A study for the European Commission

FLOOD PREVENTION AND MANAGEMENT

Gap analysis and needs assessment in the context of implementing the EU Floods Directive

September 2015

EXECUTIVE SUMMARY

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Western Balkans Investment Framework (WBIF), Infrastructure Projects Facility Technical Assistance 4 (IPF 4)

The technical assistance operation is financed under the Western Balkans Investment Framework (WBIF) which is a joint initiative of the EU, International Financial institutions, bilateral donors and the governments of the Western Balkans which supports socio-economic development and EU accession across the Western Balkans through the provision of finance and technical assistance for strategic investments, particularly in infrastructure, energy efficiency and private sector development.

WBIF PROJECTS

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Introduction

Background

After the severe floods in the spring 2014, the European Commission hosted a Donors' Conference in Brussels on 16 July 2014 to mobilise support for Bosnia and Herzegovina and Serbia. One of the follow-up actions was the organisation of a Regional Conference to strengthen policy on flood prevention and flood risk management in the Western Balkans. During the conference, on 24 November 2014, an inventory of flood management initiatives in the region was presented.

Based on a common understanding of investment needs required to prevent and deal with floods in the region and to implement the EU's Floods Directive, the European Commission ordered an analysis on the status of flood management in general, and specifically on the status of implementation of the Floods Directive, in the Western Balkans countries. It was decided that a gap analysis should be presented at a follow-up meeting in 2015, planned for the end of September.

Developing further the work initiated in the inventory, this comprehensive analysis was to:

- provide a list of flood risk management tools (flood hazard and risk maps, hydraulic models, early warning systems, etc.) and flood prevention structures within the region;
- assess the requirements for sound flood risk management including, but not limited to, the implementation of the Water Framework Directive and the Floods Directive;
- implement a gap analysis to determine what investment is required at municipal, national and regional level;
- identify "no-regret" investments and high priority measures, which address hot spot areas, communities and infrastructure that are particularly vulnerable, yet do not have impacts downstream or upstream. Investments and measures which may have greater impact would require a more comprehensive analysis;
- convert these investments and measures into a feasible, multi-annual investment, with a prioritisation schedule tailored to suit each country and associated with likely means of financing (including national and international resources, as well as private sector resources); and
- prepare an investment and capacity/governance building plan, which take in account available financing and includes a "prioritisation" ranking, specific to the EU's Water Framework Directive and Floods Directive.

This analysis was also intended to facilitate IPA programming and financial support from International Financial Institutions and International Organisations involved in flood-related assistance.

General objective

The analysis was performed in the first semester of 2015 with the general objective of enhancing the capacity of the Western Balkans in flood risk management and flood prevention and to ensure compliance with relevant European Union legislation, in particular, the Floods Directive.

The analysis deals with the needs and initiatives in the Western Balkans countries (Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Kosovo*, Montenegro and Serbia). It discusses structural and non-structural measures as well as various projects and initiatives and extracts their regional dimension.

This study present the analysis' findings to the relevant decision makers, in particular the European Commission, the International Sava River Basin Commission, the International Commission for the Protection of the Danube River the International Financial Institutions, professional bodies, individual professionals and the public with an interest in flood management. This summary provides a regional overview of the actions that need to be carried out in order to comply with the Floods Directive and additional initiatives which will ensure flood management.

1 Flood history of the region

River basins and topography

The topography of the Western Balkans Region is fundamentally determined by the Basin of the Danube River and its tributaries. Whereas the area of the Western Balkans mainly belongs to the catchment of the Danube, the southern and the south-western rivers discharge to the Adriatic Sea.

The Sava River, as the largest tributary of the Danube, with a catchment area of over 97,000 km^2, flows through Croatia and Bosnia and Herzegovina and then discharges into the Danube, in Serbia.

The Adriatic catchments concern Albania, Kosovo, the former Yugoslav Republic of Macedonia, Montenegro and Bosnia and Herzegovina. The characteristics of the topography range from the fairly large plains of the Danube, the Sava and the Tisa in the North to hilly and mountainous regions of the Dinaric Alps, often characterised by steep slopes with low vegetation, occasionally with narrow riverbeds and relatively large basins. The southern strip of shore of the Adriatic (typically in Albania) consists of fluvial lowlands. The large flatlands, and the extreme variations in the terrain and the river network, mean that large areas in the region are prone to flooding, to a varying degree.

Flood events

The mostly extreme flood disaster in the Sava catchment occurred in the Western Balkans in May 2014. This resulted in a severe loss of human life, considerable damage to property, land, businesses and, consequently, economic loss in Bosnia and Herzegovina, Serbia and, to a lesser extent, in Croatia. A meteorological event, in the form of an extreme low-pressure air mass, cyclone “Tamara”, which hit the region on the 15th of May, precipitated extreme heavy rainfall. Approximately 25% of the areas average annual rainfall fell within a few days. The subsequent floods affected several river basins in the region and resulted in unprecedented damage to assets and human life[1].

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

[1] In western, south-western, central and eastern Serbia: Sava, Tamnava, Kolubara, Jadar, Zapadna Morava, Velika Morava, Mlava and Pek. In Bosnia and Herzegovina, the northern part of the country, Republika Srpska, was hit the most, while the Tuzla and Sarajevo region suffered too along rivers Sava Bosna, Vrbas, Drina and Sana.

Flash floods from tributaries and landslides due to saturated soil destroyed houses and infrastructure, while the gradual and persistent flooding along the River Sava affected large portions of urban area and agricultural land. Thirty-eight municipalities (with a population of 1.6 million) were affected in Serbia. Thirty-two thousand inhabitants were evacuated – 24 thousand from the City of Obrenovac alone – and 51 casualties were recorded. At the same time, in Bosnia-Herzegovina, flooding and more than 3000 landslides affected over one million people, 25 casualties were reported and 75 thousand homes, in 46 municipalities, were affected.

The impact was disastrous: in Serbia alone, the total value of loss in production and assets was estimated to reach EUR 1.7 billion, about 3% of the gross domestic product. Furthermore, the disaster triggered an economic recession, partly due to the loss of jobs (some 50 thousand) and partly to suspended production. Consequently, macroeconomic indicators greatly worsened. Losses were concentrated in the productive sector (70%), agriculture, industry, mining and energy - the operation of two coalmines, essential to Serbia's electrical supply, had to be suspended - while social sectors, although also badly affected, suffered relatively less damage to infrastructure (12%). The human development index declined with the income of some 125 thousand people falling below the poverty line. Estimates put the damage from the flood in Bosnia and Herzegovina at EUR 1.3 billion, mostly due to extensive inundation of arable land, which ruined crops and destroyed livestock. Mines, the legacy of war, were displaced, further aggravating the situation.

The extent of the disaster revealed just how vulnerable Serbia and Bosnia and Herzegovina were and emphasised the need to strengthen flood control and management systems, forecasting and prevention, especially in relation to climate change. Although meteorologists issued warnings on the expected weather conditions, the municipalities were not able to foresee what height water levels would reach, or the speed with which this would occur, and the order to evacuate was issued too late. It could be argued, conditions were aggravated because defence system had not been upgraded in 25 years, flood ways were not adequately maintained, proper afforestation of drainage canals had been ignored, and therefore canals could not drain excess water.

