Prefektura e Qarkut
Shkodër

REPUBLIKA E SHQIPËRISË
MINISTRIA E MJEDISIT

Qarku Shkodër

FLOOD RISK MANAGEMENT PLAN

SHKODËR REGION

Flood Risk Management Plan

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SHKODËR REGION

For Shkodër Region, Shkodër Prefecture, Shkodër Municipality, local areas of Ana e Malit, Bërdicë, Bushat, Dajç, Gur i Zi, Rrethina, Velipojë

In cooperation with Ministry of Environment, Ministry of Interior, Ministry of Agriculture, Rural Development and Water Administration

June 2015

Ministria e Mjedisit
Tiranë, Shqipëri
www.mjedisi.gov.al

Prefektura Shkodër
Shkodër, Shqipëri

Qarku Shkodër
Shkodër, Shqipëri
www.qarkushkoder.gov.al

REPUBLIKA E SHQIPËRISË
MINISTRIA E MJEDISIT

Prefektura e Qarkut
Shkodër

Qarku Shkodër

In the frame of the project: Climate Change Adaptation in Western Balkans (CCAWB).Implemented by: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, on behalf of German Federal Ministry for Economic Cooperation and Development (BMZ)

german cooperation
DEUTSCHE ZUSAMMENARBEIT

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INFRASTRUKTUR & UMWELT

Regional Environmental Center
(REC), Albania

REGIONAL ENVIRONMENTAL CENTER

Foreword

Climate change effects are already present in Albania. In our capacity as decision-makers, we should adopt measures for mitigation and adaptation to these effects.

In the recent years we have been facing flood situations in a number of districts of Albania but those posing greater risk are the sub-localities of Shkodër region, causing not only economic but also social impact.

The Ministry of Environment, as the responsible institution for policies in the field of climate change, has requested the support of the Project on Climate Change Adaptation in the Western Balkans in two areas directly addressing the issue of floods in Shkodër County. Firstly, we have to monitor atmospheric phenomena, in order to be able to forecast and get prepared and I am happy to recognise that this role now is played by the newly launched system for early warning of floods in Drin basin.

Secondly, our local government units should be aware of the risk extent, assets affected by this risk and certainly they have to take adaptation measures by safeguarding the principles of sustainable development.

The flood risk management plan you have in your hand, has been prepared for the first time in the country and region through a comprehensive process, following the steps required under the European Floods Directive.

This guides us a step forward in our road to the European family and at the same time prepares us for major challenges ahead in the field of climate changes.

Lefter Koka,

Minister,

Ministry of Environment

Foreword

Considering our hydrological characteristics, floods in Shkodër County are highly complex. Their consequences mostly affecting the western area of the county are equally complex.

After the heavy floods of 2010, Shkodër County adapted its regional development concept, including a dedicated action measure in terms of the work for minimizing flood effects.

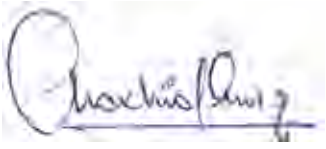
Flood exceeds any institutional and administrative limits. It requires cooperation between the bodies that are responsible for flood risk management. It requires our coordinated and harmonized actions.

We are aware of the concern we are facing as a county. Thousands hectares of land are affected by flood almost every year during the last four years. It is believed that climate changes will bring more extreme weather events, including a growing number of flood cases.

The scope of challenges we are facing can appear demanding but the action of adaptation measures that is clearly described in this document, helps us undertake the first steps.

We will be jointly capable to mitigate this risk in the future only with close inter-institutional cooperation, a substantially improved approach of interventions / infrastructure-related investments in the county territory and enhanced care for human capacity building.

Maxhid Cungu,



Chairman,

Shkodër County Council

Foreword

Floods constitute a natural phenomenon mostly affecting Shkodër prefecture, especially the sub-localities of Shkodër. In the circumstances where there is a legal framework, an inter-institutional unit and when financial and human resources are limited, capacity planning, proper division of responsibilities for the local government units and consideration of all steps in the cycle of a natural phenomenon is becoming of key importance.

In this management plan which as rarely before, has been prepared with the comprehensive involvement of local, regional and national stakeholders and serious commitment of the academy, civil society and donors, we have attempted to bring information on the flood risk extent in our area and assets at risk, and we have furthered our goal. For the first time we followed the EU Floods Directive and identified adaption measures, so that our communities will be able to adapt to such a natural phenomenon.

This document is introduced both regionally and locally, thus bringing different adaption alternatives applicable on both levels.

Felek Kasemi

General Secretary,

Shkodër Prefecture

LIST OF KEY INSTITUTIONS INVOLVED

- Ministry of Environment (http://mjedisi.gov.al/)
- Ministry of Interior,
  General Directory of Civil Emergency (http://www.mbrojtjacivile.al)
- Ministry of Agriculture and Rural Development (http://www.bujqesia.gov.al/)
- Technical Secretariat of the National Water Council
- Shkodër Region (http://www.qarkushkoder.gov.al/)
- Shkodër Prefecture
- Shkodër Municipality (http://www.bashkiashkoder.gov.al/)
- Communes of
  - Ana e Malit
  - Berdicë
  - Bushat
  - Dajç
  - Gur i Zi
  - Rrethina
  - Velipojë
- Directorate of Agriculture and Food
- Regional Environmental Agency
- KESH (Albanian Power Corporation)
- Drainage Board of Shkodër
- River Basin Council of Drin-Buna
- Agency of Drin-Buna
- Inspectorate of Environment, Forestry and Water
- Regional Directorate of Forest
- Institute for Geosciences, Environment, Water, Energy (http://www.geo.edu.al/)
- University of Shkodër (http://unishk.edu.al/)

LIST OF PROJECT PARTICIPANTS

Shkodër Region

- Prefecture: Mrs. Felek Kasemi (General secretary)
  Mr. Pëllumb Dani (Emergency specialist)
- Regional Council of Shkodër:
  Mrs. Merita Kazazi (Head of Strategy Development Department)
  Mr. Sokol Berisha (Specialist of Transport and Civil Emergency Sector)

Communes of the region

- Ana e Malit: Mr. Valentin Gocaj (specialist, project contact point)
- Berdicë: Mr. Qazim Zaja (specialist, project contact point)
- Bushat: Mr. Zija Gerbeti (specialist, project contact point)
- Dajç: Mr. Arben Gjuraj (Mayor, project contact point)
- Gur i Zi: Mr. Alfred Haxhari (specialist, project contact point)
- Rrethina: Mr. Myzafer Guri (specialist, project contact point)
- Shkodër: Mr. Gjon Laska (specialist, project contact point)
- Velipojë: Mr. Ndue Pëllumbi (specialist, project contact point)

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

- Mr. Jakob Doetsch (Project Manager)
- Mrs. Merita Mansaku-Meksi (Regional Coordinator Albania – Kosovo)

INFRASTRUKTUR & UMWELT Professor Böhm und Partner (IU)

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- Dr.-Ing. Carola Zeig (Consultant)

Regional Environmental Center - Albania (REC)

- Mr. Eduart Cani (Senior Expert)

PART I: FLOOD RISK MANAGEMENT PLAN SHKODËR REGION

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LIST OF ABBREVIATIONS / ACRONYMS

A	Agencies
A_{RB}	River basin agency
BMZ	German Federal Ministry for Economic Cooperation and Development
CC	Construction Companies
CIS	Common Implementation Strategy
D_A	Directorate of Agriculture
DB	Drainage Board
DEM	Digital Elevation Model
DFID	Department of International Development, United Kingdom
DLR	Deutsches Zentrum für Luft- und Raumfahrt (German National Aeronautics and Space Research Centre)
D_R	Regional directorates
DRR	Disaster Risk Reduction
EIA	Environmental Impact Assessment
EO	Earth Observation
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
GIS	Geographical Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German development cooperation)
HPP	Hydro Power Plant (KESH, ASHTA)
IBA	Important Bird Area
IGEWE	Institute of Geoscience, Energy, Water and Environment
IncREO	Increasing Resilience through Earth Observation
KESH	Korporata Elektroenergjitike Shqiptare (Albanian Power Corporation)
LGU	Local Governance Units
MoA	Ministry of Agriculture and Rural Development
MoE	Ministry of Environment
MoI	Ministry of Interior
MoU	Memorandum of Understanding
MTI	Ministry of Transport and Infrastructure
NB	National bodies
NGO	Non-Governmental Organization
NTPA	National Territorial Planning Agency
P	Prefecture
Q	Regional Council of Shkodër (Qark)

REC Albania	Regional Environmental Center Albania
SEIA	Strategic Environmental Impact Assessment
UNDP	United Nations Development Programme
WG-F	Working Group on Floods
WHO	World Health Organisation

Communes:

An	Ana e Malit
Be	Bërdicë
Bu	Bushat
Da	Dajç
Gu	Gur i Zi
Rr	Rrethina
Sh	Shkodër
Ve	Velipojë

1 Background and objectives

The Drin-Buna Lowland in the North Western Albanian Region of Shkodër is prone to severe floods which occurred regularly in the last years and might increase in frequency and intensity due to climatic changes in the region. The latest major floods in January 2010, December 2010 and March 2013 resulted in high economic and environmental losses. Without adequate adaptation to the increased flood risk, social, economic and health damage are likely to increase.

The Shkodër Regional Development Concept[1] considers the issue flood protection under regional development. The concept was developed and adopted by the Regional Council of Shkodër. One of the main objectives is the minimization of damages cause by floods in the coming years. It has dedicated a chapter on the effects of floods in the area by recognizing it as a weakness and threat (SRDC, 2010). To protect against floods, the strategic concepts focus on “Raising of community awareness for minimization of damages from floods paves the way to public involvement in coping with emergencies, undertaking of studies with community contributions and building of infrastructure with all round contributions”. It stipulates a clear vision “Shkoder water hub involves an Albanian, Montenegrin, Kosova and Macedonian aqueous-climatic phenomenon, therefore it should be administered with integrated projects” by aiming at “Minimization of Damages from Floods”. Under the strategic vision for 2020, the document has elaborated four measures to achieve the goal on flood protection, as follows:

- Mobilizing and strengthening human resources to minimize flood damage
- Upgrading the safety and drainage systems
- Revitalizing the affected areas
- Studying and monitoring the hydrological stations located in Shkoder

These measures have been detailed and accompanied by concrete actions to be taken by the authorities.

Building on the Shkodër Regional Development Concept, the main objective of this Flood Risk Management Plan is to improve Flood Risk Management (FRM) especially focussing on non-infrastructure measures, like warning, preparedness and spatial planning. This includes the consideration of all adequate types of measures for preparation, disaster management and recovery phases and the development of a regional flood risk management framework as well as local flood risk management plans for the Shkodër

[1] Regional Council of Shkodër & GTZ, September 2010, “The Strategic Concept for Regional Development”

region. Simultaneously, the project contributes to prepare for the implementation of the European Flood Directive in the region.

In the approximation process Albania is working to harmonize the legislation on fulfilling the requirements of the EU Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks. The main responsible authority in Albania is the Ministry of Agriculture, Rural Development and Water Administration. So far no progress has been made in this respect. However the report prepared after the flooding of 2010 by Mott MacDonald (commissioned by the Ministry of Interior and Ministry of Agriculture, Rural Development and Water Administration) is the first effort to advance this process in the country.

At the moment the flood protection is regulated under the emergency and civil protection sector. In this respect the framework is better regulated and a new Law on Civil Protection is under finalization, while a full structure at national and regional level is established, operating under the current Law No. 8756, date 26.03.2001 as amended. There are four main areas of Albanian legislation and policy that relate to flood risk management (Mott MacDonald, 2012a):

- Civil protection legislation that relates to planning for and responding to an emergency;
- Disaster Risk Reduction (DRR) regulations and policies;
- Flood protection and
- Development planning that regulates and controls the development of infrastructure in areas at risk of flooding.

Furthermore there are links with other areas of legislation and policy such as financial and economic matters, environment, natural resources, agriculture and tourism.

1.1 Involved institutions

The main cooperation partners of the project are the Regional and Local Government Units, the communes and relevant stakeholder groups, e.g.

- Ministries, national institutes and agencies;
- Prefecture, Regional Council of Shkodër, regional directorates, municipalities and communes;
- Spatial planning departments, rescue services, emergency management;
- NGOs on nature conservation, agriculture, forestry and energy producers.

The project focuses on the development of a regional Flood Risk Management Plan for the affected municipalities and communes in and around Shkodër.

This includes local FRM plans for the communes Ana e Malit, Bërdicë, Bushat, Dajç, Gur i Zi, Rrethina, Shkodër and Velipojë. The process builds up on both the work that has already been done in the past and the contributions of the relevant regional and local administrations and other relevant stakeholders.

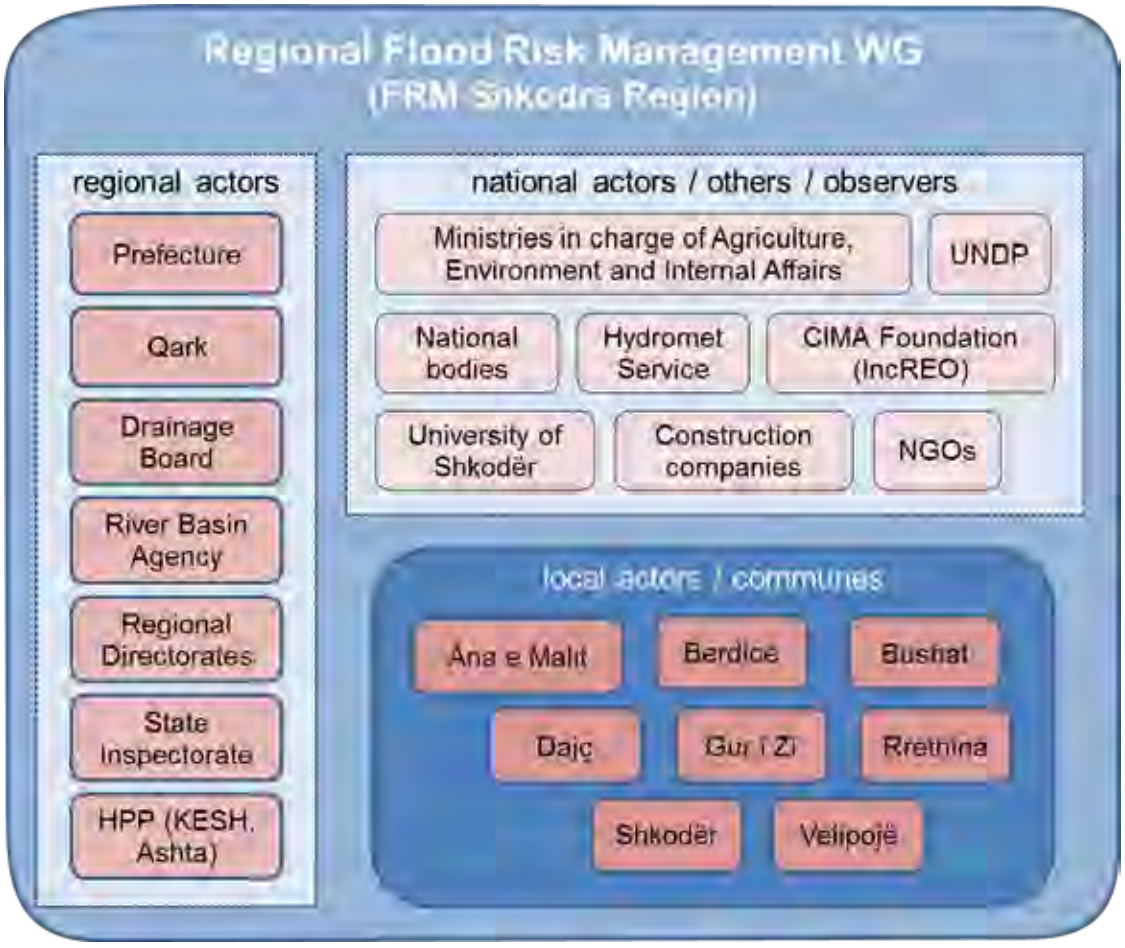


Figure 1: Involved national, regional and local actors of FRM plan (Shkodër Region)

Key aspects of stakeholder involvement in the development of the FRM plan are:

- The regional FRM plan is guided by the principles of the EU Floods Directive; the directive requires strong stakeholder driven processes.
- The FRM plan includes a catalogue of measures related to the EU's "Types of measures", adjusted to the regional characteristics; the catalogue is a proposal, which has to be filled in and adjusted by local actors and stakeholders.
- The activities include training measures for communes with focus on risk reduction, prevention of damage and awareness raising;
- The facts and figures used for planning the measures are based on the practical knowledge of the local specialists at each working group on LGU level, guided and verified at maximum possible extend by the project experts.

This report has been developed based on the actual territorial division of the area consisting of eight communes corresponding to one municipality. But, considering a recent major development of the administrative-territorial reform, in which the Albanian Parliament adopted the Law No. 115/2014 “For the administrative-territorial division of the local government units in the Republic of Albania” (date 31.7.2014) and the respective map of 61 LGUs (www.reformaterritoriale.al), it is planned to merge the former communes into a lower number of municipalities. In this way the project area will be part of two municipalities. These municipalities will be Shkodër (merging Shkodër, Rrethina, Gur i Zi, Dajç, Ana e Malit, Berdicë, and Velipojë) and Vau Dejës (merging Bushat with 5 other existing LGUs).

However, the Regional FRM Plan and the respective Local FRM Plans have considered two scenarios for the implementation of measures:

- Scenario 1: If the merge does not take place, the regional and local plans will be implemented by each participating LGU;
- Scenario 2: If the merge takes place according to the reform – which itself is not going to change borders and will consider the existing LGUs and their borders as service areas under the large Municipality – the plans will be implemented by Shkodër and Vau Dejës in their sub-division areas and administrations.

1.2 Working steps and methods

Flood risk management plans of the communes focus on prevention, protection and preparedness. With a view to giving rivers more space, the communes should consider where possible the maintenance and / or restoration of floodplains, as well as measures to prevent and reduce damage to human health, the environment, cultural heritage and economic activity. Important for a modern approach in FRM is to build on prevention and protection measures that cover the whole Flood Risk Management cycle, from preparation and disaster management to the recovery phase. All potential actors who could contribute to risk mitigation were involved in the FRM plan drafting process.

The process comprised:

- Identification of the most affected LGUs based on the existing facts, assessment and analysis conducted by Albanian authorities and GIZ project;
- Setting up a regional working group on FRM including all relevant local, regional and national actors;
- Assessment and discussion on the risk situation, main hot spots and general needs for action for the Shkodër Region together with the regional working group;
- Development and agreement on the objectives for FRM, processes in the project and single steps including the responsibilities for the steps;

- Development and agreement on the regional and local FRM plans, including a common picture of the flood risk management measures and further activities for the region and the communes.

The main focus in this task was to identify and classify in a participatory process with relevant actors the potential measures and responsibilities for different types of measures. A joint indicative assessment for the measures regarding simple criteria (general impact of measures, bottlenecks for realisation, necessary resources), that is documented in the chapter “Priorities”, makes transparent, that many different actors are involved and responsibilities for each measure have to be clearly defined. Not only structural cost intensive measures solve the problems and many measures can be taken without great efforts within “normal” development planning steps.

Figure 2 gives an overview of the working steps and time line for the FRM plan in Shkodër Region, considering the standards of the European Floods Directive.

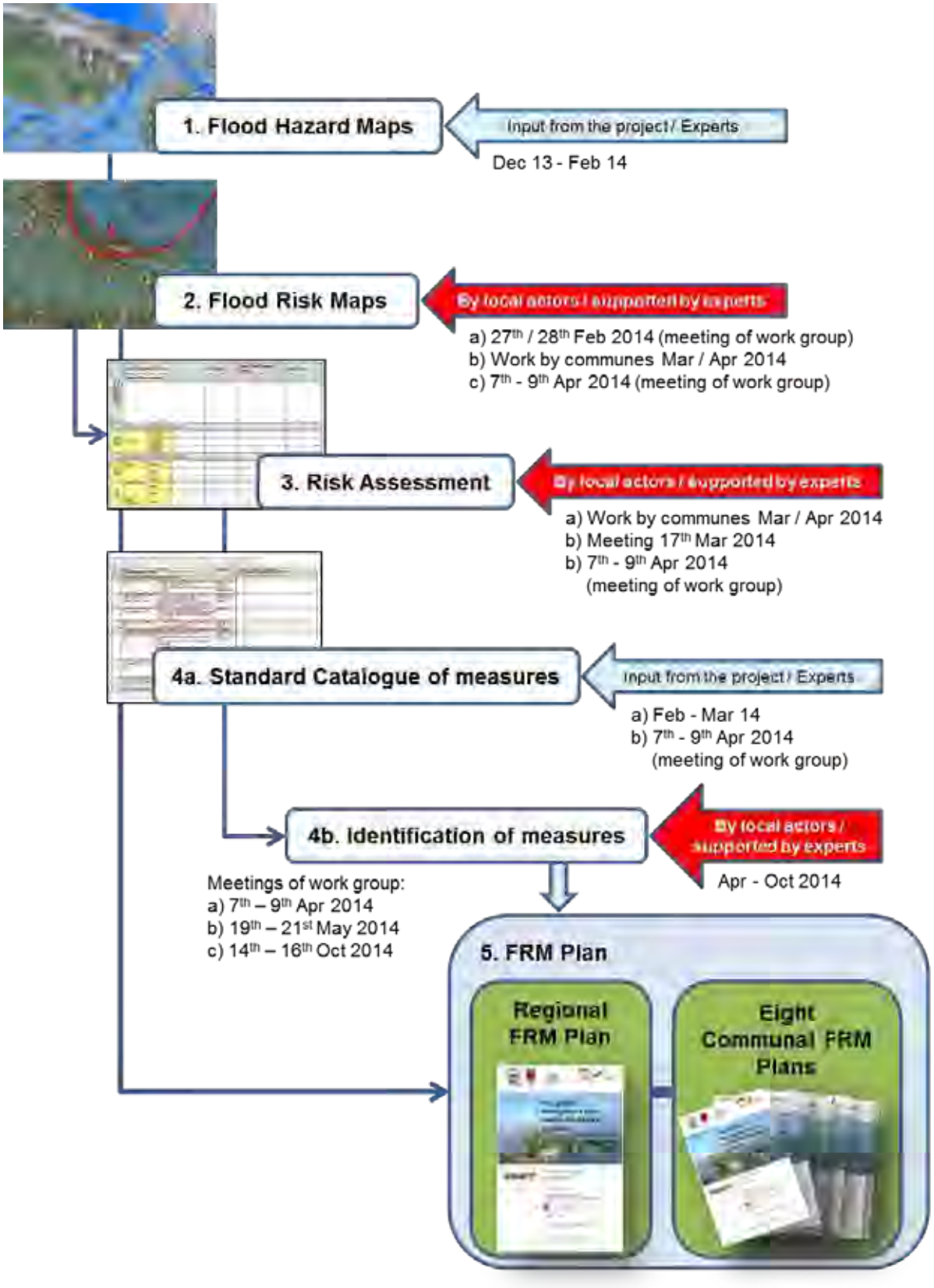


Figure 2: Working steps for the FRM plan

Within the first working step flood hazard maps were used to visualise the flood extent (hazard maps) and objects at risk (risk maps).

According to the EU flood directive the risks for objects of the following groups have been assessed and shown in risk maps and in the FRM plan:

- Human lives (people, especially elderly people, children and disabled);
- Economic activities (businesses, farms, agricultural land);
- Environment (protected landscape, birds and wildlife, sensible flora and fauna as well as groundwater quality);
- Cultural heritage (also churches, graveyards).

Risk from following flood scenarios shall be taken into consideration according the EU flood directive: flooding with a statistically

- Frequent return period (short return period, once in < 10 years);
- Medium return period (once in 50 – 100 years);
- Extreme flood or long return period (highest possible flood or once in 200 or 500 years or more).

Due to missing reliable simulation models and long term statistics the scenarios were built up on existing information about former flood events. The assessment of former events (see also Mott McDonald, 2012a) delivers no sufficient information about all three scenarios. Thus following scenarios were chosen based on the best available documentation of flood extents in the past 50 years:

- Medium to frequent event: the working group agreed on the flood extent of the January 2010 flood; it was documented by TerraSAR and Radarsat by the German national aeronautics and space research centre (DLR, 2010) in satellite images. Statistically it has a return period (depending on the cross section) of 10-20 years.
- Extreme event: the heaviest documented flood event of the last 50 years took place in December 2010 (Mott McDonald, 2012b)[2].

An approach with modelled flood scenarios was not possible due to missing models, data and time. However, to discuss the flood risks and measures to reduce the flood risk the risk maps based on historic events were absolutely sufficient.

[2] Mott MacDonald (2012a) estimates a return period for the December 2010 event of 50 – 100 years (depending on the cross section in the region). However, no higher floods or no larger flood extent were documented in available documents for historic floods. This also is influenced by river draining and dams built in the last 50 years, which makes long term statistics impossible.

All flood information was integrated into the flood risk maps, which show areas and objects which can be damaged by floods. The focus was on risk areas and risk objects relevant for human health, environment, cultural heritage and economic activities. Thus, the assessment of the flood risk situation built on the first two working steps (flood hazard and risk maps) and comprised the main hot spots and general needs for action (listed in a tabular fact sheet).

Within working step 4a catalogue of measures (which build on the EU Floods Directive) was used as a check list to select and define measures (administrative instruments, protection aspects, technical flood protection aspects, preparedness aspects, see Annex D). The subsequent identification of measures included both the selection and the description of measures and respective responsibilities. Also priorities had to be set, based on a joint indicative assessment for the measures regarding simple criteria (general impact of measures, bottlenecks for realisation, necessary resources, environmental criteria, and social criteria). The priorities of the action plan show:

- which low cost measures may be taken first,
- which additional evaluations may be necessary,
- which actors are mainly in charge and
- for which measures additional funds must be raised.

The last step dealt with the documentation in terms of the final report and supplementary maps. FRM plans are the summary of the risk assessment and the action plans. They include the Regional FRM plan (regional strategy, framework, regional measures) as well as the Local FRM plans (local action plans) and focus on prevention, protection and preparedness. All identified measures that may contribute to the reduction of flood risk in the region are divided into

- regional measures (to be realized by regional or national actors) and
- local measures (to be taken by the communes).

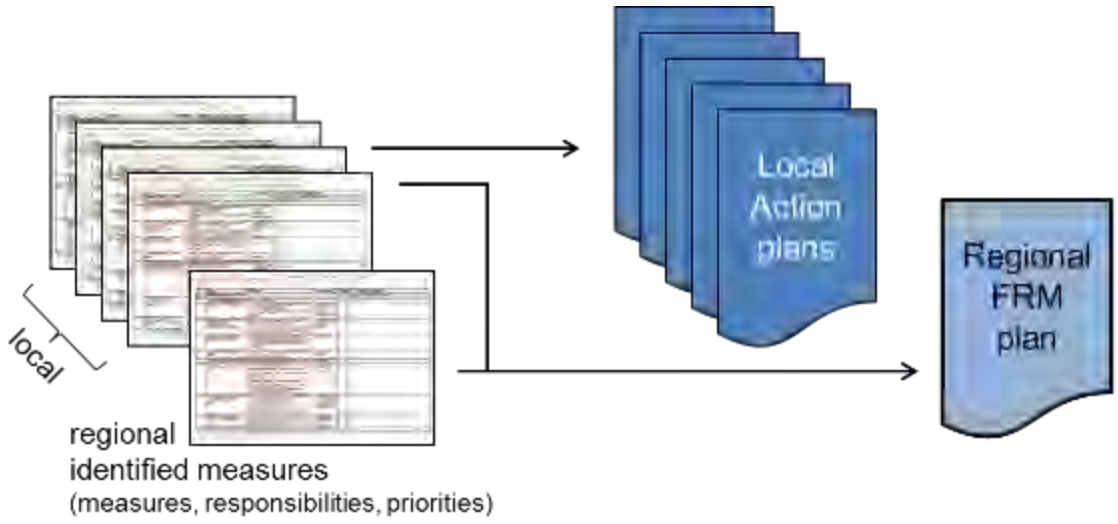


Figure 3: FRM plan of Shkodër Region and local action plans

1.3 Framework of the European Flood Directive

The “European Directive 2007/60/EC on the assessment and management of flood risks” contributes to setting a legal framework for integrated water management including flood risk management for all European member states. It builds up on the change of strategy in fighting against flood risks: the traditional approach was to protect people, economic goods and agricultural land from floods (which regularly fails when extreme floods overtop the protection works). The modern approach of the directive is to cooperate with all relevant actors to “life with the floods”, to protect if possible, to adapt uses and constructions to flood risks in respective areas and especially to prepare for being flooded in a holistic approach with all potentially affected people, organisations, administrations and businesses.

