect to managing social risks.

As the social assessments are still at an initial stage, there cannot yet be a high level of confidence that the programme will minimise, manage and fully compensate all negative social impacts.

However, the process of SEA that complies with EU Directives and Croatian laws will provide a higher level of confidence on the quality of the assessment of social issues and risks. Programme Sava will arrange an independent third party expert to conduct a review of the SEA to ensure that the SEA team has addressed all of the requirements of the EU EIA Directive and that the SEA Report can be understood by a broad readership.

In addition, compliance of the Land Acquisition, Resettlement and Compensation Plan with EBRD PR5 will provide a higher level of confidence that the programme can manage and fully compensate land acquisition impacts, but the exact scope of the plan is yet to be defined. Compliance with EBRD performance requirements PR 2: Labour and Working Conditions, PR 4: Community Health, Safety and Security, PR 8: Cultural Heritage and PR 10: Information Disclosure and Stakeholder Engagement will also provide higher confidence in future.

Stakeholder consultation will also bring a higher level of confidence. Programme Sava has paid attention to gaining agreement with important project stakeholders through various public forums, including the annual Sava River Conference. Stakeholders engaged include ministries, municipal and planning authorities, Croatian Waters, HEP, the Sava River Commission, the International Commission for the Protection of the Danube River, NGOs, technical experts, and civil society organisations. The MCA workshop engaged 27 professional and academic experts of the Expert Council. Such stakeholder engagement is expected to extend throughout the future SEA process.

Regarding opportunities, the multi-purpose objectives of the programme concern social benefits: flood protection, water supply, increased tourism and recreational facilities, urban regeneration (including new space free from flood and perceived amenity), increased areas suitable for agriculture, improved transportation infrastructure, and improved navigability. **Option 2,** has been designed to maximise the benefits and minimise social risks as compared to the original programme as conceived through **Option 1.** However, there has not been an assessment of specific opportunities or enhancements at local levels, for example in relation to all HPPs, or in relation to specific project-affected communities or social groups. This has been done in the initial two HPP EIAs, which mention the potential enhancements that would be enabled, for example the EIA of HPP Podsused identifies projects in its hinterland that would be enabled by flood control. This will need to be taken into account for all components of the programme in the SEA.

Regarding legacy issues and cumulative impacts, the objective of the programme is to address the legacy social impacts of the un-completed scheme developed in 1970s, and the current assessment will also assess cumulative impacts. The FS will review all development plans for new neighbouring HPP developments and floodwater management, to assess the cumulative effect of hydropower development in the river basin and throughout the region. The SEA will assess cumulative impacts on Natura 2000 sites and nature reserves.

The Program Sava team has undertaken an analysis that draws strengths, weaknesses, opportunities and threats out of existing plans and participative processes (including the National Strategic Reference Framework 2013, Regional Development Strategy of the Republic of Croatia 2013, ZagrebPlan 2011-2013, Development Strategy for the County of Zagreb 2013, Development Strategy for Sisak-Moslavina County 2013, and the Program Sava logical framework). They have identified a range of issues related to social aspects, including:

Strengths	*Weaknesses*	*Opportunities*	*Threats*
• Urban development • Increased functionality of urban areas • Improved quality of life	• Uneven regional growth and increasing regional differences • Aging population • Inadequate emergency medical services • Overstressed urban-rural division • Insufficient transportation infrastructure	• Croatian accession to the eu and eu fund • Development of the local labour market • Improved response to natural disasters • Improved public and individual transport	• Fragmentation and unresolved property relations • Loss of property and human life from disasters, and • Limited employment.

7.3 Summary of Key Issues

- Social issues and risks most relevant to the project have been and will continue to be assessed, in particular through the SEA process.
- Assessments conducted to date have not identified specific communities that will be affected, quantified the significance of the impacts, or covered all social risks. Gaps include loss or change of livelihood, loss of or restricted access to areas currently used for informal recreation, impacts on vulnerable groups, and community-level stakeholder engagement and support.
- The programme appears to be planning only to compensate for social impacts, with no measures that go beyond compensation to ensure that affected communities experience a net benefit, and no plans to address opportunities or enhancements, for example amongst specific project-affected communities.
- Completion of the SEA to meet EU requirements, addressing all social impacts, preparation of the Land Acquisition, Resettlement and Compensation Plan to meet EBRD requirements, and continuing stakeholder involvement will ultimately deliver a higher level of confidence that the programme will be able to mitigate, manage and compensate for all social impacts.

7.4 Relevant Evidence

Interview:	3, 5, 11, 14-16, 18, 20, 24, 28, 29, 33
Document:	1-3, 5, 13, 18, 21-24, 26-29, 33-35, 37, 43, 61-67, 73, 82-84, 91, 95, 103, 107, 114, 118, 122-124, 135, 136
Photo:	1-3, 6-8, 10, 13-30

8 Environmental Issues and Risks (ES-8)

This topic addresses early identification and analysis of environmental issues and risks that may influence decisions to invest in preparation of a hydropower project under consideration. The intent is that environmental issues and risks have been evaluated at an early stage, and decisions to invest in project preparation are informed on these matters.

This topic is important because without an early stage analysis, environmental issues and risks may be encountered after the developer has made significant investments into project preparation and it may be difficult to consider an alternative project.

8.1 Background Information

The programme-affected area encompasses the footprint of individual components, boundaries of three groundwater aquifers affected by the project, the flood line from the Slovenian border in the west to Mačkovac in the east, areas affected by downstream flows, and Natura 2000 sites potentially affected by the programme.

The SEA and environmental impact assessment (EIA) processes related to the programme includes:

- An SEA to be prepared and approved according to the Croatian Regulation on Strategic Environmental Assessment of Plans and Programmes. As a part of the process, an assessment regarding Natura 2000 areas will be conducted;
- An Environmental Screening (ES) to be prepared and approved for each component, including associated infrastructure such as road and bridges; and
- Where the ES determines that an EIA is required, an Environmental Impact Assessment (EIA) shall be prepared and approved for each component.

The most relevant environmental issues and risks during the construction and operation of the programme include:

Construction

- Loss of habitat and impacts to wildlife at and in the vicinity of the construction site; and
- Disposal of construction waste and wastewater, noise and impacts on air quality.

Operation

- Loss or change of habitat, including loss/change of Natura 2000 sites Sutla, Potok Bregana, Potok Dolje upstream by HPP Podsused, loss/change of habitat in Natura 2000 site Odransko polje downstream by HPP Strelečko in Option 1 and HPP Sisak in Option 2, and impacts to other Natura 2000 sites through inundation of river banks for HPP reservoirs, alteration of groundwater level and change of hydrological regime;
- Other biodiversity impacts, including deforestation, loss of species, impacts to migratory fish, growth of invasive species, and impacts on ecosystem services such as the provision of recreation;
- Contamination of groundwater aquifers used for water supplies caused when rising groundwater levels meet landfill sites and other pollution sources;
- Impacts of increased or decreased groundwater levels on water supply, irrigation and the natural environment; and
- Downstream flow effects, including erosion and sedimentation.

Natura 2000 sites are home to important habitat types and species, and function as core areas in ecological networks. These sites are designated by EU Member States within the framework of the EU Birds and Habitats Directives in order to secure their conservation status. The project area encompasses the following Natura 2000 areas:

- Areas significant for birds: Turopolje, Sava kod Hruščice and Donja Posavina;
- Areas significant for habitats and species: Odransko polje, Sunjsko polje, Odra kod Jagodna, Sutla, Žutica, Medvednica, Potok Dolje, Stupnički lug, Kupa, Sava nizvodno od Hruščice, Potok Bregana and Lonjsko polje.