The occurrence of floods and flooding over the past five years has shown the importance of regional flood control and sustainable water management. The frequency and extent of severe floods along Danube and Sava Rivers and their main tributaries (for example the Drina in Bosnia and Herzegovina and the Kolubara in Serbia) justify the growing concern for human life, homes, heritage and the environment.

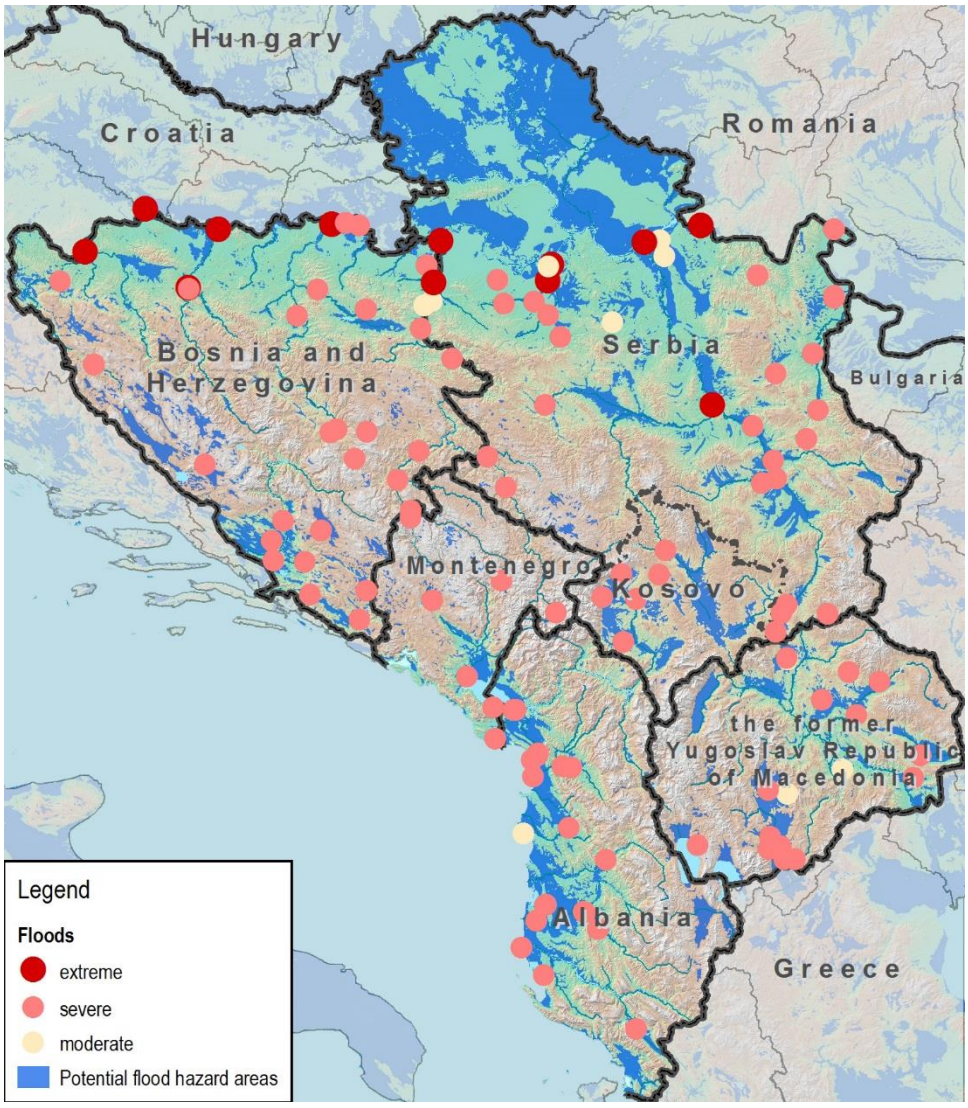
The geomorphological characteristics, hydrological features of the watercourses and geotechnical formation, (for example saturated soil conditions during heavy rains, steep and bare hillsides, ravines, gullies, etc.), in some areas of the Western Balkans, such as in Albania, the former Yugoslav Republic of Macedonia and Montenegro, can also precipitate devastating flash floods following torrential rainfall. There is potentially, significant flood risk throughout the region, especially in highly populated areas. Kosovo, on the other hand, due to its topography and the characteristics of its terrain, could experience a different form of flooding, such as flash floods in hilly areas, major lowland flooding and even “dam-failure”

situations (breakage or leakage due to operational structures and locks failing to support increased water pressure, earthquakes, landslides or rock falls), which could result in major flood damage.

Albania, Bosnia and Herzegovina and Serbia appear to be the most vulnerable countries in the Western Balkans Region. They have been most affected and suffered most damage over the past five years. If floods can occur at any time of the year, the region is nevertheless most severely affected during the spring due to increased rainfall and melting snow.

The major flood events of the past five years are presented in Figure 1, and summarised in Table 1. The impact of floods and torrents has been classified, according to colour, as extreme, severe and moderate, based on the area and population affected. It can be concluded that plains and relatively narrow valleys in the hilly and mountainous regions are those areas most exposed to flooding. The impact of the floods through damage caused to human health and the economy is greater on the floodplains and at lower river sections, where towns, industrial areas and farmlands are concentrated.

Figure 1 Location of floods in 2010-2015 in the Western Balkans



Sources: Various: Danube River Basin District: flood events in 2010 (International Commission for Protection of the Danube River Flood Report 2010), FloodList, ReliefWeb, International Federation of Red Cross and Red Crescent Societies, Consultant's drawing