Thus the purpose of the directive is to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the community. According the directive flood risk management shall address all aspects of floods, including prevention, protection and preparedness. Thus the actions and measures of the flood risk management plan shall tackle all the stages of the flood risk management cycle (see Figure 4). They shall include measures for the prevention of flooding, for the preventive protection against flooding, and for preparedness. They also shall include measures for the periods before a flooding is coming, for the time when a flood event is happening and for the period of recovery after a flood has happened.

Figure 4: The FRM cycle according to the EU FRM Directive
[graphic: INFRASTRUKTUR & UMWELT, EU-project STRIMA 2014, modified]

The directive has to be implemented in coordination with other legal acts, mainly the Directive 2000/60/EC (Water Framework Directive) and requires cyclical implementation. The directive focusses on the integration of all relevant sectors, including land use management, civil protection, dam management, strategic and environmental impact assessments, nature legislation, public consultation etc.. A major objective is the coordination across the river basin, including requirements for transboundary coordination.

In general the EU floods directive foresees three steps, which have to be implemented in all member states within the given deadlines for all river basins:

1. Identification of potential significant flood risk areas;
2. Flood hazard and flood risk mapping;
3. Flood risk management planning.

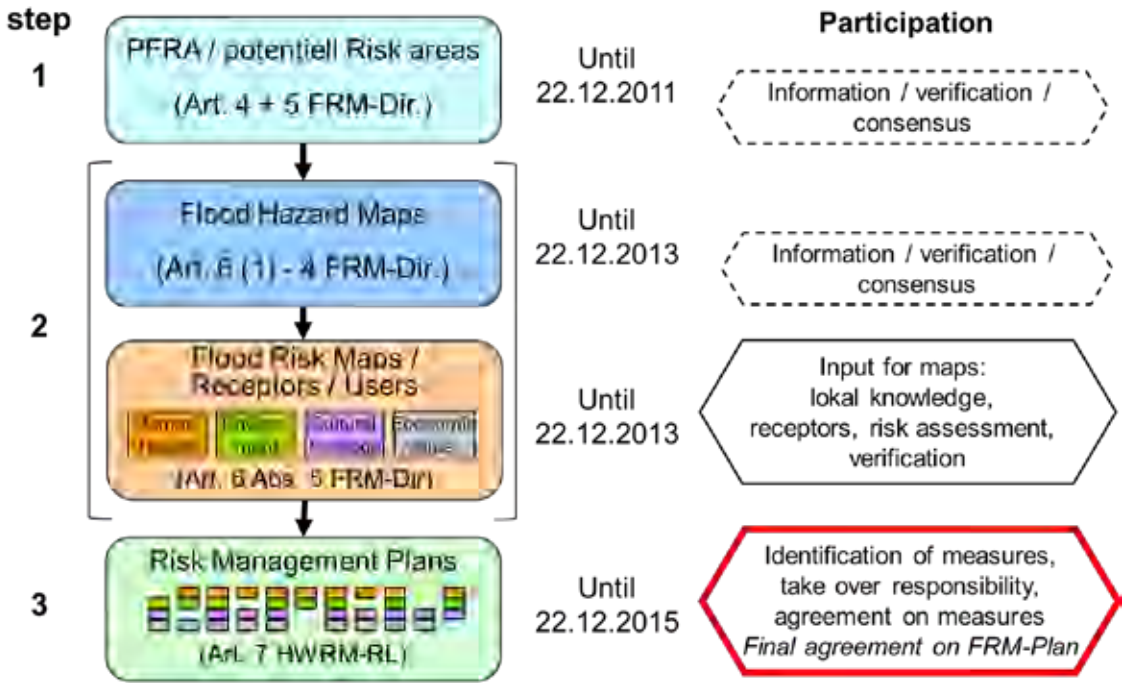


Figure 5: The steps and milestones of FRM according to the EU-FRM-directive (reference to articles of the directive in brackets) [graphic: INFRASTRUKTUR & UMWELT]

For the Shkodër region the EU directive is not binding since it is not within an EU member state yet. Nevertheless it was agreed between the partners when specifying the project to follow the directive as close as possible to contribute to European integration. For the project area the first step (preliminary flood risk assessment and identification of potential flood risk areas) was not to be done since former events and significant flood damages demonstrated clearly the significant flood risk for this area.

The second step (development of flood hazard maps or flood extension maps) was partly tackled by the World Bank project of Mott McDonald (Mott McDonald, 2012b): however, due to a missing comprehensive run-off-model and missing input data there are doubts about the accuracy of the flood hazard maps. Due to a low resolution of the used grid of the DEM and missing 2D hydraulic modelling for the river basin it is not sufficient to evaluate certain parts on communal level. As flood risk mapping was no priority task of this project available information was used and refined. Therefore the mapping activities are based on existing flood hazard and risk information, generated from satellite image and aerial photos of former events etc. (see existing data and existing materials). Based on the available information the maps were improved jointly with the communes and regional actors.

Thus the third step was in the focus of the activities in the project area, see chapter 1.2. The following image shows the necessary steps within the FRM planning process, including risk description / assessment, appraisal of deficits / need for action, identification of potential measures, planning of measures and documentation.

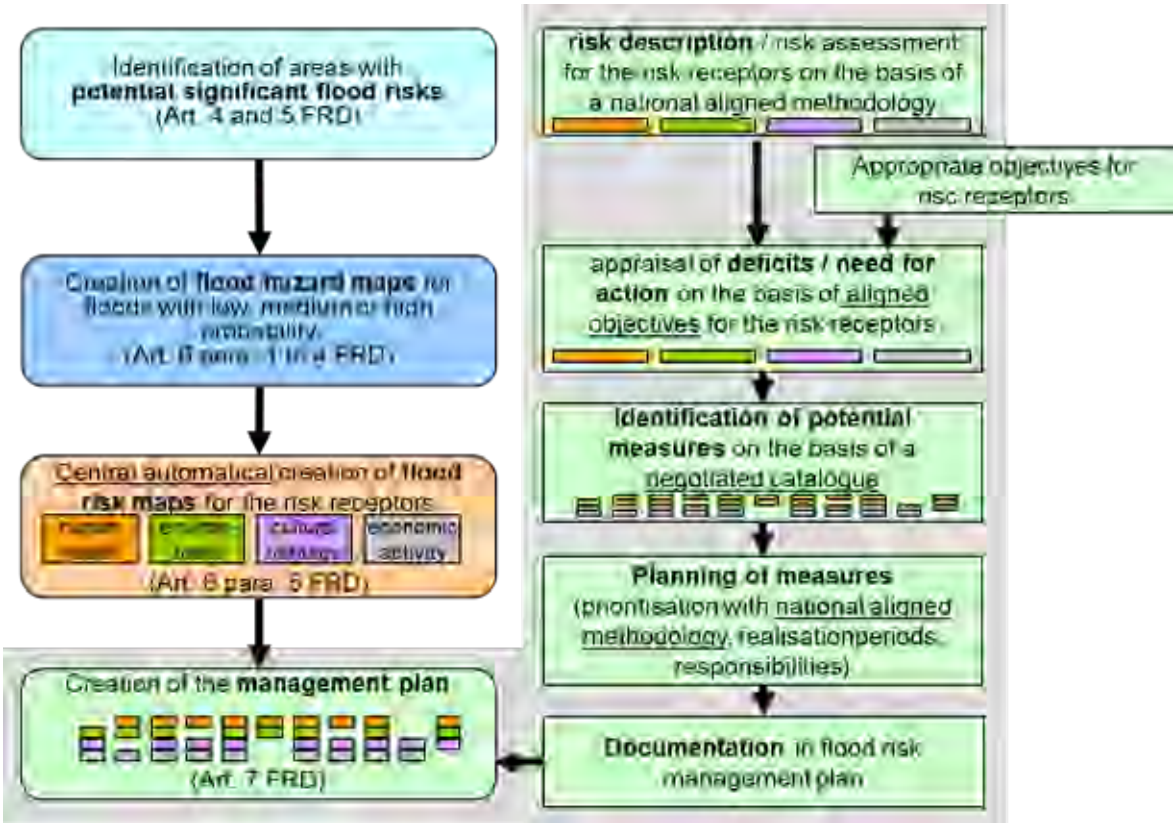


Figure 6: Development of the FRM-Plan according to the EU FRM Directive [graphic: INFRASTRUKTUR & UMWELT]

The FRM project Shkodër follows in general the steps and the methodological approaches of the EU to implement the directive. Further details are documented in the working papers of the EU's working group on floods (WG-F) and in the working groups that coordinate the CIS process (Common Implementation Strategy)[3].

1.4 Climate Change background

In general climate change projections for the region show an increase in temperatures as well as an increase in frequency and intensity of floods (IPCC, 2014). While summer periods will be dryer, latest figures of the European Environmental Agency predict an increase of heavy precipitation in the winter period between 5-15 %. Especially climate variability will increase and more extreme events are likely to happen (EEA, 2014).

For flood risk management the interest in climate change projections is related to events causing high water discharges such as extreme precipitation events, early snow-melt and more intensive precipitation in winter time.

[3] The CIS guidance documents are published under http://ec.europa.eu/environment/water/flood_risk/implem.htm

While climate change is expected to increase both the magnitude and the frequency of floods there is still considerable uncertainty about the exact climate change impacts. Therefore international best practice in flood risk management considering climate change is to be flexible to adapt to a wider range of future scenarios (UNECE, 2009).

In a recent report (Mott MacDonald 2012b) an increase in discharge of 10 % is suggested to be considered, but it is noted that this is probably an upper estimate of potential climate change impacts.

In this FRMP climate change trends have been considered.

2 Characteristics of the project area

The project area is located in North West Albania at the border to Montenegro. It is characterised by the coastal floodplain of the rivers Drin and Buna, the surrounding mountains - foothills of the Albanian Alps - with heights up to more than 1,700 m (Mali i Cukalit, east of Shkodër) and Shkodër Lake, a large inland lake which is shared between the two countries Albania and Montenegro. Buna River at the south end of the lake is the only outflow discharging to the Adriatic Sea after joining with Drin River close to the city of Shkodër. Floods are frequent during the November-March period, when the region receives about 80-85 percent of its annual precipitation (Bogdani, 2006). This potential risk area in the Shkodër region covers the communes Ana e Malit, Bërdicë, Bushat, Dajç, Gur i Zi, Rrethina, Shkodër and Velipojë, see Figure 7.

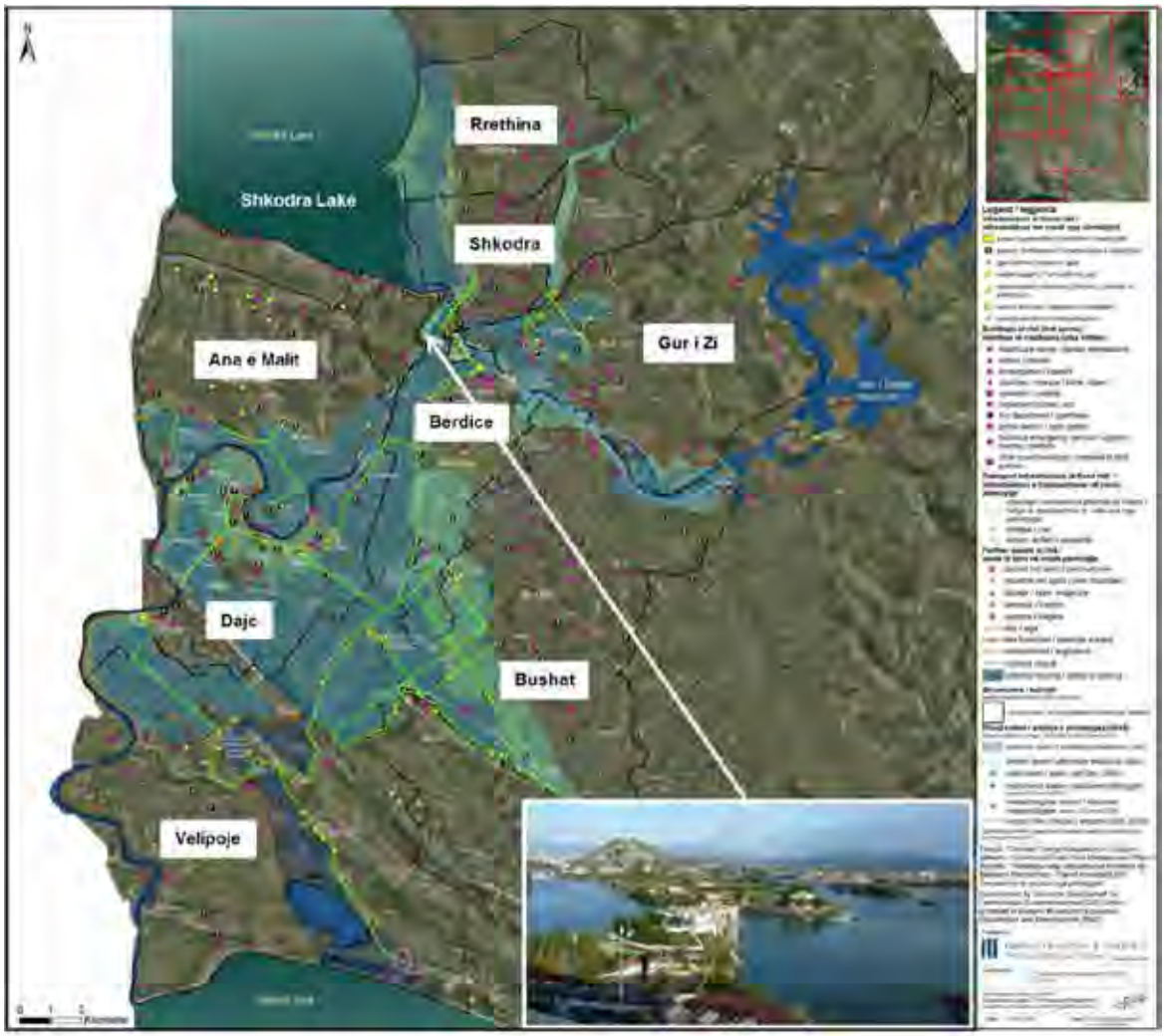


Figure 7: Shkodër region with 8 communes of the project – magnified section of the confluence of Drin and Buna in the South of Shkodër

2.1 Drin-Buna River Basin

The Drin-Buna Lowland is part of the extended trans-boundary Drin with the riparian countries of Albania, Kosovo, Macedonia and Montenegro. The total catchment area of the basin is approximately 20,380 km² (LWI, 2014) and it includes the Black Drin, White Drin and Buna River, as well as the Shkodër, Ohrid and Prespa lakes. The Black Drin originates from Lake Ohrid and flows up north crossing the border between Macedonia and Albania. The White Drin rises in Kosovo. The two streams flow into the Fierzë reservoir. From there the Drin River passes the dam cascade of the three reservoirs Fierzë (73 km²), Koman (12 km²) and Vau Dejës (25 km²) operated by the Albanian power corporation KESH (Korporata Elektroenergjitike Shqiptare). The dams have been constructed till 1975 (lowest dam Vau Dejës), till 1978 (highest dam Fierzë) and till 1985 (Koman) (LWI, 2014). Hydropower production in the Drin River is highly important to Albania producing about 90 % of the country's electricity. Further downstream the Drin joins the outlet of Shkodër Lake, the Buna River and losses its name.

Figure 8: Drin and Buna River Basin - overview (Poci, 2012)

The Buna River stretches from the outlet of Shkodër Lake to the Adriatic Sea and has a length of 44 km. On the last kilometers - before joining the sea - Buna River runs partly along the border between Montenegro and Albania. The Drin-Buna Lowland represents a very complex water system where rivers, lakes, wetlands and groundwater interact. Besides many natural values, the Drin Basin is important to the economy of riparian countries. The main users of water are energy, agriculture and livestock, water supply and sanitation, mining and industry, environment, fisheries, tourism and transport.

Figure 9: Drin and Buna River Basin – river network (LWI, 2014)

Due to the heavy rainfalls in the winter season on the one hand and the limited discharge potential on the other hand, flooding is a regular natural phenomenon in the Drin-Buna Lowland. The whole Drin-Buna catchment is characterised by a mainly Mediterranean climate with up to more than 3,000 mm of average annual precipitation in the mountainous parts of the catchment. Rainfall occurs mainly from November to March and there is a wide variation of the total amount and the spatial dispersion of rain in the different parts of the catchment.

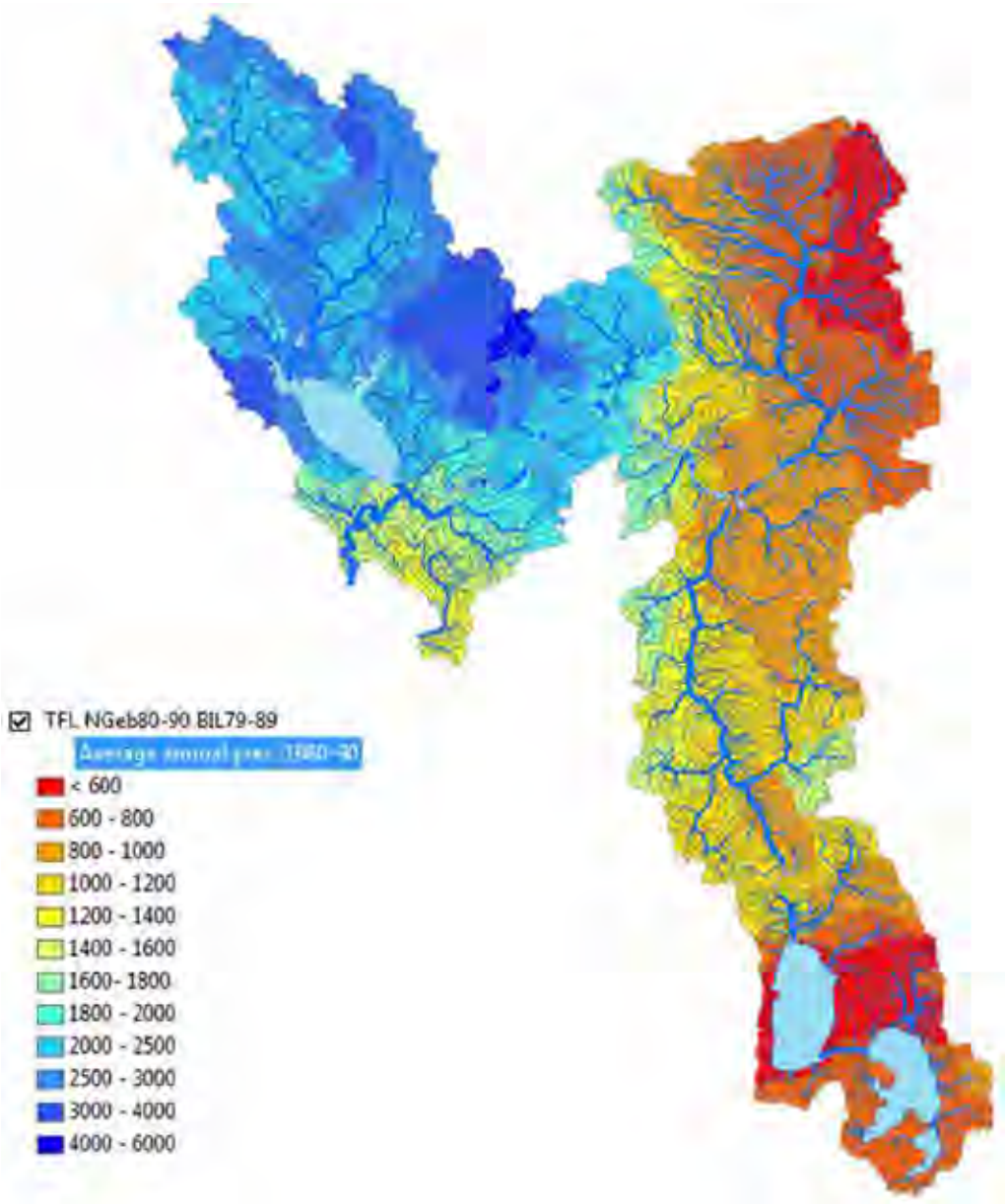


Figure 10: Rainfall map – average annual precipitation 1980-1990 (GIZ[4])

[4] Map prepared through hydrological model prepared for Flood Early Warning System under GIZ project 'Climate Change Adaptation in Western Balkans' based on precipitation data of National Hydrometeorological Services of Albania, Kosovo, Macedonia and Montenegro

The flood intensity therefore strongly depends on the interference of rainfall pattern in the different parts of the whole catchment. Melting snow in spring is another major contributor to floods. The Drin-Buna Lowland is especially affected by flooding when all tributaries have high loads of water at the same time: Drin and Gjadër River coming from the mountains east and south east of Shkodër, Kir River coming from north east and the Buna River which is the only outflow of Shkodër Lake, see Figure 11. Furthermore, the water balance of the Lake Shkodër (377-530 km²), shared by Albania and Montenegro, is highly influenced by the Morača and Zeta Rivers which drain the northern mountain range of the sub-basin Montenegro.

Figure 11: The tributary area in the Drin-Buna Lowland (IU, 2013)

The high risk of flooding in this region originates from a flow diversion of Drin River in the 19th century. Until 1848 Drin River found its way to the Adriatic Sea passing Bushat, Gramsh (here joined by Gjadër River) and then flowing into the sea near Lezhë. Caused by flood events in 1848, 1858 and 1896 the flow of Drin diverted (REC, 2010). The natural channel shift was later on supported by the construction of canals to use hydropower for mills south of Shkodër and by the partial closure of the former Drin river bed (Schwarz, 2009). Today the Drin River mainly discharges via Buna River. Its old bed is part of the drainage system but without high discharge potential, see Figure 12.

The existing flood protection system dates from the 1960ies and relies on a series of dikes and drainage channels (Mott MacDonald, 2012a). These have been constructed mainly after the catastrophic inundation of the years 1962-63. In this time huge investments have

been carried out in the lower part of the rivers Drin and Buna. Although many of the technical flood protection measures have been beneficial during following flood events - like for example that one in winter 1970-71, they also triggered further expansion of settlements in river floodplains, thereby raising the potential for flood damage. This flood prone lowland is a natural retention area but settling and cultivating here was deliberately enforced in the time of the socialist regime when Albania was strongly depending on its own production and every patch of fertile land was used for agricultural purpose.

In the same time the hydropower cascade was realised in order to secure Albanians energy demand. The water flows of Drin have been subject to strong changes after the building of huge dams in the upper course beginning of 1970ies, the excessive gravel exploitation from the area just downstream of the main dam at Vau Dejes and just recently by the construction of the river power plant in Ashta, see Figure 12. The latter changed the formerly braided river into a so called anabranching river system thereby changing the watercourses, the sediment household and reducing the typical habitats (Schwarz, 2009).

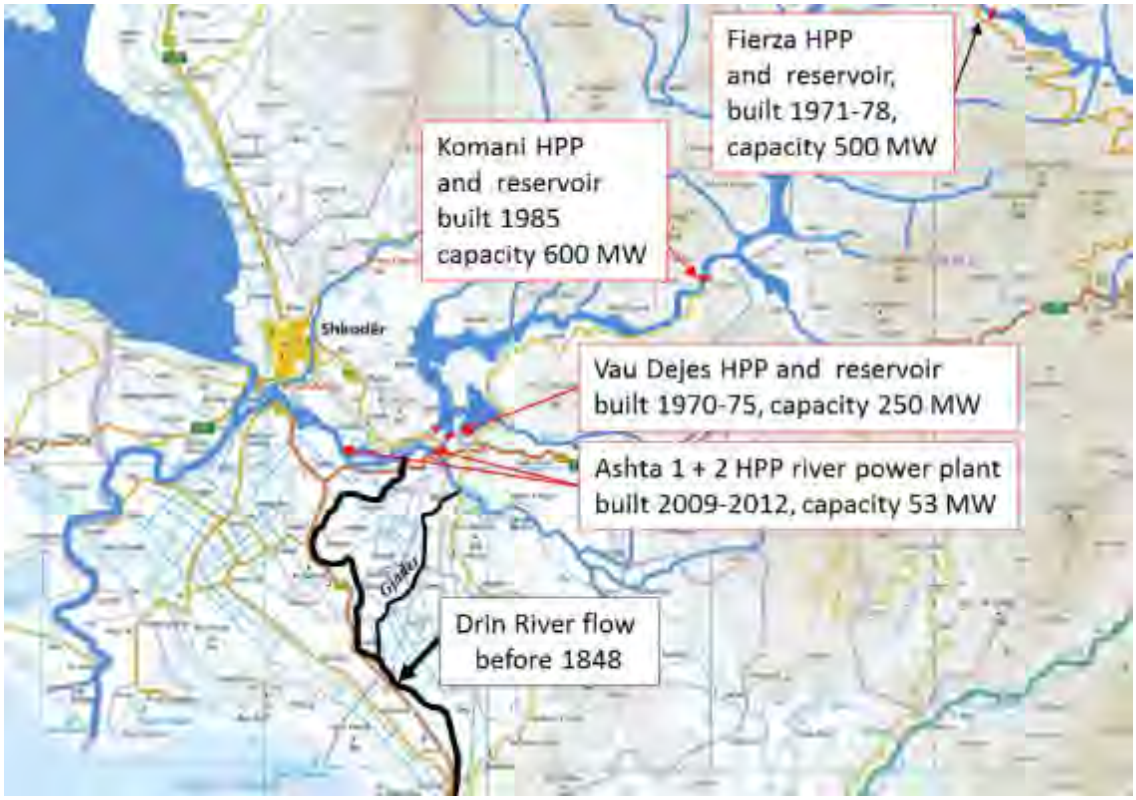


*Figure 12: F*low of Drin and Gjadër River before diversion in 1848 and the Drin hydropower cascade including the new river power plant Ashta (IU, 2013)

Today, the hydraulic capacity of the actual downstream river bed and its natural flood plains allow passage of minor floods only. On the first non-diked stretch of 9.5 km after merging with Drin the river Buna has a transport capacity of max. 1,500 m³/s (Mott MacDonald, 2012a). The lower 32 km until the Buna delta are protected by dikes and have a capacity of 2,200 m³/s. The mean annual discharge of Drin-Buna is about

680 m³/s, of which 360 m³/s come from the Drin itself and 320 m³/s from the Buna - from Lake Shkodër (Mott MacDonald, 2011). Medium to larger floods led to severe inundations and flood damage in the past.

Furthermore, along with the natural water courses, the area has been heavily modified by humans for the purpose of reclaiming the lowland by intensive drainage and irrigation. The drainage system itself can be considered as a groundwater management system which is connected with flood management in times of high water levels. The system plays an important role on water flow and pressure release and it protects land and houses in the entire area from rising ground water. Once the surface of the area is flooded hydraulically the smaller drainage channels themselves have a minor impact on the flow of the surface water. The main channels that lead towards the sea (through Murtemza channel to Viluni Lake) can significantly contribute to increase the discharge from the lowland area into the sea and thus reduce the build-up of flood water within the Trushi field (Mott MacDonald, 2012b).

This system is composed of dams, dikes, barriers and large drainage channels. These are mainly located along Buna River, Bushat Commune and Velipojë Commune. The most important infrastructure interventions are the dikes in Dajç Commune, the primary drainage channels (K1 channels) in Bushat, the Dike of Selmanaj in Velipojë, the Dike of Torovica, the Murtemza Channel in Velipojë and the two dikes of Cas and Viluni.

The following table lists some of the main manmade interventions of the Drin-Buna Lowland, see also Mott McDonald, 2012a. The locations of the dikes as well as the most problematic spots are described in chapter 4, see Figure 16.