Findings presented under this topic are based on interviews with IPF consultants and other stakeholders, existing EIA reports, the Conceptual Solution Report, the terms of reference of the IPF consultants, and review of the legislative framework.

8.2 Detailed Topic Evaluation

8.2.1 Basic Expectations

Assessment

Statement: *An assessment has been undertaken of environmental issues and risks most relevant to the project.*

Environmental issues and risks most relevant to the programme have been and will continue to be assessed through three processes: two EIA reports for HPP Podsused and HPP Drenje; an MCA analysis that is part of the Conceptual Solution Report; and the SEA currently being undertaken by the IPF consultants. Whilst additional ES/EIA will be conducted for each component in due course, they will not be conducted at an early stage.

Environmental Impact Assessment

The HPP EIAs included assessment of the following environmental risks:

- Risks for the programme created by upstream Slovenian HPPs, including hydrological risk, sediment transport and changes in river morphology;
- Construction phase: impacts on wildlife, loss of habitat and impacts on protected flora and fauna, deforestation, loss of agricultural land, groundwater contamination resulted from nearby landfill site, loss of landscape area along the river bank, dust emission and air pollution, noise, and waste disposal.
- Operation phase: change of the hydrological regime in the reservoir area and downstream, deepening of river bed downstream, impacts to migratory fish, impacts to the drainage system and other infrastructures as a result of increased groundwater level, and landscape impact.

Multi-criteria Analysis

The MCA enables the incorporation of environmental considerations into the programme design. It is based on an Analytic Hierarchy Process technique. Under this approach, weights are assigned to 14 selected technical, economic, social and environmental criteria/objectives, covering 34 indicators of impacts. The total score for an option is then defined as the sum of the score for each criterion multiplied by its weighting. These assessments were presented in the Conceptual Solution report.

The MCA encompasses seven environmental indicators under two criteria:

- Protection of the environment, including loss of surface water habitats, loss of areas of significant for habitats and species (Natura 2000), loss of areas of significance for birds (Natura 2000), change of habitats not included in Natura 2000, deforestation, and loss of forest ecosystem services;
- Maintain or improve the water management regime in retention areas: the possibility of controlling water outlet into retentions. This is recognised as an opportunity.

Three other MCA criteria are related to environmental issues although not listed under “environment”:

- Water supply: increased/decreased groundwater level; potential contamination of water wells; and
- Downstream hydrological regime beyond Sisak: change of flood flows and flood water levels, change of low flows and low water levels, and change of river sediment regime.

Strategic Environmental Assessment

According to the ToR of the IPF consultants, the SEA will be conducted following a screening/scoping process. At the time this report was drafted, the Scoping Report was being reviewed by the Croatian Government, while opinions on environmental screening of Natura 2000 areas have been obtained. Detailed assessments will be undertaken based on the approved scope of work. The assessment of impacts on Natura 2000 areas will be conducted as part of the SEA. The TOR for the SEA emphasises the importance of biodiversity assessment, including flora, fauna (especially ichthyofauna, birds and bats), noise and cumulative effects. It also requires that special attention will be given to impacts on groundwater and surface water.

Note that some of the programme's environmental impacts will be assessed through the technical studies of the FS/SEA/CBA study including: hydrology of the river basin, geology, hydrogeology, seismology, erosion and sedimentation and embankment stability.

Outcomes

Statement: *The project is likely to minimise and manage negative environmental impacts.*

Environmental assessment is still at an initial stage and not all impacts have been identified. However, **both Options 1 and 2** are likely to minimise and manage negative environmental impacts owing to the detailed analysis being conducted for the options as part of the FS/SEA/CBA study.

In accordance with their terms of reference, IPF consultants will review permitting and licensing requirements including administrative procedures governing hydropower development in Croatia to ensure that required permits, documents and licenses are identified and can be complied with through programme implementation. This includes regional and transboundary development programmes such as the Sava River Management Plan and the Environmental Program for the Danube River Basin. These legislative requirements, commitments and impacts have been analysed and incorporated during the conceptual solution development for each option, and will inform the preparation of FS/CBA/SEA study.

The EIA reports for HPP Podsused and HPP Drenje include environmental mitigation measures applicable to pre-construction, construction, operation and decommissioning phases, as well as corresponding monitoring programmes and costs. The SEA will include the development of an Environmental and Social Action Plan (ESAP) and an Environmental and Social Management and Monitoring Plan (ESMMP) for the Programme. In addition, IPF consultants will finalise a Project Implementation Plan to detail a roadmap of project construction and operation to ensure consistent implementation of those management plans. The cost of environmental mitigation, including management plans and monitoring programmes, will be included into the programme budget. The FS will also provide recommendations for concerning the capacity requirements of Program Sava Ltd in subsequent implementation of the projects within the programme.

HEP, which may be the developer and operator of some or all of the HPPs, has an environmental management system. Program Sava Ltd has a newly developed Environmental, Health and Safety (EHS) Policy. In addition, EBRD financing would require compliance with their Environmental and Social Policy and PR1-PR10, requiring a detailed environmental and social action plan, and the development of management plans to address specific environmental impacts, such as an erosion and sediment control plan, or a traffic management plan.

The TOR requires the IPF consultants to conduct a cost-benefit assessment of the programme. However environmental externalities (e.g. cost of environmental mitigations, environmental benefits from flood control, groundwater replenishment, water retention) are not yet included. The IPF consultants are working to improve the CBA to encompass the main environmental considerations. Please refer to ES-9 Economic and Financial Issues and Risks for further details.

Between the two options, the MCA determines that **Option 2** has fewer negative environmental impacts (affecting only half of habitats, Natura 2000 areas, forests, and ecosystem services) compared to **Option 1**.

Negative environmental impacts associated with Option 2 differ from those of Option 1, in the following areas:

- Impacts of HPP Podsused will be the same for both options (loss of habitats, increased groundwater levels, contamination to groundwater and downstream flow effects);
- Option 2 will have fewer impacts on Natura 2000 areas and other habitats by keeping Sava River water within the river, whilst Option 1 will allow it to reach the levees;
- Option 2 will have less risk of contamination of groundwater in Zagreb because the groundwater level will increase less in the area of the four smaller HPPs;
- Option 2 will have additional impacts of a larger HPP Prečko and the filling the Sava-Odra channel; and
- Option 1 HPP Strelečko will cut a river meander on the Sava River off to form a lake and have upstream effects on the Sava River, whilst Option 2 HPP Sisak will have upstream effects on the Kupa River and facilities in Sisak City.

8.2.2 Advanced Expectations

Statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence supported by objective evidence that a project can avoid, minimize, mitigate and/or fully compensate negative environmental impacts; or

- identification of opportunities for environmental enhancement, and there is potential for some of these enhancements to be realised; or

- identification of risk relating to legacy issues or cumulative impacts; or

- an analysis undertaken of strengths, weaknesses, opportunities and threats of a project with respect to managing environmental risks.

As environmental assessment is still at an initial stage, there cannot yet be a high level of confidence that the project will minimise, manage and fully compensate all negative environmental impacts.

However, the process of the SEA, in compliance with the EU SEA Directive and Croatian law, provides greater confidence that issues have been assessed at an early stage, and that the assessment will be of a sufficient quality. Program Sava Ltd will arrange an independent third party expert to conduct a review of the SEA to ensure that the SEA team has addresses all of the requirements of the relevant EU Directives.

The TOR for the IPF consultants includes a checklist of potential environmental impacts of hydro projects, providing an initial guide and checklist for the SEA process. All potentially project-affected areas are covered, including the catchment, upstream river, reservoir area, downstream river, host resettlement areas, project construction sites, transmission lines, canals and pipelines, access roads, and peripheral areas. The SEA has not yet addressed certain aspects that are included in this checklist: invasive species, migration of fish, and the downstream flow regimes.