Table 1 Summary of major flood events in the Western Balkans, 2010-1015

Date	Affected areas, municipalities	Extent of damage	Flood impact rating
Albania			
Jan. 2010	Shkodra, Lezhë and Durrës.	10,000 hectares flooded, over 5,000 people evacuated, 2,200 houses damaged	severe
Nov-Dec. 2010	Drini and Mati River Deltas Ulza and Shkopeti reservoirs	15,000 people evacuated, 6,000 km^2 land flooded, 4,800 houses flooded	severe
Nov. 2014	Tirana, Lezhë, Shkodër and Fier	11,000 people evacuated, 3 people died, 7500 houses damaged	severe
Feb. 2015	Vlora and Fier, Berat, Elbasan and Gjirokaster Rivers Vjosa, Devoll, Osu, Seman	42,000 people affected	severe
Bosnia and Herzegovina			
Dec. 2010	Drina River catchment, Municipalities of Bosanska Krupa, Domaljevac - Šamac, Orašje, Tuzla, Maglaj , Goražde, Foča - Ustikolina, Pale - Prača, Ravno, Čitluk Čapljina, Stolac, Mostar, Trnovo, Ilidža, Novi Grad, Tomislavgrad, Drvar, Trebinje, Bileća, Nevesinje, Foča, Novo Goražde, Bratunac, Zvornik, Bijeljina	20,000 people affected, 5,000 houses flooded, 6,000 people evacuated	severe
May 2014	Sava tributaries: Una, Sana, Vrbas, Vrbanja, Bosna and Drina and Sava River at Rača	Nearly 15% of GDP lost, 13,200 km^2 flooded, over 1 million people in 46 municipalities affected, 25 lives lost	extreme
Aug. 2014	Northern and Western Bosnia and Herzegovina. All areas along the Sava, Sava tributaries: Una, Vrbas, Štira, Banja Luka, Gračanica, Tuzla, Foka, Višegrad, Banja Koviljača, Loznica, Kragujevac, Čačak, Zvornik, Žepče, Lukavac, Zenica	Some 200 homes evacuated	severe
the former Yugoslav Republic of Macedonia			
Feb. 2013	River Kojnarka Kumanovo, Štip, Sveti Nikole, Strumica, Valandovo, Ohrid, Probištip and Kočani	Approximately 6,000 people affected	severe
Jan-Feb. 2015	Eastern region: River Crna - Region of Bitola Municipalities of Mogila, Novaci and Bitola	Over 100,000 people affected	severe
Feb. 2015	Southern and central parts of the country	100,000 people affected	severe
Montenegro			
Dec. 2010	Whole of Montenegro to various extents Rivers Lim, Tara, Morača, Drina tributaries and Bojana Lakes Skadar, Piva and in Nikšić area	21 municipalities affected, 1.49% of GDP equalling to MEUR 43 lost	severe
Serbia			
Feb. 2010	Eastern and central parts of Serbia: Zaječar, Aleksinac, Požega and Knjaževac, Negotin, Svrljig Boljevac; Merošina, Doljevac, Koceljeva, Ub, Lajkovac, Ljig, Vladimirci, Žitorađa, Priboj and Prijepolje	1,306 households damaged, more than 3,150 people affected	severe
Sep. 2014	Eastern Serbia municipalities of Kladovo, Majdanpek and Negotin	Approximately 7,000 people affected	severe
Feb. 2013	Pčinja District of southern Serbia Bujanovac, Preševo, Trgovište, Istog, Kliné, Đakovica, Peć, Skénderaj, Kosovska Mitrovica	Approximately 3,500 people affected, 181 families evacuated	severe
May 2014	Western, South-western, central and Eastern Serbia: Sava, Tamnava, Kolubara, Jadar, Zapadna Morava, Velika Morava, Mlava and Pek at Beli Brod on the tributary river Kolubara – Obrenovac	EUR 1,525 million lost equal to about 3% of the GDP, 9,100 km^2 and 38 municipalities/cities affected, 1.6 million people affected, 51 lives lost	extreme

Source: Various: Danube River Basin District: flood events in 2010 (ICPDR flood report 2010), FloodList, ReliefWeb, International Federation of Red Cross and Red Crescent Societies

Flood risk and climate change

The Western Balkans countries are more and more exposed to the impact of climate change. They are experiencing increased periods of extreme heat in the summer months and increased rainfall during the cooler seasons. According to long-term projections, the average annual temperature will increase by 2° C to 3° C by 2050 and precipitation will decrease in the summer, resulting in longer dry

periods followed by more sudden heavy rainfalls[2]. This combination increases the likelihood of floods as well as their destructive nature whilst decreasing the region's capacity to react to these floods. In short, floods, which already constitute the most common natural disaster in the region, are increasing their risk.

Historical flood data from the Western Balkans[3] indeed suggests a more frequent occurrence of flood events, characterised by more extreme and more rapid increase in water levels, attributed to an uneven distribution of precipitation and torrential rain, and this particularly over the last decade. More and larger areas and, therefore, a greater population are being affected by flooding with a strong impact on national economies. This calls for increased international collaboration in river basin and flood management and sound adaptation measures as a focus area of sustainable water management.

In addition to climate change trends, flood events are also aggravated by environmental degradation factors, such as continued pollution, inappropriate waste management and sewage treatment, badly managed urbanisation or careless land use. Thus, initiatives to deal with extreme water levels and more effective safety measures in these areas of the Western Balkans should be initiated and increased. In addition to controlling the flow of major rivers and torrents, lands, which tend to become inundated, should be considered and managed as water retention areas, thereby creating a means to save scarce water resources in those areas where annual precipitation is expected to decrease. Land use planning intending to prevent deforestation or overgrazing should, for example, focus on vegetation and crops with enhanced resilience and the ability to survive low flow periods in order to reduce flood damage.

2 Objective and methodology of the gap analysis

Specific objectives of the study

There are two stages in the process of defining the steps required to close the implementation gap of the Floods Directive. The first consists in assessing the present situation, while the second consists in mapping existing initiatives, both structural and non-structural, and identifying actions needed to improve flood management organisation and infrastructure. This study follows the Directive's objectives and stages, with some inherent limitations.

Floods Directive and its limitations

The purpose of the Floods Directive is to establish a framework for the assessment and management of flood risks. The Directive represents a new approach to flood management. It encourages setting targets and defining measures with a view to flood risk maps. Flood risk maps are tools combining flood hazard (inundation characteristics and probability) with the monetary value of the predicted damage.

It has to be noted that the Floods Directive is, by nature, a soft directive, defining common processes to be followed by the countries concerned rather than stipulating specific targets to be met through implementing structural measures. Each country adopting the Directive formulates country-specific physical

[2] http://www.climateadaptation.eu/

[3] Sources of the historical data are the same as indicated for Figure 1.

interventions after a long process of assessing the flood hazards and risks described in the Directive. The interventions are then defined in a flood management plan, which is the final step of the planning process. In the absence of hazard and risk maps, it was not possible to draft a gap and needs assessment for infrastructure investment measures as defined by the Floods Directive. Therefore, the current study, besides making recommendations on non-structural measures needed for implementing the Floods Directive, provides only an indicative list of flood infrastructure projects identified according to criteria reflecting the ambition of the Floods Directive.

These infrastructure projects are ranked according to preliminary assessments of flood prone areas in terms impacted population and land use. This ranking would not necessarily be the same if it was based on a detailed risk mapping exercise. The applied methodology is nevertheless an initial starting point for a proper flood risk assessment and allows identifying “no-regret” investments, that is to say the investments at the top of the list, with the greatest impact and efficiency.

Justified prioritised lists of structural measures will be developed after the preparation of the flood risk assessments. This was underlined also by several stakeholders during the workshops with the relevant national authorities in project countries.

Assessment methodology

In this context, the study consists of a thorough collection and preliminary assessment of non-structural and structural initiatives received from key stakeholders of each of Western Balkans countries. In order to provide sound, viable suggestions, the data collection focused on the institutional framework of flood management in each country, which is crucial in the implementation process of the Floods Directive.

Assessment of non-structural measures

Based on the desk-study analysis of the institutional framework and the data collected on non-structural measures, the Consultant defined and recommended consolidated measures to improve the institutional framework of each country in relation to their proposals. The details of these measures could then be further developed by the countries themselves, with a possible contribution from the donor organisations during the following phases of the Floods Directive implementation process.

Assessment of structural measures

The collection of the data on structural measures was based on a data collection sheet prepared by the Consultant. The data was entered into a database and analyses were then carried out to assess:

- project maturity,
- already allocated funding, and
- prioritisation in order to identify “no-regret” projects.

