Flood Prevention Map (FPM)  
for Leposaviq/Leposavić, Zveçan/Zvečan and Zubin Potok municipalities, northern Kosovo 

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(on request of the United Nations Development Programme (UNDP))  
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Executive Summary

An exceptionally mild winter with hardly any snow has triggered extremely heavy rainfalls during April 2014 and 2015. The rains have caused floods leading to significant infrastructure damage to several communities in Kosovo. According to the Hydrometeorological Institute of Kosovo (HMIK) April 2014 was the wettest month in recorded history, with 19 days of heavy rainfalls causing flash floods in a number of areas throughout Kosovo.

As a result of the heavy rainfalls northern Kosovo, especially the municipalities of Leposaviq/Leposavić and Zvečan/Zvečan, was heavily affected by floods. Luckily, the floods did not cause human victims; however, dozens of agricultural plots were affected, thus hindering normal planting process. The infrastructure was seriously damaged, especially bridges and roads. Their state has been significantly worsened during floods. In Zubin Potok municipality rainfalls caused a landslide, which blocked a significant local road.

Scarce technical and financial resources only increased vulnerability of these municipalities. The municipal authorities undertook all efforts to provide assistance to the people in need, to ensure communication and traffic between banks of the Ibër/Ibar River, and to clean, where possible, riverbeds of the Ibër/Ibar and its tributaries. Further efforts of the municipalities and international organisations were aimed at restoring the infrastructure and taking measures to protect population and their property from floods in future.

To assess the damage and their impact in these three municipalities UNDP, respectively section of Disaster Risk Reduction Initiative Kosovo has engaged external expert which in July 2014 has compiled a report.

This report was focused predominantly on comparing pre- and post-disaster situations and identifying gaps and weaknesses resulting from floods as such.

From evaluation of Expert stream that:
Floods in April 2014 in Northern Kosovo and, in particular, in three target municipalities, had a two fold impact on their normal life:
- Impact on the livelihoods through damage of agricultural land; and
- Impact on infrastructure, including damage of bridges and roads.

Although caused by heavy rainfalls, the floods would not probably have such serious consequences, if their impact would not have been amplified by human carelessness. It would not be a huge exaggeration to say that clogging up riverbeds by solid waste and wood and lack of elementary protective measures became eventually the secondary cause of flooding.

Flood is a recurrent emergency in northern Kosovo, which takes place almost every year and more or less in the same time of the year. Nevertheless, neither municipal authorities nor landowners seem to have learnt any lessons of preventive behaviour. As an eloquent example, similar breakdown of bridges of the same construction type happened as a result of floods in 2013, 2014 and 2015. Landslide in Zubin Potok, which luckily did not cause any human victims, although triggered by rainfall, was eventually a result of human miscalculation, poor design and absence of protective measures.

1 References to Kosovo shall be understood to be in the context of Security Council Resolution 1244 (1999)
According to the Expert, any consequences of floods could have been avoided if basic principles of safe behaviour had not been ignored.

He compared gives states: **Recommendations on flood prevention mainly include necessary measures that should be taken to physically prevent devastating impact of floods. Necessary preventive measures should be taken also at legislative level and in legislation enforcement. Other recommendations are related to general Disaster Risk Reduction measures, including improvement of institutional arrangements between central and municipal authorities and building culture of safety and resilience.**

Based on this evaluation UNDP has engaged experts within for the appraisal of all rivers that have flooded and has undertaken several activities:
- In 2014, the Soćanica/Sočanica river in Leposaviq/ć Municipality is regulated,
- In 2015 Vučanska river in Leposaviq/ć municipality and Banjska river in Zveçan/Zečan municality are regulated.

These activities have been undertaken in collaboration with the three municipalities Leposaviq/Leposavić, Zveçan/Zečan and Zubin Potok.

For compilation of this report is based on the Kosovo methodology for risk assessment and European Commission Staff Working Paper “Risk Assessment and Mapping Guidelines for Disaster Management”.

In this report are presented all rivers that have been flooded or have a potential that in the future may be flood land, houses, roads, bridges and other objects.

For each river that flooded surfaces are presented by category of risk (high risk, medium risk and low risk) as well as the causes of the flooding and recommendations for activities how to eliminate flooding.

In recent recommendations is a list of all the rivers which are divided according to municipalities. Rivers are ordered by priority. Priority is based on the damages that can be caused by a possible flooding.