Table 1: Design dike crest levels (Mott MacDonald, 2012a)

River	Location	Design Level
Drin River	Ashta	19.0
	Juban	18.38 - 16.15
	Vukatana	13.7 - 12-25
Buna River	Shirq	8.5
	KK5	7.5
	Belaj	6.5
	Pentar	6.2
	Luarz	5.1
	Rec	4.8
	Pulaj	3.6
Murtemza Collector	Cas	6.5
	Viluni	5.24 - 4.15

The ability of this system to function as one interacting system depends much on the maintenance of the channels and other parts of it. It is reported by local responsibles and farmers that due to missing maintenance smaller floods cause flooding of fields in some areas. On the other hand e.g. the construction of a new dike at Cas to protect agriculture land south of the Murtemza passage has cut off former retention area and might cause an additional bottleneck.

Moreover, the sea level alteration is another factor that influences the southern part of the Drin-Buna Lowland. The phenomenon of sea erosion is visible alongside the sea coast of the lagoon of Viluni up to the end flow of the Buna River. Along the coast the inroad of the sea is about 2 meters especially close to the delta of the river Buna. Given this progression by the sea, the loss of the coast may be much more dramatic than the average estimates of the last 50 years which place it at 500 meters. One of the factors favouring the advance of the sea toward the land and the intensification of erosion is the blockage of the alluviums that used to come from the River Drin and the construction of hydropower stations over its bed (LEAP of Velipojë - REC, 2006).

2.2 Protected areas

The entire project area within the Buna delta is recognised as a protected area both nationally and internationally. It is also a trans-boundary protected area shared with Montenegro. The delta together with Shkodër Lake is an internationally recognised Ramsar site designated in 2006. The Ramsar designation specifically alludes to the Buna River, wet woodland, freshwater marshes and wet pastures. The principal threats to the site listed in the Ramsar citation include land reclamation through drainage, development for agriculture and changes in water regime. Plant species cited in the Ramsar designation include twelve endangered species, twelve vulnerable species and ten rare species. It also supports 36 globally threatened animal species. Domni Marsh adjacent to the Murtemza Collector is also recognised internationally as an Important Bird Area (IBA) (Mott MacDonald, 2012a).

The entire site is also a ‘Natural Managed Reservation / Area of Management for Habitats and Species or Category IV site designated by the Ministry of Environment in 2010. The relevant legal clauses relating to Category IV sites in Albania state that ‘the third level of protection’ is given to prevent ‘change of the natural state of water reservations, resources, lakes and wetland systems’ (Clause 2a) (Mott MacDonald, 2012a).

Such status makes compulsory the EIA for every intervention in the area, in both planning and investments. Especially this impacts the planning for the maintenance and flood protection measures in Buna River, which falls under stricter protection rules.

Figure 13: Map of the protected area in the project area (MoE, 2005)

3 Transboundary flood risk management aspects

3.1 Transboundary dimension of the risk area and cooperation

The project area and the relevant flood risk area have different transboundary dimensions:

- The Drin River Basin is a transboundary river basin as described in chapter 2.
- The Buna River is the border between Albania and Montenegro on the last ca. 20 km before it meets the Adriatic Sea.
- The flood risk area of Drin and Buna covers beside Albanian territory also Montenegrin.
- Lake Shkodër and by this the discharge in Drin and Buna rivers are influenced by Albanian and Montenegrin tributaries.

Not only in the light of the EU flood directive transboundary flood risk management aspects have to be integrated into the FRM planning process in international river basins. The EU directive requires explicitly the mutual information about the FRM approaches and coordination of FRM measures to prevent adverse consequences of FRM measures on neighbouring countries. Formally this requirement is valid only for EU member states; but however, since the guideline shall be guiding for this project transnational cooperation is sensible. In detail the transboundary flood effects (beside different transboundary effects in the upstream areas) are:

- Influence of the (international) Lake Shkodër on the flood situation in the region;
- Downstream border river situation, which means, that all measures for maintenance and reconstruction of the river, dikes or other protections works might have an influence on the neighbouring territory (both ways: Albania to Montenegro and vice versa);
- Forecast and prevention measures are closely connected between the Albanian and Montenegrin part of the flood risk area in the Delta; Montenegro depends on flood forecast and preparedness measures of Albanian stakeholders.

Transboundary flood risk management calls for different steps of cooperation:

- Mutual information on risks and actions;
- Joint risk assessment, modelling and warning system;
- Joint or mutually adjusted flood risk management planning;
- Joint emergency response planning;
- Communication and cooperation during flood events / joint emergency response actions.

Consequently Montenegrin actors and stakeholders were partly involved in the working process of this flood risk management plan to firstly reach the minimum objective of mutual information and to make a step towards coordinated FRM planning. The Montenegrin representatives of the Directorate for Waters of Montenegro and the Coordinator for the territorial unit Bar / Ulcinj / Budva of the Directorate for Emergency Management in the Ministry of Interior participated in some working meetings. At the same time they were working on flood risk management plans for different cities and regions in Montenegro. The “Municipality Ulcinj-Plan for protection of flooding“ is most relevant in this regard since it neighbours the Shkodër region.

3.2 Status and perspective of transboundary risk management

The project area as lowest part of the international Drin River Basin is also subject of the international cooperation of all riparian countries. The Ministers responsible for water resources and environmental management of the Riparians and high level representatives signed in Tirana on 25 November 2011 the Memorandum of Understanding for the Management of the Extended Transboundary Drin Basin. The Strategic Shared Vision for the management of the Drin Basin forms the content of the Memorandum of Understanding (MoU). The Strategic Shared Vision, as well as a number of priority actions for the promotion of multilateral coordination and cooperation, had been formed and elaborated through the Drin Dialogue. A set of actions are proposed aiming to facilitate the implementation of the MoU. The Action Plan[5] defines and describes activities, objectives, and institutions that will be responsible for the implementation of each activity, resources and experts to be involved and deliverables. “Short term” actions are proposed in the Action Plan until the end of 2015. The implementation of the activities will be largely defined by the availability of adequate human and financial resources. Concrete planning for “medium-term” actions is set to be made towards the end of 2015 on the basis of an assessment of the: (a) progress regarding the implementation of the actions and activities; (b) outcomes that will be achieved as direct or indirect effect of the implementation of the action plan; (c) outcomes that will be succeeded by the Riparians through their efforts to address water related management issues. The actions include following types of measures:

1. Enhancement of coordination mechanisms among the Parties
2. Enhancement of the knowledge basis about the Drin Basin
3. Improvement of information exchange through the establishment of a system for regular exchange of relevant information among the competent authorities of each Party

[5] Action Plan for the implementation of the Memorandum of Understanding for the Management of the Extended Transboundary Drin Basin, June 2012 – December 2015 (Draft September 2012

4. Enhancement of cooperation in the field of flood risk preparedness, management and mutual support
5. Institutional strengthening in the field of integrated water resources management
6. Promotion of public participation and stakeholder engagement.

Under no. 4 the flood risk oriented actions are: “4.1 Establishment of an ad-hoc expert working group for flood management under the DCG” and “4.2 Study on options for the establishment of cooperation at technical level”.

In the closer project area the transboundary cooperation of Albanian and Montenegrin neighbours is based on regularly meetings and visits that are held in both sides of the border. The FRM project also involves both Albanian and Montenegrin partners. In 2013 a number of workshops with national and local actors in Montenegro were held, in which the methodology of FRM in the light of the EU floods directive was presented, discussed and training on its implementation provided. In a regional working group meeting in Bar, Montenegro (10th October 2013), the regional strategy was discussed. As one result of the activities in Montenegro the communities developed flood risk maps with support of UNDP.

The harmonization of geodetic benchmark points between Montenegro and Albania is a basis for future mapping activities. The commissions’ members from Montenegro and Albania fixed the geodetic benchmark points (Rasovic, 2014).

On the Montenegrin side flood risk management plan sections were developed in the similar structure like on the Albanian side. The catalogue of measures was used in a similar way.

The following cooperation issues could be developed further in future regarding the improvement of cross-border cooperation:

Table 2: Status and perspective of cross-border-cooperation in the region

Cooperation, information	Existing on national levels	Local cooperation on FRM-plan level; with communes
Regular working group	Existing on national levels	Local working group; with communes; on FRM and emergency response
Risk Assessment / Mapping	--	Joint risk maps; joint risk assessment
Joint modelling / joint forecast	Partly under development; forecast system within GIZ project	Further development; training
Emergency response	In small scale on case to case basis	Joint emergency response plan; regular trainings

3.3 Flood protection action plan for the Municipality of Ulcinj

The following actions have be drafted in the Flood Protection Action plan for the Ulcinj Municipality regarding the river training of the different rivers in the region on Montenegrin side:

Table 3: Overview on river training measures on the Montenegrin side

No.	Watercourse	Part of the course	Required works
1	Bojana River	Embankment on the lines: St.Đorđe-Sutjel and Reč-St.Nikola	Upgrading and reconstruction of embankment, regulation
2.	Skadar Lake	Ceklinska kaseta	complex works Requires special analysis
3	Skadar Lake	Donjozetska kaseta	complex works
4	Vladimirska river, Rastiški creek	lower stream	Regulation of the planning flows in the river Bojana
5	Međuriječje	Upper stream	Construction of reservoirs (accumulation)

Furthermore for the Municipality of Ulcinj flood risk management measures were developed based on the catalogue of measures as used in the Shkodër Region:

Table 4: FRM measures on the territory of the Municipality of Ulcinj (based on the catalogue of measures of the FRM Shkodër project)

No.	Measures	Description	Competences
1	Flood adapted planning and building	e.g. water and pressure resistant windows in flood standard, flood resistant facades, flood adapted room use in living quarters (avoiding damage causing use of cellar rooms), supporting parts of buildings	Municipalities, Principals
2	Publication of flood hazard and flood risk maps close to the spot	The publication of digital and analog data of flood hazard and flood risk maps close to the spot aims primarily to a raise of awareness as well as a modification of behavior in case of floods. In addition the mentioned maps form a basis for the operational application (e.g. the optimization of alert and operation schedules) and other measures of flood risk management.	Water Authorities, Municipalities, Organizations
3	Continuing advancement of awareness raising and publicity	Continuing advancement of awareness raising and publicity by allocation of digital and analog information (e.g. also by local visualization of expected water levels), as well as organization of symposia, workshops and advanced trainings.	Water Authorities, Municipalities, Organizations
4	Alignment or optimization of alert and operation schedules	Examination and actualization of existing alert and operation schedules among other things by allocation of flood risk and flood hazard maps as well as further information material and an eventually meaningful adoption of working foreign systems.	Municipalities, Civil Protection and Emergency Services
5	Improvement of flood precautions in the spatial planning and urban planning systems.	Protection and Recovery of flood plains by designation of priority and reserve areas.	Spatial planning Agencies, Municipalities
6	Support of the development towards natural floodplains.	site-appropriate agriculture and forestry, Extensive use of the floodplains, leaving them for natural succession	Municipality, Agriculture, Forestry
7	Construction of a protective construction (dike, dam or flood wall)	Construction of dikes, dams or flood walls based on the interactions with adjacent sections of valleys, involved plans and verifications by calculation	Municipality, Organizations
8	keeping clear flood discharge cross-sections in settlement areas	Clearance of the river section out of vegetation or sedimentation	Municipality, Organizations, Civil Protection
9	Object / Facility protection of infrastructure facilities (e.g. transport nodes, switching and branching systems)	Construction of dikes, dams or flood walls for facility protection, strengthening of primary substations, infrastructure nodes relocation from flooded areas	Municipality, Organizations, utilities companies
10	Civil Protection	Examination and improvement of existing resource plans and crisis management systems by conduction of flood exercises, advanced training, definition of organization structures, setup of irrigation dams and local warning systems for the population and allocation of infrastructure and material.	Municipalities, Civil Protection and Emergency Services

4 Flood Risk Assessment in the project area

4.1 Recent floods and existing flood protection

In the January 2010 flood event, the water load on Buna was approximately 3,600 m³/s (3,000 m³/s coming from the Drin River). This flood was mainly caused by snowmelt in the Drin River basin. Detailed information on the impacts of this event can be found in WHO report[6] (2010) and Mott MacDonald (2012b).

Even more dramatic was the flooding in December 2010 when there were heavy rainfalls from the second week in November on until the middle of December. In this period the region of Shkodër received about 900 mm rainfall which is half of the average annual rainfall. The water level of Lake Shkodër reached the maximum historic recorded level and the water load on Buna was higher than 4,000 m³/s. The inundation was one of the biggest remembered in terms of areal extent, depth and duration (Mott MacDonald, 2011), see Figure 15.

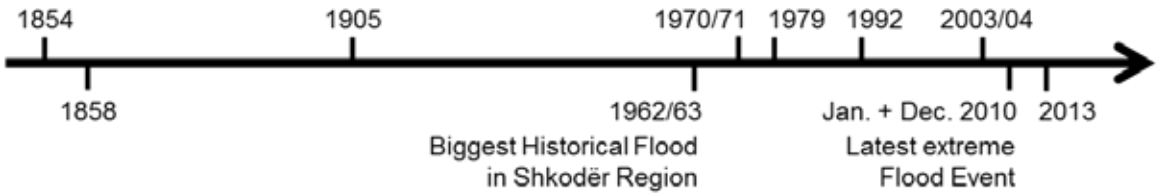


Figure 14: Historic mayor flood events since 1851 (Mott MacDonald, 2012a)[7]

[6] http://www.seeclimateforum.org/upload/document/flood_in_shkodra.pdf

[7] Based on available data – no further mayor floods documented since 1851

Figure 15: Satellite Image of flood extent in January 2010 and December 2010 (TerraSAR and Radarsat - DLR, 2010)

During the flood event there were several breaches on river dikes. Consequently, the communes on the eastern bank of the Buna River were inundated to a great extent. The only discharging option was the Murtemza collector to the Viluni Lake (commune of Velipojë). The former additional option for water discharge to Lezhë (Kakariqi field) has been blocked by the construction of the Torovicë dike. Therefore the water depth upstream of the Murtemza opening amounted to 6.15 m, because the discharging capacity of the collector was not sufficient (bottleneck - Mott Mac Donald, 2011), see Figure 16.

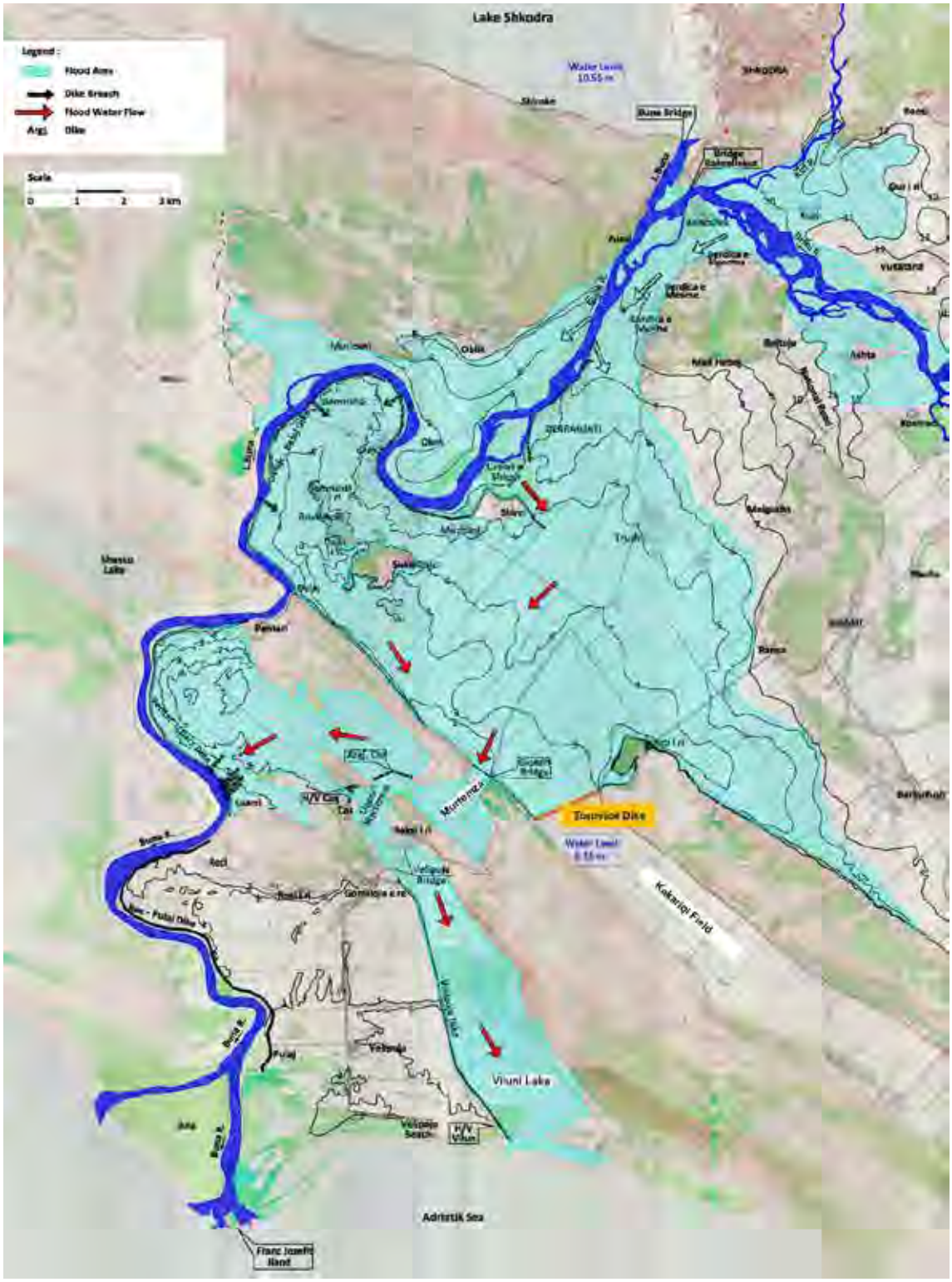


Figure 16: Flood event December 2010 (Mott MacDonald, 2012a – modified)

The hydroelectric power cascade, consisting of three consecutive reservoirs and dams (Fierza, Komani and Vau Dejës), serves for hydropower generation. The dam authority aims at keeping high reservoir water levels all over the year. This constellation does not increase the downstream flood risk of natural floods unless high amounts of stored water

have to be released either in order to reduce the reservoir water level as a precautionary measure for preparedness of increasing reservoir inflow or if the gates have to be opened because the maximum level is reached like in December 2010.

This severe flood was the consequence of a combination of human and natural factors. As causes of major floods in the Drin-Buna Lowland several studies therefore list different aspects which in combination may lead to a crisis situation. These are

as natural factors:

- heavy and long lasting rainfalls in the winter season often in combination with
- snowmelt in late winter / early spring causing overflow in the rivers of Buna, Drin, Kir and the lake of Shkodër,

as human factors:

- the sudden release of huge amounts of water from the hydropower reservoirs and
- the not properly working drainage system in the lowland.

The changes in the land ownership structure (farmland fragmentation) after the 1990's had led to serious damages in the irrigation and drainage schemes which are one of the components of the existing flood protection system. Due to the failure to maintain the systems especially the first and second level drainage channels are not functioning properly (e.g. channels are not cleaned or blocked by illegal building) - the drainage system is in a state of disrepair (Mott MacDonald, 2011).

In the case of flood the water may stay in the floodplain from only some hours up to several weeks. The first is the case if the inundation is caused by flash floods, when the flooding is generated by heavy rainfall concentrated in a small area. Then the runoff is very high but the water volume is comparing small. The latter occurs regularly from river flooding, especially during the winter and spring seasons, when the period of rainfall is longer or by snowmelt in the whole river basin. The water level of Lake Shkodër rises during flood season for up to 3 meters.

Reactions on the severe flood in the Shkodër region in December 2010:

- The Government of Albania, financially supported by World Bank within the framework of the "Disaster Risk Mitigation and Adaptation Project"[8], started a programme of flood management studies and rehabilitation works. In this context several intercepts of flood protection dikes along Buna River have been repaired, raised and strengthened.

[8] http://www.worldbank.org/projects/P110845/disaster-risk-mitigation-adaptation-project?lang=en&tab=overview

- In a second step a post-disaster comprehensive flood risk assessment and management study was commissioned by World Bank. Main aim of this study "The Flood Risk Management Plan for the Lower Drin & Buna River Basin" which was conducted by the international consultancy Mott McDonald was to show measures for flood protection and reduction of flood damage for the medium and long term. The proposed measures are mainly of technical nature and relate to the improvement of technical flood protection system at various locations in the flood risk area (strengthening and new construction of dikes, drainage channels, pumping stations). But the proposed midterm measures also cover aspects of flood damage reduction (e.g. by adapted building). The recommendations of the Mott MacDonald study were taken into consideration in the FRM process and suggested measures were discussed with the local actors and included in the action plans on regional and communal level. Further detailed information on technical matters can be obtained in the final report of the study, Mott MacDonald, 2012a).
- Moreover, regarding the emergency management during flood events, in addition to the "National Civil Emergency Plan"[9] (adopted in 2014), a "National Strategy for Disaster Risk Reduction and Civil Protection 2014-2018" has been prepared (supported by UNDP and DFID) in 2013 (currently in the consultation stage).

4.2 Flood risk maps

The flood risk maps of each commune were created by an interactive process. The first version of the flood risk maps consisted of a GIS database provided by IncREO (Increasing Resilience through Earth Observation) and satellite images of the flood extent during specific flood events. IncREO is a collaborative EU research project on emergency response management and risk-preparedness, co-funded by the European Union's Seventh Framework Programme (European Commission`s Work Programme 2012). The GIS database consists of a base map (based on ortho-photos) and several layers of risk assets (power distribution, gas station, water supply, communication, hospital, school / kindergarten, churches / mosque, cemetery, police station, bridges), whose locations have been determined by EO-methods. Furthermore, the GIS database includes information about the communal boundaries of the region. Based on the information of the satellite images of the flood events in January 2010 and in December 2010 (see Figure 15) two further GIS layer have been integrated into the GIS database of IncREO. Compared to former flood events in the Shkodër region, the flood extent in January 2010 is estimated as a medium flood event and the flood extent in December 2010 is estimated as an extreme flood event.

[9] http://www.mbrojtjacivile.al/?page_id=453

Within the first regional working group meeting in February 2014 the representatives of the communes (Ana e Malit, Bërdicë, Bushat, Dajç, Gur i Zi, Rrethina and Velipojë) reviewed the prepared flood risk maps. Hereby, the existing information about the flood extents, the local boundaries as well the type, number and location of risk assets were revised, added or updated (see figure below).

Figure 17: Legend of flood risk maps – assets at risk

The second and third review of the flood risk maps were integrated into the ongoing risk assessment process (local working group meetings in March - May 2014), in parallel to the discussion and completion of the flood risk fact sheets.

The current versions of local flood risk maps contain different types of risk assets - infrastructure at flood risk, buildings at risk, transport infrastructure at flood risk and further assets at risk - which are listed in detail in the following legend, see Figure 15.

In addition, the flood risk maps include information about dikes, embankments, drainage channels and affected housing areas. Also the already mentioned communal boundaries, flood extents of the medium and the extreme flood event as well as water levels of several locations during the flood event in December 2010 are covered. Thus, the flood risk maps give an overview of affected areas as well as affected infrastructural assets. This information serves the basis for the risk assessment, which has been done in detail by editing of the risk fact sheets. A short summary of general characteristics as well as detailed information concerning affected land use of the risk fact sheet are also part of the local flood risk maps, see Figure 18.

Figure 18: Exemplary local flood risk map (Commune of Velipojë)

The regional flood risk map gives a general overview of the collected information without detailed information about specific hot spots, see Figure 7 and Annex E.

4.3 Description and assessment of existing flood risk

The flood affected area is mainly rural territory, except the city of Shkodër. The most flood affected assets are houses, livestock stables and roads. During the flood event in December 2010 the documented total number of affected resp. evacuated inhabitants in this area was about 12,145 and the number of affected houses was about 7,120 (4,540 flooded houses and 2,580 houses surrounded by water), while the number of assets at risk in this area was more than 400 of different types. Damage to risk assets and population here is not that important and the population has learned from the past on how to build to be protected. However, agriculture and livestock is vital for the people. According to the evidences of the Directorate of Agriculture in the Region, during the flood events the cultivated land and croplands are highly affected (about 10,280 ha from which about 4,887 ha of cultivated land) and the economic damage is very high (about 500,350,000 Lek). While for the livestock the situation can be considered more dramatic as some of the animals were surrounded by water and drowned (about 32,634 animals were evacuated). Regarding Shkodër City the major number of facilities affected were in the western part. However the municipality is undergoing a process of identification of these assets in number and type. This process is ongoing since 2010 and not yet finalised. Detailed information about assets at flood risk on communal level is described in the respective local flood risk management plan.

The following diagram gives an overview of the number of affected inhabitants and households in each commune of Shkodër Region (related to flood event in December 2010).

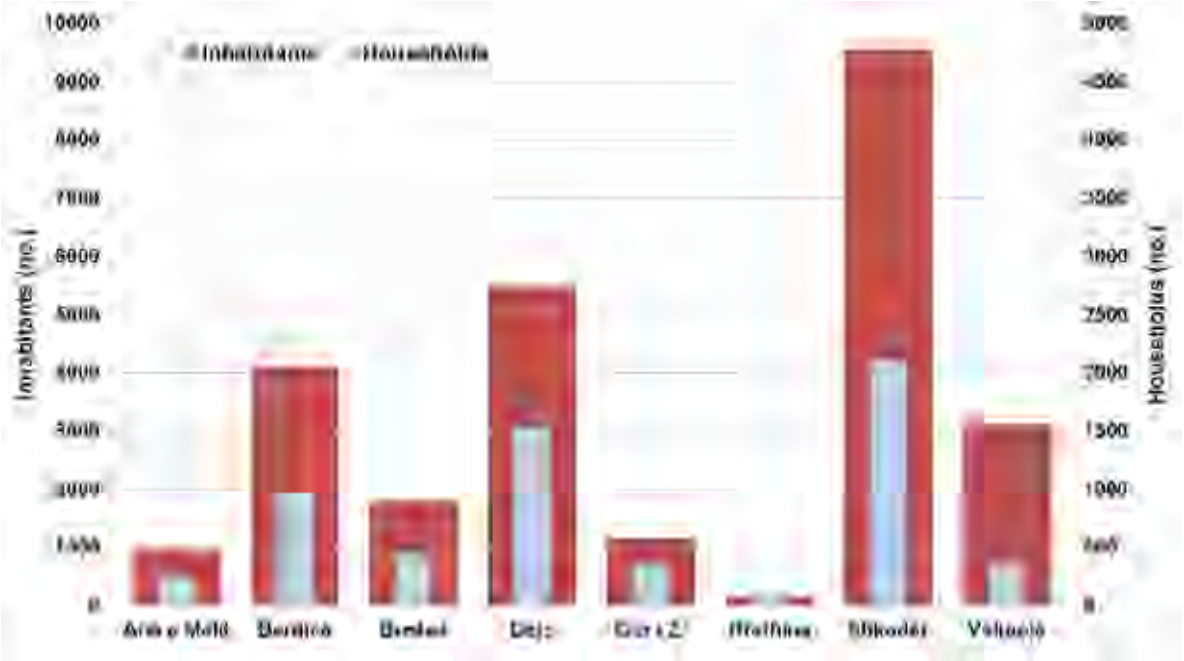


Figure 19: Potentially flood affected population of Shkodër Region

As described in the chapter above, different types of risk assets were investigated within the risk assessment (infrastructure, buildings, transport infrastructure and further assets at flood risk). In the following table the number of risk assets and the respective number of risk assets affected by an extreme flood event (referred to the flood event in December 2010) are listed for each commune of the region.