Analyses on funding security and project maturity were performed based on the information collected, including classification of the projects according to a set of criteria. A comprehensive multi-criteria analysis was performed to prioritise the projects according to the size of the expected impacts and the impact efficiency of the projects.

Data analyses relied on basic project information. In general, only those projects that aimed to keep the negative consequences of flooding and inland water levels at an acceptable standard were considered. The protection of human life was a minimum objective. The methodology applied referred to information on the project itself (technical definition) and its estimated impacts.

Infrastructure projects were selected for analysis only when they had:

- a real flood protection content (not irrigation investment, for example),
- sufficient information available to carry out the assessment, and
- complied with national and EU legislation.

The next part of the evaluation involved applying ranking criteria on impacts and efficiency. The calculation used values derived from the assessment of impacts. Impacts were estimated based on a regional map of potential flood hazard areas, developed by the Consultant specifically for this study. Impact efficiency was calculated as the ratio of impact and investment costs.

Stakeholders' consultation

Both structural and non-structural measures and projects were presented to key stakeholders from the countries involved.

At these meetings, it was made clear that the lists of projects could not be regarded as "to do" list as none of the Western Balkans countries had completed their national strategy and investment plans or prepared their detailed Flood Hazard and Flood Risk Maps and, indeed, new needs and priorities could emerge.

3 Main findings

3.1 Institutional framework

The institutional framework is crucial to the implementation of the Floods Directive, as it requires complex tasks to be performed in close cooperation with various monitoring, data management and planning institutions at local, country and regional levels. Although the Directive does not define the ideal institutional framework, its implementation requires a well-functioning, and well-governed, network of public and private players.

Table 2 and Table 3 summarise the countries' status in terms of strategy and institutions as well as on transposition of legislation pertaining to flood management.

Table 2 Strategic and institutional background for the implementation process `

Country	Strategy and institutions related to flood management	
	Overall assessment	Comments
Albania	Basic requirements are met, further detailing of tasks is needed	Institutional background set up, with a strong central co-ordination under the Prime Minister's Office. National strategy on water management exists with chapters on flood management.
Bosnia and Herzegovina	Basic requirements are met, substantial variations among entities	Organisational and strategic framework exists at all levels (state, entities and Brčko District), Brčko District being the relatively less developed. The institutional setting is defined in the Constitution of Bosnia and Herzegovina. Fragmentation of the institutions is a major problem influencing the efficiency of flood management. A Directive Specific Investment Plan for Floods Directive has been drafted, but needs to be finalised by competent institutions and then adopted by all levels of authority. Preliminary Flood Risk Assessments for two entities are completed, preparation of Flood Hazard Maps and Flood Risk Maps and management plans at state level are planned and finance secured. Federal Water Management Strategy exists. Strategy of integral water management of Republika Srpska is prepared but not adopted yet. Action Plan for flood management exists.
Kosovo	Basic requirements are met, further detailing of tasks is needed	Strong central water and flood management organisation in place. Water basin authorities are being established, but with a severe lack of resources. Strategy on water management containing chapters on flood issues.
the former Yugoslav Republic of Macedonia	Basic requirements are met, further detailing of tasks is needed	Clear, though fragmented, organisational setup with water basin management authorities. Flood management issues are incorporated into the water strategy, the national security strategy and in the National Development Programme for Agriculture, concerning farming on the flood ways.
Montenegro	Basic requirements are met, further detailing of tasks is needed	Clear, though fragmented, organisational setup with water basin management authorities. Strategy on water management exists but is outdated. New strategy is to be developed after new legislation on waters adopted.
Serbia	Basic requirements are met, further detailing of tasks is ongoing	Traditionally strong organisational framework, strong central co-ordinating body in operation. Strategies exist. New strategies and Floods Directive Implementation Plan are under preparation. Action Plan for Flood Management is being adopted.

Source: Consultant's assessment based on country Progress Reports "Monitoring transposition and implementation of the EU environmental acquis", Environment and Climate Regional Accession Network (ECRAN), April 2012 – March 2014

Table 3 Legal background for the implementation process

Country	Legal framework in line with the Floods Directive		
	Overall assessment	ECRAN estimates	Comments
Albania	Legal framework in place or under preparation	73%	Law on waters includes chapters on flood management. New law on irrigation and drainage including flood management tools, and law civil protection are under preparation. No sufficient legislation on land use. **Full transposition of the Floods Directive was planned by 2014. Full implementation is foreseen to be completed in 2023.**
Bosnia and Herzegovina	Legal framework in place	71%	Legislation is organised on entity basis creating countrywide variations. Legislation on water management and the harmful effects of waters covers flood management. **No legislative plans available for achieving full transposition. Full implementation is foreseen to be completed in 2018.**
Kosovo	Limited legislation in place	12%	New Law on Waters covers flood management themes. **The date of full transposition of the Floods Directive is not determined yet. Full implementation is foreseen to be completed in 2023.**
the former Yugoslav Republic of Macedonia	Limited legislation in place	14%	Law on Waters and Law on Emergency Situations include chapters on flood management. **Planned date for achieving full transposition is end of 2018. Full implementation is foreseen to be completed in 2023.**
Montenegro	Basic legal framework in place	52%	New law on water fully complying with the Floods Directive is being adopted. **The date of full transposition was planned as 2015, but postponed to 2016. Full implementation is foreseen to be completed in 2023.**
Serbia	Legal framework in place, new legislation under preparation	71%	Legislation exists, the new law on waters fully complying with the Floods Directive is under preparation/adoption. **The date of full transposition of the Floods Directive is being defined. Full implementation is foreseen to be completed in 2021.**

Source: Consultant's assessment based on collected data and country Progress Reports "Monitoring transposition and implementation of the EU environmental acquis", Environment and Climate Regional Accession Network (ECRAN), April 2012 – March 2014

It can be concluded, looking at the above table, that implementation status in the Western Balkans countries is not homogeneous. In general, flood issues are, in a broader context, incorporated into water and emergency management plans. Bosnia and Herzegovina is the only country that has an implementation plan that is coherent with the Floods Directive, although the document has not yet been adopted[4]. This means that flood management receives varying and, in some cases, limited attention. It is not specifically addressed in the strategic framework plans and legislation is often not in place. Furthermore, only two countries (Bosnia and Herzegovina and Serbia) have incorporated the Floods Directive approach into their flood management plan. The others have just begun defining the actions necessary to implement the Floods Directive. The situation seems even less favourable when one looks at interrelated legislation, local regulations and emergency plans. Legislation on land use and waste management is either under revision or under preparation or the level of enforcement is insufficient. This merely increases the difficulty in addressing flood hazards and hinders the implementation of the Floods Directive and the management of floods.

The Floods Directive requires specific institutional setups and a strong coordination. Implementing these requirements is often a long process, even in the more established European Union Member States. Therefore, the full implementation of the Directive, in the entire region, is not likely to be achieved before 2025. The country most advanced in the process, as reported by ECRAN and as shown by the assessment, is Bosnia and Herzegovina. Its 2017 target for completing the implementation process does, nonetheless, seem rather ambitious. The targets, in general, are challenging and will require considerable resources and hard work, if they are to be achieved.