In addition, the IPF consultants have found that insufficient data on erosion and sedimentation along the river presents a risk to the analysis of downstream effects, and the absence of information on upstream Slovenian HPPs will make it difficult to conduct cumulative impacts assessment. These risks, which may lower confidence of the assessment, have been recognised and are being addressed by the IPF consultants.

The SEA will include an assessment of greenhouse gas emissions. Climate change will be analysed through a sensitivity assessment of climate change impacts on hydrological forecasts and energy yield.

Regarding opportunities and enhancements, the multi-purpose objectives of the programme concern opportunities, specifically:

- Flood control and the reduction of environmental pollution resulting from flood events;
- Replenishment of the Zagreb groundwater aquifer;
- Increased capacity of controlling water outlet into retentions; and

- Increased resilience to climate change (i.e. adaption to floods, water supply, hydropower and irrigation in a changing climate), and increased capacity to cope with a changing climate.

According to the MCA, **Option 2** provides greater capability for flood control, greater groundwater aquifer replenishment capacity and better capacity to cope with a changing climate.

However, aside from the initial HPP EIAs, there has not been any assessment of specific environmental opportunities or enhancements at the component level or related to specific issues, such as opportunities to ensure improved preservation of Natura 2000 sites, for example. This has been done in the initial two HPP EIAs, which mention potential enhancements, for example the EIA of HPP Podsused proposes the mitigation of illegal landfill sites along streams. This will need to be taken into account for all components of the programme in the SEA.

Regarding legacy issues and cumulative impacts, the overall objective of the programme is to address the legacy of the un-completed scheme developed in 1970s and negative environmental impacts resulting from the upstream Slovenian HPPs. The hydrological analysis is inherently a cumulative analysis. The SEA will assess cumulative impacts to Natura 2000 sites and nature reservation sites, as well as other cumulative environmental impacts.

Programme Sava has undertaken an analysis that draws strengths, weaknesses, opportunities and threats out of existing plans and participative processes (including the National Strategic Reference Framework 2013, Regional Development Strategy of the Republic of Croatia 2013, ZagrebPlan 2011-2013, Development Strategy for the County of Zagreb 2013, Development Strategy for Sisak-Moslavina County 2013, and the Program Sava logical framework). They have identified a range of issues related to environmental aspects, including:

Strengths	*Weaknesses*	*Opportunities*	*Threats*
• Protection of aquifers • Reforestation, protected habitats and species • Reduced flood hazards • Recreating new monitoring schemes of environmental conditions	• Lack of environmental awareness • Undeveloped infrastructure and services for waste management and water • Lack of information in relation to flood flows from upstream slovenia • Insufficient warning systems	• Water quality improvement • Rehabilitation of devastated wetland areas • Restoration of degraded or damaged protected species and habitats	• Existing environmental pollution • Possible permanent loss of biodiversity and habitat • Insufficient cooperation with neighbouring countries on water protection, and • Limited possibility of achievement and maintenance of eu environmental standards.

8.3 Summary of Key Issues

- Environmental issues and risks most relevant to the project have been and will continue to be assessed, in particular through the SEA process and the technical analyses of the IPF consultants. As these are yet to be completed, the degree to which the programme will minimise and manage all negative environmental impacts cannot be fully determined.
- The SEA has not yet included topics of migration of fish, invasive species and downstream flow regimes. Lack of baseline data on erosion, sediments, biodiversity and upstream Slovenian HPPs also presents risks for the SEA. These risks, which may lower confidence of the assessment, have been recognised and are being addressed by the IPF consultants.
- Aside from two initial HPP EIAs, there has not been any assessment of specific environmental opportunities or enhancements for each component at a local level or concerning specific issues.

8.4 Relevant Evidence

Interview:	3, 5, 11, 14, 15, 16, 18, 20, 24, 28, 29, 33
Document:	1-4, 7, 13, 15, 16, 18, 21-24, 26-29, 33-35, 37, 43, 61, 62, 69, 73, 79, 82-84, 88, 91, 93-95, 101, 104, 111, 118, 122-124
Photo:	1-9, 12-15, 19, 20

9 Economic and Financial Issues and Risks (ES-9)

This topic addresses early identification and analysis of economic and financial issues and risks that may influence decisions to invest in preparation of a hydropower project or system of projects. The intent is that economic and financial issues and risks have been evaluated at an early stage, the project will deliver a net economic benefit, that the project or the system within which it operates will be financially viable, and decisions to invest in project preparation are informed on these matters.

This topic is important because without an early stage analysis, economic and financial issues and risks may be encountered after the developer has made significant investments into project preparation and it may be difficult to consider an alternative project.

9.1 Background Information

As a programme of several HPPs and water management infrastructure, the programme may be implemented through a number of financially-independent components or groups of components, or possibly as one programme. The financial structure of the programme is yet to be determined.

The investment and operational costs of the options are estimated as:

	Option 0	**Option 1**	**Option 2**
Undiscounted total investment costs	€ 203,934,201	€ 1,286,361,240	€ 1,591,421,677
Undiscounted total annual operational costs	€ 45,639,480	€ 427,634,669	€ 427,551,380

Our findings presented under this topic are based largely on the terms of reference and analysis of the IPF consultants.

There are high macroeconomic risks in Croatia, which has suffered a protracted recession since 2009, with a sharp contraction in the availability of credit, and high public debt. However, the Euro – Kuna exchange rate remains stable and inflation remains low and stable.

Initial estimates, as set out in the application form for the WBIF grant, were that € 580 million would be sought from EU Structural Funds for the 'public' components (the channel and river embankments), whilst a € 300 million loan would be sought from a financial institution, probably EBRD, for the HPPs.

In keeping with new concession processes that have been adopted with EU accession (the Concessions Act 2012, Public-Private Partnerships Act and Public Procurement Act), contracts for HPP development or concessions for their development and operation would be procured by GoC. Therefore HEP would be required to compete on the open market for the development or operation of the HPPs. HEP's decision on whether to bid – and all other potential bidders' decision – cannot be guaranteed, and will be determined by the financial viability of each contract or concession.

9.2 Detailed Topic Evaluation

9.2.1 Basic Expectations

Assessment

Statement: *An assessment has been undertaken of financial issues, risks and opportunities most relevant to the project, and likely costs and benefits.*

Assessment of financial issues and risks is a key part of the IPF consultants' scope of work. Their terms of reference require the development of detailed construction cost estimates, land acquisition costs, supervision and professional services costs, and operational and maintenance costs, to deliver a financial model for the entire programme as well as individual components. Their scope also includes a risk and sensitivity analysis, encompassing financial and economic risks and their influence on project viability. The consultants' mobilisation report confirms the development of a preliminary financial model, the further development of this model into an analysis that allows stakeholders to determine the financial viability of individual components and the programme, and a sensitivity analysis incorporating financial and macroeconomic risks (e.g. increases in interest rates, changes in investment costs, availability of grant funds etc.).

Assessment of the likely economic costs and benefits is also included in the IPF consultants' terms of reference. Their scope includes the development of an inventory of socio-economic benefits, and (with the financial model above) the development of a robust economic analysis for individual components and the programme which should include benefits of CO_2 emission reduction, socio-economic benefits, and socio-economic mitigation costs. Both the financial and economic analysis will deliver estimates of Net Present Value (NPV) and Internal Rate of Return (IRR).

The IPF consultants presented an initial financial and economic model as part of the Conceptual Solutions Report for the MCA workshop in June 2014. This preliminary model was based on estimates of costs and revenues for each HPP and the Sava-Odra canal, under both Options 1 and 2, delivering financial and economic NPV and IRR for the options, but not for individual HPPs. Estimated benefits that were added to develop the economic analysis were the benefits arising from irrigation, urban regeneration, employment, and CO_2 emissions reductions. Financial NPV is included as an indicator in the MCA scoring process, whilst an indicator of economic NPV was not included because economic benefits were considered to be incorporated in the range of other indicators used in the MCA.