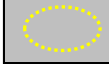
x / y	x: numbre of affected risk assets y: numbre of risk assets

The results of the risk assessments are highlighted in different colours.

no relevant risk assets	
≤ 5 affected risk assets	
≤ 10 affected risk assets	
≤ 15 affected risk assets	
> 15 affected risk assets	

Table 5: Assets at risk - regional overview (referred to the flood event in Dec. 2010)

Legend		**Ana e Malit**	**Berdicë**	**Bushat**	**Dajç**	**Gur i Zi**	**Rrethina**	**Shkodër**	**Velipojë**
Infrastructure at flood risk / *infrastruktura me rrezik nga përmbytjet*									
	power generation *prodhimi i energjisë*	0/0	0/0	0/1	0/0	0/0	0/0	0/0	0/0
	power distribution *shpërndarja e energjisë*	3/13	4/9	8/27	16/19	3/7	1/3	2/13	5/14
	gas station *stacion gazi*	0/1	3/6	1/2	1/1	0/5	0/8	6/21	0/3
	water supply *furnizim me ujë*	2/14	3/5	12/14	4/4	0/0	2/3	0/0	6/9
	wastewater treatment *trajtim i ujërave të përdorura*	0/0	0/0	7/7	0/0	3/3	0/0	1/1	3/4
	waste diposal *depozitim mbetjesh*	0/0	0/0	0/1	0/0	0/0	1/1	0/0	0/0
	communication *komunikacion*	2/2	0/0	0/0	0/1	1/2	0/0	0/0	0/0

Legend		Ana e Malit	Berdicë	Bushat	Dajç	Gur i Zi	Rrethina	Shkodër	Velipojë
Buildings at risk (hot spots) / *ndërtesa të rrezikuara (pika kritike)*									
	healthcare center *qender shendetsore*	1/3	0/7	3/11	4/8	2/4	0/2	0/6	0/2
	school *shkollë*	1/5	1/5	3/6	3/8	2/8	0/10	0/38	2/9
	kindergarten *kopësht*	0/0	0/0	1/1	0/0	1/1	0/0	0/1	0/0
	churches, mosque *kishë, xhami*	2/2	0/4	5/12	3/9	1/7	0/4	2/12	1/6
	cemetery *varrezë*	0/8	0/10	2/17	2/6	2/12	0/9	0/8	1/10
	retirement homes *azil*	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	fire department *zjarrfikëse*	0/0	0/0	0/0	0/0	0/0	0/0	0/1	0/0
	police station *rajon policie*	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	technical emergency, service *urgjenca teknike, shërbimi*	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/1
	other public buildings *ndërtesa të tjera publike*	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Transport infrastructure at flood risk / *infrastruktura e transportuese në rrezik përmbytje*									
	important connections *lidhje të rëndësishme*	→ see flood risk map of Shkodra Region (Annex C)							
	bridges *urat*	23/16	20/12	88/41	18/18	37/03	10/03	10/06	18/04
	airport, airfield *aeroporte*	0/0	0/0	0/0	0/0	0/0	0/1	0/0	0/0
Further assets at risk / asete të tjera në rrezik përmbytje									
	cultural hot spots *pika kulturore*	0/0	0/0	0/0	4/4	0/0	0/0	1/2	0/2
	industrial hot spots *pika industriale*	0/0	1/1	1/1	0/0	0/1	0/0	0/0	0/0
	storage *depozita*	1/1	0/0	0/0	1/3	7/9	0/0	0/0	0/0
	livestock *blegtori*	3/3	0/0	6/7	6/6	0/1	2/2	0/0	5/5
	customs *dogana*	1/1	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	dike *digë*	→ see flood risk map of Shkodra Region (Annex C)							
	dike breached *plasaritje e digës*								
	embankment *argjinaturë*								
	channel *kanal*								
	affected housing *shtëpi të prekura*	5	5	3	14	1	4	2	6

Infrastructure at flood risk

With regard to the infrastructure of the region the most flood affected assets are power distribution, gas station and water supply. In 2010 electricity cuts occurred especially in the housing areas of Dajç and Bushat. In contrast, the most potentially affected gas stations are located in Shkodër and Bërdicë (however, no environmental contaminations by leaking fuel have been reported in the last flood events). With regard to the water supply of the region (mainly wells) many communes are at risk. The percentage of potentially affected water supply stations is in Dajç at 100 % (4 of 4), in Bushat at 85 % and in Bërdicë, Rrethina and Velipojë higher than 60 %, see Table 5. Furthermore, the main water supply station of Velipojë is located in the flood risk area of Bushat and the main water supply stations of Shkodër are located in the flood risk area of Rrethina and Berdicë.

Buildings at flood risk

No buildings like retirement homes, fire departments or police stations and technical emergency services are at risk in Shkodër region. Common public buildings are healthcare centres, schools (including kindergarten), churches, mosques and cemeteries. Particularly important for the population of the region are functioning healthcare centres and schools. The strongest constraints during the flood event in December 2010 arose in the communes Bushat and Dajç.

Transport infrastructure at flood risk

During the flood event in December 2010 most parts of the roads within the flooded area were not usable or only to a limited extent. The most important roads are the main road Shkodër –Tirana and the connection between Shkodër and Velipojë (passing through Bërdicë and Bushat). But also the cross connections to Dajç and Ana e Malit are potentially at flood risk. In addition, many bridges are affected by flood events.

Further assets at flood risk

Further assets at risk comprise cultural hot spots, industrial hot spots, storage, livestock and customs. In addition, the most affected housing areas and therefore the affected private buildings as well as affected inhabitants were investigated. In Shkodër region, cultural and industrial hot spots as well as customs stations (national border) are quite less relevant compared to storage and livestock. Especially in Gur i Zi is a high percentage of storages at flood risk. Bushat and Dajç are potentially most affected regarding livestock farming. Housing areas are more or less at flood risk throughout the region. The potential particular damage depends on the one hand on the flood extent and on the other hand on the topography and the consequent water levels. Moreover, in case of high water level of Shkodër lake parts of the City of Shkodër are flooded. With regard to the number of affected housing areas, the communes of Dajç, Velipojë, Ana e Malit and Bërdicë have to be mentioned as most affected.

Flood protection infrastructure

Dikes and dams along the Buna River and enforced embankments along Drin and Buna are partly in insufficient conditions for flood protection. In the 2010 events dikes were overtopped and partly destroyed, e.g. Belaj-Dajç-Shirq Dike (commune Dajç), Pentar-Luarz Dike (commune Velipojë) or Cas Dike near Murtemza Collector (Mott MacDonald, 2012a). Generally the dike system has been improved in the last years but is still under risk in many stretches. The interventions in the rivers for embankments and dikes are done on ad-hoc basis. There is no detailed modelling for the rivers which would indicate the obsolete areas. After the flood in January 2010, the government took immediate measures and constructed embankments along Buna and Drin River, reinforced the Selmanaj dike and dikes along Buna River in Dajç. These interventions were quick reactions on the flood event and therefore partly again damaged during the extreme flood event in December 2010 and later in 2013.

To protect Shkodër city, a by-pass for the city and at the same time a flood protection barrier, was started to be constructed in the western part. However its construction is not completed and is not clear if the solution will have the considered impacts on risk reduction and possibly other consequences.

The detailed results of the flood risk assessment of each commune - in the form of local risk fact sheets - are described in the respective local flood risk management plan.

5 Flood Risk Management Measures

5.1 Objectives for flood risk management in the region

The main objective of flood risk management according to the EU Flood Directive is: “To establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for

- Human health,
- Environment,
- Cultural heritage and
- Economic activity“.

This main objective is underlined by four objectives of FRM which tackle the stages of floods (before, during, after floods) as well as the improvement of existing situations and prevention of new negative impacts (see Figure 20).

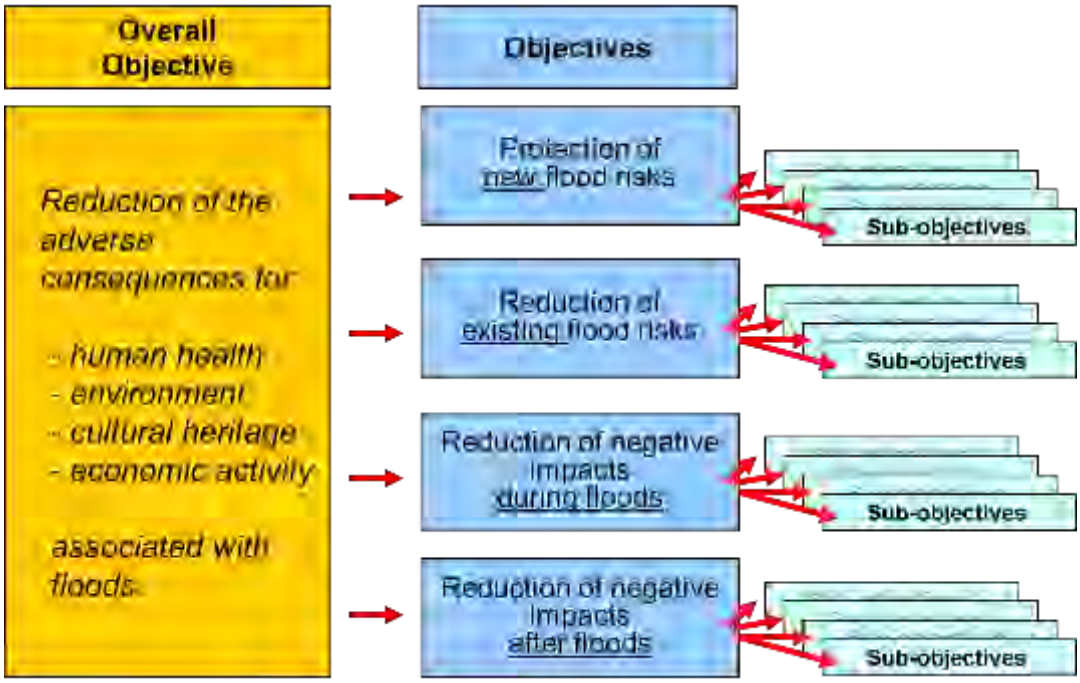


Figure 20: Objectives of flood risk management (according to the EU Flood Directive)

From these objectives of the floods directive for FRM more detailed objectives were generated and proposed. The proposals were presented and discussed in the first regional working group meetings. As a result the following table shows objectives for FRM in the Shkodër Region to form a joint understanding of the goals of all activities in the FRM plans. Thus the objectives are the starting points for the risk assessment and the development of measures.

Table 6: List of objectives for FRM in the Shkodër Region

Specific Objective[10]		Reference to receptors			
		humans	Environ-ment	cultural heritage	economy
1. Prevention of new risks in the flood risk areas					
1.1	No increase of existing discharge. Protection of retention functions (flood plains) in and at the rivers / streams.	x	x	x	x
1.2	Prevention of new settlement activities in the flood prone areas (HQ_{100} and $HQ_{extreme}$).	x	x	x	x
1.3	Prevention of new risks in all flood risk areas ($HQ_{extreme}$); regarding new buildings and new infrastructure facilities (water supply, wastewater, energy, telecommunication etc.).	x	x	x	x
1.4	Prevention of non-flood-adapted handling for water-endangering substances flood risk areas.	x	x	x	x
1.5	Prevention of new erosion risks in flood risk areas.		x		
1.6	Inspection, maintenance and, when appropriate, improvement of technical flood protection works.	x		x	x
2. Reduction of existing risks in the flood-prone areas					
2.1	Assessment + reduction of the damage potential in flood risk areas (adaptation and raising resistance of buildings, trans-port systems, infrastructure, land use, protection works etc.).	x	x	x	x
2.2	Strengthening of awareness regarding flood risks in the planning process and in building projects.	x	x	x	x
2.5	Improvement of the natural water storage with positive effects on the flood situation (reduction of the peak flows, increasing of the flood retention capacity).	x	x	x	x
2.6	Assessment and protection of storages for water-endangering substances in flood risk areas.		x		
2.7	Improvement and completion of technical flood protection measures that do not have negative effects on other, under consideration of the principles of solidarity.	x		x	x
3. Reduction of adverse consequences during a flood event					
3.1	Improvement of the ability to react of the affected population and of facilities managers.	x	x	x	x
3.2	Improvement of the ability to react of administrations and safety organizations at local and regional level.	x	x	x	x
3.3	Improvement of the organizational principles and resources for civil protection and disaster management.	x	x	x	x
4. Reduction of adverse consequences after a flood event					
4.1	Improvement of the damage post-processing by administrations and safety organizations at local and regional levels; also for population and facilities managers.	x	x	x	x
4.3	Protecting against existential financial disasters by insurances and fonds.	x		x	x
4.4	Preparation of flood adapted restoration / rebuilding after damages; preparation of flood related waste management.	x	x	x	x

[10] Comment:
The objectives have been developed from the objectives of FRM according to the EU floods directive. The objectives are linked with the catalogue of measures (see Annex D); all selected measures shall contribute to at least one objective. In most cases one measure contributes to more than one objective. This is already a hind for more efficient measures.

5.2 Identified Measures

5.2.1 Responsibility for implementation

For the realisation of defined measures different institutions according to their mandate and responsibilities are responsible on the communal, regional and national level, see Figure 21. In addition, Annex A contains a schematic diagram of the institutional framework of flood management in Albania.

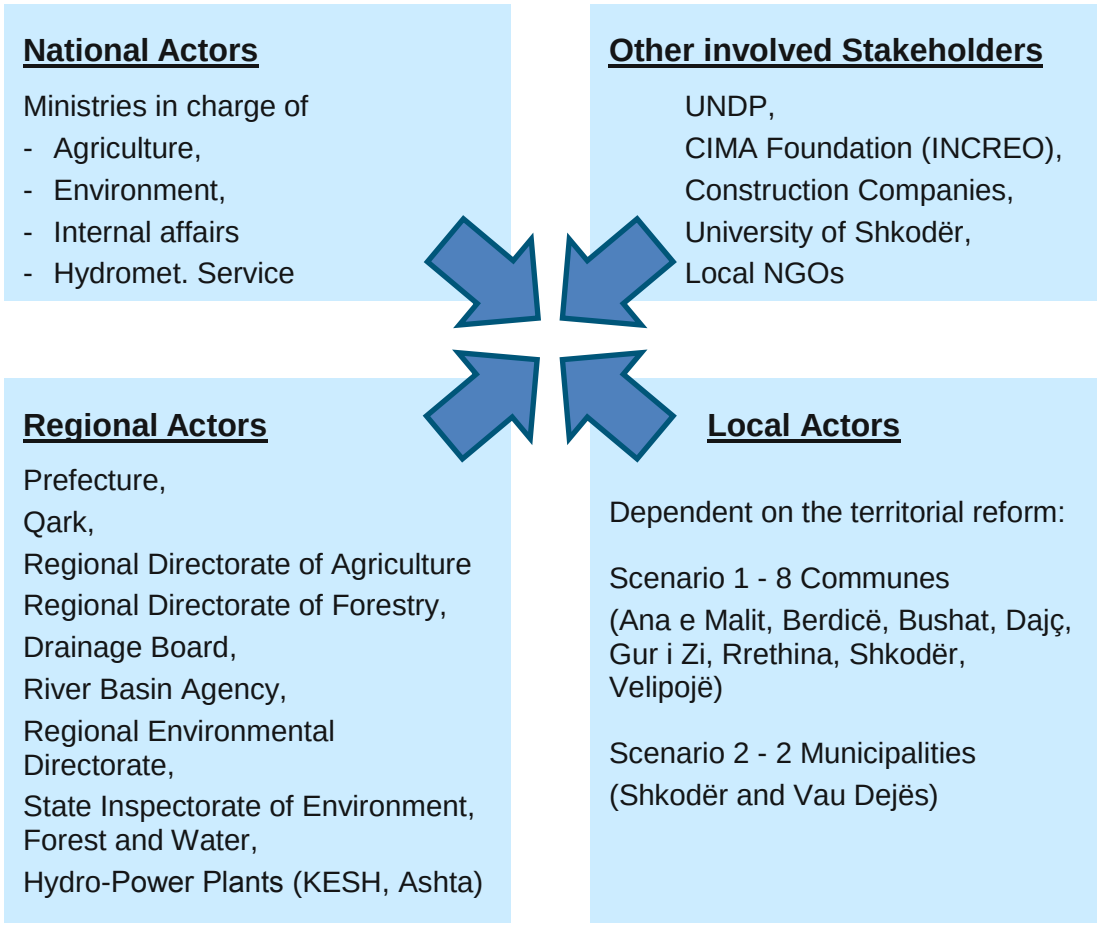


Figure 21: Responsibilities on national, regional or local level

The agreed responsibilities for the realisation of the specific identified measures are indicated in the respective tables in the following chapters (5.2.2-5.2.5).

Within the regional working group meeting in October 2014 the responsibilities for the realisation steps for all selected measures were discussed and agreed.

The following abbreviations are used for different responsible institutions.[11]

Table 7: Abbreviations of national, regional and local actors as used in the following tables

Regional actors		**Local actors**	
P	Prefecture	An	Ana e Malit
Q	Regional Council of Shkodër (Qark)	Be	Bërdicë
DB	Drainage Board	Bu	Bushat
A_{RB}	River basin agency	Da	Dajç
A	Agencies	Gu	Gur i Zi
D_A	Directorate of Agriculture	Rr	Rrethina
D_R	Regional directorates	Sh	Shkodër
HP	HPP (KESH, ASHTA)	Ve	Velipojë
CC	Construction Companies		
M	Ministries		
NB	National bodies		

[11] Listed are those organisations that are mentioned in the action plans as responsible for the implementation or for contributions to FRM-measures. A full list of participating organisations can be found in the front part of this report.

5.2.2 Prevention measures

Risk prevention measures are divided into three categories (1.1.-1.3.) - Administrative instruments to create a policy basis for avoidance of risk, measures for adaptation of land use and risk prevention by flood adapted building. Table 8 shows which measures have been considered necessary on regional and also on communal level of Shkodër region.

Table 8: Selection of FRM measures with regard to prevention of risks

No.	Measures	Measures of communes								Region
		Ana e Malit	Bërdicë	Bushat	Dajç	Gur i Zi	Rrethina	Shkodër	Velipojë	
1.	**Aspect: Prevention of risks**									
1.1.	**Administrative Instruments** (for avoidance of risk)									
1.1.1.	Mapping of flood risk areas	x	x	x	x	x	x	x	x	x
1.1.2.	Restriction for building in risk areas (in spatial planning / urban planning)	x	x	x	x	x	x	x	x	x
1.1.3.	Protection of the flood plains and retention areas	x	x	x	x	x	x	x	x	x
1.2.	**Adaptation of Land Use** (for avoidance of risk, removal or relocation and reduction of risk)									
1.2.1.	Adaptation of existing land use in flood risk areas (including agriculture and forestry)	x	x	x	x	x	x	x	x	x
1.2.2.	Adaptation of constructions and infrastructure in risk areas (flood adapted planning and building)	x	x	x	x	x	x	x	x	x
1.2.3.	Consultation of agriculture and forestry for awareness-raising	x	x	x	x	x	x		x	x
1.3.	**Risk prevention by flood adapted building**									
1.3.1.	Flood adapted handling for water imperilling substances					x				x

The following tables show the summary of measures on regional and communal level for each sub-category of prevention measures. For details see FRM measures of regional or national actors (Annex B) and respective local FRM plans (part II-1 to 8).

Table 9: Administrative Instruments (for avoidance of risk)

1.1.1. Mapping of flood risk areas

Regional measures	Communal measures
- Development and distribution of flood risk maps on regional scale - Instructions for the use of risk maps in the community centres in the whole region - Information campaigns (distribution of leaflets to the population) about flood risks, measures to be taken and flood emergency response (including public and private precautionary measures)	- Digital mapping (GIS) - development and update of database (for different purposes of urban and environmental planning, including FRM; based on GIS layers for land use, infrastructure etc.) - Distribution of flood risk maps, flood hazard maps and emergency guidelines to communes (via community centres, leaflets and website)

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x										x	x	x	x	x	x	x	x

1.1.2. Restriction for building in risk areas (in spatial planning / urban planning)

Regional measures	Communal measures
- Review of existing local and regional urban development plans and integration of flood risk aspects - Systematic communication with communes about developments in flood risk areas - Support of LGUs in taking action against illegal construction in risk areas - Distribution / explanation of risk areas to urban planners (seminars, university lectures, workshops) - Support inhabitants, who had built illegal constructions, to move from flood risk areas (information, consultation and support in finding land) [Linked with local FRM plan: Rrethina]	- Review of existing local development plans and integration of flood risk aspects; adjust local development plans to flood risk areas - Distribution / explanation of risk areas to urban planners - Stronger restrictions for illegal building development (especially in risk areas) - Support inhabitants, who had built illegal constructions, to move from flood risk areas (information, consultation, support in finding land)

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x				x					x	x	x	x	x	x	x	x	x

1.1.3. Protection of flood plains and retention areas

Regional measures	Communal measures
- Draw and establish specific monitoring / controlling rules and sanctions for each district - Identification of retention areas - Preparation of concrete projects and protection measures for each LGU and area together with technical experts or institutions	- Public information about importance of flood plain protection and flood risk areas identification and publication of these areas (maps) - Drafting regulations on land use restrictions (provide guidelines on territory functions) - Raising awareness on the importance of this issue

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x	x	x								x	x	x	x	x	x	x	x

Table 10: Adaptation of Land Use (for avoidance of risk, removal or relocation and reduction of risk)

1.2.1. Adaptation of existing land use in flood risk areas (including agriculture and forestry)	
Regional measures	**Communal measures**
- Coordination of the assessment / validation of the situation for the assets at risk and decision on adaptation measures for each LGU - Development of projects for adaptation of land use in risk areas - Conduct seminars, workshops, promoting alternatives to urban development in flood safe areas - Identify and define specific areas for concrete interventions for forestry, life stock farming and grazing land, cultivation areas etc. (projects with specialised authorities) - Consult and inform communes and farmers to perform changes in planting structures by introducing spring crops and giving up land use during flood season [Linked with local FRM plans: Dajç and Velipojë] - Digitalisation of data / backup of data about cultivated crops and land suitability [Linked with local FRM plan: Berdicë] - Establishment of bigger farms (higher efficiency) to ensure implementation of agricultural policies [Linked with local FRM plans: Dajç and Rrethina]	- Assessment of assets at risk; identification and realisation of preventive adaptation measures - Adaptation of planting (appropriate crops like spring crops, no crops which take a year to grow; no water-vulnerable plants) - Education on land management - Guidance (plan) for construction in safe areas and hilly territories - Digitalisation of data / backup of data about cultivated crops and land suitability

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x	x	x		x	x					x	x	x	x	x	x	x	x

1.2.2. Adaptation of constructions and infrastructure in risk areas (flood adapted planning and building)

Regional measures	Communal measures
- Create a new concept for the adaptation of new construction as well as the corresponding infrastructure in risk areas - Draw new legislative regulations in coordination with respective ministries (for new roads, structural and urban adjustments, construction of new facilities) - Concrete projects and their approval - Organizing seminars, workshops at regional, national and local levels to determine constructions models - Setting new standards for building or equipping them to adapt to risk zones - Ensure that roads and bridges are above maximum level of floods [Linked with local FRM plan: Rrethina]	- Lifting of house basements up to a level of 1.5-2.5 m (according to the respective water level during floods) - Information and support in flood adapted house construction - Ensure that roads and bridges are above maximum level of floods (see also 3.5.2.) - Use ground floor for storage etc. (not for living) - Waterproofing doors and insulated facades

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x								x	x	x	x	x	x	x	x	x	x

1.2.3. Consultation of agriculture and forestry for awareness-raising

Regional measures	Communal measures
- Common agriculture and forestry workshops on flood risk and risk reduction with the municipalities facing the same nature of risk - Seminars and meetings with individual municipalities for specific potential risks - Conclusions and definition of concrete measures for intervention	- Meetings / forums with farmers on agriculture issues (flood resistant crops) - Distribution of information / education materials about plants / crops / forestry vegetation

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x										x	x	x	x	x	x		x

Table 11: Risk prevention by flood adapted building

1.3.1. Flood adapted handling for water imperilling substances

Regional measures	Communal measures
- Identification of European standards for the protection specifications, identify their suitability for specific terrain areas at risk - Design projects for intervention by a short-term, medium-term and long-term time frame - Education (guidance) of farmers about storage and packing of fertilizer	- Education of farmers about storage and packing of fertilizer (reduction of fertilizer storage, due to chemical composition (e.g. phosphorus and nitrogen content)

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x				x										x			

5.2.3 Natural Flood Protection measures

Flood protection measures are divided into two categories (2.1. and 2.2.) - Natural flood management and reactivation of retention areas. Each category of protection measures contains several specific measures, which are listed in Table 12. In addition, the table shows which measures have been considered necessary on regional and also on communal level of Shkodër region.

Table 12: Selection of FRM measures with regard to natural flood protection

No.	Measures	Measures of communes								Region
		Ana e Malit	Bërdicë	Bushat	Dajç	Gur i Zi	Rrethina	Shkodër	Velipojë	
2.	**Aspect: Natural Flood Protection**									
2.1.	**Natural flood management, water flow regulation**									
2.1.1.	Revitalisation of river beds and river banks / former flood plains		x		x	x	x			x
2.1.2.	Changing of river courses and slope conditions	x					x			x
2.1.3.	Protection of zones along river banks	x				x	x			x
2.1.4.	Support of the development of natural floodplains	x		x	x	x			x	x
2.1.5.	Modified extensive river maintenance									x
2.1.6.	Disconnection / Removal of pavements in urban areas / Rainwater management							x		x
2.2.	**Reactivation of retention areas** (runoff regulation / water flow regulation)									
2.2.1.	Deconstruction a dike or dam									x
2.2.2.	Setting back dikes	not applicable								
2.2.3.	Removal of an artificial bank	not applicable								
2.2.4.	Connection of a retention-relevant terrain (e.g. back waters, old river arms)									x

x	Communal measures	x	Regional measures

Table 13: Natural flood management, water flow regulation (in accordance with river basin management / Water Framework Directive)

2.1.1. Revitalisation of river beds and river banks / former flood plains

Regional measures	Communal measures
- Interventions in the Buna River, Kir and Gjadër, mainly in the areas of Sub-Shkodër - Design technical projects of interventions - Planting of riverside areas with appropriate vegetation to protect riverbanks and ensure water flow [Linked with local FRM plans: Berdicë, Gur i Zi and Rrethina] - Engineering / hydrological surveys outlining special protection measures (focus on the actively eroded areas such as, Darragjat, Shirq-Mushan, Dajç, Samrish i Vjetër and Rrushkull) [Linked with local FRM plan: Dajç]	- Planting of riverside areas with appropriate vegetation (protection of riverbanks) to reduce erosion

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
		x	x		x							x		x	x	x		

2.1.2. Changing of river courses and slope conditions

Regional measures	Communal measures

- Identification of potential deviations in the rivers Drin and Buna
- Design technical projects of interventions (see Mott MacDonald, 2012a: improvement of discharge capacities at Murtemza collector and direction south of the area)
- Organisation of workshops or seminars with the participation of foreign bodies on the necessity of implementing these projects and determining points of river diversion intervention
- Measures to ensure water flow or to increase the river discharge capacity (e.g. by extension); especially at:
  - Drin River (Ganjollë village to Ashta HP),
  - Kir River and
  - Buna River (Samrisht i vjetër, Dajç and Shirq)
  [Linked with local FRM plans: Berdicë, Gur i Zi and Rrethina]
- Carry out riverbed interventions (reduction of sediments in riverbeds) [Linked with local FRM plan: Dajç]
	- Intervention in Kir River together with A_{RB} and DB to ensure the water flow in the middle of the river bed (raising embankments on both sides of the river)
	- Increase river discharge capacity of Buna River (by agreement between states of Belaj bottleneck)
	- Investigation of potential increase of discharge capacity of Murtemza channel
	- Professional management of riverbed gravels

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x	x	x								x					x		

2.1.3. Protection of zones along river banks

Regional measures	Communal measures

- Identify risk areas according to the respective municipalities
- Design technical projects of interventions. Regional and local meetings for setting such interventions
- Preservation and enhancement of forestry vegetation (willows, acacias, etc.) to reduce erosion over embankments due to river activity (by Forest Directorate) [Linked with local FRM plans: Ana e Malit, Berdicë, Rrethina, Shkodër and Velipojë]
- Protection of river bank areas / prevention of constructions and land use [Linked with local FRM plans: Berdicë, Dajç, Shkodër and Velipojë]:
  - Buna River (1,5 km): area of Bërdicë e Mesme (village in the North of Bërdicë) and Pentari-Pulaj (15 km)
  - Implement a drainage system in the zones of Urrela and Shirq village to enable quick water discharge
  - Shkodër lake: bypass North-South of Shkodër
	- Protection of river bank areas (planting of hydrophilic vegetation e.g. willows, acacias and poplars along the riverside to protect soil from erosion), prevention of constructions and land use:
	  - Buna River: in the area of Zue village (1 km)
	  - Drin River (3,5 km): Ganjola-Vukatanë-Kuç
	  - Kir River (1,5 km): Bardhaj-Bleran and in the area of Kuci village

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x	x	x			x					x				x	x		

2.1.4. Support of the development of natural floodplains

Regional measures	Communal measures
- Identification of existing and recent natural floodplains - Design projects to protect and reactivate former natural flood plains - Organise regional and local seminars for determining specific areas for intervention - Enhance forest vegetation in natural floodplains, by planting water-loving seedlings with strong rooting system, such as reeds, willows, acacias, etc. [Linked with local FRM plan: Shkodër] - Development of vegetation plan [Linked with local FRM plan: Gur i Zi]	- Enhance resilient vegetation (water plants, forests) - Land use for gazing livestock (willow / field) in the flood plains. Protect flood plains from agriculture (education and cooperation activities)

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x		x		x	x					x		x	x	x			x

2.1.5. Modified extensive river maintenance	
Regional measures	**Communal measures**
- Planning of interventions and systematic periodic maintenance determined by the intervention (e.g. interventions in the riverbed of Kir River to improve the river flow and reduce riverbank erosion) [Linked with local FRM plan: Rrethina]	-

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
		x																

2.1.6. Disconnection / Removal of pavements in urban areas / Rainwater management	
Regional measures	**Communal measures**
- Determination of specific points of intervention by the heads of LGUs - Preparation of such projects and their approval - Forecasting the draft budgets of LGUs for such interventions	- Surface drainage of rain water using the natural terrain slope of the city

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
	x	x															x	

Table 14: Reactivation of retention areas (runoff regulation / water flow regulation)

2.2.1. Deconstruction a dike or dam	
Regional measures	**Communal measures**
- Identify barriers in the riverbeds of Kir, Drin and Buna River. Develop specific projects to deconstruct them	-

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
		x	x															

2.2.2. Setting back dikes
Not applicable - no measures identified

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve

2.2.3. Removal of an artificial bank
Not applicable - no measures identified

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve

2.2.4. Connection of a retention-relevant terrain (e.g. back waters, old river arms)	
Regional measures	**Communal measures**
- Identify / define the areas likely to be flooded in cooperation with LGUs and determining the levels of beds, see also 1.1.1.	-

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x	x	x															

5.2.4 Technical flood protection measures

Technical flood protection measures are divided into six categories (3.1.-3.6.) - Water flow regulation with regard to flood plains, dikes and channels as well as surface water management, facility protection and other protection measures. Each category of technical protection measures contains several specific measures, which are listed in Table 15. In addition, the table shows which measures have been considered necessary on regional and also on communal level of Shkodër region.