It is important to note that the strategies already in existence cannot be considered as implementation outcomes of the Directive. Vital inputs, such as flood hazard and flood risk assessment, have not yet been carried out in most countries. Bosnia and Herzegovina and Serbia are the only exceptions, since their preliminary assessments are available. These preliminary assessments can contribute towards the development of detailed Directive specific strategies and plans.

Flood hazard and risk mapping, flood management plans

As previously mentioned the flood hazard and risk assessment, as well as mapping, constitute the crucial elements of the Directive. The philosophy behind this sequence is that the countries are to establish first a solid and well-documented database on the potential damages of the floods and then devise a strategy and detailed flood management plans which are to be prepared in line with the Directive. The process starts with the preparation of preliminary, countrywide assessments. This is followed by detailed assessments, based on updated Floods Directive Implementation Plans, which define the most relevant flood basins.

The preparation of the flood hazard and risk maps has already started in the region. Bosnia and Herzegovina is at the forefront, having prepared its preliminary maps. The country will soon initiate detailed hazard and risk mapping. Serbia has prepared its preliminary assessment and is now in the process of preparing specific plans for implementing the Floods Directive, while the other countries are planning the initial steps. Even though Bosnia and Herzegovina and Serbia are the

[4] EnvIS Bosnia and Herzegovina; http://www.envis.ba

only countries to have carried out the first steps, several pilot projects targeting the preparation of flood hazard and risk assessments for specific river basins have been initiated throughout the region. At regional level, risk-mapping exercises have been carried out on the Sava by the International Sava River Basin Commission, on the Danube by the International Commission for the Protection of the Danube River and on the Drini River Basin (covering Albania, Kosovo and the former Yugoslav Republic of Macedonia). Projects have been initiated in Bosnia and Herzegovina, on the Sava River and its tributaries, and in the former Yugoslav Republic of Macedonia on the Strumica River, mostly funded by international donors (European Commission, European Investment Bank, World Bank, United Nations Development Programme, German Institute for International Cooperation, Swiss Agency for Development and Cooperation, United States Agency for International Development).

3.2 Main problems and solutions

Bottlenecks of the implementation of the Floods Directive

As noted above, the implementation of the Floods Directive requires an institutional framework with clearly defined responsibilities and the competency and authorisation to enforce legislation relevant to flood hazard and risk management. Currently, in most of the Western Balkans countries, the fragmented organisational set-up and the lack of resources result in weak authoritative bodies lacking the capacity to enforce legislation. This situation encourages irresponsible land use in flood hazard areas, which increases the risk of floods and the extent of the resulting flood damage. The coordination across governmental bodies, even where river basin management authorities have been set up, is often inefficient. However, Bosnia and Herzegovina and Serbia, where the implementation of the Floods Directive has been prioritised at a higher level as they were compelled to act quickly due to their exposure position and history of heavy floods, are example of good practices. Also, the centralised water and flood management system in Kosovo, even if still at an early stage for now, is a good start for the successful implementation of the Floods Directive.

In general, the human capacity, tools and the experience required to implement the Directive are not readily available in the Western Balkans countries. At present, higher education institutions in most of the countries are not turning out flood management experts and water professionals in sufficient numbers, with the required skills to establish and operate databases, monitoring and early warning systems necessary for the Floods Directive implementation. Even in the countries with a strong academic background, such as Serbia, the lack of skilled professionals, uncertainties of employment, poor working conditions and low wages create a situation where the complex exercise of implementing the Directive requires external assistance. In the case of smaller countries, the national education system cannot ensure a long-term supply of well-educated professionals, which hinders the Directives' implementation and will affect, at a later stage, the implementation of the flood management plans and strategies.

Besides organisational capacity, the availability of information and data on the terrain, the watercourses and hydro-meteorological phenomena is crucial in the implementation process. Although, over the last decade considerable results have been achieved in this field, in all the countries, the spatial coverage is still weak, and none of the countries’ data collection and management methods meet the desired requirements of detailed hazard and risk assessment or emergency

management. These issues mostly concern the hydro-meteorological services, the local water management bodies responsible for water monitoring stations and the central organisations involved in hydrological modelling, forecasting and the operation of the early warning systems. Sharing and managing data are crucial problems, which need to be solved at regional level, but also at country level in the case of Bosnia and Herzegovina.

Recommendations

To implement the Directive fully, a complex approach is required in order to allow long-term sustainability of the results. The actions proposed cover the legal and institutional framework and include specific steps to implement the Directive. Actions to be taken by the countries cover the areas below.

- Capacity building
  - Regulatory measures for the enforcement of legislation and establishment of the necessary coherence with regulations in other fields, such as land use, law on local governance or local regulations
  - Strengthening the organisational background, the central governmental bodies, the hydro-meteorological services and the river basin management authorities, in particular through targeted training
  - Developing data collection and management capacities, modelling and computing tools (hardware and software), local and territorial water and flood management bodies
  - Planning and implementing educational programmes in tertiary education of flood management, modelling, planning and design
  - Planning and implementing awareness raising programmes for the public and economic actors potentially affected by floods
- Preparatory activities
  - Developing detailed methodologies for data collection and management, hydraulic modelling, climate and weather modelling and forecasting
  - Detailing regulations and establishing standards to support implementation, development of a detailed Floods Directive implementation strategy and plan (establishing a solid and precisely defined legal and institutional framework)
  - Collection and management of data necessary for implementing the Directive (GIS databases on the terrain, water courses, population, the state of existing flood protection infrastructure, land use, economic activities, protected values, etc.)
- Flood assessment and planning, as defined in the Floods Directive
  - Preliminary Flood Risk Assessment
  - Flood Hazard and Flood Risk Maps
  - Flood Management Plans

The activities scheduled completion dates, and costs directly related to the implementation of the Floods Directive, vary from country to country. However, the countries form two basic groups in terms of implementation progress. As mentioned previously, Serbia and Bosnia and Herzegovina have completed their preliminary flood risk assessment and therefore the implementation process is envisaged to be completed by 2018-2020, with an overall budget of

EUR 12.0 million and 12.4 million, respectively. In the other four countries, the implementation process is not expected to be concluded before 2023. The total estimated budget for implementation of the Floods Directive is highest for Albania with EUR 13.2 million. The former Yugoslav Republic of Macedonia and Montenegro will require EUR 11.8 million to complete the implementation process while Kosovo's estimated budget for implementation is EUR 7.1 million.

These forecasted budgets and the dates of implementation are based on international data, the Consultant's experience and other experience gained during the implementation of the Floods Directive in the region. The total budget estimates only cover the cost of preparing documents, studies, formulating legislative texts, flood hazard and risks maps and strategies, and do not include procurement costs for monitoring stations or equipment for establishing early warning systems.

Parallel to the activities directly related to the implementation of the Directive, there are other activities which can greatly contribute to the success of flood and water management, although they are not always directly related. These include for example the development of legislation on land use and waste management and its enforcement, strengthening the co-operation with dam operators or using the potential arising from international cooperation (the International Sava River Basin Commission, the International Commission for the Protection of the Danube River, the Memorandum of Understanding of the countries of the Drini River Basin for common water management and the EU Civil Protection Mechanism).

Countries' initiatives

Besides the proposed actions, specific projects/measures were identified for each country, and registered in a non-structural measures database. In total 51 country-specific measures have been identified.