The above analysis has a number of weaknesses: analysis is not provided in full for the separate HPPs/components, and the analysis is not based on any prediction of how the components might be structured (for example the Sava-Odra canal with HPP Prečko, or the Zagreb HPPs in one bundle); costs of environmental mitigation are not yet included; the range of benefits included in the economic analysis is very narrow; and the economic cost of social and environmental impacts are not included. However, financial and economic modelling is just beginning, and a full analysis will be possible on the basis of more detailed designs, once the preferred option has been identified.

In addition, in July 2013 WYG consultants delivered a more detailed cost-benefit analysis for one of the plants, HPP Podsused. This provides estimated investment costs, financing, operating costs, revenue, and financial and economic NPV and IRR over 30 years. In this case, economic benefits included in the economic analysis are CO_2 emissions reductions and employment only, and no economic externalities/costs are included.

Regarding financial opportunities, the scope of the IPF consultants includes a Financing Plan, which will identify potential financing arrangements with EBRD and EC structural funds, and a component to provide support to Program Sava Ltd to secure and negotiate financing. The mobilisation report confirms that the following will be assessed: potential for bank / IFI financing; potential for private sector participation or equity investment; and the potential for EU grant funding. The consultants will also provide training to the Program Sava team on arranging finance. There is no indication that financial opportunities related to reducing costs, for example through re-using materials and through the use of the best technology to improve efficiency, would be considered at this early stage.

Outcomes

Statement: *The project or the corporate entity to which it belongs is likely to manage financial issues, attract finance, and deliver a net economic benefit within the sphere of influence of the given hydropower project.*

Provisional results in the initial financial and economic model are as follows:

	Option 1	Option 2
Total investment costs (€)	€ 1,286,361,240	€ 1,591,421,677
Total annual operating costs (€)	€ 45,639,480	€ 427,551,380
Financial NPV	- € 194,435,677	- € 119,988,478
Financial IRR	2.16%	2.54%
Economic NPV	€ 288,492,637	€ 466,841,056
Economic IRR	11.99%	22.45%

The financial NPV is negative in both options as neither generates sufficient power. Some interviewees estimated that the electricity price would have to be above € 50 / MWh for the programme to be viable, whilst the current price is € 35/MWh. Financial NPV is expected to be negative for individual HPPs. The CBA of HPP Podsused delivered a total investment cost of € 306,754,174, financial NPV of - € 35,906,019, financial IRR of 2.57%, economic NPV of € 124,898,710, and economic IRR of 7.46%.

It is impossible to judge at this stage whether the programme is likely to be able to manage financial issues. The negative financial NPV for both options supports a preliminary conclusion that investment under both options is commercially inviable. However the scope of the FS/SEA/CBA study includes detailed assessment of financial issues in order that the programme is designed in a manner that will enable the programme to be economically viable, and individual components are commercially viable and able to manage financial issues.

Program Sava Ltd has very limited financial management capacity at present, and this would require developing significantly if it is to manage programme implementation in future. HEP, as one candidate able to bid to develop and operate the HPPs, probably has sufficient financial management capacity, but no information on this has been made available to this assessment.

It is impossible to judge at this stage whether the programme is likely to be able to attract finance. However, the scope of the FS/SEA/CBA study was designed with the participation of potential financers (EBRD) and directly addresses the design of the programme in order that it may attract finance, the development of a financing plan, and support to Program Sava Ltd in arranging financing. The components that provide public goods of flood control (the channel and embankments etc.) would be separately financed by grants from the EU Structural Fund. A negative financial NPV may assist in obtaining grant financing from EC Structural Funds.

It will be important that the study determines the structure and sequence of construction of the programme, in order that financial issues can be identified for each component. This may be achieved through the development of the Project Implementation Plan (PIP), Financing Plan and Procurement Plan, and support to financial close, but it is notable that the IPF consultants state in their mobilisation report (page 71, under 9.2 Task 7 – Support to Financial Close) that developing the project financing arrangements “may include the need to undertake specific project-level feasibility studies which are outside the scope of this [contract]”. Delineation of the components and their procurement model is critical for full financial appraisal, yet there appears to be little in the scope of the FS/SEA/CBA study that requires this. The scope requires the delivery to the level of “Conceptual Solution” to assure technical and economic viability of the overall programme only, and the commitment to financial analysis is for individual HPPs only, rather than linked to the projects that will be delineated in the Financing Plan and Procurement Plan.

The provisional economic NPV and IRR above suggest that the programme will deliver a net economic benefit. However, this is calculated on the basis of irrigation, urban regeneration, employment, and CO_2 emissions reductions only. The net economic benefit may be higher, for example if economic benefits of flood control are included, or lower, for example if the social costs of the loss of recreational areas are included. At this stage, it is very difficult to complete a reliable economic analysis without improved data on the economic costs of flooding.

9.2.2 Advanced Expectations

Scoring statement: *In addition to basic expectations, the assessment may try to achieve:*

- a higher level of confidence that a project or corporate entity to which it belongs can manage financial issues under a broad range of circumstances, fund environmental and social mitigation measures, and readily attract finance; or

- a high level of confidence supported by a broad consideration of potential costs and benefits including social and environmental externalities that the project can be deliver significant and sustainable net benefits; or

- an analysis undertaken of strengths, weaknesses, opportunities and threats of a project with respect to managing financial risks.

It is too early to determine with confidence that the programme, or the companies that will develop and operate the individual HPPs, can manage financial issues under a broad range of circumstances. The financial and economic analysis will include sensitivity analysis, including the risk of climate change for the hydrological resource, but the full range of risks to be incorporated into the sensitivity analysis has not been identified yet. EU procurement and concession law govern the procurement of engineering contractors or the award of concessions to developers or operators, providing greater confidence that the successful bidders will have a track record in financial management and the mitigation of financial risks through contingency planning and insurance. Program Sava Ltd has no plans to specifically assess the track record of these companies in financial management, but it is very early in the process to do so.

The financial and economic analysis is currently in its very initial stages. However, as described above, it is not clear how individual components and their procurement model will be delineated, allowing full financial appraisal. Independent verification of the financial and economic analysis (linked to the PIP, Financing Plan and Procurement Plan) and early discussions with potential financers at EBRD, would build confidence in the ability of the programme and its components to manage financial issues.

Regarding the financing of environmental and social mitigation measures, estimates will be included in the financial and economic analysis, as it develops, drawing on the SEA findings, and the programme is being designed and financed in order to incorporate environmental and social mitigation measures. In addition, the financial analysis will include contingency budgets.

The programme can be confident of attracting finance, from EU structural funds for public infrastructure, and from EBRD, if their early involvement continues through the FS/SEA/CBA study and into discussions on the feasibility of specific components.

At present there can be little confidence that the programme will deliver a significant and sustained net economic benefit, as the full range of socio-economic benefits has not been defined or economically valued, and social and environmental externalities have not been valued. Whilst the FS/SEA/CBA study terms of reference requires the identification of socio-economic benefits, and their inclusion in the economic analysis, it does not refer to the identification and valuation of social and economic externalities/costs.