Table 15: Selection of FRM measures with regard to technical flood protection

C	Measures	Measures of communes								Region
		Ana e Malit	Bërdicë	Bushat	Dajç	Gur i Zi	Rrethina	Shkodër	Velipojë	
3.	**Aspect: Technical Flood Protection**									
3.1.	**Water Flow Regulation / Flood plain works** (Retention measures)									
3.1.1.	Construction of a retention pond	not applicable								
3.1.2.	Creation of a retention polder	not applicable								
3.1.3.	Restoration, expansion or improvement of existing retention systems (dams / ponds / polders)									x
3.2.	**Water Flow Regulation / Channels** (Dikes, Dams, Flood Walls and Mobile Flood Protection)									
3.2.1.	Flood protection works (dike, dam or flood wall)	x				x				x
3.2.2.	Strengthening of existing flood protection works	x			x					x
3.2.3.	Adoption of a mobile (stationary) flood protection system	not applicable								
3.2.4.	Drainage in diked area and backflow protection									x
3.3.	**Water Flow Regulation / Channels** (Measures in the rivers / river training)									
3.3.1.	Keeping clear cross-sections in settlement areas	x		x	x		x		x	x
3.3.2.	Removal of bottlenecks / narrow passages in rivers	x								x
3.3.3.	Construction and strengthening of a bypass channel									x

C	Measures	Measures of communes								Region
		Ana e Malit	Bërdicë	Bushat	Dajç	Gur i Zi	Rrethina	Shkodër	Velipojë	
3.4.	**Surface water management** (Measures of urban water management)									
3.4.1.	Rain water management						x	x		
3.4.2.	Development of a municipal retention system (e.g. rainwater storage canal							x		
3.4.3.	Flood-adapted improvement of a drainage system (e.g. bar screen, non-return flap)									x
3.5.	**Protection of object / facilities**									
3.5.1.	Object / Facility protection of individual buildings	not applicable								
3.5.2.	Object / Facility protection of infrastructure facilities (e.g. transport nodes, switching and branching systems)	x	x	x	x	x	x	x		x
3.6.	**Other protection measures**									
3.6.1.	Improvement of the storage management of dammed river systems / reservoirs									x
3.6.2.	Protection against seepage and ground water	x					x			

x	Communal measures	x	Regional measures

Table 16: Water Flow Regulation / Food plain works (Retention measures)

3.1.1. Construction of a retention pond

Not applicable - no measures identified

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve

3.1.2. Creation of a retention polder

Not applicable - no measures identified

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve

3.1.3. Restoration, expansion or improvement of existing retention systems (dams, ponds, polders)

Regional measures	Communal measures
- Cleaning up and expansion of Viluni, Murtemza and Domni channels. Setting up of a normal water flow along the channel to rapidly remove the collected water from Dajç and Bushat [Linked with local FRM plan: Velipojë]	-

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
		x																

Table 17: Water Flow Regulation / Channels (Dikes, Dams, Flood Walls and Mobile Flood Protection)

3.2.1. Flood protection works (dike, dam or flood wall)	
Regional measures	**Communal measures**

- Systematic identification of gaps in the dike system and demands for improvements
- Construction of dams / embankments [Linked with local FRM plans: Berdicë and Rrethina]:
  - Drin-Buna River: area of Bërdicë e Sipërme (2 km) and Bërdicë e Mesme (1,5 km), Zue (1 km) and Gur i Zi
  - Kir River: area of Rrethina (along the agricultural land of Bardhaj, Bleran and Zues villages: 2 km)
  (see Medium Term Flood Mitigation Solutions, Mott MacDonald, 2012a)
- Construction of bypass in the western part of Shkodër city (see also 3.2.2.) [Linked with local FRM plan: Shkodër]
- Develop specific intervention projects
- Taking necessary measures to avoid the damage of land in the axis Ganjolle-Vukatane-Kuc, due to deviation of the Drin River bed from construction of Ashta hydropower plant [Linked with local FRM plan: Gur i Zi]
- Assessment on details for possible dam / dike at the east side of the settlement of Cas (additional dam with a commanding gate nearby the water pump of Cas (hidrovor), where about 30 houses were flooded during the Dec. 2010 flood event). Surface elevation with regard to protection of existing houses [Linked with local FRM plan: Velipojë]
	- Embankment along Drin River (in the area of Kuç, Juban, Rrenc, Guri Zi, Vukatanë and Ganjolla) and along Buna River (in the area of Ana e Malit
	- Protection and observation of existing embankments (using monitors, guards, etc.)

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x		x							x	x	x				x			

3.2.2. Strengthening of existing flood protection works

Regional measures	Communal measures
- Systematic assessment of protection works (dikes, dams) regarding safety and structural condition; identification of deficits - Strengthening of current embankments in Ana e Malit, Dajç, Guri i Zi, Rrethina (in the riverbeds of Kir and Buna) [Linked with local FRM plan: Rrethina] - Bypass of Shkodër requires intervention to complete construction (see also 3.2.1.) - Reconstruction of Buna River embankment (15 km from Pentar to Pulaj) [Linked with local FRM plan: Velipojë]	- Review of existing dikes in the area of Dajç Darragjat dhe Dajç (which were damaged after the reconstruction in 2011) - Afforestation along mountain streams in Ana e Malit to strengthen the embankments

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x	x									x			x				

3.2.3. Adoption of a mobile (stationary) flood protection system

Not applicable - no measures identified

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve

3.2.4. Drainage in diked area and backflow protection

Regional measures	Communal measures
- Strengthening the current pumping stations in the municipality Velipojë (dike of Cas, Plazh), Ana e Malit and Shkodër [Linked with local FRM plan: Velipojë] - Maintenance of drainage channels, especially in the Murtemza passage and upstream Viluni Lake	-

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
		x																

Table 18: Water Flow Regulation / Channels (Measures in the rivers / river training)

3.3.1. Keeping clear cross-sections in settlement areas

Regional measures	Communal measures
- Cleaning / maintenance (removal of sediments and waste, extension of the riverbed, etc.) of: - Buna River: e.g. Shirqit, Dajç and Samrisht - Drin River: e.g. upper course of Ashta HP - Kir River, Gjadër River and - First (second) level of drainage channels [Linked with local FRM plans: Berdicë, Dajç and Gur i Zi] - Cleaning and enlargement of Viluni Channel (length: 9 km) and Murtemza (see Mott MacDonald, 2012a) [Linked with local FRM plan: Velipojë]	- Keeping clear cross-sections in the area of: - Ana e Malit: first (22 km) and third (72 km) channels of drainage system - Bushat: first and second channels of drainage system (55 km in the area of the villages of Fshati i Ri, Mali i Jushit, Hoten, Konaj, Rranxa, Melgushe, Barbullush, Kukel) - Dajç (Buna River) - Rrethina (Kir River) - Velipojë: third level of drainage system - Education of farmers for keeping clean drainage channels

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x	x	x								x		x	x		x		x

3.3.2. Removal of bottlenecks / narrow passages in rivers

Regional measures	Communal measures
- Removal of obstacles to the rivers Buna (e.g. nearby Belaj) and Kir to manage water flow [Linked with local FRM plan: Ana e Malit] - Follow-up on additional measures from the Mott McDonald Study (with regional and national actors, e.g. SEA), further assessments and follow up of possible actions e.g.: - Improvements in the Murtemza passage - Improvements in the channels on the west side of Trushi field	- Expansion of Belaj bottleneck to increase the water discharge capacity

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
		x									x							

3.3.3. Construction and strengthening of a bypass channel

Regional measures	Communal measures
- Further discussion on additional measures from the Mott McDonald Study - Revitalisation of old flow cascade of Dirni River - Opening of Urrela channel for higher discharge [Linked with local FRM plan: Dajç]	-

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x	x	x															

Table 19: Surface water management (Measures of urban water management)

3.4.1. Rain water management																		
Regional measures											**Communal measures**							
-											- Assess water collection systems based on a functioning scheme defined by regulation - Construction of collection system for rain water and control of water level by using gates							
P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
																x	x	

3.4.2. Development of a municipal retention system (e.g. rain water storage canal)																		
Regional measures											**Communal measures**							
-											- Project for separation of rain water from wastewater							
P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
																	x	

3.4.3. Flood-adapted improvement of a drainage system (e.g. bar screen, non-return flap)																		
Regional measures											**Communal measures**							
- Develop technical projects on cleaning the drainage channels											-							
P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
		x																

Table 20: Protection of object / facilities

3.5.1. Object / Facility protection of individual buildings																		
Regional measures											**Communal measures**							
-											-							
P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve

3.5.2. Object / Facility protection of infrastructure facilities (e.g. transport nodes, switching and branching systems)																		
Regional measures											**Communal measures**							
- Support LGUs regarding heightening / reinforcing main roads and also bridges (above maximum level of the extreme flood event)											- Heightening / reinforcing main roads and also bridges (above maximum level of the extreme flood event): - Ana e Malit: Obot-Oblikë and Goricë-Muriqan road - Berdicë: Velipoja road, Dajci and Dragjati roads, the bridge at Berdica arch and national road partly - Gur i Zi / Rrethina: Zues road							
P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
	x										x	x	x	x	x	x	x	

Table 21: Other protection measures

3.6.1. Improvement of the storage management of dammed river systems / reservoirs	
Regional measures	**Communal measures**
- Improve the current regulations, instructions for Hydro Power Plants (HPP) and Reservoirs - Introduction of new standards for communication (exchange of information in situations of heavy rainfall) - Early warning of discharge and notification of appropriate structures and community at risk - Training and seminars on rules of discharge and critical levels with head of HPP, LGUs	-

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
							X		X									

3.6.2. Protection against seepage and ground water	
Regional measures	**Communal measures**
-	- Raise community awareness on housing construction regarding seepage and groundwater - Establishment of flood protection structures in public systems of water supply, construction of retaining walls, isolation, reconstruction of pumping stations

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
											X					X		

5.2.5 Preparedness and information

Preparedness and information measures are divided into four categories (4.1. and 4.4.) - Economical preparedness, informational preparedness, behavior-related preparedness and allowance, preparation and post-processing of hazard control. Each category of these measures contains several specific measures, which are listed in Table 22. In addition, the table shows which measures have been considered necessary on regional and also on communal level of Shkodër region.

Table 22: Selection of FRM measures with regard to preparedness

No.	Measures	Measures of communes								Region
		Ana e Malit	Bërdicë	Bushat	Dajç	Gur i Zi	Rrethina	Shkodër	Velipojë	
4.	**Aspect: Preparedness and Information**									
4.1.	**Economical / financial preparedness**									
4.1.1.	Financial precautions by reserves and insurances (insurance against natural hazards)	x	x	x	x	x	x	x	x	x
4.2.	**Informational preparedness**									
4.2.1.	Improvement of flood forecast and flood warning / messaging	x	x	x	x	x	x	x	x	x
4.3.	**Behavior-related preparedness**									
4.3.1.	Publication of flood hazard and flood risk maps close to the spot	x	x	x	x	x	x	x	x	x
4.3.2.	Continuing advancement of awareness raising and publicity	x	x	x	x	x	x	x	x	x
4.4.	**Allowance, preparation and post-processing of hazard control**									
4.4.1.	Alignment or optimization of alert and operation schemes (disaster management schemes)	x	x	x	x	x	x	x	x	x
4.4.2.	Civil Protection	x	x	x	x	x	x	x	x	x
4.4.3.	Collection and analysis of experiences concerning flood events	x	x	x	x	x	x	x	x	x

The economical and informational preparedness is considered as necessary measure on the regional level as well as from all involved communes, see the following tables.

Table 23: Economical / financial preparedness

4.1.1. Financial precautions by reserves and insurances (insurance against natural hazards)	
Regional measures	**Communal measures**
- Calculation and approval of budgets earmarked for unforeseen emergency interventions for Prefecture, Qark, LGUs and the respective departments. Calculation and adoption of emergency funds, which are used only in emergency situations - Control and continuous monitoring by prefecture for each institution and LGU - Clarification, development and promotion of disaster related insurances; promotion and consulting of the public regarding insurances - Develop / offer contract based insurance services for damages through insurance operators; raise awareness of insurance needs for the inhabitants [Linked with local FRM plans: Berdicë, Bushat, Shkodër and Velipojë]	- Pubic information and promotion of disaster insurances – if available - Support households to sign insurances for flood damage – if possible - Carry out contract based insurance services for damages due to flood events

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x								x		x	x	x	x	x	x	x	x

Table 24: Informational preparedness

4.2.1. Improvement of flood forecast and flood warning / messaging	
Regional measures	**Communal measures**
- Establishment of a flood warning system in the river basin of Drin-Buna for whole region based on information from entire river basin - Pre-warning / early information on planned water release (opening of spillways) from KESH to the regional / communal actors; setting up and agreement on a warning and communication plan - Establishment of operating room to monitor the situation and collection of data on Prefecture level - Coordination of information (and data) for flood forecast in the region; improvement of information management (like forecast, preventive measures, disaster control) regarding local communities - Preparation of such projects to the amount, type and location of the deployment of these instruments in cooperation with foreign organisations or specialists of ministries or regional departments - Update alarm and warning plans and of contact lists - Regular determination of the order of information and update it continuously depending on demographic shifts, changes in structures or institutions - Maintenance and operation of hydrometeorological stations - Provide access to online information - Provision of Bulletin for hydrometeorological hazards	- Regular exchange with the weather / flood monitoring (e.g. IGEWE) and Drin cascade management authorities (e.g. KESH) to establish a cooperation relationship and to provide timely information in case of emergency - Ensure rainfall and weather forecasting bulletins are received. Provide direct access to weather forecasting online data - Establish communication relationships and mutual cooperation with weather monitoring and warning institutions

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x							x				x	x	x	x	x	x	x	x

Table 25: Behavior-related preparedness

4.3.1. Publication of flood hazard and flood risk maps close to the spot	
Regional measures	**Communal measures**
- Develop an informative bulletin based on digital database for 24-hours situation in the Prefecture area and inform the community via print and visual media	- Advertising charts or billboards with mapping of relevant / vulnerable areas. Maps shall be associated with explanatory tables on rainfalls and discharges and shall be placed inside glass frames to inform residents continuously about flood hazard areas and flooding levels

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x							x				x	x	x	x	x	x	x	x

4.3.2. Continuing advancement of awareness raising and publicity	
Regional measures	**Communal measures**
- Organisation of periodical trainings and seminars with experts, institutions, communities, universities, students, NGOs operating in this field in the regional and national level - Organisation of stakeholder related and public conversations / discussions about these topics in the local media	- Publishing the risk maps and warn- / alarm schemes at a public place; information campaigns and media - Publication of information materials and web pages to transfer the most important information to a “public language”, to be understood by everyone (additional: information events for the public)

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x										x	x	x	x	x	x	x	x

Table 26: Allowance, preparation and post-processing of hazard control

4.4.1. Alignment or optimization of alert and operation schemes (disaster management schemes)	
Regional measures	**Communal measures**
- Organisation of regular information and systematic surveys of all institutions (e.g. half-yearly meeting of the regional working group for review of activities, new requirements and for exchange of experiences) - Determine the choice of the measures with responsible bodies and timely information relevant authorities, on the basis of a previously prepared form or standardized - Determining the legal liability on the basis of a form of notice to the relevant and responsible bodies (responsible organisation related to water levels or discharges in a fixed cross-section) - Compilation of relevant data and database update according to occurring flood events - Administration of the database at the Prefecture and distribution to each regional directorate and each LGU (especially the part which is by law in each respective domain or jurisdiction)	- Maintaining a database and carrying out biannual updates in terms of contacts and persons which should be engaged in the warning process and flood emergency situations - Drafting collection points and evacuation itinerary maps (for population and livestock) in line with flood extent forecasting - Advertising evacuation maps in the centre of villages, to ensure easy and quick orientation - Regular review and update if necessary

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x										x	x	x	x	x	x	x	x

4.4.2. Civil Protection	
Regional measures	**Communal measures**
- Develop “warn, alarm, preparedness and disaster management plans” with concrete scenarios according to specific areas at regional level and LGU - Review and update the warn and alarm plans at prefecture level and each regional directorate on a regular basis, e.g. every 12 months (Directorates Police, Army, Drainage Board, River Basin, Forestry, Agriculture, Regional and rural roads) - Improve cooperation of all institutions that are doing the monitoring in the river basins on different subjects - Preparation of training plans for concrete scenarios related to former flood events (participation of all operating structures of the district and also the structures corresponding to neighbouring areas / countries). Include drills for emergency situations	- Development of communal disaster management plan to define evacuation routes, safe locations (people, animals, goods) and the alert timing. The plan should be drafted based on the flood event in December 2010 - Carry out meetings with the community to define safe areas and means of transportation in case of emergencies (in order to maximise evacuation efficiency and safety) - Publication of the evacuation plan in order to make the population familiar with the procedure. Distribution of evacuation maps especially in the first / most affected areas - Construction of stations for first aid and the safety of people, livestock and machineries in case of emergencies (utilisation of safe mobility means for quickly evacuation of people, livestock, food, etc.)

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x										x	x	x	x	x	x	x	x

4.4.3. Collection and analysis of experiences concerning flood events	
Regional measures	**Communal measures**
- Develop a database (program – state of the art) for data collection of each type of flood risk (according to the specifications of each area) - Use of computerised forms including all relevant data and specifications for each type of risk - Documentation of damage information (type, amount, duration, manner of providing information, intervention measures)	- Carry out further updates of the data recorded by the communes in 2010 - Revise maintenance and drafting of documentation protocols for professional use - Agree on one person (or a small group in the commune that takes care of the documentation of flood events (photos, damage reports, talk to people)

P	Q	DB	A_{RB}	A	D_A	D_R	HP	CC	M	NB	An	Be	Bu	Da	Gu	Rr	Sh	Ve
x	x										x	x	x	x	x	x	x	x

5.3 Priorities for implementation of measures

The selected measures are rated regarding the following criteria:

- Positive impacts (regarding the objects of FRM);
- (Indirect) negative impacts (potential ecological effects or negative effects on others);
- Complexity / costs (easy to realize or difficult / cost intensive).

The following assessment scheme delivers the criteria:

Criteria	positive	neutral / medium	negative
Effects on risk reduction	• Clear contribution to one or more objective can be expected within 12 months. • Reduction of risk / of damage in the next flood event can be expected.	• Impacts are not clear. • Contributions to one or more objective can be expected on a medium or long term.	• In total realistically in the named area no positive effects are expected.
Negative (ecologic) effects	• No negative impact can be seen based on present knowledge.	• Impacts cannot be assessed based on the present state of planning / knowledge.	• Potentially negative impacts on ecology or on other areas / regions.
Complexity of realisation / chance to be realised	• Realisation is not complex. • Can be realised within 12 months mainly with own resources.	• Can be realised within 12 – 24 months. • Realisation mainly with own resources; additional resources are necessary but might be activated.	• Very complex. • Additional studies / planning are necessary. • Cannot be done with own resources. • Additional / external actors have to be involved.
Costs	• No major costs arise (< 1.000 €). • Can be paid of existing budgets.	• Costs of 1.000 – 10.000 € • External budgets have to found. • It seems possible to find budgets (idea existing).	• High costs (> 10.000 €) • External budgets necessary. • Not clear if budgets can be found (no idea existing).

Result: Priority

	High / short term	Medium / medium term	Low / long term
Result: Priority	• Short term realisation (1-2 years) • Mainly with own resources	• Medium term realisation (3-4 years) • Additional resources have to be found	• Long term realisation • Budgets necessary, funds / donors have to be found

The priority is a combination of the above mentioned criteria. Based on the assessment of all measures the priorities were discussed and agreed together with the local and regional project partners in a consensual process during the working group meeting in October 2014. The results of the prioritisation of the regional FRM measures are listed in the table of FRM Measures of regional or national actors (see Annex B).

The following table lists the number of selected measures on local level (see part II-1 to 8) and regional level (see Annex B).

Table 27: Number of selected measures on local and regional level

No.	Type of Measure (Shkodër Region)	Total number of measures								
		Ana e Malit	Berdicë	Bushat	Dajç	Gur i Zi	Rrethina	Shkodër	Velipojë	Regional
1.	**Aspect: Prevention of risks**	**22**	**22**	**21**	**20**	**26**	**24**	**13**	**25**	**30**
1.1	**Administrative Instruments**	**10**	**10**	**11**	**10**	**12**	**12**	**8**	**15**	**11**
1.1.1.	Mapping of flood risk areas	3	5	5	5	5	4	3	5	3
1.1.2.	Restriction for building in risk areas	5	4	4	4	5	5	2	4	5
1.1.3.	Protection of the flood plains and retention areas	2	1	2	1	2	3	3	6	3
1.2	**Adaptation of Land Use**	**12**	**12**	**10**	**10**	**13**	**12**	**5**	**10**	**16**
1.2.1.	Adaptation of existing land use in flood risk areas	4	5	4	5	6	5	2	5	7
1.2.2.	Adaptation of constructions and infrastructure in risk areas	5	5	4	3	5	5	3	3	6
1.2.3.	Consultation of agriculture and forestry for awareness-raising	3	2	2	2	2	2	0	2	3
1.3	**Risk prevention by flood adapted building**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**3**
1.3.1.	Flood adapted handling for water imperilling substances	0	0	0	0	1	0	0	0	3
2.	**Aspect: Natural Flood Protection**	**7**	**5**	**2**	**6**	**5**	**5**	**3**	**2**	**25**
2.1	**Natural flood management**	**7**	**5**	**2**	**6**	**5**	**5**	**3**	**2**	**23**
2.1.1.	Revitalisation of river beds and river banks / former flood plains	2	1	0	2	1	1	0	0	4
2.1.2.	Changing of river courses and slope conditions	3	2	0	1	0	1	0	0	5
2.1.3.	Protection of zones along river banks	1	2	0	1	2	2	1	2	5
2.1.4.	Support of the development of natural floodplains	1	0	2	2	2	0	1	1	5
2.1.5.	Modified extensive river maintenance	0	0	0	0	0	1	0	0	1
2.1.6.	Disconnection / Removal of pavements in urban areas / Rainwater management	0	0	0	0	0	0	1	0	3
2.2	**Reactivation of retention areas**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
2.2.1.	Deconstruction a dike or dam	0	0	0	0	0	0	0	0	1
2.2.2.	Setting back dikes	0	0	0	0	0	0	0	0	
2.2.3.	Removal of an artificial bank	0	0	0	0	0	0	0	0	
2.2.4.	Connection of a retention-relevant terrain	0	0	0	0	0	0	0	0	1
3.	**Aspect: Technical Flood Protection**	**7**	**3**	**3**	**5**	**6**	**7**	**4**	**7**	**27**
3.1	**Water Flow Regulation / Flood plain works**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**
3.1.1.	Construction of a retention pond	0	0	0	0	0	0	0	0	
3.1.2.	Creation of a retention polder	0	0	0	0	0	0	0	0	
3.1.3.	Restoration, expansion or improvement of existing retention systems	0	0	0	0	0	0	0	1	1

No.	Type of Measure (Shkodër Region)	Total number of measures								
		Ana e Malit	Berdicë	Bushat	Dajç	Gur i Zi	Rrethina	Shkodër	Velipojë	Regional
3.2	**Water Flow Regulation (e.g. dikes)**	**0**	**1**	**0**	**1**	**4**	**2**	**1**	**3**	**12**
3.2.1.	Flood protection works	2	1	0	0	4	1	1	1	6
3.2.2.	Strengthening of existing flood protection works	1	0	0	1	0	1	0	1	4
3.2.3.	Adoption of a mobile (stationary) flood protection system	0	0	0	0	0	0	0	0	
3.2.4.	Drainage in diked area and backflow protection	0	0	0	0	0	0	0	1	2
3.3	**Water Flow Regulation (e.g. river training)**	**4**	**1**	**2**	**3**	**1**	**2**	**0**	**3**	**8**
3.3.1.	Keeping clear cross-sections in settlement areas	3	1	2	2	1	2	0	3	3
3.3.2.	Removal of bottlenecks / narrow passages in rivers	2	0	0	0	0	0	0	0	2
3.3.3.	Construction and strengthening of a bypass channel	0	0	0	1	0	0	0	0	3
3.4	**Surface water management**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**0**	**1**
3.4.1.	Rain water management	0	0	0	0	0	1	1	0	
3.4.2.	Development of a municipal retention system	0	0	0	0	0	0	1	0	
3.4.3.	Flood-adapted improvement of a drainage system	0	0	0	0	0	0	0	0	1
3.5	**Protection of object / facilities**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**
3.5.1.	Object / Facility protection of individual buildings	0	0	0	0	0	0	0	0	
3.5.2.	Object / Facility protection of infrastructure facilities	1	1	1	1	1	1	1	0	1
3.6	**Other protection measures**	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**4**
3.6.1.	Improvement of the storage management of dammed river systems / reservoirs	0	0	0	0	0	0	0	0	4
3.6.2.	Protection against seepage and ground water	0	0	0	0	0	1	0	0	
4.	**Aspect: Preparedness and information**	**18**	**15**	**15**	**14**	**16**	**15**	**14**	**15**	**27**
4.1	**Economical / financial preparedness**	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**5**
4.1.1.	Financial precautions by reserves and insurances	1	2	2	1	2	2	2	2	5
4.2	**Informational preparedness**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**7**
4.2.1.	Improvement of flood forecast and flood warning / messaging	3	3	3	3	3	3	3	3	7
4.3	**Behavior-related preparedness**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**
4.3.1.	Publication of flood hazard and flood risk maps close to the spot	2	1	1	1	1	1	1	1	1
4.3.2.	Continuing advancement of awareness raising and publicity	1	1	1	1	1	1	1	1	2
4.4	**Allowance, preparation, post-processing**	**11**	**8**	**8**	**8**	**9**	**8**	**7**	**8**	**12**
4.4.1.	Alignment or optimization of alert and operation schemes	4	3	3	3	3	3	2	3	5
4.4.2.	Civil Protection	5	3	3	3	4	3	3	3	4
4.4.3.	Collection and analysis of experiences concerning flood events	2	2	2	2	2	2	2	2	3

The prioritization of the selected types of measures on **regional** level (priority 1-3 or not specified) is illustrated in the following diagrams.