The non-structural measures with regional relevance and funding sources are as follows:

- Support to Water Resources Management in Drina River Basin (World Bank),
- Programme for Prevention, Preparedness and Response to Floods in the Western Balkans and Turkey (IPA FLOODS) (European Commission) ,
- Adapting to Climate Change in the Western Balkans (GiZ Germany),
- REACT2ALERT (European Commission),
- Improving transnational capacity for advanced environmental monitoring and more rational use of common water resources (financing not yet secured),
- Improvement of Joint Actions in Flood Management in the Sava River Basin (Western Balkans Investment Framework),
- West Balkans Drina River Basin Management Project (GEF/SCCF),
- South East Europe and Caucasus Catastrophe Risk Insurance Facility (IDA),
- Achieving Climate Resilient Infrastructure through Mainstreaming of Ecosystem Based Adaptation Approaches in the Western Balkans Region (UNEP/GEF),
- FLOOD EDU (financing not yet secured).

The total budget of non-structural projects already initiated by the Western Balkans countries is EUR 86.3 million. Most of this amount belongs to projects in Serbia and Bosnia and Herzegovina; the respective budget requirements of Albania and Kosovo are comparatively speaking a lot less. The total regional budget, required for the implementation of the non-structural measures to fulfil the requirements of

the Floods Directive in the Western Balkan Countries is estimated to EUR 102.5 million.

Besides the projects identified by the countries, the International Commission for the Protection of the Danube River and the International Sava River Basin Commission are working for the initiation of the following non-structural projects in the near future:

- Development of the Flood Risk Management Plan for the Sava River Basin,
- Sustainable Operational Flood Forecasting in Real-Time and Water Resource Management,
- Establishment and completion of the Sava GIS – 2nd and 3rd phases,
- Hydrological Study for the Sava River Basin,
- DANICE – DANube river basin ICE conveyance investigation and icy flood management,
- APROD-CL – Analysing flood discharge PROpagation for the whole Danube river and creation of Coherent Longitudinal profile for discreet events,
- LAREDAR – Hazard and risk mapping, risk management planning of the LAkes and REservoirs in the DAnube River basin,
- FORTRED – FORest TRaining in thE Danube floodplain,
- MERGBORD – MERGing hazard maps at national BORder areas in the Danube basin.

Another important forum for co-operation on non-structural measures at regional level is the European Union Civil Protection Mechanism. Current members from the Western Balkans are Serbia, the former Yugoslav Republic of Macedonia and Montenegro. The Emergency Response Coordination Centre, as the operational hub of the mechanism, manages a voluntary pool of resources including material assistance, equipment and expertise, all of which was readily deployed at the time of the flood crisis in Serbia and Bosnia and Herzegovina in 2014.

The countries participating to the EU Civil Protection Mechanism have been given the opportunity to enhance their preparedness, disaster resilience, competencies in flood prevention and risk management – and recent legislation has placed greater emphasis on the latter – by exchanging information on best practices, making use of new communication methods, monitoring tools, information system, etc. However, the tools designed to strengthen preparedness have not yet been widely used by the participating Western Balkans countries.

3.3 Structural interventions to reduce flood risks

Overview of the proposed measures

At stakeholders' meetings and during individual consultations, a number of projects were identified by the stakeholders forming a long list of priorities in the broader field of flood management.

In total, 173 structural projects were proposed by the Western Balkans countries. Almost half of the projects (87) were collected from Bosnia and Herzegovina, albeit with relatively small budgets. Serbia also proposed a large number of projects, whereas the smaller countries proposed around 10 each, most of which were more comprehensive and had higher budgets.

Table 4 Overview of the proposed structural measures

Country	Total estimated budget, EUR	Number of projects
Albania	204 360 000	8
Bosnia and Herzegovina	231 092 264	87
Kosovo	50 930 785	9
the former Yugoslav Republic of Macedonia	21 806 364	7
Montenegro	116 300 000	11
Serbia	128 029 891	51
Total	**752 519 304**	**173**

Source: Consultant's assessment based on data collected from country stakeholders

Types of interventions

The structural projects are usually composed of a number of interventions. To ensure a sound assessment, 13 different types of interventions were identified, prior to data collection, and the collected projects were classified according to that typology. After the first round of data collection, additional categories were included such as dam reconstruction, riverbed rehabilitation and construction of the earthen weirs. Most of the proposed structural projects include more than one intervention. The projects, typically, concern dike construction/rehabilitation or channel construction/rehabilitation with riverbed regulation and floodway rehabilitation and regulation.

Table 5 Breakdown of the proposed projects

Country	Flood management interventions			Special interventions				
	Dike rehabilitation/ construction	Channel rehabilitation/ construction	Riverbed regulation/ Floodway rehabilitation	Pumping station rehabilitation/ construction	Reservoir construction	Road rehabilitation/ construction	Bridge rehabilitation/ construction	Other
Albania	10	6	15	11	1	5	3	4
Bosnia and Herzegovina	54	39	75	5	0	1	1	5
Kosovo	12	13	16	1	1	0	13	1
the former Yugoslav Republic of Macedonia	9	6	8	1	1	1	0	5
Montenegro	11	0	15	0	0	1	0	0
Serbia	24	8	27	7	0	2	3	6
Total	**120**	**72**	**156**	**25**	**3**	**10**	**20**	**21**

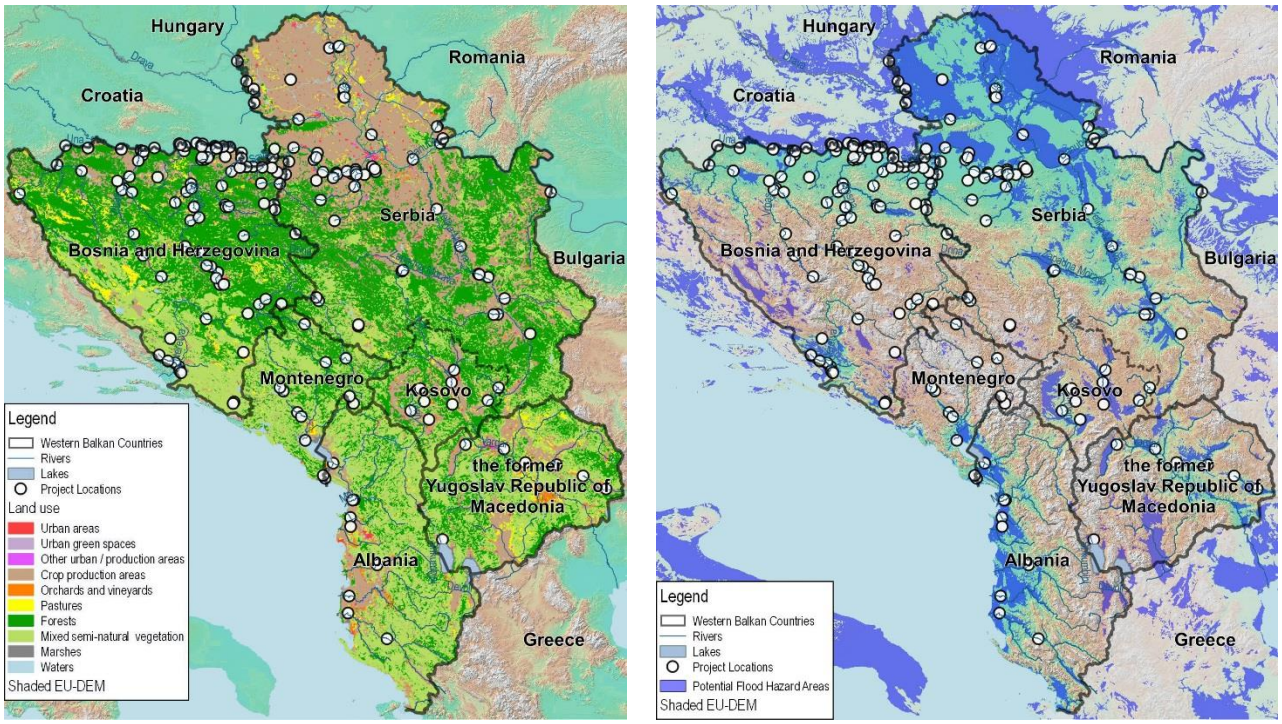
Source: Consultant's assessment based on data collected from country stakeholders