Program Sava Ltd has undertaken an analysis that draws strengths, weaknesses, opportunities and threats out of existing plans and participative processes (including the National Strategic Reference Framework 2013, Regional Development Strategy of the Republic of Croatia 2013, ZagrebPlan 2011-2013, Development Strategy for the County of Zagreb 2013, Development Strategy for Sisak-Moslavina County 2013, and the Program Sava logical framework). They have identified a range of issues related to financial and economic issues and risks, including:

Strengths	*Weaknesses*	*Opportunities*	*Threats*
• Liberalised access to the EU market • Strong banking,	• Track record of inappropriate management of	• The potential for additional business development	• Slow implementation of competition policy.

financial and insurance sector
- Relatively strong financial capacity of the City of Zagreb

investments in development projects in Croatia
- Lack of adequate manpower especially skilled manpower
- Poor business environment and investment climate

- Drawing on experience of implementing the programme
- Engagement with EU funding programmes, and

9.3 Summary of Key Issues

- Assessment of financial and economic issues and risks is underway, and will be used to contribute to the design of the programme in order that the programme and its constituent components are financially and economically viable.
- It is not clear how the analysis of financial viability of the components will relate to the Project Implementation Plan, Financing Plan and Procurement Plan. Delineation of the components into projects to be procured should be considered as early as possible, in order that the most financially viable combination of projects can be identified and considered iteratively with the Financing Plan and Procurement Plan.
- The costs of environmental and social mitigation measures are not yet included in the analysis, which should be addressed as soon as it is possible to estimate these measures.
- Economic valuation of the full range of benefits of the programme and their incorporation into the CBA is yet to be done, and the scope of the CBA does not encompass environmental and social externalities, which should be corrected if it is to meaningfully determine an economic rate of return.
- The financial and economic analysis would benefit from independent third party review, and the early involvement of potential financers.

9.4 Relevant Evidence

Interview:	1, 2, 4, 10, 15, 21, 30, 34, 36
Document:	1, 2, 3, 17, 18, 20, 30, 33
Photo:	-

Appendix A: Written Support of the Project Operator

Zagreb na Savi

International Hydropower Association
Nine Sutton Court Road
London Borough of Sutton
SM1 4SZ
United Kingdom

PREDMET: PROCJENA ODRŽIVOSTI PROGRAMA ZAGREB NA SAVI METODOLOGIJOM HYDROPOWER SUSTAINABILITY ASSESSMENT PROTOCOLA

Poštovani,

Vijeće programa Zagreb na Savi u potpunosti podržava procjenu održivosti programa prema *Hydropower Sustainability Assessment Protocolu* u njegovoj ranoj fazi razvoja. Smatramo da je od izuzetne važnosti postaviti dobre temelje za daljnji razvoj programa te nam je zadovoljstvo što će Zagreb na Savi biti prvi program u svijetu koji će biti evaluiran u ovoj fazi.

Tvrtka voditelj programa (HEP RVNP) ima našu bezuvjetnu podršku u svojim nastojanjima za postizanje visokog stupnja održivosti jer program Zagreb na Savi ima dalekosežne utjecaje na cijelu državu i društvo u svim svojim segmentima.

Vjerujemo da ćemo zajedničkim naporima stvoriti program koji je održiv u svim svojim sastavnicama te da je ovo samo početak suradnje programa Zagreb na Savi i *International Hydropower Associationa*.

S poštovanjem,

Ivan Vrdoljak

Ministar gospodarstva i predsjednik Vijeća Programa

U Zagrebu, 3. travnja 2014.

Appendix B: Verbal Evidence

Ref	Interviewee/s	Position	Organization	Date	Interviewers
1	Irena Ratković Malbaša	Assistant to Director	Program Sava Ltd	30.6.2014	Doug Smith, Inger Poveda Björklund, Aida Khalil, Elisa Xiao
	Venko Ćurlin	Head of Physical Planning Department			
	Ivana Ivanković	Head of Hydro Engineering Department			
2	Valeria Valeri	Long Term Senior Project Manager	WBIF-IPF3 (Mott Mcdonald, Atkins, WYG)	30.6.2014	Doug Smith, Inger Poveda Björklund
3	Valeria Valeri	Long Term Senior Project Manager	WBIF-IPF3 (Mott Mcdonald, Atkins, WYG)	30.6.2014	Aida Khalil, Elisa Xiao
4	Nikola Pinjuh	Technical consultant	WBIF-IPF3 (Mott Mcdonald, Atkins, WYG)	30.6.2014	Doug Smith, Inger Poveda Björklund
	Maja Kerovec	Technical consultant			
5	Nikola Pinjuh	Technical consultant	WBIF-IPF3 (Mott Mcdonald, Atkins, WYG)	30.6.2014	Elisa Xiao, Aida Khalil
	Maja Kerovec	Technical consultant			
6	Andrino Petković	Director of Water Management Department for the Upper Sava	Croatian Waters	1.7.2014	Doug Smith, Aida Khalil
	Danko Biondić	Head of Development Sector			
	Marijan Babić	Head of PIU for EU-funded Flood Protection Projects			
	Zoran Marković	Deputy Director of the Water Department for the Upper Sava River			
	Juraj Cerovski				
	Tomislav Gasić				
	Zlatko Jurisa	Water Department for the Upper Sava River			
	Vesna Grizelj-Šimić	Department of Development			
	Ružica Drmić	PIU for EU-funded Flood Protection Projects			
	Davorka Stepinal	PIU for EU-funded Flood Protection Projects			
	Darko Barbalić	Water Management Institute			
7	Irena Ratković Malbaša	Assistant to Director	Program Sava Ltd	1.7.2014	Doug Smith, Aida Khalil
8	Vesna Vrga	Project Cordinator	Zagreb Society of Architects (DAZ)	2.7.2014	Doug Smith, Inger Poveda Björklund
9	Miljenko Ivica	Technical Expert	Program Sava Ltd / HEP d.d.	2.7.2014	Doug Smith, Inger Poveda Björklund
10	Valerija Kemen Pepeonik	Assistant Head of Office for Strategic Planning and City Development	City of Zagreb	2.7.2014	Doug Smith, Inger Poveda Björklund
	Branko Kincl	Member	HAZU (Croatian Academy of Sciences and Arts)		
11	Branko Kincl	Member	HAZU (Croatian Academy of Sciences and Arts)	2.7.2014	Elisa Xiao
12	Valerija Kemen	Assistant Head of Office for	City of Zagreb	2.7.2014	Aida Khalil

Ref	Interviewee/s	Position	Organization	Date	Interviewers
	Pepeonik	Strategic Planning and City Development			
13	Marko Pavić	Secretary	Slap (NGO – Association for the Preservation of Croatian Waters and Sea)	2.7.2014	Doug Smith, Inger Poveda Björklund
14	Marko Pavić	Secretary	Slap (NGO – Association for the Preservation of Croatian Waters and Sea)	2.7.2014	Aida Khalil, Elisa Xiao
15	David Nieuwenhuis	Project Manager	WBIF-IPF3	2.7.2014	Doug Smith, Inger Poveda Björklund, Aida Khalil, Elisa Xiao
16	Ivana Ivanković	Head of Hydro Engineering Department	Program Sava Ltd	3.7.2014	Aida Khalil, Elisa Xiao
	Irena Ratković Malbaša	Assistant to Director	Program Sava Ltd		
	Miljenko Ivica	Technical Expert	Program Sava Ltd / HEP d.d.		
	Venko Ćurlin	Head of Physical Planning Department	Program Sava Ltd		
17	Dejan Komatina	Secretary	ISRBC	3.7.2014	Doug Smith, Inger Poveda Björklund
18	Dejan Komatina	Secretary	ISRBC	3.7.2014	Aida Khalil, Elisa Xiao
19	Branimir Barišić	PR Manager	Program Sava Ltd	3.7.2014	Doug Smith
20	Branimir Barišić	PR Manager	Program Sava Ltd	3.7.2014	Elisa Xiao
21	Slavko Krajcar	Member	Expert Council	3.7.2014	Doug Smith, Inger Poveda Björklund
22	Slavko Krajcar	Member	Expert Council	3.7.2014	Aida Khalil
23	Mirjana Matešić	Director	Croatian business partnership for sustainable development	3.7.2014	Doug Smith
24	Nataša Mihajlović	Head of Energy Policy, Strategy and EU Projects	Ministry of Economy	3.7.2014	Doug Smith, Elisa Xiao
25	Leo Penović	Former Director	Program Sava Ltd	3.7.2014	Doug Smith
	Igor Stankovski	Director			
26	Željko Pavlin	Technical expert	Elektroprojekt Zagreb d.d.	3.7.2014	Inger Poveda Björklund, Aida Khalil
27	Sandra Jakopec	Director	Croatian Association of Urban Planners	3.7.2014	Aida Khalil
28	Vesna Montan	EIA Department	Ministry of Environment and Nature Protection	4.7.2014	Elisa Xiao, Doug Smith
	Martin Magdec	SEA Department			
	Josep Hren	Department for Nature Protection			
29	Marin Pasarić	Assistant Editor	croenergo.eu, and representative of the Croatian Association of Energetics	4.7.2014	Elisa Xiao, Aida Khalil, Doug Smith