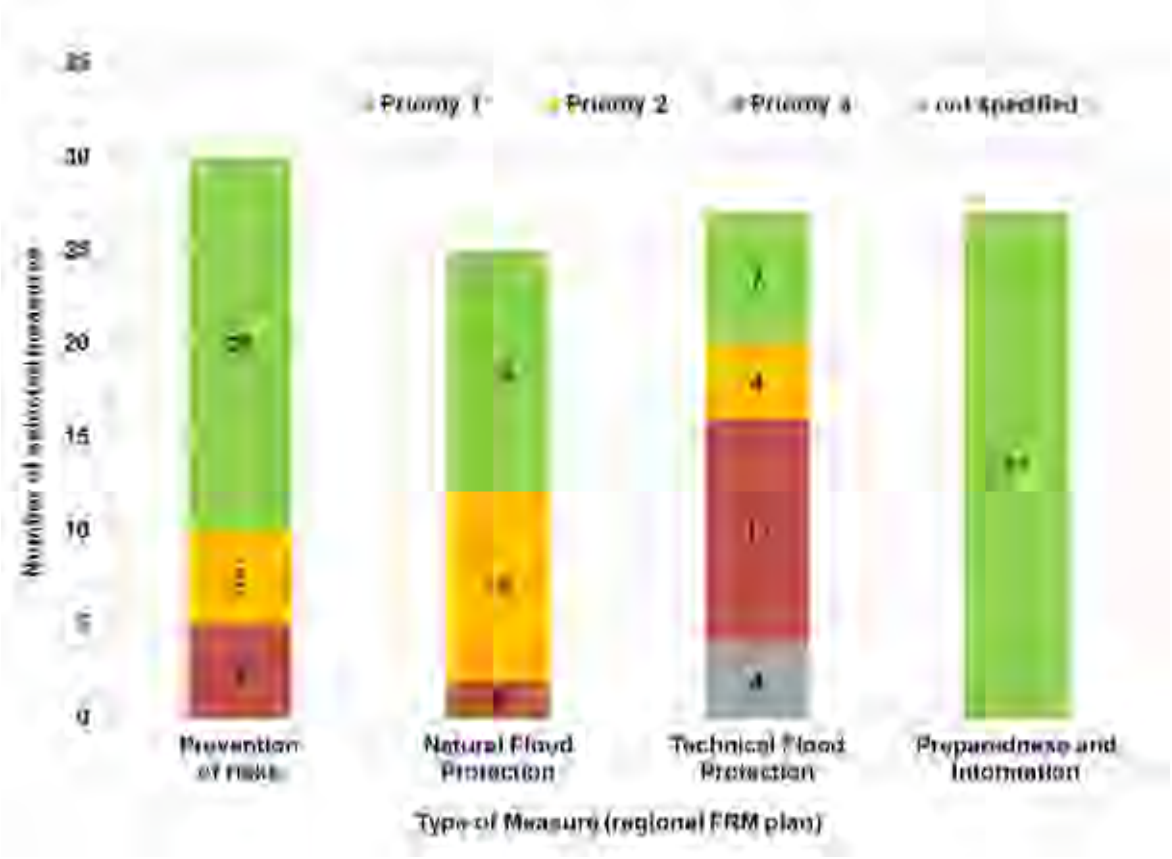


Figure 22: Number of selected regional measures with different priority

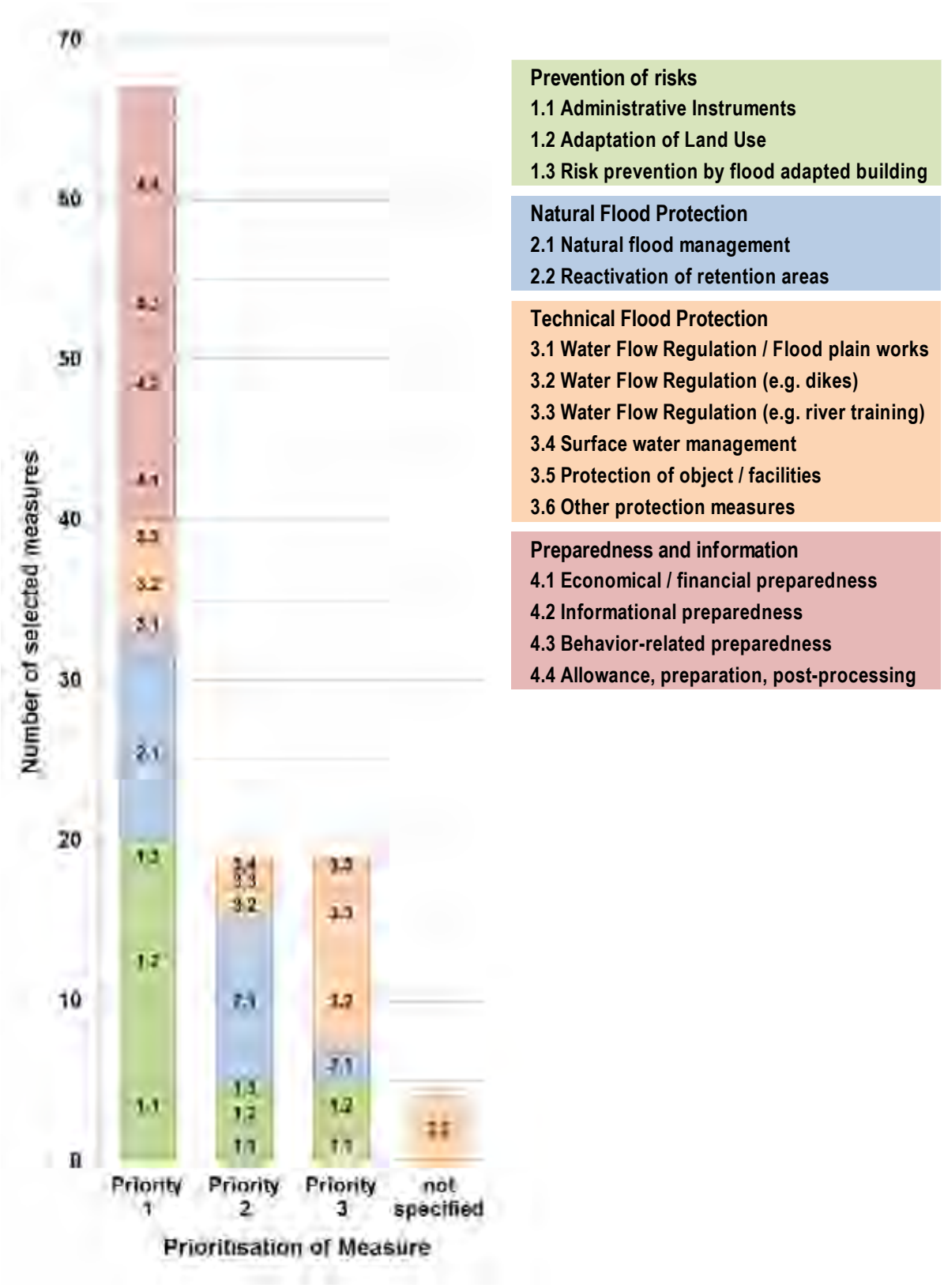


Figure 23: Priority of different types of regional measures

6 Implementation and monitoring

6.1 Implementation schedule

Regarding the EU-flood directive FRM-plans shall be updated in a six-years-cycle. However, this is just the schedule for monitoring and revision of the plans. The realisation of the measures should be started and completed depending on their set priority. As listed in the prioritisation criteria following periods for the realisation should be the goal:

- Priority 1: Should be realised within 12 months; mainly with own resources.
- Priority 2: Should be realised within 12 – 24 months; the time until is necessary for further planning, preparations and fund raising.
- Priority 3: Realisation time cannot be determined; additional studies or planning are necessary. Most of these measures cannot be done with own resources and additional or external actors have to be involved. These measures should be followed up, monitored and updated at the best every 12 months, at least every 2-3 years.

6.2 General funding opportunities for implementation

As many identified measures do not need extensive funding as a first step funding for implementing such measures should come from the normal budget of communes, Prefecture etc. and should be considered in the annual budget planning. Besides this there are several funding opportunities on regional, national and international level that Qark and Local Government Units can use to implement adaptation measures.

On regional level Shkodër Qark profit from:

- Funding portfolio of the Regional Development Programme - Northern Albania (small and medium size projects) (http://www.rdpnorthernalbania.org/);
- Decentralization and Local Development Programme (support on waste management and project proposal writing) (http://www.dldp.al/dldp/);
- Mountain Area Development Agency (providing support for farmers) (http://en.redeval.org/).

On national level there is the Fund for Regions Development[12] and the Albanian Development Fund (http://www.albaniandf.org). Both these funds as well as funds coming from Ministry of Agriculture and Rural Development can be used for infrastructure interventions.

[12] http://www.kryeministria.al/al/newsroom/lajme/nje-fond-i-qeverise-per-rilindjen-urbane-si-asnjehere-me-pare

On international level LGUs and Qark can benefit from the following funding opportunities:

- IPA Cross border Cooperation Programme Albania – Montenegro (http://www.albania-montenegro.org/index.html) and
  IPA Adriatic (http://www.adriaticipacbc.org/) both with a focus on technical assistance;
- Critical Ecosystem partnership Fund (for measures dealing mostly with natural flood protection) (http://www.cepf.net/Pages/default.aspx).

Furthermore other funding opportunities might be available and should be proactively assessed.

6.3 Implementation monitoring and review

The monitoring framework sets out the measures that could be used by the responsible organisations (Prefecture / Quark) to monitor the implementation of the plan and its measures together with the communes.

The uncertainties associated with the strategic character of the measures make monitoring even more important since in a periodical reviewing process much details for implementation can be regularly be added. Monitoring allows for periodic checks

- of the implementation progress
- to confirm the accuracy of the assumptions on which the original plan was based on
- to ensure that the proposed mitigation measures remain relevant and are being effectively implemented and
- to review and revise the action plan periodically.

Monitoring should measure the following:

Monitoring criteria	Questions to be answered
Realisation status of planned measures	• Were planned measures started or completed? • What are bottlenecks if measures were not started?
Effectiveness of realised measures	• Did the measures change the risk situation? • How can the mitigation effects be described or quantified? • If no positive effects are visible: why? What could be improved to raise the mitigation effects? • Did (unforeseen) negative effects occur?
Changing framework or assumptions	• Did important changes affect the action plan? (Administrative? Physical? Population? Etc.) • Have projects of others been started that change the framework for the action plan? • Are projects of others upcoming that should take FRM-actions into account (need for communication)?
Update the action plan	• Which measures should be changed / adjusted / deleted from the action plan? • Are adjustments in the responsibilities necessary?
Environmental effects	• Are ecologic effects visible that change the environmental assessment results?
Communication; administrative / personal changes	• Is the communication and coordination process on track? Or has it to be adjusted or improved? • Did administrative or personal changes occur that call for adjustments in the action plan (or in communication)?

Monitoring tools

The following actions have been suggested as monitoring tools for the plan measure types.

Table 28: Suggested Monitoring Tools

Action	Deliverables to monitor / tools	Timescales
Checks and information gathering according the monitoring criteria	Reports on the status of risk-areas, measures, communication etc. (see criteria). → table / format to be regularly updated; comments	Every 12 months (from agreement on action plan in working group 11/2015)
Coordination between actors and with the other bodies associated with flood risk management.	• 6 monthly meetings of the regional FRM working group • 12 monthly flood risk management planning meetings (extended work group meetings)	Every 6/12 months from plan adoption and for duration of plan.

Review period

In order to ensure that the flood risk reduction will be actively and successfully realised and respective measures are put in place the action plan should be reviewed regarding the realisation of measures and updated with a defined review period. An adequate review period is 12 months. However for some measures ongoing reviews should be in place.

The working group should meet every 6 months to periodically discuss upcoming projects and coordinate the implementation actions. The wider stakeholder group (or: extended working group) should meet not less than once a year (every 12 months).

Cross-border aspects

A representative of the Montenegrin FRM-processes and neighbouring communes should be invited to the 6-monthly working group meetings. There it is to be decided if the monitoring of the Montenegrin actions can be integrated into a joint review and monitoring process.

Review and monitoring responsibilities

The key actor and coordinator of the FRM-plan action are (1) the Prefecture and (2) the Qark. They are also responsible for the review, monitoring and regular updating of the regional FRM-plan. The regional FRM-working group (including Prefecture, Qark, all communes and relevant key actors of the different regional administrations) shall function as “reviewing and monitoring group”, coordinated by the Prefecture. Thus the Prefecture coordinates the monitoring tools, meetings of the working group and contributions of all actors to the reviewing documents (see monitoring tools).

7 Environmental effects of FRM Measures

7.1 Strategic Environmental Assessments for FRM plans

Strategic Environmental Assessment (SEA) is the process by which environmental considerations are required to be fully integrated into the preparation and adoption of plans and programmes. The objective of the SEA process is to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of specified plans and programmes with a view to promoting sustainable development.

The realisation of flood risk management measures may cause a significant environmental effect which is often assessable in detail only in the later, detailed planning stage. Therefor the SEA shall indicate in the early stage of programmatic or strategic planning for which kinds of FRM-measures potential significant negative effects have to be taken into consideration when setting priorities, making decisions on options and stepping forward in the implementation phase. From this kind of screening of the strategic character of the FRM plan and its measures it can be decided to set priorities on certain kind s of measures. An environmental impact assessment for technical measures and those which are likely to have significant environmental impacts has to be done according EU Directive 85/ 337/ EEC in the planning and approval process of the measures. An appropriate assessment of the impacts of the development on sensitive habitats under the EU Habitats Directive and reiterated in Circular NPWS 1/08 must also be factored in to the evolution of developments that potentially affects sites designated under the EU's Natura 2000 programme.

7.2 Screening potential significant environmental impacts of different types of measure

All types of measures that are relevant for this flood risk management plan were evaluated regarding their likely significant effects on the environmental factors according the EU Directive 2001/42/EC of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment, such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors.

The following tables show the results of the screening assessment. All types of measures are indicated with one of three categories:

+	Likely positive effects (positive)	o	Likely no significant effect (neutral)	-	Likely significant negative effects (negative)

The assessment is based on the assumption that the measure is planned and implemented in an adequate way and technical standard that reduces negative impacts as much as possible and seeks for most possible positive effects and synergies. All results of the screening shall be reflected and monitored in the detailed planning and implementation stage.

If the likely environmental effect of a measure is not predictable at this stage of planning or strategic programming and mainly depends on details of further planning (or implementation), the screening result has to stay open. This is demonstrated by an indifferent signature, showing the likely range of assessment results:

+ / - **o / -**	Indifferent on this stage of planning; effects depend on details of planning and implementation; to be assessed in the realisation phase and in EIA (indifferent)

In this case especially further environmental assessments have to be done in regard the environmental impacts of certain investments or other kinds of measures.

For the types of measures for the prevention of risk by mainly administrative approaches the environmental effects are likely to be neutral or positive. No likely significant negative effects have to be expected (see following table).

Table 29: Prevention measures: screening of likely significant environmental effects

No.	Type of Measures	Likely effects on environment factors						
		Human health	Flora / Fauna / Biodiversity	Soil	Water	Climate / air	Landscape	Cultural heritage
1.	**Aspect: Prevention of risks**							
1.1.	**Administrative Instruments** (for avoidance of risk)							
1.1.1.	Mapping of flood risk areas	+	o	o	o	o	o	o
1.1.2.	Restriction for building in risk areas (in spatial planning / urban planning)	+	o	o	o	o	o	+
1.1.3.	Protection of the flood plains and retention areas	+	+	+	+	+	+	+
1.2.	**Adaptation of Land Use** (for avoidance of risk, removal or relocation and reduction of risk)							
1.2.1.	Adaptation of existing land use in flood risk areas (including agriculture and forestry)	+	+	+	+	o	o	+
1.2.2.	Adaptation of constructions and infrastructure in risk areas (flood adapted planning and building)	+	o	o	o	o	o	+
1.2.3.	Consultation of agriculture and forestry for awareness-raising	o	o	o	o	o	o	o
1.3.	**Risk prevention by flood adapted building**							
1.3.1.	Flood adapted handling for water imperilling substances	o	+	+	+	o	o	o

For the Natural Flood Protection Measures the likely environmental effects are mainly positive (due to the fact that natural measures as such are designated to have positive ecologic impacts or at least minimise or compensate negative impacts. However for all measures that are based on smaller or larger reconstructions of the river beds, banks or channels the overall long term effects should be positive, but on the shorter term negative impacts are possible. Regarding biodiversity, flora and fauna as well as soil negative impacts are possible depending on the design and the constructions. Here the screening results indicate indifferent likely effects that have to be validated in an later, more detailed planning stage. For these types of measure environmental effects shall carefully be taken into consideration with further realisation steps and an EIA might be necessary to assess the potential effects.

Table 30: Natural flood protection measures: screening of likely significant environmental effects

No.	Type of Measures	Likely effects on environment factors						
		Human health	Flora / Fauna / Biodiversity	Soil	Water	Climate / air	Landscape	Cultural heritage
2.	**Aspect: Natural Flood Protection**							
2.1.	**Natural flood management, water flow regulation**							
2.1.1.	Revitalisation of river beds and river banks / former flood plains	o	+	+	+	o	+	o
2.1.2.	Changing of river courses and slope conditions	o	+/-	+/-	+	o	o	o
2.1.3.	Protection of zones along river banks	o	+	+	+	o	+	o
2.1.4.	Support of the development of natural floodplains	+	+	+	+	o	+	o
2.1.5.	Modified extensive river maintenance	o	+	+	+	o	o	o
2.1.6.	Disconnection / Removal of pavements in urban areas / Rainwater management	+	+	+	+	o	o	+
2.2.	**Reactivation of retention areas** (runoff regulation / water flow regulation)							
2.2.1.	Deconstruction a dike or dam	+	+/-	+/-	+	o	+	+/-
2.2.2.	Setting back dikes	+	+/-	+/-	+	o	+	+/-
2.2.3.	Removal of an artificial bank	+	+	+	+	o	+	+
2.2.4.	Connection of a retention-relevant terrain (e.g. back waters, old river arms)	+	+	+	+	o	+	+

For the Technical Flood Protection Measures the likely environmental effects can differ significantly with different solution in the design, the technical standards and accompanying measures for reduction and compensation of potentially negative effects. As shown in the screening table below all constructive measures in and along rivers may cause negative effects for flora, fauna and biodiversity if e.g. vegetation and habitats are

removed for constructions at the rivers – even if this is only temporarily. The mainly affected environmental factors besides flora / fauna can be soil and landscape.

Here also the likely negative or indifferent effects have to be validated in a later, more detailed planning stage. They can be reduced or even eliminated very often by following principles of ecological planning and construction. For these types of measure often a project EIA will be necessary in the realisation phase.

Table 31: Technical flood protection measures: screening of likely significant environmental effects

No.	Type of Measures	Likely effects on environment factors						
		Human health	Flora / Fauna / Biodiversity	Soil	Water	Climate / air	Landscape	Cultural heritage
3.	**Aspect: Technical Flood Protection**							
3.1.	**Water Flow Regulation / Flood plain works** (Retention measures)							
3.1.1.	Construction of a retention pond	+	-	+/-	-	-	-	+/-
3.1.2.	Creation of a retention polder	+	-	+/-	-	-	-	+/-
3.1.3.	Restoration, expansion or improvement of existing retention systems (dams/ ponds / polders)	+	-	+/-	-	-	-	+/-
3.2.	**Water Flow Regulation / Channels** (Dikes, Dams, Flood Walls and Mobile Flood Protection)							
3.2.1.	Flood protection works (dike, dam or flood wall)	+	-	-	-	o	-	+/-
3.2.2.	Strengthening of existing flood protection works	+	-	-	-	o	-	+/-
3.2.3.	Adoption of a mobile (stationary) flood protection system	+	-	-	-	o	-	+/-
3.2.4.	Drainage in diked area and backflow protection	+	-	-	-	-	o	+
3.3.	**Water Flow Regulation / Channels** (Measures in the rivers / river training)							
3.3.1.	Keeping clear cross-sections in settlement areas	+	-	-	-	o	o	+
3.3.2.	Removal of bottlenecks / narrow passages in rivers	+	+/-	-	+	o	o	+
3.3.3.	Construction and strengthening of a bypass channel	+	-	-	-	o	-	+
3.4.	**Surface water management** (Measures of urban water management)							
3.4.1.	Rain water management	+	+/o	+/o	+/o	+/o	o	o
3.4.2.	Development of a municipal retention system (e.g. rainwater storage canal	+	o	o	+	o	o	+
3.4.3.	Flood-adapted improvement of a drainage system (e.g. bar screen, non-return flap)	+	o	o	+	o	o	+
3.5.	**Protection of object / facilities**							
3.5.1.	Object / Facility protection of individual buildings	+	+	+	+	o	o	+
3.5.2.	Object / Facility protection of infrastructure facilities (e.g. transport nodes, switching and branching systems)	+	+	+	+	o	o	+

No.	Type of Measures	Likely effects on environment factors						
		Human health	Flora / Fauna / Biodiversity	Soil	Water	Climate / air	Landscape	Cultural heritage
3.6.	**Other protection measures**							
3.6.1.	Improvement of the storage management of dammed river systems / reservoirs	+	o	o	+	o	o	+
3.6.2.	Protection against seepage and ground water	+	o/-	o/-	+/-	o	o	+

For the types of measures for improving the preparedness and information by financial, informational and behaviour oriented measures the environmental effects are mainly neutral or in few cases likely to be positive. No significant negative effects have to be expected (see following table).

Table 32: Preparedness and information: screening of likely significant environmental effects

No.	Type of Measures	Likely effects on environment factors						
		Human health	Flora / Fauna / Biodiversity	Soil	Water	Climate / air	Landscape	Cultural heritage
4.	**Aspect: Preparedness and Information**							
4.1.	**Economical / financial preparedness**							
4.1.1.	Financial precautions by reserves and insurances (insurance against natural hazards)	o	o	o	o	o	o	o
4.2.	**Informational preparedness**							
4.2.1.	Improvement of flood forecast and flood warning / messaging	+	o	o	o	o	o	+
4.3.	**Behaviour-related preparedness**							
4.3.1.	Publication of flood hazard and flood risk maps close to the spot	+	o	o	o	o	o	+
4.3.2.	Continuing advancement of awareness raising and publicity	+	o	o	o	o	o	+
4.4.	**Allowance, preparation and post-processing of hazard control**							
4.4.1.	Alignment or optimization of alert and operation schemes (disaster management schemes)	+	o	o	o	o	o	+
4.4.2.	Civil Protection	+	o	o	o	o	o	+
4.4.3.	Collection and analysis of experiences concerning flood events	o	o	o	o	o	o	o

7.3 Conclusion of the screening of likely environmental effects

The screening of likely environmental effects of the flood risk management measures shows that many measures, like administrative, organisational and informational measures will have no significant negative or even positive effects on the environmental factors. If these measures also have a significant impact on reducing the flood risk they might get the priority for implementation.

For the more constructive or technical measures, which often have a clearly defined risk reduction effect, negative effects for flora, fauna biodiversity and soil as well as some other minor effects might be caused by the flood prevention measures. In these cases further environmental analysis and assessments are required during the further detailed planning and implementation process as part of the approval procedures.

This screening of likely effects shall support the further decision making on priorities on strategic and planning level. It does not substitute any further detailed project related environmental impact assessment in regard to national law and European directives.

8 Pubic Information and publicity measures

8.1 Participation in the FRM planning process

Public information and involvement of stakeholders at all levels and the public into FRM processes is crucial for the success of the FRM approach. The FRM plan is based on the strategy to share the duties with all relevant organisations and persons in their respective responsibility. This is also the approach of the EU Flood Directive and Strategy.

To reach this goal within the FRM process in the Shkodër Region in 2013/2014 all communal, regional and some national relevant organisations were involved. Following participation activities took place:

- 11-15 Nov. 2013 Shkodër Region (Fact Finding Mission): Individual meetings with regional and local actors
- 27-28 Feb. 2014 Shkodër Regional working group meetings
- 17 Mar. 2014 Dajç Local working group meeting
- 7-9 Apr. 2014 Communes 8 individual working meetings
- 8 Apr. 2014 Shkodër Local working group meeting
- 19-20 May 2014 Communes 8 individual working meetings
- 21 May Shkodër Regional working group meeting
- 22 May 2014 Tirana Individual meetings with Ministries
- Oct 2014 Shkodër Regional working group meeting

Further a lot of bilateral meetings were held with experts of the national, regional and local partners of the project. In between of the working group meetings the national consultant organized many bilateral follow-up meetings to inform and support the national, regional and local actors. Thus all communes were visited regularly to develop the different steps of risk assessment, risk mapping and action planning in close cooperation.

8.2 Public awareness rising and information activities

In addition following activities were realised to inform the public and to raise awareness for the FRM issues:

- Development of a regional flood risk map and 8 local flood risk maps; as one of the basic awareness raising measures information was developed on were and in which intensity the flood risk potentially occurs.
- Publication of regional and local flood risk maps in each commune (municipality center): the maps are printed within the project in a large scale to be posted in public areas within the communes.

- Development and distribution of leaflets including information about potential flood risk areas and risk assets (flood risk map) as well as guiding information and contacts. An example of the shape of the leaflet can be found here:

- Workshop on Disaster Management / Emergency response planning workshop.

For the future these activities have to be regularly updated, continued and repeated in a permanent process. The list of measures contains some priority measures on communication and information that are important regarding the public contributions, self-preparedness, protection of flood plains by everyone, preparation for the next flood event. The measures under Preparedness and Information (no. 4 of Types of Measures) of the catalogue should have a high importance in a short, medium and long term strategy. Actors are mainly communes, Prefecture and Qark (see specific determination of responsible actors in the action plan tables, which have been named by them; thus the process has reached a high level of commitment with the action plan).