Project maturity

The maturity analysis assessed the availability of various project documents, such as feasibility studies, planning, design and construction permits. Prior the analysis, four project maturity levels were defined: high, high-medium, low-medium and low. Albania proposed eight projects, all in the low-medium maturity level, with a total budget of over EUR 200 million, and a substantial lack of funding sources. The overall budget of the 87 projects proposed by Bosnia and Herzegovina amounts to approximatively EUR 231 million, with EUR 111 million secured. These projects are either highly mature or have low and low-medium maturity levels, with the overwhelming part of the overall budget (some EUR 175 million) for the latter. Kosovo, the former Yugoslav Republic of Macedonia and Montenegro have very limited funds secured for their proposed projects, most of which are low or low-medium maturity levels (7, 5, and 8 projects, respectively). A single, highly mature

project has been identified in each of the three countries, unlike in Serbia where five projects fall in the highly mature level with a total budget of EUR 16.4 million and 22 projects demonstrate high-medium maturity. Serbia secured financing of EUR 28.4 million of the total EUR 128 million.

Figure 2 Land use, potential flood hazard areas and proposed structural projects



Sources: EUDEM and CORINE databases, Consultant's drawing

Funding sources

Three different sources of financing were identified:

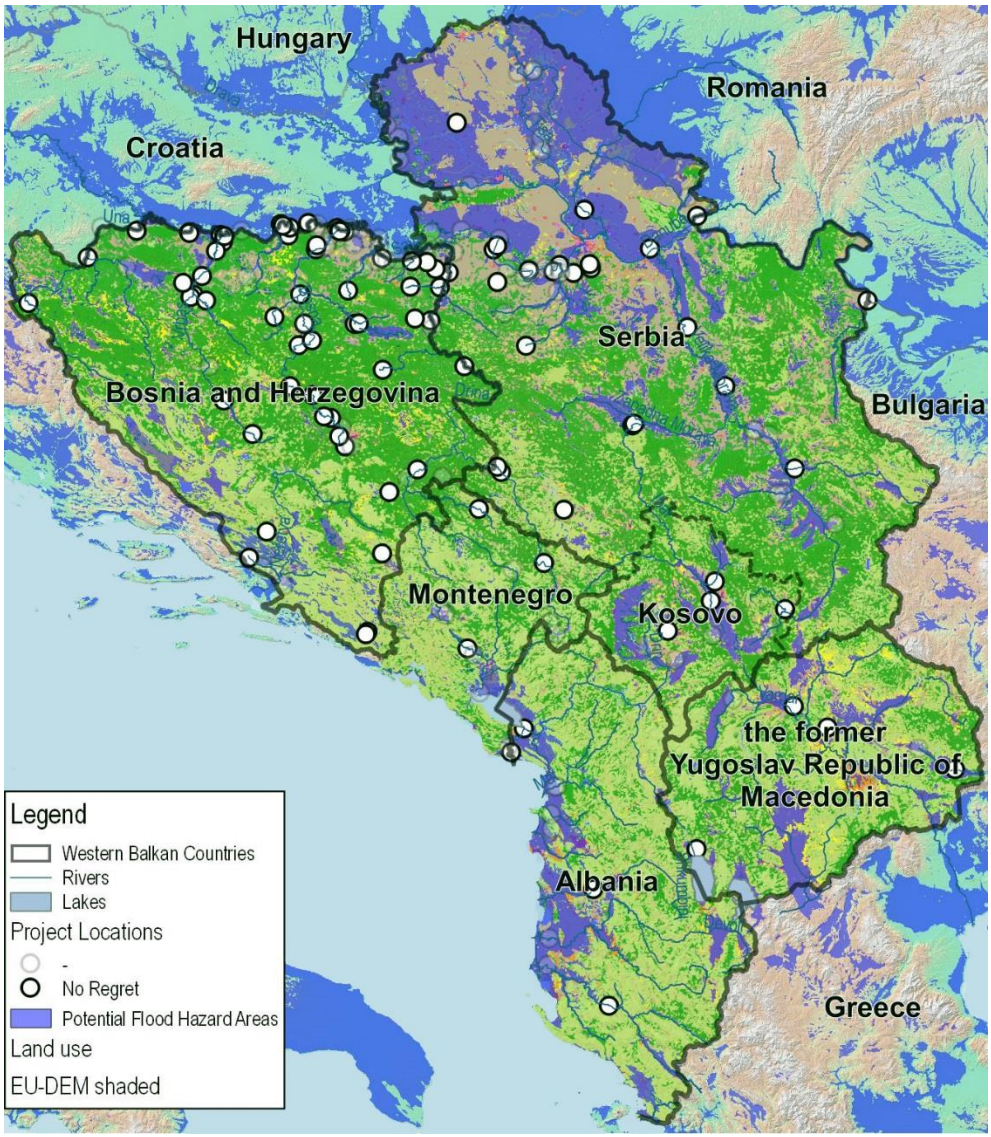
- national institutions whether local or central,
- the European Union's Instrument for Pre-Accession Assistance, and
- other international sources, as International Financial Institutions or bilateral donors.

"No-regret" projects

As stated above, infrastructure investment cannot be planned in accordance with the Floods Directive, as decision-makers lack sufficient information on flood risks since detailed flood risk maps and assessments are not yet available in most cases. The analysis has therefore been carried out for "no-regret" measures.

A "no-regret" project is defined in this study as an intervention that affects an area with a high number of inhabitants, numerous assets and significant economic activities, irrespective of any other, potentially, more effective or efficient projects in another location. Assessment of the level of flood problems is based on the type of land use in the area potentially affected by flooding and the affected population. In addition, projects that have already been financed by national bodies and/or international financing institutions have also been considered as "no-regret" projects.