Ref	Interviewee/s	Position	Organization	Date	Interviewers
30	Goran Vojković		University of Zagreb, Faculty of Transport and Traffic Sciences	4.7.2014	Doug Smith
31	Tihana Ledecki	Head of Water and Water Management	City of Zagreb	4.7.2014	Doug Smith, Inger Poveda Björklund
32	Teo Budanko	President	Zagreb Society of Architects (DAZ)	4.7.2014	Aida Khalil
	Gianmarco ćurcić Baldini	Member of Management Board	Zagreb Society of Architects (DAZ)		
33	Kristijan Posavec	Technical Expert	Faculty of Mining, Geology and Petroleum Enigineering	4.7.2014	Doug Smith, Inger Poveda Björklund, Aida Khalil, Elisa Xiao
34	Vedran Jurić	Director of Investment Department	HEP d.d.	Telephone 31.7.2014	Doug Smith
35	Irma Popovic Dujmovic		WWF Croatia (NGO)	Telephone 6.8.2014	Doug Smith
36	David Nieuwenhuis, Valeria Valeri	Project Manager	WBIF-IPF3	Telephone 7.8.2014	Doug Smith

Appendix C: Documentary Evidence

Ref	Author / Organization	Title	Year	Language	Note
1	Infrastructure Project Facility for the Western Balkans	Study Proposal: Feasibility Study, SEA and CBA Terms of Reference	2013	eng	
2	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme IPF3 Mobilisation report	2014	eng	Program Sava IPF3 Mobilisation Report
3	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report_Main_16_6_2014	2014	eng	Options Assessment
4	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix A1 Physical Characteristics	2014	eng	Overview of programme context
5	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix A2 Social Inclusion	2014	eng	
6	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix A4 Flooding	2014	eng	
7	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix A5 Built Environment	2014	eng	
8	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix B1 – Option 0	2014	eng	Vodoprivredno Projektni Biro d.d. – Technical Assessment of Option 0
9	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix A5.6 Transport Study	2014	eng	
10	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix A5.3 Navigability	2014	eng	
11	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix B2.1 – Option 0	2014	eng	Vodoprivredno Projektni Biro d.d. – Mathematical Modelling of Option 0
12	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix B2.2 – Option 0	2014	eng	University of Zagreb Faculty of Mining, Geology and Petroleum Engineering. – Mathematical Modelling of Option 0
13	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix C1 – Option 1	2014	eng	University of Zagreb – Conceptual Design of Option 1
14	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix C2 – Option 1	2014	eng	University of Zagreb - Mathematical Modelling for Option 1
15	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix C2 – Option 1	2014	eng	University of Zagreb Faculty of Mining, Geology and Petroleum Engineering. – Mathematical Modelling of Option 1 – Groundwater Flow and Contaminant Transport Modelling

Ref	Author / Organization	Title	Year	Language	Note
16	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix D – Option 2	2014	eng	Elektroprojekt d.d. 2013 Multipurpose Hydro-engineeering Scheme: Development, Protection and Utilisation of the Sava River and its Hinterland from the Slovenian Border to Sisak
17	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix E – Financial and Economic Model	2014	eng	With accompanying excel model
18	IPF3 (Atkins, Mott MCDonald, WYG)	Sava Zagreb Programme Conceptual Solutions Report Appendix F	2014	eng	Multi-criteria Analysis Report
19	Elektoprojekt Zagreb doo, Vodoprivredni-biro dd, IGH dd, Faculty of Mining, Geology and Petroleum	Sava Zagreb Programme Conceptual Study Drawings	2013	cro/eng	Option 2013 - folders with drawing files
20	WYG International	Sava Zagreb Program CBA analysis of Podsused HPP	2013	eng	
21	WYG International	Sava Zagreb Programme Logical Frameworks Report	2013	eng	Early Logical Fremwork of Program Sava
22	WYG International	Sava Zagreb Programme Report 2013	2013	eng	Report with good comprehensive overview
23	Elektoprojekt Zagreb doo	SUO HE Drenje	2006	cro	environmental impact assessment
24	Elektoprojekt Zagreb doo	SUO HE Podsused	2006	cro	environmental impact assessment
25	Elektoprojekt Zagreb doo	Zagreb_prethodna studija izvodljivosti	2012	cro	Pre-feasibility study for Option 1
26	Program Sava Ltd	Program Sava Stakeholder Engagement and Management 140717	2014	eng	Draft
27	Program Sava Ltd	Stakeholder analysis-zagreb na savi			
28	Program Sava Ltd	Programe Sava Stakeholder Registry 140626	2014	eng	Stakeholder Mapping Draft
29	Program Sava Ltd	ProgramSava Policies 140626 en	2014	eng	Integrated Management System Policies - draft
30	Program Sava Ltd	ProgramSava WBIF Grant Application Form 2012	2012	eng	
31	Program Sava Ltd	ProgramSava-ExternalDocumentsRegister-140628.xls	2014	eng	External Documents Registry with links and notes in English
32	Program Sava Ltd	ProgramSava-LegalRegistry-140718.xls	2014	eng/cro	Laws, rules, physical plans, etc. registry with links
33	Program Sava Ltd	ProjektSava kSWOT analiza 140626 en	2014	eng	Comparative SWOT analysis, with accompanying excel database
34	Program Sava Ltd	Booklet of maps provided to the Protocol assessment team	2014	cro	
35	Program Sava Ltd	Communication Strategy	2013	eng	
36	Program Sava Ltd	Program Sava - AST_TABLE 07052014	2014	eng	Options Selection Criteria
37	Program Sava Ltd	Program Sava - Scoring	2014	eng	Options Assessment