9 Emergency response planning

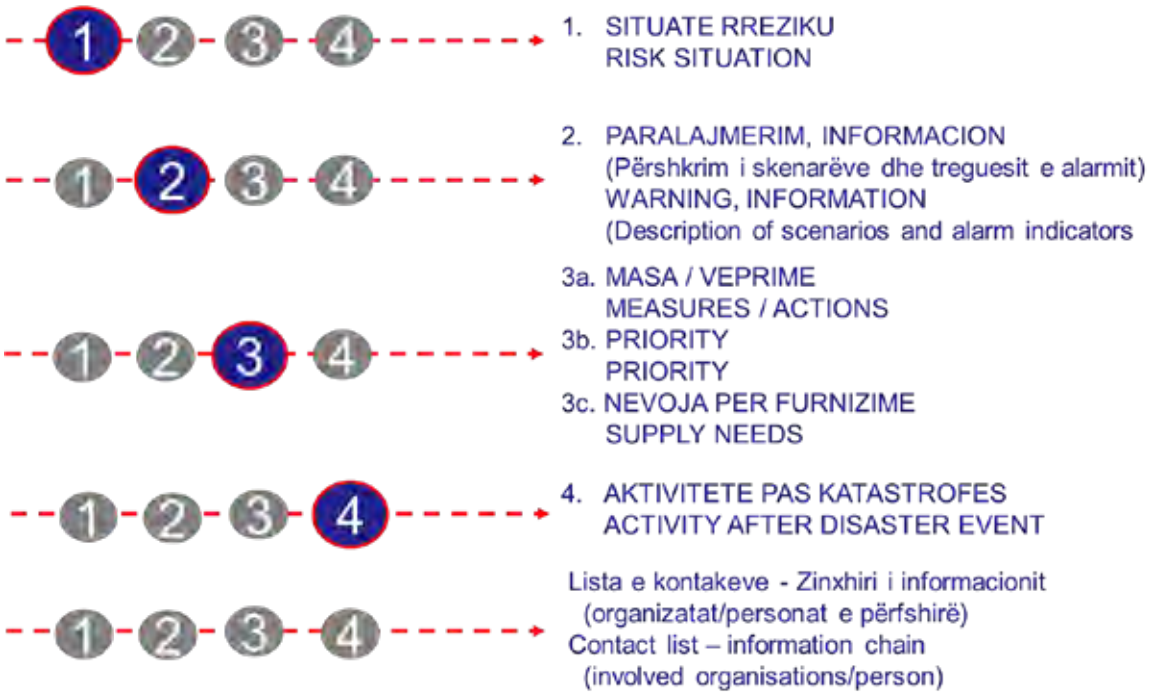
The Flood Risk Management Measure list shows in measure 4.4.1 – 4.4.3 different activities to set up, improve and discuss Disaster Management or “Emergency Response Planning” in the communes. Since this measure has got a very high priority due to the importance and the significant risk reduction potential on a comparing low cost basis it was agreed to start with an impulse workshop within this FRM project. The local FRM plans show the specific results for those communes who already completed the emergency planning tables (from October 2014). The emergency response plan has to cover all dimensions of a flood event and potential responses:

Figure 24: Action fields of flood emergency response planning

The objectives of the chosen approach are:

- Short term realisation;
- Low cost basis;
- Work with local experience rather than focus on external experts;
- Pragmatic method, based on step-by-step guideline and existing information.

The respective Emergency Response planning process was designed as follows using a 4-step process:



For each step a scheme (Excel-Format) is to be filled to assess the situation and to develop measures as well as priorities.

As result each commune has a guidance for the emergency case that guides the responsible actors and other parties that shall take actions through the different stages of the emergency situation:

1. Warning; verification of the warning; alarm; distribution of the alarm to relevant persons.
2. Take priority measures to prepare; communicate with other persons about their actions.
3. Evacuation (persons, cattle, economic values, ecologic dangers).
4. Take measures to protect goods; close down public areas; set up signs.
5. Take measures during the event; supply of people, cattle etc. (electricity, water, food).
6. Organise the recovery phase; follow well developed priorities.

In the following the formats are shown to give examples. The tables can be found in the Annex C.

Figure 25: Risk situation (1)

Figure 26: Warning, information (2)

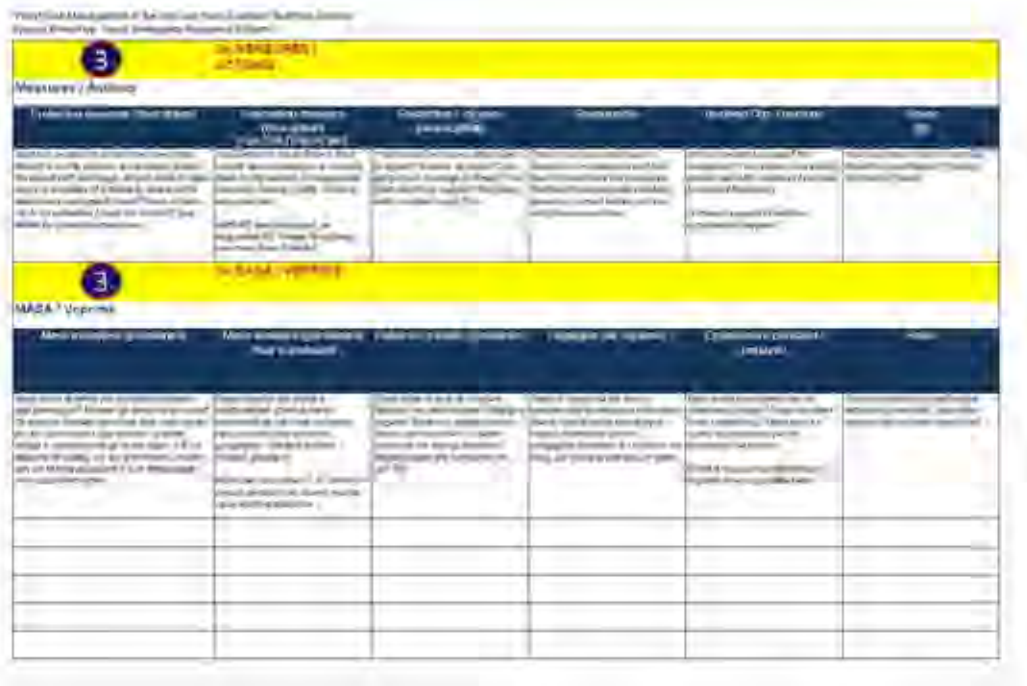


Figure 27: Measures / actions (3a)

Figure 28: Priority (3b) and Supply needs (3c)

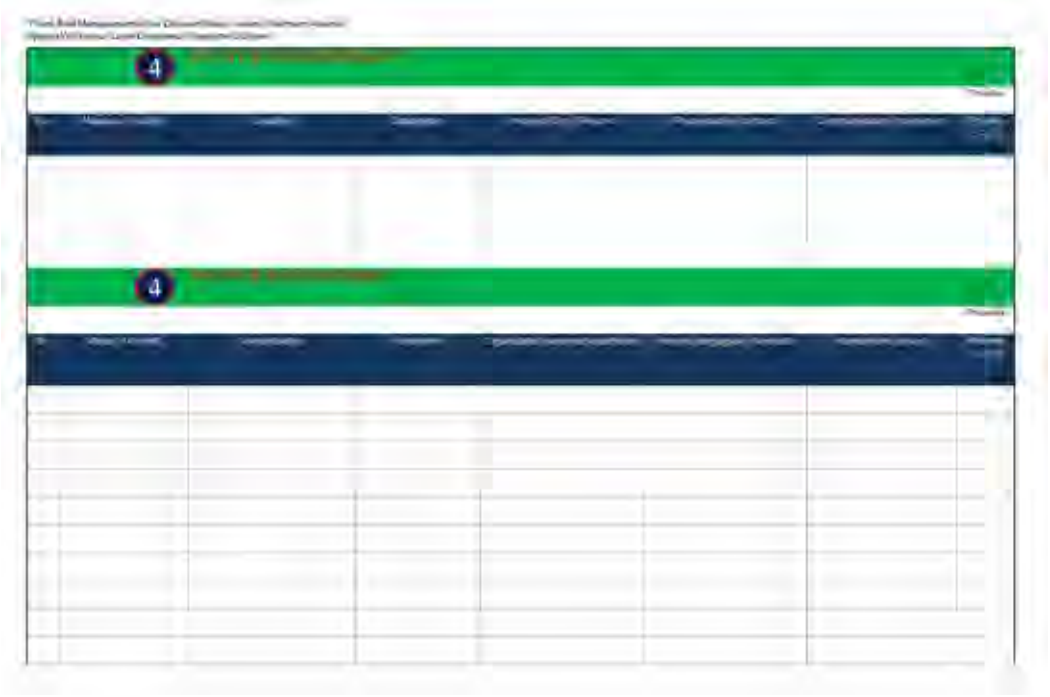


Figure 29: Activity after disaster event (4)

Figure 30: Contact list – information chain

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11 Glossary[13]

Basin (river) - The area from which water runs off to a given river.

Characterisation - The process of expressing the observed/predicted behaviour of a system and its components for optimal use in decision making.

Consequence - An impact such as economic, social or environmental damage/improvement that may result from a flood. May be expressed quantitatively
(e.g. monetary value), by category (e.g. High, Medium, Low) or descriptively.

Damage potential - A description of the value of social, economic and ecological impacts (harm) that would be caused in the event of a flood.

Dependence - The extent to which one variable depends on another variable. Dependence affects the likelihood of two or more thresholds being exceeded simultaneously. When it is not known whether dependence exists between two variables or parameters, guidance on the importance of any assumption can be provided by assessing the fully dependent and independent cases (see also correlation).

Discharge (stream, river) - As measured by volume per unit of time.

Efficiency - In everyday language, the ratio of outputs to inputs; in economics, optimality.

Emergency management - The ensemble of the activities covering emergency planning, emergency control and post-event assessment.

Evacuation scheme - Plan for the combination of actions needed for evacuation (warning, communication, transport etc.).

Exposure - Quantification of the receptors that may be influenced by a hazard (flood), for example, number of people and their demographics, number and type of properties etc.

Expectation - Or expected value - of a variable, refers to the mean value the variable takes. For example, in a 100 year period, a 1 in 100 year event is expected to be equalled or exceeded once.

Expected annual frequency - Expected number of occurrences per year (reciprocal of the return period of a given event).

Flood - A temporary covering of land by water outside its normal confines.

Flood control (measure) - A structural intervention to limit flooding and so an example of a risk management measure.

[13] See www.floodsite.net

Flood damage - Damage to receptors (buildings, infrastructure, goods), production and intangibles (life, cultural and ecological assets) caused by a flood.

Flood forecasting system - A system designed to forecast flood levels before they occur:

Flood hazard map - Map with the predicted or documented extent of flooding, with or without an indication of the flood probability.

Flood level - Water level during a flood.

Flood management measures - Actions that are taken to reduce either the probability of flooding or the consequences of flooding or some combination of the two.

Flood peak - Highest water level recorded in the river during a flood.

Floodplain - Part of alluvial plain that would be naturally flooded in the absence of engineered interventions.

Flood prevention - actions to prevent the occurrence of an extreme discharge peak.

Flood protection (measure) - To protect a certain area from inundation (using dikes etc.).

Flood risk management - Continuous and holistic societal analysis, assessment and mitigation of flood risk.

Flood warning system - A system designed to warn members of the public of the potential of imminent flooding. Typically linked to a flood forecasting system.

Governance - The processes of decision making and implementation

Hazard - A physical event, phenomenon or human activity with the *potential* to result in harm. A hazard does not necessarily lead to harm.

Hazard mapping - The process of establishing the spatial extents of hazardous phenomena.

Integrated risk management - An approach to risk management that embraces all sources, pathways and receptors of risk and considers combinations of structural and non-structural solutions.

Intervention - A planned activity designed to effect an improvement in an existing natural or engineered system (including social, organisation/defence systems).

Inundation - Flooding of land with water. (NB: In certain European languages this can refer to deliberate flooding, to reduce the consequences of flooding on nearby areas, for example. The general definition is preferred here.)

Mitigation - *see Flood management measures*

Pathway - Route that a hazard takes to reach Receptors. A pathway must exist for a Hazard to be realised.

Preparedness - The ability to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Resilience - The ability of a system/community/society/defence to react to and recover from the damaging effect of realised hazards.

Resistance - The ability of a system to remain unchanged by external events.

Response (in context) - The reaction of a defence or system to environmental loading or changed policy.

Risk - Risk is a function of probability, exposure and vulnerability. Often, in practice, exposure is incorporated in the assessment of consequences, therefore risk can be considered as having two components. The probability that an event will occur and the impact (or *consequence)* associated with that event.

Risk assessment - Comprises understanding, evaluating and interpreting the perceptions of risk and societal tolerances of risk to inform decisions and actions in the flood risk management process.

Risk management - The complete process of risk analysis, risk assessment, options appraisal and implementation of risk management measures

Risk management measure - An action that is taken to reduce either the probability of flooding or the consequences of flooding or some combination of the two

Risk mapping - The process of establishing the spatial extent of risk (combining information on probability and consequences). Risk mapping requires combining maps of hazards and vulnerabilities. The results of these analyses are usually presented in the form of maps that show the magnitude and nature of the risk.

Risk reduction - The reduction of the likelihood of harm, by either reduction in the probability of a flood occurring or a reduction in the exposure or vulnerability of the receptors.

Spatial planning - Public policy and actions intended to influence the distribution of activities in space and the linkages between them. It will operate at EU, national and local levels and embraces land use planning and regional policy.

Stakeholders - Parties/persons with a direct interest (stake) in an issue.

Strategy (flood risk management-) - A strategy is a combination of long-term goals, aims, specific targets, technical measures, policy instruments, and process which are continuously aligned with the societal context.

Sustainable Development - Is development that meets the needs of the present without compromising the ability of future generations to meet their own needs

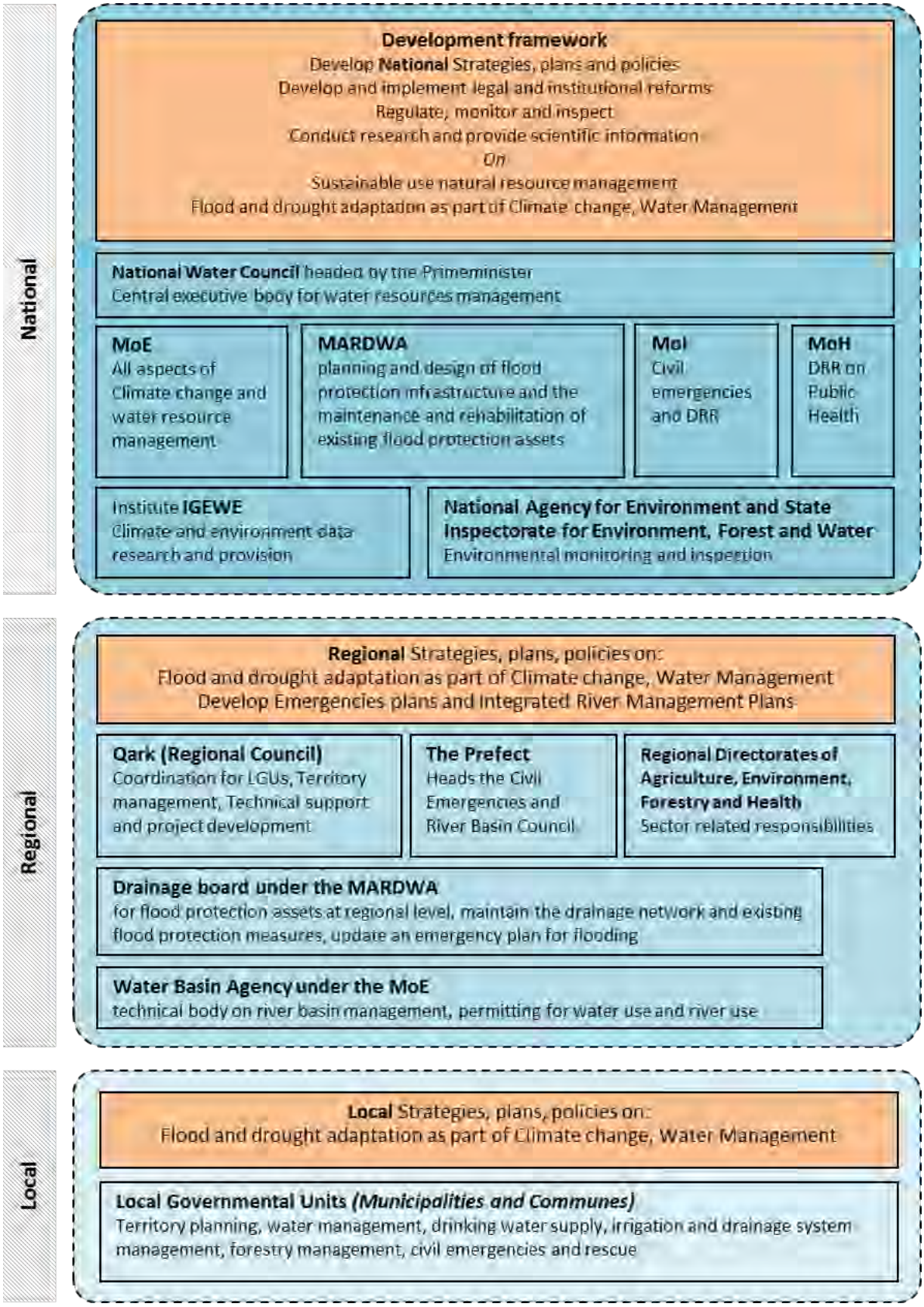
System - An assembly of elements, and the interconnections between them, constituting a whole and generally characterised by its behaviour. Applied also for social and human systems.

Uncertainty - A general concept that reflects our lack of sureness about someone or something, ranging from just short of complete sureness to an almost complete lack of conviction about an outcome.

Vulnerability - Characteristic of a system that describes its potential to be harmed. This can be considered as a combination of susceptibility and value.

Annex A:

Institutional Framework on Flood Management (REC, 2013)


National
Development framework
Develop National Strategies, plans and policies
Develop and implement legal and institutional reforms
Regulate, monitor and inspect
Conduct research and provide scientific information
On
Sustainable use natural resource management
Flood and drought adaptation as part of Climate change, Water Management
National Water Council headed by the Primeminister
Central executive body for water resources management
MoE
All aspects of Climate change and water resource management
MARDWA
planning and design of flood protection infrastructure and the maintenance and rehabilitation of existing flood protection assets
MoI
Civil emergencies and DRR
MoH
DRR on Public Health
Institute IGEWE
Climate and environment data research and provision
National Agency for Environment and State Inspectorate for Environment, Forest and Water
Environmental monitoring and inspection
Regional
Regional Strategies, plans, policies on:
Flood and drought adaptation as part of Climate change, Water Management
Develop Emergencies plans and Integrated River Management Plans
Qark (Regional Council)
Coordination for LGUs, Territory management, Technical support and project development
The Prefect
Heads the Civil Emergencies and River Basin Council
Regional Directorates of Agriculture, Environment, Forestry and Health
Sector related responsibilities
Drainage board under the MARDWA
for flood protection assets at regional level, maintain the drainage network and existing flood protection measures, update an emergency plan for flooding
Water Basin Agency under the MoE
technical body on river basin management, permitting for water use and river use
Local
Local Strategies, plans, policies on:
Flood and drought adaptation as part of Climate change, Water Management
Local Governmental Units (Municipalities and Communes)
Territory planning, water management, drinking water supply, irrigation and drainage system management, forestry management, civil emergencies and rescue

Annex B:

FRM Measures of regional or national actors

Abbreviation of national and regional actors

P	Prefecture
Q	Regional Council of Shkodër (Qark)
DB	Drainage Board
A_{RB}	River basin agency
A	Agencies
D_A	Directorate of Agriculture
D_R	Regional directorates
HP	HPP (KESH, ASHTA)
CC	Construction Companies
M	Ministries
NB	National bodies

No.	Type of Measure	Measures	Responsibility	Priority
1.	**Aspect: Prevention of risks**			
1.1.	**Administrative Instruments (for avoidance of risk)**			
1.1.1.	Mapping of flood risk areas	• Development and distribution of flood risk maps on regional scale	P, Q	1
		• Instructions for the use of risk maps in the community centres in the whole region	P, Q	1
		• Information campaigns (distribution of leaflets to the population) about flood risks, measures to be taken and flood emergency response (including public and private precautionary measures)	P, Q	1
1.1.2.	Restriction for building in risk areas (in spatial planning / urban planning)	• Review of existing local and regional urban development plans and integration of flood risk aspects	Q	3
		• Systematic communication with communes about developments in flood risk areas	P, Q	1
		• Support of communes in fighting against illegal constructions in risk areas	P, Q, State Institute of Environment, Forest and Waters	1
		• Distribution / explanation of risk areas to urban planners (seminars, university lectures workshops)	P, Q, DA	1
		• Support inhabitants, who had built illegal constructions, to move from flood risk areas.(information, consultation, support in finding land)	P, Q	3
1.1.3.	Protection of the flood plains and retention areas	• Draw and establish specific monitoring / controlling rules and sanctions for each district	A_{RB}	2
		• Identification of retention areas	P, DB, A_{RB},	1
		• Preparation of concrete projects and protection measures for each LGU and area together with technical experts or institutions	Q, DB, A_{RB},	2
1.2.	**Adaptation of Land Use (for avoidance of risk, removal or relocation and reduction of risk)**			
1.2.1.	Adaptation of existing land use in flood risk areas (including agriculture and forestry)	• Coordination of the assessment / validation of the situation for the assets at risk and decision on adaptation measures for each LGU	P, D_B, A_{RB}, D_A,	1
		• Development of projects for adaptation of land use in risk areas.	Q, A_{RB}, D_A	2
		• Conduct seminars, workshops promoting alternatives to urban development in flood safe areas	P, Q	1
		• Identify and define specific areas for concrete interventions for forestry, life stock farming and grazing land, cultivation areas etc. (projects with specialised authorities)	Q, D_A, Regional Directorate of Forest	2

No.	Type of Measure	Measures	Responsibility	Priority
		• Consult and inform communes and farmers to perform changes in planting structures by introducing spring crops and giving up land use during flood season	D_A, Regional Directorate of Forest	1
		• Digitalisation of data / backup of data about cultivated crops and land suitability	Q, D_A	1
		• Establishment of bigger farms (higher efficiency) to ensure implementation of agricultural policies.	D_A	3
1.2.2.	Adaptation of constructions and infrastructure in risk areas (flood adapted planning and building)	• Create a new concept for the adaptation of new construction as well as the corresponding infrastructure in risk areas	Q	3
		• Draw new legislative regulations in coordination with respective ministries (for new roads, structural and urban adjustments, construction of new facilities)	National Government	1
		• Concrete projects and their approval	Q	3
		• Organizing seminars, workshops at regional, national and local levels to determine constructions models	P, Q	1
		• Setting new standards for building or equipping them to adapt to risk zones	National Government	1
		• Ensure that roads and bridges above maximum level of floods	National Government	1
1.2.3.	Consultation of agriculture and forestry for awareness-raising	• Common agriculture and forestry workshops on flood risk and risk reduction with the municipalities facing the same nature of risk	P	1
		• Seminars and meetings with individual municipalities for specific potential risks	P, Q	1
		• Conclusions and definition of concrete measures for intervention	P, Q	1
1.3.	**Risk prevention by flood adapted building**			
1.3.1.	Flood adapted handling for water imperilling substances	• Identification of European standards for the protection specifications, identify their suitability for specific terrain areas at risk	P, Q	1
		• Design projects for intervention by a short-term, medium-term and long-term time frame	P, Q	2
		• Education of farmers about storage and packing of fertilizer	D_A	1
2.	**<u>Aspect</u>: Natural Flood Protection**			
2.1.	**Natural flood management, water flow regulation** (in coordination with river basin management / Water Framework Directive)			
2.1.1.	Revitalisation of river beds and river banks / former flood plains	• Interventions in the Buna River, Kir and Gjadër, mainly in the areas of Sub-Shkodër	DB	2
		• Design technical projects of interventions	D_A	2

No.	Type of Measure	Measures	Responsibility	Priority
		• Planting of riverside areas with appropriate vegetation to protect riverbanks and ensure water flow	D_A	2
		• Engineering / hydrological surveys outlining special protection measures (focus on the actively eroded areas such as, Darragjat, Shirq-Mushan, Dajç, Samrish i Vjetër and Rrushkull)	DB, ARB	2
2.1.2.	Changing of river courses and slope conditions	• Identification of potential deviations in the rivers Drin and Buna	DB, A_{RB}	1
		• Design technical projects of interventions (see Mott MacDonald study: improvement of discharge capacities at Murtemza collector and direction south of the area)	DB	2
		• Organisation of workshops or seminars with the participation of foreign bodies on the necessity of implementing these projects and determining points of river diversion intervention	P, Q	1
		• Measures to ensure water flow or to increase the river discharge capacity (e.g. by extension); especially at - Drin River (Ganjollë village to Ashta HP, - Kir River and - Buna River (Samrisht i vjetër, Dajç and Shirq)	P, DB, A_{RB}	2
		• Carry out riverbed interventions (reduction of sediments in riverbeds)	DB	2
2.1.3.	Protection of zones along river banks	• Identify risk areas according to the respective municipalities	DB	1
		• Regional and local meetings for setting such interventions	P, Q	1
		• Design technical projects of interventions	DB	2
		• Preservation and enhancement of forestry vegetation (willows, acacias, etc.) to reduce erosion over embankments due to river activity	Regional Directorate of Forest	3
		• Protection of river bank areas / prevention of constructions and land use	DB, A_{RB}	1
2.1.4.	Support of the development of natural floodplains	• Identification of existing and recent natural floodplains	A_{RB}, D_A	1
		• Design projects to protect and reactivate former natural flood plains	A_{RB}, D_A	2
		• Organise regional and local seminars for determining specific areas for intervention	P, Q	1
		• Enhance forest vegetation in this area, by planting water-loving seedlings with strong rooting system, such as reeds, willows, acacias, etc.	D_A, Regional Directorate of Forest	3
		• Development of vegetation plan	D_A, Regional Directorate of Forest	1

No.	Type of Measure	Measures	Responsibility	Priority
2.1.5.	Modified extensive river maintenance	• Planning of interventions and systematic periodic maintenance determined by the intervention	DB	1
2.1.6.	Disconnection / Removal of pavements in urban areas / Rainwater management	• Determination of specific points of intervention by the heads of LGUs	DB	1
		• Preparation of such projects and their approval	DB	2
		• Forecasting the draft budgets of LGUs for such interventions	Q	1
2.2.	**Reactivation of retention areas** (Runoff regulation / water flow regulation)			
2.2.1.	Deconstruction a dike or dam	• Identify the barrier in the riverbeds of Kir, Drin and Buna. Develop specific projects to deconstruct them.	DB, A_{RB}	1
2.2.2.	Setting back dikes			
2.2.3.	Removal of an artificial bank			
2.2.4.	Connection of a retention-relevant terrain (e.g. back waters, old river arms)	• Identify / define the areas likely to be flooded in cooperation with LGUs and determining the levels of beds, see also 1.1.1	P, Q, DB, A_{RB},	1
3.	**<u>Aspect:</u> Technical Flood Protection**			
3.1.	**Water Flow Regulation / Flood plain works** (Retention measures)			
3.1.1.	Construction of a retention pond			
3.1.2.	Creation of a retention polder			
3.1.3.	Restoration, expansion or improvement of existing retention systems (dams, ponds, polders)	• Cleaning up and expansion of Viluni, Murtemza and Domni channels. Setting up of a normal water flow along the channel to rapidly remove the collected water from Dajç and Bushat	DB	1
3.2.	**Water Flow Regulation / Channels** (Dikes, Dams, Flood Walls and Mobile Flood Protection)			
3.2.1.	Flood protection works (dike, dam or flood wall)	• Systematic identification of gaps in the dike system and demands for improvements	DB	1
		• Construction of dams / embankments: - Kir River: areas of Rrethina and Guri i Zi - Buna River: area of Dajç, Ana e Malit, Bërdicë e Mesme (see Medium Term Flood Mitigation Solutions, Mott MacDonald, 2012a) - Area of Cas: Velipojë - Drin River: area of Berdicë and Gur i Zi	DB	3
		• Develop specific intervention projects	DB	3
		• Construction of bypass in the western part of Shkodër city (see also 3.2.2.)	National Government	3

No.	Type of Measure	Measures	Responsibility	Priority
		• Taking necessary measures to avoid the damage of land in the axis Ganjolle-Vukatane-Kuc, due to deviation of the Drin River bed from construction of Ashta hydropower plant	P, DB	3
		• Assessment on details for possible dam / dike at the east side of the settlement of Cas (additional dam with a commanding gate nearby the water pump of Cas (hidrovor), where about 30 houses were flooded during the Dec. 2010 flood event.). Surface elevation with regard to protection of existing houses	DB, M	3
3.2.2.	Strengthening of existing flood protection works	• Systematic assessment of protection works (dikes, dams) regarding safety and structural condition; identification of deficits	P, DB	1
		• Strengthening of current embankments in Ana e Malit, Dajç, Guri i Zi, Rrethina (in the riverbeds of Kir and Buna)	P, DB	2
		• Bypass of Shkodër requires intervention to complete construction (see also 3.2.1.)	P, Q	1
		• Reconstruction of Buna River embankment (15 km length) capturing the area from Pentar down to Pulaj	DB	2
3.2.3.	Adoption of a mobile (stationary) flood protection system			
3.2.4.	Drainage in diked area and backflow protection	• Strengthening the current pumping stations in the municipality Velipojë (Cas, Plazh), Ana e Malit and Shkodër	DB	3
		• Maintenance of drainage channels, especially in the Murtemza passage and upstream Viluni Lake	DB	1
3.3.	**Water Flow Regulation / Channels** (Measures in the rivers / river training)			
3.3.1.	Keeping clear cross-sections in settlement areas	• Cleaning / maintenance (removal of sediments and waste, extension of the riverbed, etc.) of: - Buna River: e.g. Shirqit, Dajç and Samrisht - Drin River: e.g. upper course of Ashta HP - Kir River, Gjadër River and - First (second) level of drainage channels	P, Q	3
		• Design plans for intervention	DB, A_{RB}	3
		• Cleaning and enlargement of Viluni Channel (length: 9 km) (see Mott MacDonald, 2012a)	DB	2
3.3.2.	Removal of bottlenecks / narrow passages in rivers	• Removal of obstacles to the rivers Buna (e.g. nearby Belaj) and Kir to manage water flow	DB	1