Figure 3 Locations of "no-regret" projects



Sources: EUDEM and CORINE databases, Consultant's drawing

The total number of "no-regret" projects, with fully secured funding, is 33. In Kosovo, the former Yugoslav Republic of Macedonia and Montenegro no projects with full financing could be identified. In Albania, Serbia and Bosnia and Herzegovina, there are already funds of about EUR 6.3, 28.1 and 106 million, respectively, allocated for the construction of flood prevention infrastructure. Furthermore, 25 narrow definition "no-regret" and 34 extended definition "no-regret" projects were identified. These projects are with outstanding impacts and having either high ("narrow definition") or moderately high ("extended definition") efficiency. For these two groups of projects, funds, at this point, are virtually non-existent. The overwhelming majority of such projects will be carried out in Bosnia and Herzegovina and Serbia.

Concerning maturity and "no-regret" projects, complex evaluation procedures, specifically developed for this study, were applied. Forty-seven structural projects out of the 173 are already categorised as high-level maturity and 92 projects were identified as "no-regret" based on their impacts, efficiency and secured funding. Twenty-eight of the "no-regret" projects have already reached high-level maturity.

The estimated budget of the "no-regret" structural projects totals to EUR 388 million, which implies a funding gap of EUR 245.9 million.

The national source of funding is rather limited. In fact, Bosnia and Herzegovina is the only country that allocated larger amount of national sources for its projects (EUR 6.7 million), providing funding for 12 of its 44 “no-regret” projects, and has already secured funds of considerable volume (EUR 106.1 million) from various sources. IPA funds have already been allocated to “no-regret” projects in Serbia and Bosnia and Herzegovina, EUR 28.14 million and EUR 24.7 million, respectively. Albania also receives partial IPA funding for one of its projects.

Projects of regional relevance

The regional relevance of any structural measure can be claimed in the following cases:

- the planned intervention affects more than one country,
- the impacts of the project extend to more than one country.

The projects with cross-border impact areas are most relevant, seen from a regional perspective. As required by the Floods Directive and Water Framework Directive, a common understanding is then needed that shall manifest in common solutions and measures on both sides of the border. In total, there are 22 "no-regret" projects, with a total budget of EUR 134.6 million, identified as having direct cross boundary impact.

Projects that concern border rivers and cross-boundary rivers, within a 15 km buffer zone, are considered as projects where the impact on cross-boundary waters are likely to occur. In these cases, a similar procedure to that described above should be followed. In this class of projects, where there is an impact on cross boundary waters, there are 41 "no-regret" projects with a total budget of EUR 245.1 million.

Projects which have a direct impact on regional waters, can be defined as those where the impact area of the project affects a delineated potential flood hazard area that crosses, or touches, a country border. This feature is common for 37 more "no-regret" projects, with a total budget of EUR 198.8 million.

The measures defined as having indirect impact on regional waters are those whose impact areas concern international river sub-basins within the Western Balkans region. There are 59 such "no-regret" projects, with a total budget of EUR 310.8 million.

In the analysis, projects with impact areas effecting potential flood hazard areas of cross-boundary nature with an EU Member State are also considered. There are 32 "no-regret" projects where the EU Member States of Croatia, Greece, Hungary, Romania and Bulgaria are all likely to be affected, to some extent.

As the results show, the vast majority of the planned structural projects have some regional relevance, that is, in part, due to the relatively small size of many of the Western Balkans countries and the length of rivers in the region.

The forums for cooperation, data and information exchange at regional level can be facilitated by the International Sava River Basin Commission, the International Commission for the Protection of the Danube River, the co-operation of the Drini Core Group of the Drini Memorandum and the EU Civil Protection Mechanism.

4 The way forward

The following road map is proposed when implementing sound flood protection and management in the Western Balkans countries.

1 The countries should develop and adopt their **Floods Directive implementation plan and programme**.

2 The countries should **accelerate the transposition of EU legislation**. Besides the full transposition of the Floods Directive and the Water Framework Directive, detailed bylaws and decrees, annexed with renewed planning, design and construction standards, are to be developed. These should be in line with the country-specific institutional settings and the overall framework of disaster risk management and should consider the foreseeable impacts of climate change.

3 The countries should take steps to **incorporate flood management issues into all other sectoral procedures**, such as urbanisation, urban and rural housing, agriculture or dam management. Special emphasis is to be given to land use in flood areas, sewage and waste management, as well as climate change. Strengthening legislative enforcement is a key issue, in general, but also in light of land use and property issues.

4 The Floods Directive is a soft directive and, therefore, it is necessary that institutional and planning activities are in place prior to its implementation. The **implementation of the Directive** has to be accelerated, organisational structures have to be rehabilitated and refined, and existing management organisations need to prepare for the Directive's implementation. Strengthening organisational structures must be carried out as soon as possible.

5 The preparation of **flood hazard and flood risk assessments and flood management plans** are the major points of the Floods Directive. For the Western Balkans countries, with the exception of Serbia and Bosnia and Herzegovina, the preparation of the preliminary flood risk assessment is a prerequisite and must be initiated.

6 Based on the results of the assessments, **flood management strategies and flood risk management plans**, at the country and local level, should be prepared and adopted. Based on those, a final **prioritised structural investment list** for each country has to be developed in order to ensure sound flood management.

7 While preparing long-term plans, short-term investments also need to be planned, focusing on the **most urgent interventions** based on available information. At this stage, the "no-regret" project list presented in this study

needs to be replaced with the prioritised list, adopted by the countries. The short-term investment plan is to be revised later, preferably at the end of flood risk mapping process, and replaced once the flood management plans have been prepared.

8 **Early warning and hydro-meteorological monitoring** are important elements of the Floods Directive as they contribute greatly to the planning and design as well as to the successful management of flood situations. The monitoring systems need to be developed in all countries of the region, based on a common foundation, and data has to be made available to all interested parties. Historical data on waters today held by the Serbian water authorities must to be shared with the neighbouring countries to assist their efforts in analysing floods.

9 The implementation of the Floods Directive requires **knowledgeable and dedicated staff at regional, country and local levels**. At present, none of the countries has sufficient flood professionals. Using existing knowledge at the largest universities in the region, region-wide undergraduate and professional educational and training programmes need to be developed. The programmes should focus on the tools of flood modelling, planning and design according to the definitions of the Floods Directive and the existing European practices. Considering that results of any complex educational programme must be tangible and will require time, initiatives to address this must be taken as soon as possible to avoid further weakening of the professional background in the region.

10 Emphasis is to be given to **disseminating information on floods**, the **possible actions in emergencies** and the **activities related to flood control** to local inhabitants and economic players. These activities, as highlighted in the Directive, can drastically decrease damages of floods and can have significant results in short term.

11 The European Commission, the International Financial Institutions and other funding sources should consider **prioritising funding measures** to support the implementation of the Floods Directive, particularly the preparation of the flood hazard and risk maps and development of the national flood strategies and countrywide flood risk management plans.

12 The countries should strengthen their **regional and cross-border cooperation in flood management planning and design** and use existing structures to foster more efficient interventions and data sharing. The International Sava River Basin Commission and the International Commission for the Protection of the Danube River, as the main organisations of such mission, must be supported politically and financially. The obligations and opportunities stemming from the membership of Western Balkans countries in the EU Civil Protection Mechanism shall also be used.

13 **Monitoring the results of the Floods Directive implementation process and the activities of the countries and sharing good** practices shall be done on a regular basis by the international professional organisations and the donor.