Ref	Author / Organization	Title	Year	Language	Note
		07052014			Scoring System
38	Program Sava Ltd	Political Risks Analysis	2014	eng	
39	Program Sava Ltd	Minutes of Meeting of the Steering Board 20.3.2014	2014	cro	
40	Croatian Government	Program Sava - Government Conclusion	2013	eng	Translation of Government Conclusion supporting development of the program
41	Croatian Government	Program Sava - Government Conclusion	2013	cro	Government Conclusion supporting development of the program (OG 101/13)
42	Croatian Government	Program Sava - Stakeholder Agreement	2013	cro	Program Sava Stakeholders Agreement following the Government Conclusion
43	Ministry of Economy	Odluka o provođenju strateške procjene na okoliš	2014	cro	Decision on SEA - Sava Zagreb Programme
44	City of Zagreb	ZagrebPlan Summary	2010	eng	Development Strategy of the City of Zagreb
45	Program Sava Ltd / DAZ / Architecture Faculty of the University of Zagreb	Zagreb na Savi Workshop Report 7.12.2013	2013	cro	
46	Ministry of Economy	National Action Plan for Renewable Energy Sources to 2020	2013	eng	
47	Ministry of Economy (Igor Raguzin)	Recently Adopted National Renewable Energy Action Plan by 2020	2013	eng	Presentation available online
48	Republic of Croatia	Energy Strategy of the Republic of Croatia	2009	eng	
49	Republic of Croatia Ministry of the Sea, Transport and Infrastructure	Development Strategy for Inland Waterway Transport in the Republic of Croatia (2008-2018)	2008	eng	
50	Republic of Croatia	Transport Development Strategy	1999	eng	
51	Government of Croatia	Croatian Operational Programme Transport (2007-2013)	2007?	eng	
52	Ministry of Environmental and Nature Protection	Programmes, Projects and Strategies	2008	eng	http://www.mzoip.hr/default.aspx?id=4354
53	Ministry of Justice of the Republic of Croatia	Action Plan with Anti-Corruption Strategy	2012	eng	
54	Croatian Waters	Strategija Upravljanja Vodama	2009	cro	Strategy for Water Management
55	Sisacko-moslavacka County	Razvojna strategija Sisacko-moslavacke zupanije	2007	cro	Regional Development Strategy of Sisačko-moslavačka County
56	Sisak-Moslavina County	Sisak-Moslavina County Development Strategy (2007-2013)	2007	eng	http://www.smz.hr/images/stories/fondovi/CDS_SMC.pdf
57	Zagrebacka County	Razvojna strategija Zagrebacke zupanije 2011-2013	2007	cro	Regional Development Strategy of Zagrebačka County
58	Zagreb County	Information on the conclusion Agreement on cooperation	2014	cro	
59	City of Zagreb	Strategic projects – capital investments	2011	eng	http://www.zagreb.hr/default.aspx?id=2013
60	City of Sisak	City of Sisak Development	2012	eng	

Ref	Author / Organization	Title	Year	Language	Note
		Strategy, 2012-2014			
61	Republic of Croatia	Regulations on Environmental Impact Assessment and Strategic Environmental Assessment (OG 64/08)	2008	eng	
62	Government of Croatia	Regulation on strategic environmental assessment of plans and programmes	2007	cro	
63	Government of Croatia	Expropriation Act	2014	cro	
64	Government of Croatia	Physical Planning Act	2014	cro	
65	Government of Croatia	Law on building inspection	2014	cro	
66	Government of Croatia	Building Act	2014	cro	
67	Government of Croatia	The law on strategic investment projects of Croatia	2013	cro	
68	Government of Croatia	Uredba o strateškoj procjeni_NN 64_08		cro	
69	Government of Croatia	zakon o zaštiti okoliša_SEA	2013	cro	Law on Nature Protection
70	EC, Government of Croatia	Ciljevi - Operativni program iz konkurentnost i kohezije 2014-2020 131108	2014	cro	Objectives - Operational Programme Competitiveness and Cohesion from 2014-2020 131108.pdf
71	EC, Government of Croatia	PA_OFFICIAL PROPOSAL_CROATIA	2014		EC - Croatia Partnership Agreement
72	EC DG-Environment	Subject: Towards Better Environmental Options for Flood Risk Management	2011	eng	
73	European Commission	EC Communication - European Union Strategy for Danube Region	2013	eng	
74	European Commission	EC position paper on development of Partnership Agreement	2013	cro/eng	One of key documents for Croatian use of EU funds
75	European Commission	Europe 2020 targets	2011	eng	http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index_en.htm
76	European Commission	The Core Network Corridors. Trans European Transport Network (TENT-T)	2013	eng	http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/site/en/maps.html
77	European Commission	Water Directives	2014	eng	http://ec.europa.eu/environment/water/index_en.htm
78	Council of Europe Group of States Against Corruption (GRECO)	Fourth Evaluation Round - Corruption prevention in respect of members of parliament, judges and prosecutors – Evaluation Report – Croatia - Adopted by GRECO at its 64th Plenary Meeting (Strasbourg, 16-20 June 2014)	2014	eng	
79	European Environment Agency	Survey of resource efficiency policies in EEA member and cooperating countries /	2011	eng	

Ref	Author / Organization	Title	Year	Language	Note
		Country Profile: Croatia			
80	EBRD	Strategy for Croatia	2013	eng	
81	EBRD	Commercial laws of Croatia, an assessment by EBRD (2013)	2013	eng	http://www.ebrd.com/downloads/sector/legal/croatia14.pdf
82	EBRD	Environmental and Social Policy and Performance Requirements	2008, 2012	Eng	
83	EBRD	Directive 2001/42/EC of the European Parliament and of the Council on the Assessment of the Effects of Certain Plans and Programmes on the Environment	2001		EC SEA Directive
84	EBRD	Public Information Policy	2014		
85	World Bank	Project Performance Assessment Report. Republic of Croatia. Energy Efficiency Project (IBRD-71980) Renewable Energy resources Project (TF-54973) District Heating Project (IBRD-48280) June 27, 2013	2013	eng	http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/07/10/000333037_20130710130620/Rendered/PDF/788750PPAR0P070Box0377365B00PUBLIC0.pdf
86	World Bank / Water Partnership Programme	Water and Climate Adaptation Plan for the Sava River Basin: Draft Final Report for Consultation	2014	eng	
87	United Nations	European Recreational Inland Navigation Network Resolution No. 52	2013	eng	http://www.unece.org/fileadmin/DAM/trans/doc/2013/sc3wp3/ECE-TRANS-SC3-164-Rev1e_01.pdf
88	United Nations	United Nations Economic Commission for Europe, Croatia Environmental Performance Reviews report (April, 2014)	2014	eng	http://www.unece.org/fileadmin/DAM/env/epr/epr_studies/ECE_CEP_172_En.pdf
89	ICPDR	Danube River Basin District: Map of HPPs	2014	eng	
90	ISRBC	Preliminary Flood Risk Assessment in the Sava River Basin	2014	eng	
91	ISRBC	ISRBC Action Plan 2011-2015	2011	eng	
92	ISRBC	ISRBC Recommendation 3-13 on Projects of High Importance for Sustainable Development	2013	cro/eng	Priority projects list by ISRBC
93	ISRBC	ISRBC Sava River Basin Analysis Report	2009	eng	
94	ISRBC	ISRBC Sava River Basin Management Plan - draft	2013	eng	Long overdue approval by ministers. Expected by the end of the year.
95	ISRBC	ISRBC Sava Stakeholder Forum Report	2011	eng	
96	ISRBC	Sava Newsflash – Official Bulletin of the ISRBC, No. 13	2014	eng/cro	
97	ISRBC	Leaflet on 'ISRBC Projects'	undat	eng	