No.	Type of Measure	Measures	Responsibility	Priority
		• Follow-up on measures from the Mott McDonald Study (with regional and national actors, e.g. SEA); Further assessments and follow up of possible actions; e.g.: - Improvements in the Murtemza passage - Improvements in the channels on the west side of Trushi field	DB	1
3.3.3.	Construction and strengthening of a bypass channel	• Further discussion on additional measures from the Mott McDonald Study	P, Q, DB, A_{RB}	3
		• Revitalisation of old flow cascade of Dirni River	DB, A_{RB}	3
		• Opening of Urrela channel for higher discharge	DB, A_{RB}	3
3.4.	**Surface water management** (Measures of urban water management)			
3.4.1.	Rain water management			
3.4.2.	Development of a municipal retention system (e.g. rainwater storage canal)			
3.4.3.	Flood-adapted improvement of a drainage system (e.g. bar screen, non-return flap)	• Develop technical projects on cleaning the drainage channels	DB	2
3.5.	**Protection of object / facilities**			
3.5.1.	Object / Facility protection of individual buildings			
3.5.2.	Object / Facility protection of infrastructure facilities (e.g. transport nodes, switching and branching systems)	• Heightening / reinforcing main roads and also bridges in Bërdicë	Q	3
3.6.	**Other protection measures**			
3.6.1.	Improvement of the storage management of dammed river systems / reservoirs	• Improve the current regulations, instructions for Hydro Power Plants (HPP) and Reservoirs	National Government[14]	
		• Introduction of new standards for communication (exchange of information in situations of heavy rainfall)	National Government	
		• Early warning of discharge and notification of appropriate structures and community at risk	National Government	
		• Training and seminars on rules of discharge and critical levels with head of HPP, LGUs	National Government	

[14] Ministry in charge for Energy

No.	Type of Measure	Measures	Responsibility	Priority
3.6.2.	Protection against seepage and ground water			
4.	**Aspect: Preparedness and information**			
4.1.	**Economical / financial preparedness**			
4.1.1.	Financial precautions by reserves and insurances (insurance against natural hazards)	• Calculation and approval of budgets earmarked for unforeseen emergency interventions for Prefecture, Qark, LGUs and the respective departments	P, Q, LGUs, Line Ministries	1
		• Calculation and adoption of emergency funds, which are used only in emergency situations	P, Ministry of Internal Affairs	1
		• Control and continuous monitoring by prefecture for each institution and LGU	P	1
		• Clarification, development and promotion of disaster related insurances; promotion and consulting of the public regarding insurances	P, Ministry of Internal Affairs	1
		• Develop / offer contract based insurance services for damages through insurance operators; raise awareness of insurance needs for the inhabitants	Insurance companies	1
4.2.	**Informational preparedness**			
4.2.1.	Improvement of flood forecast and flood warning / messaging	• Establishment of a flood warning system in the river basin of Drin-Buna, River Kir, Gjadër, reservoirs, Lake Shiroke, Fierzë Koman for making flood warning information available	P	1
		• Pre-warning / early information on planned water release (opening of spillways) from KESH to the regional / communal actors; setting up and agreement on a warning and communication plan	P	1
		• Establishment of operating room to monitor the situation and collect data on Prefecture level	P	1
		• Data collection for flood forecast for different locations; improvement of information management (like forecast, preventive measures, disaster control) regarding the central coordinators and local community	P	1
		• Preparation of such projects to the amount, type and location of the deployment of these instruments in cooperation with foreign organisations or specialists of ministries or regional departments	P	1
		• Update alarm and warning plans and of contact lists	P	1
		• Regular determination of the order of information and update it continuously depending on demographic shifts, changes in structures or institutions	P	1

No.	Type of Measure	Measures	Responsibility	Priority
4.3	**Behavior-related preparedness**			
4.3.1.	Publication of flood hazard and flood risk maps close to the spot	• Make flood hazard and flood risk maps available to public (inform the community via print and visual media or develop an informative bulletin based on digital database for 24-hours situation in the Prefecture area)	P	1
4.3.2.	Continuing advancement of awareness raising and publicity	• Organisation of periodical trainings and seminars with experts, institutions, communities, universities, students, NGOs operating in this field in the regional and national level	P, Q	1
		• Organisation of stakeholder related and public conversations / discussions about these topics in the local media	P, Q	1
4.4	**Allowance, preparation and post-processing of hazard control**			
4.4.1.	Alignment or optimization of alert and operation schemes (disaster management schemes)	• Organisation of regular information and systematic surveys of all institutions, by their roles, for each river flow, reservoir, lake, etc.	P, Q	1
		• Determine the choice of the measurements with responsible bodies and timely information relevant authorities, on the basis of a previously prepared form or standardized	P, Q	1
		• Determining the legal liability on the basis of a form of notice to the relevant and responsible bodies in cases of discharges by reported real figures of the amount of water discharged	P, Q	1
		• Compilation of relevant data and database update according to occurring flood events	P, Q	1
		• Administration of the database at the Prefecture and distribution to each regional directorate and each LGU (especially the part which is by law in each respective domain or jurisdiction)	P, Q	1
4.4.2.	Civil Protection	• Develop “warn, alarm, preparedness and disaster management plans” with concrete scenarios according to specific areas at regional level and LGU	P	1
		• Review and update the warn and alarm plans at prefecture level and each regional directorate on a regular basis, e.g. every 12 months (D_R, Police, Army, DB, A_{RB}, Forestry, Agriculture, regional and rural roads)	P	1
		• Cooperation with the monitoring structures	P	1
		• Preparation of training plans for concrete scenarios related to former flood events (participation of all operating structures of the district and also the structures corresponding to neighbouring areas / countries)	P, LGUs	1

No.	Type of Measure	Measures	Responsibility	Priority
4.4.3.	Collection and analysis of experiences concerning flood events	• Develop a database (program – prior art) for data collection of each type of flood risk (according to the specifications of each area)	P, Q	1
		• Use of computerised forms including all relevant data and specifications for each type of risk	P, Q	1
		• Documentation of damage information (type, amount, duration, manner of providing information, intervention measures)	P, Q	1

Annex C:

Emergency Response Plan Scheme

1	RISK SITUATION						
Emergency Situation / Risk				**Risk Situation**			**Priority**
No.	Object	Location	Risk from water level ([m] a.s.l.)	Risk / potential damage	Contact / Person	Communication (how/when)	Priority (1-2-3)
	Type of object as named in risk map / All objects at risk shown in the risk map that might be important for emergency situation / damage / life	*Village oder street name, specify as much as necessary to identify the object*	*Damage / risk start when the water level reaches the hight of [... Meterabove Sea Level] or: = hight of object; if not know: leave empty*	*describe what happens in case of flood, damages, endagerd lifes (people and animals) and goods; danger for infrastruture functions etc.;* *e.g. water enters the houses, xx Persons endagered, water supply endagered, risk for lifestock (xxx no.) etc.*	*Person that cares for the object; housekeeps, oweners, etc.;* *can be more than 1*	*communication details for the persons named in colum before*	*how important is the object compared with others?*
1	SITUATE RREZIKU						
Situatë emergjence / Rreziku				**Situatë rreziku**			**Prioritetet**
Nr.	Objekti	Vendndodhja	Niveli i objektit te rrezikuar nga niveli i detit ([m] a.s.l.)	Rrezik/ dëm i mundshëm	Kontakti / Personi	Komunikimi (si/kur)	Priority (1-2-3)
	Lloji i objektit siç emërtohet në hartën e rrezikut / Të gjitha objektet në rrezik treguar në hartën e rrezikut që mund të jenë të rëndësishëm në gjendjen e emergjencës / dëmit / jetës (të tilla si shkolla, shtëpi, magazina, dyqan)	*Emri i fshtatit, emri i rrugës, specifiko sa me shume te jete e mundur qe objekti te idetifikohet qarte*	*Demi / rreziku nis kur niveli iujit arrin ne nivelin ne metra [... Mbi nivelin e detit] ose: = lartesine e objektit; nese nuk e dini lereni bosh*	*Peshkruaj cfare ndodh ne rast permbytje, demi, rreziku per jeten (njerez dhe kafshe) dhe te mira materiale; dem ne infrastrukture, etj..;* *p.sh. uji futet ne shtepi, xx persona demtohen, ujesjellesi demtohet, dem ne bageti (xxx nr.) etj.*	*Personi qe kujdeset per objektin; familjare, pronare, ej. Mund te jene me shume se 1*	*Detajet e komunikimit per personin e shenuar ne kollonen paraardhese (telefon, email, adrese)*	*sa i rëndësishme është objekti në krahasim me të tjerët në këtë lisë?*

2	WARNING, INFORMATION (Description of szenarios and alarm indicators)						
Flooded area	Event (Medium / Extreme)	Indicators upstream ("alarm")	Location / comment	Observed by	Information transferred to / requested by	Information channel (Telefon, E-Mail, SMS, www etc.)	Timing / forcast time (hours left)
2	PARALAJMERIM, INFORMACION (Përshkrim i skenarëve dhe treguesit e alarmit)						
		Informacion mbi indikatorin					
Zona e përmbytur (Mund te jete nje fshat, lagje, kryqezim rruge, fushe)	Dukuri (Mesatare / Ekstreme) Bazuar ne harten e rrezikut qe ka njesia	Indikatorët mbirrjedhë ("alarm") Mund te jete shkarimet, reshje te dendura, prurje uji	Vendndodhja (E indikatorit, si psh shkarkimet nga diga e vaut te Dejes, ose prurjet sipas stacionit ne Valbone)	Vëzhguar nga (Mund te jete autoritet i caktuar ose nje person i caktuar)	Informacioni i marre i transferohet / kerkohet nga (Kush e ka informacionin dhe kujt ia apo duhet t`ia transferoje)	Kanali apo mjeti i perdorur per informim (Mund te jete emer dhe telefon apo emer dhe email, sa me qarte dhe direkt)	Koha / koha e parashikuar qe ngjarja te ndodhe **(orët)** (Vendos kohen maksimale dhe minimale ose parashkimin me te mire, nga koha kur merret informacioni deri sa ngjarja te ndodhe)

3

3a MEASURES / ACTIONS

Measures / Actions

Protection measure (description)	Evacuation measure (description) EVACUATION POINT	Restriction / closure (descrioption)	Responsible	Involved Org. / persons	Timing [h]
what can be done to protect the object from floods? Can the persons at the object protect the object with sandbags, or with wood to close doors or windows (if prepared); where is the nescessary equipment stored? Have oil tanks etc to be protected / fixed not to fload? See leaflet for protection measures.	*If protection is not sufficient: what should be evacuated on a voluntary base by the owners (or responsible persons): People, Cattle, furniture, equipment etc.,* *WHERE shall the object be evacuated to? Please be priceise; use more lines if helpful.*	*What should be closed, shutz down or signed? Closure of roads? Sign dangerours buildings or areas? Shut down electricity supply? Shut down wells or water supply? Etc.*	*Person / persons who have to decide on the measures and who have to koordinate the measures. Normaly the responsible (contact) person as named before, but can also be someone else.*	*Who is needed to support the measures? If not known who exactly please name the number of persons to support the activity.* *Is special support of another organisation required?*	*How long does it take to complete the activity (estimation)? Start to completion (hours)*

3

3a MASA / VEPRIME

MASA / Veprime

Masë mbrojtëse (përshkrimi)	Masa evakuimi (përshkrimi) Pikat e evakuimit	Kufizime / mbyllje (përshkrim)	Pëgjegjës për veprimet	Organizata e perfshira / personat	Koha
çfarë mund të bëhet për të mbrojtur objektin nga përmbytjet? Mundet që personat në objekt t'a mbrojnë objektin me thasë rëre, ose me dru për të vulosur dyert apo dritaret; ku është pajisja e rëndësishme që duhet ruajtur? A ka depozita të naftës, etj. që të mbrohen / fiksim i tyre që të mos plluskojnë? Shih fletëpalosje për masat e mbrojtjes.	*Nëse mbrojtja nuk është e mjaftueshme: çfarë duhet të evakuohet në një bazë vullnetare nga pronarët (ose personat përgjegjës): Njerëzit, kafshët, mobilje, pajisje etj,* *KU duhet evakuohen ? Ju lutemi jini preciz; përdorin më shumë rreshta nëse është e dobishme.*	*Çfarë duhet të jenë të mbyllura, mbyllen ose nënshkruhen? Mbyllja e rrugëve? Markimi i ndërtesave apo zonave që rrezikohen? Stakimi i furnizimin me energji elektrike? Mbyllen puset dhe furnizimin me ujë? Etj*	*Personi / personat që marrin vendime për të vendosur mbi masat dhe të cilët duhet të koordinojnë masat. Normalisht personi përgjegjës (kontakti) ai i shënuar më parë, por mund të jetë dikush tjetër.*	*Kush është i nevojshëm për të mbështetur masat? Nëse nuk dihet kush saktësisht ju lutem emrin e numrit të personave për të mbështetur aktivitetin.* *Është e nevojshme mbështetja e veçantë e një organizate tjetër?*	*Sa kohë duhet për të përfunduar aktivitetin (vlerësim)? Nga fillimi i veprimit deri në përfundimit (orë)*

3b PRIO	3c SUPPLY NEEDS 3			
Priority	**Supply Needs**			
Priority (1-2-3)	Supply needs			
	Water	Food	Electricity	Medical care
order in which the activities shall be completed; reflect importance of object AND required time	*after fullfilling the protection / evacuation measures: are persons of cattle caught by floods? Do they need to be supplied with water?* *If so, where from, who organises it, who takes care of coordination? How is the supply done? Are roads / boats nescessary? are they available?*	*see Water, here same for food;* *Think of persons AND Animals / cattle.*	*see Water, here same for food;*	*see Water, here same for food;*
3b PRIO	**3c NEVOJA PER FURNIZIME 3**			
Priority	**Nevojë për furnizim**			
Prioritet (1-2-3)	Nevojat pë furnizime			
	Ujë	Ushqim	Energji elektrike	Kujdes shëndetësor
rendin në të cilën aktivitetet do të ushtrohen; pasqyrojnë rëndësinë e objektit dhe kohën e kërkuar	*pas plotësimit të mbrojtjes / masat e evakuimit: janë personat apo bagëtia prekur apo izluar nga përmbytjet? A kanë ata nevojë të furnizohen me ujë?* *Nëse po, ku nga, cili e organizon atë, cili kujdeset për koordinimin? Si bëhet furnizimi? A janë rrugët / varkat e nevojshme? janë në dispozicion?*	*shikoni Ujin, këtu njëjtë për ushqimin;* *Mendoni për personat dhe kafshët / bagëtinë.*	*shikoni Ujin, këtu njëjtë për energjinë.*	*shikoni Ujin, këtu njëjtë për kujdesin shëndetësor.*

4 ACTIVITY AFTER DISASTER EVENT

No.	Measure / Activity	Location	Description	Involved Org. / Pesons	Responsible / contact	Communication (how/when)	Priority (1-2-3)

4 AKTIVITETE PAS KATASTROFES

Nr.	Masa / Aktiviteti	Vendndodhja	Përshkrimi	Organizatat/ personat e përfshirë	Personi përgjegjës /i kontaktit	Komunikimi (si/kur)	Prioritet (1-2-3)

Contact list - Information Chain

Involved Organisations/Person

Organisation (Institution)	Persons (Names)	Contact data	Comments

Lista e kontakeve - Zinxhiri i informacionit

Organizatat/personat e përfshirë

Organizata (Institucioni)	Personat (Emrat)	Të dhënat e kontaktit	Komente

Annex D:

Catalogue of Measures

Flood Risk Management Planning (FRM) SHKODËR REGION
(in accordance with the types of measures; EU guidance document no. 29-2013,
in the framework of the EU-Floods Directive 2007/60/EC)

No.	Measures	Description	Competences*
1.	**Aspect: Prevention of risks**		
1.1.	**Administrative Instruments (for avoidance of risk)**		
1.1.1.	Mapping of flood risk areas	• Mapping of areas with flood risk (low, medium, frequent floods) • Public notice on maps and active information by the relevant municipality	Water Management, Regional Agencies; Communes
1.1.2.	Restriction for building in risk areas (in spatial planning / urban planning)	• Publishing of risk areas / risk maps for urban planners and housing permissions • Fixing protection areas to prevent constructions in risk areas (e.g. priority and reserve zones)	Spatial planning Agencies, Municipalities
1.1.3.	Protection of the flood plains and retention areas	• Restrictions and regulations for land use in flood plains that might cause new risks or that cause negative effects for flooding or run off • Determination and publication of retention areas. • Protection by restrictions for buildings	Water Agencies, municipalities
1.2.	**Adaptation of Land Use (for avoidance of risk, removal or relocation and reduction of risk)**		
1.2.1.	Adaptation of existing land use in flood risk areas (including agriculture and forestry)	• Systematic assessment of assets at risk • Development of adapted land uses in risk areas • Promotion of alternatives for urban development in flood safe areas • Adaptation of land uses and objects at risk by precautionary measures, protection works, changes in land use or changes in maintenance / operation • E.g. medium-term conversion of arable land in permanent green grassland, change of production methods (e.g. conservation soil cultivation) and of machine use	Municipalities, River Management Organisations
1.2.2.	Adaptation of constructions and infrastructure in risk areas (flood adapted planning and building)	• Inclusion of measures of the flood-adapted construction and facility protection • Retention of water in urban and rural areas. • Flood-safe construction of transport infrastructure (e.g. raising, protection walls, switchgears) • E.g. water and pressure resistant windows in flood standard, flood resistant facades, flood adapted room use in living quarters (avoiding damage causing use of cellar rooms), supporting parts of buildings	Municipalities, Local Planning Agencies, Operators of Infrastructure etc.
1.2.3.	Consultation of agriculture and forestry for awareness-raising	• E.g. status analysis, targeted advice for agriculture and forestry for sustainable management, public information events	Water Agencies, relevant Authorities

No.	Measures	Description	Competences*
1.3.	**Risk prevention by flood adapted building**		
1.3.1.	Flood adapted handling for water imperilling substances	• E.g. storage and handling according to respective technical guidelines	Operator of Facilities, Principals
2.	**Aspect: Natural Flood Protection**		
2.1.	**Natural flood management, water flow regulation** (in coordination with river basin management / Water Framework Directive)		
2.1.1.	Revitalisation of river beds and river banks / former flood plains	• E.g. Bank flattening, structuring of the river shores, removal of reinforcement constructions • Installation of nature oriented river beds • Development of site-typical vegetation in and at the water	Responsible, Municipalities / Organisations
2.1.2.	Changing of river courses and slope conditions	• Changing of river courses corresponding to the morphological approach (e.g. branched, meandering) • Mere demand of an initial channel with an initial lock, excavation masses suitable for raising the bed section	Responsible, Municipalities / Organisations
2.1.3.	Protection of zones along river banks	• Classification and local marking of a bank border strip • Securing of a water compatible use or an entire abandonment • Support for nature-oriented water body development	Responsible, Municipalities / Organisations
2.1.4.	Support of the development of natural floodplains	• Site-appropriate agriculture and forestry along rivers • Extensive use of the floodplains, leaving them for natural succession	Municipality, Agriculture, Forestry
2.1.5.	Modified extensive river maintenance	• Adequate river maintenance with reference to environmental aspects (e.g. equipment choice, consideration of spatial and temporal aspects)	Municipality, Water Management
2.1.6.	Disconnection / Removal of pavements in urban areas / Rainwater management	• Parking spaces / footpaths can be conducted permeable for water (e.g. with gravel or rubble surface) • Rainwater can be collected and superficial drained in ground depressions	Municipality, Water Management
2.2.	**Reactivation of retention areas** (Runoff regulation / water flow regulation)		
2.2.1.	Deconstruction a dike or dam	• Deconstruction of old dikes or dams, which do not fulfil their intended use or were no longer required	Municipality, Water Management
2.2.2.	Setting back dikes	• Construction of a new dike in the interior and complete deconstruction of old dikes • Principle: Replace dikes in front of the protectable object instead of right at the river bank, create retention area	Municipality, Water Management

No.	Measures	Description	Competences*
2.2.3.	Removal of an artificial bank	• Reactivation of originally existing flood areas, which have been raised flood-free by constructions in the past; lowering the banks if possible	Municipality, Principal
2.2.4.	Connection of a retention-relevant terrain (e.g. back waters, old river arms)	• Reactivation of potentially natural flood areas by rising the base or installation of ground sills formed as bed pitches • Planting of water adapted forest which causes an increase of the water level at that cross-section but opens additional retention area for the river system	Municipality, Organisations
3.	**Aspect: Technical Flood Protection**		
3.1.	**Water Flow Regulation / Flood plain works** (Retention measures)		
3.1.1.	Construction of a retention pond	• Construction of a (small) retention pond: dam and pond in or along a river	Municipality, Water Man.
3.1.2.	Creation of a retention polder	• Construction of a retention polder in former flood plain, with inlet and outlet structures, to be flooded and operated in flood situations	Municipality, Water Management
3.1.3.	Restoration, expansion or improvement of existing retention systems (dams, ponds, polders)	• E.g. Strengthening of the retention system and / or rising or extension of the dams, restoration of main plant components to rise the hydrological effectiveness • Operational improvement, control optimization and technical optimization of the whole system	Municipality, Water Management
3.2.	**Water Flow Regulation / Channels** (Dikes, Dams, Flood Walls and Mobile Flood Protection)		
3.2.1.	Flood protection works (dike, dam or flood wall)	• Protection of risk objects or areas by dikes, dams or flood walls	Municipality, Water Man.
3.2.2.	Strengthening of existing flood protection works	• Strengthening or heightening of dikes, dams or flood walls based	Municipality, Water Man.
3.2.3.	Adoption of a mobile (stationary) flood protection system	• Mobile and stationary flood protection system (stocking and setting up in the event of a flood) • In accordance with an disaster action plan, regular trainings of the emergency services	Municipality, Water Management
3.2.4.	Drainage in diked area and backflow protection	• Construction and strengthening of appropriate pumping stations; backflow protection systems as punctual interferences	Municipality, Water Man., Civil Protection
3.3.	**Water Flow Regulation / Channels** (Measures in the rivers / river training)		
3.3.1.	Keeping clear cross-sections in settlement areas	• Clearance of the river section from vegetation or sedimentation	Municipality, Civil Protection
3.3.2.	Removal of bottlenecks / narrow passages in rivers	• Physical removal of obstacles and narrow passages by river profiling / alternative bank reinforcements	Municipality, Water Man., Civil Protection
3.3.3.	Construction and strengthening of a bypass channel	• Construction of a bypass channel in areas of lower restriction by utilizing historical water courses	Municipality, Water Man., Civil Protection

No.	Measures	Description	Competences*
3.4.	**Surface water management** (Measures of urban water management)		
3.4.1.	Rain water management	• Assessment and adaptation of the local rainwater collection / retention strategies • Preparation of information material	Municipality, Water Management
3.4.2.	Development of a municipal retention system (e.g. rainwater storage canal)	• Development of local retention systems, • Disconnection of rainwater pipes from the sewage • Construction of retention and infiltration ponds	Municipality, Water Management
3.4.3.	Flood-adapted improvement of a drainage system (e.g. bar screen, non-return flap)	• Development/ Improvement of flood safe local drainage systems, e.g. large valves in sewer systems	Municipality, Water Management
3.5.	**Protection of object / facilities**		
3.5.1.	Object / Facility protection of individual buildings	• Construction of dikes, dams or flood walls for facility protection (pressure-tight windows, displacement of concrete shells)	Municipality, Operators, Privates
3.5.2.	Object / Facility protection of infrastructure facilities (e.g. transport nodes, switching and branching systems)	• Construction of dikes, dams or flood walls for facility protection, strengthening of protection works, infrastructure relocation from flood risk areas	Municipality, Operators, utilities companies
3.6.	**Other protection measures**		
3.6.1.	Improvement of the storage management of dammed river systems / reservoirs	• Assessment and improvement of maintenance and operation concepts of reservoirs, uses of reservoirs and hydropower plants to increase retention effects • Communication with operators about their contributions to flood risk management • Increase retention volume / create additional retention volume by appropriate management concepts	Operator of storages and reservoirs
3.6.2.	Protection against seepage and ground water	• Accompanying measures for protection of existing buildings against ground and pressure water e.g. by protection wells and deep diaphragm walls, whereat building of protection wells is only allowed in exceptional cases and after an examination of aspects of groundwater protection	Municipalities, Organisations
4.	**Aspect: Preparedness and information**		
4.1.	**Economical / financial preparedness**		
4.1.1.	Financial precautions by reserves and insurances (insurance against natural hazards)	• E.g. generation reserve funds and / or contract insurances against damages due to natural hazards	Municipalities, property owners; upstream actors

No.	Measures	Description	Competences*
4.2.	**Informational preparedness**		
4.2.1.	Improvement of flood forecast and flood warning / messaging	• E.g. development of long-distance data transmission as well as optimization of data management and allocation in the internet • E.g. optimization of communication chain • Actualization of contact persons • Examination of signal levels, • Examination of local alert services • E.g. establishing new flood prediction models for river basins • Improvement of quality of predictions (particularly for small river basins) by optimization of precipitation discharge models and integration of additional metering or prediction data of precipitation • Linking precipitation discharge models to hydrodynamic procedures to determine and communicate the predicted and discharge specified water levels	Water Authorities, Organisations, meteorological services, river basin management
4.3	**Behavior-related preparedness**		
4.3.1.	Publication of flood hazard and flood risk maps close to the spot	• Publication of digital and analog data of flood hazard and flood risk maps to a raise of awareness and to change behavior in preparedness and in case of floods	Water Authorities, Municipalities, Organisations
4.3.2.	Continuing advancement of awareness raising and publicity	• Continuing advancement of awareness raising and publicity by allocation of digital and analog information (e.g. also by local visualization of expected water levels), as well as organization of symposia, workshops and advanced trainings	Water Authorities, Municipalities, Organisations
4.4	**Allowance, preparation and post-processing of hazard control**		
4.4.1.	Alignment or optimization of alert and operation schemes (disaster management schemes)	• Examination and actualization of existing alert and operation schedules among others by allocation of flood risk and flood hazard maps	Municipalities, Civil Protection and Emergency Services
4.4.2.	Civil Protection	• Examination and improvement of existing resource plans and crisis management systems by conduction of flood exercises, advanced training, definition of organisation structures • Setup of mobile protection dams and local warning systems for the population and allocation of infrastructure and material	Municipalities, Civil Protection and Emergency Services

No.	Measures	Description	Competences*
4.4.3.	Collection and analysis of experiences concerning flood events	• Central collection and editing of past flood events for analysis and eventually necessary optimizations of the flood risk management • The collection contains information of flood events (Photos, water levels, times, hydrological conditions) as well as information concerning damage to persons and property (e.g. on buildings and areas), a documentation of the operational commitment (process of flood risk prognosis and flood risk warnings, hazard control, Civil Protection) and an evaluation of the influence of technical flood prevention facilities (barriers, banks, dams, mobile constructions)	Water Authorities, Municipalities, Organisations, Civil Protection, Emergency Services, Residents

Annex E:

Regional flood risk map

Flood Risk Map Shkodra Region /
Harta e rrezikut nga përmbytjet, Rajoni Shkodër