Ref	Author / Organization	Title	Year	Language	Note
			ed		
98	ISRBC	Framework Agreement on the Sava River Basin, with associated Protocols on navigation, prevention of water pollution caused by navigation, and flood protection	2004	eng	Main agreement and Protocol on navigation agreed 2002, amended 2004, Protocol on pollution agreed 2009, flood protection agreed 2010.
99	ISRBC / ICPDR	Joint Statement on Guiding Principles for the Development of Inland Navigation and Environmental Protection in the Danube River Basin	2007	eng	http://www.icpdr.org/main/activities-projects/joint-statement-navigation-environment
100	ISRBC	Rehabilitation and development of navigation on the Sava river. 2nd Joint Statement Implementation Meeting	2012	eng	
101	ISRBC	Sava River Basin Management Plan Background paper No. 7 Invasive alien species	2013	eng	http://www.savacommission.org/dms/docs/dokumenti/srbmp_micro_web/backgroundpapers_final/no_7_background_paper_invasive_alien_species.pdf
102	IUCN	IUCN - Protection of Biodiversity of the Sava River Basin Floodplains	2009	eng	
103	UN Habitat	UN - The State of European Cities in Transition 2013	2013	eng	
104	BTI Project	BTI 2014 Croatia Country Report	2014	eng	Political / Economic Transformation
105	Delcredere Ducroire	Delcredere Ducroire - Croatia Risk Assessment	2013	eng	Political Risk Overvieew
106	Euler Hermes	Euler Hermes - Country Risk Analysis - Croatia	2013	eng	
107	Roland Berger	Roland_Berger_Hot-Spots-in-CEE_20090604	2009	eng	Central and Eastern Europe Mayor Cities Assesment
108	Bertelsmann Stiftung	Sustainable Governance Indicators. Croatia Report	2014	eng	
109	World Bank	Worldwide Governance Index - Croatia Report 1996-2012	2013	eng	
110	Business Anti-corruption Portal	Business Anti-corruption Portal: Croatia Country Profile	2014	eng	http://www.business-anti-corruption.com/country-profiles/europe-central-asia/croatia/snapshot.aspx
111	HEP d.d.	HEP and the environment		eng	
112	HEP d.d.	HEP Anticorruption policy		cro	
113	HEP d.d.	HEP Awards, memberships and certificates		eng	
114	HEP d.d.	HEP Corporate social responsibility		eng	
115	HEP d.d.	HEP Financial Statements		eng	
116	HEP d.d.	HEP Sustainable development		eng	
117	HEP d.d.	HEP Sustainable Development Publications		eng	
118	HEP	HEP Annual Report 2012	2012	eng	

Ref	Author / Organization	Title	Year	Language	Note
119	Faculty of Mining, Geology and Petroleum	KP Izvjesce_HE-Zagreb - podz2013-Opcija2	2013	cro	Analysis of the impacts on the Zagreb and Samobor groundwater aquifers
120	Wolf Theiss	Wolf Theiss Guide to Generating Electricity from Renewable Sources in Central, Eastern & South-eastern Europe	2013	eng	http://www.wolftheiss.com/tl_files/wolftheiss/CSC/Guides/The_Wolf_Theiss_Guide_to_Generating_Electricity_from_Renewable_Sources_in_CEE_and_SEE_2013.pdf
121	NGOs	Letter to DG Enlarg by NGOs	2011	eng	Letter expresing opposition by NGOs to Croatian Waters projects
122	SLAP (NGO)	Savjetovanje o Savi 27.11.2012.	2012	cro	1st Conference on Sava Zagreb Development
123	SLAP (NGO)	2. Savjetovanje o Savi 06.06.2013.	2013	cro	2nd Conference on Sava Zagreb Development
124	SLAP (NGO)	3. Savjetovanje o Savi, 04.12.2013	2013	cro	3rd Conference on Sava Zagreb Development
125	The Renewable Energy and Energy Efficiency Partnership (REEEP)	REEEP Policy Database on Croatia	2012	eng	http://www.reegle.info/policy-and-regulatory-overviews/HR
126		Paper - Proposal for Development of Water Area of the Brezice HPP	2006	slo/eng	Paper on development of adjecent area in Republic of Slovenia
127	EIHP	Country Energy Profile - Croatia	2010	eng	http://www.eihp.hr/hrvatski/projekti/unece/pdf/bibilioteka/Energy%20profile%20-%202010.pdf
128	IWA	Chapter 8, Managed Aquifer Recharge as a component of sustainable water strategies. In book: Water Reclamation Technologies for Safe Managed Aquifer Recharge	2009	eng	https://circabc.europa.eu/webdav/CircaBC/env/wfd/Library/framework_directive/thematic_documents/relevant_research/science-policy_briefs/RECLAIM_WATER_Policy_Brief_Final.pdf
129	The Institute of Public Finance	The Efficiency of the Water Supply in Croatia. Newsletter No 37	2008	eng	http://www.ijf.hr/eng/newsletter/37.pdf
130	Urban Development Vienna	Vienna on the Danube	2010	eng	https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008127.pdf
131	Bozicevic, J et al	Evaluation of the Croatian transport system	2008	eng	
132	Platina	Manual on Good Practices in Sustainable Waterway Planning	2010	eng	
133	Balkan Rivers	Balkan Rivers		eng	http://www.balkanrivers.net/
134	Golub, M.; and Kurevija, T.	Geothermal energy development strategy in republic of Croatia due to promotion of renewable Energy in the European Union	2007	eng	http://rgnzborad.rgn.hr/19_7.pdf
135	Croatia Census 2011	Population by Ethnicity, by Towns/Municipalities, 2011 Census	2011	eng	http://www.dzs.hr/Eng/censuses/census2011/results/htm/E01_01_04/e01_01_04_RH.html
136	UPR info	Croatia Mid-term	2013	eng	

Ref	Author / Organization	Title	Year	Language	Note
		Implementation Assessment			
137	ANVIL	Regional Organisation Study: International Sava River Basin Commission (ISRBC)	2013	Eng	Research paper
138	LSEE	Decentralisation and Regional Policy in Croatia: The impact of EU accession and the prospect of territorial reorganisation	2011	Eng	Research paper
139	University of Zagreb	Administrative Aspects of Regional and Cohesion Policy in Croatia: In Search of a Better Coordination of Parallel Processes	2011	Eng	Research paper

Appendix D: Visual Evidence

Photo 1: View upstream from Podsused Bridge towards site of HPP Podsused

Photo 2: Left Bank of the Sava at Podsused Bridge: this area to be flooded by the reservoir of HPP Prečko

Photo 3: Right Bank of the Sava at Podsused Bridge: this area to be flooded by the reservoir of HPP Prečko

Photo 4: Jankomir Spillway viewed from the right embankment of the Sava-Odra channel

Photo 5: Jankomir Spillway viewed from the left embankment of the Sava-Odra channel

Photo 6: Ponds formed from areas used for gravel extraction, now used for fishing

Photo 7: The downstream end of the Sava-Odra channel

Photo 8: The downstream end of the Sava-Odra channel

Photo 9: Existing weir at the site proposed for SHPP Sanci, currently used to enable water extraction for cooling a thermal power plant

Photo 10: The thermal power plant at Sanci

Photo 11: Odra 'siphon' connecting the Odra and Sava

Photo 12: Point where Odra siphon meets the Sava

Photo 13: Embankments by the Sava in Sisak

Photo 14: Site of HPP Sisak, with thermal power plant on the right bank

Photo 15: Downstream of Sisak Dam Site, a Ship Port to the right side, to accommodate a port to be relocated from upstream

Photo 16: Typical rural houses in the vicinity of the Sava

Photo 17: Typical rural houses in the vicinity of the Sava

Photo 18: Typical rural houses in the vicinity of the Sava

Photo 19: Agricultural land along the Sava River on the Zagreb-Sisak stretch

Photo 20: Agricultural land along the Sava River on the Zagreb-Sisak stretch

Photo 21: Agricultural land along the Sava River on the Zagreb-Sisak stretch

Photo 22: Recreational activities – cycling along the embankments by the Jankomir spillway

Photo 23: Recreational activities – fishing near the site of the SHPP Sanci

Photo 24: Recreational activities – golf course adjacent to the left embankment near the Jankomir spillway

Photo 25: Recreational activities – archery in the flood plain, near the thermal power plant / site of SHPP Sanci

Photo 26: Roma communities residing at Palanjek

Photo 27: Roma people camping under a bridge within the Sava-Odra channel

Photo 28: Waste tyre processing company which would have to be relocated for the HPP Prečko reservoir, near the Podsused Bridge.

Photo 29: Sisak port, to be relocated if HPP Sisak is built

Photo 30: Recreational activities – people fishing and bathing in the ponds in the Sava-Odra channel