The consultant has also introduced the map of anti-erosion activities that need to be taken in the river basins.

According to the laws in Kosovo stream that the flood protection programmes are the joint responsibility of the municipalities (urban areas) and the River Basin Units in other areas, coordinating as necessary with other stakeholder organizations. Primary responsibility for flooding in urban areas is the remit of Municipalities and Primary responsibility for flooding in the wider river basin is the remit of the River Basin Units (RBUs) (within the Ministry of Environment)

The consultant expresses his sincere gratitude to all interviewed officials in Kosovo, who provided him with comprehensive information and fair opinions. Special and warmest thanks go to Ms Zana Hoxha-Edip, Kosovo Disaster Risk Reduction Initiative (KDRRI) Project Manager in UNDP Kosovo and Dejan Antic, UNDP Project Officer whose assistance in preparation and conducting of this flood map was, without exaggeration, inval
I. INTRODUCTION

Background

An exceptionally mild winter with hardly any snow has triggered extremely heavy rainfalls during April 2014 and 2015. The rains have caused floods leading to significant infrastructure damage to several communities in Kosovo. According to the Hydrometeorological Institute of Kosovo (HMIK) April 2014 was the wettest month in recorded history, with 19 days of heavy rainfalls causing flash floods in a number of areas throughout Kosovo.

As a result of the heavy rainfalls Northern Kosovo, especially the municipalities of Leposaviq/Leposavić and Zveçan/Zvečan, was heavily affected by floods. Luckily, the floods did not cause human victims; however, dozens of agricultural plots were affected, thus hindering normal planting process. The infrastructure was seriously damaged, especially bridges and roads. Their state has been significantly worsened during floods. In Zubin Potok municipality rainfalls caused a landslide, which blocked a significant local road.

Scarce technical and financial resources only increased vulnerability of these municipalities. The municipal authorities undertook all efforts to provide assistance to the people in need, to ensure communication and traffic between banks of the Ibër/Ibar River, and to clean, where possible, riverbeds of the Ibër/Ibar and its tributaries. Further efforts of the municipalities and international organisations were aimed at restoring the infrastructure and taking measures to protect population and their property from floods in future.
**Purpose of the mapping**

After a natural disaster, the essential task is to assess the consequences of a specific event and compare the pre-disaster situation with the post-disaster reality. The assessment process seeks to identify and capture the needs of the people, the damages to physical assets and infrastructure arising from this event, and the subsequent economic losses caused by the event. Also the process is aimed at identifying the social and community level dimensions and sectorial aspects of recovery needs.

The purpose of this “Risk Assessment and Mapping of the Damage Prone Villages” (RAMDPV) was to have information:

- **On damages critical infrastructure (roads, livelihoods, emergency management buildings etc) which need urgent repair rehabilitatio**
- A report of which can be assigned a priority of protection against flooding, can plan short term and long term activity protection against floods.
- Also, the specific activities for each river in Leposaviq/Leposavić, Zvečan/Zvečan and Zubin Potok Municipalities

LPDNA (Local Post-Disaster Needs Assessment) as a part of Kosovo Floods Recovery Support project led by UNDP Kosovo, and encompasses at least two following recovery and reconstruction perspectives: (i) the evaluation of damages and losses to estimate economic recovery and reconstruction needs, and (ii) the identification of human impacts and organisational gaps the RAMDPV

It allows knowing the exact places where they are causing damage and activities that need to be taken to eliminate these damages and sets the river priority in which we have to intervene.

The RAMDPV focused on three target municipalities of Kosovo, namely Leposaviq/Leposavić, Zvečan/Zvečan and Zubin Potok, which have been identified as the most affected by floods in last years.

Conducting the RAMDPV required close interaction with the respective local municipalities to ensure an inclusive and participatory assessment of the local needs. Also, the RAMDPV included close cooperation with local inhabitants.
**Objectives and methodology**

The key objective of RAMDPV is to assist the municipal authorities:
- to be informed of the rivers which flood and damage the local infrastructure (road, livelihoods, emergency management buildings etc) and activities to be taken for protection against flooding of these rivers.
- To be informed of the river priority in which should be taken activities for protection against floods.
- For planning activities that need to be taken in the short term and long-term plans.
- For easier information for all rivers of the municipality which will ease planning in their territory.
  
  This is enabled by informations presented through GIS.

For the compilation of this report the expert is consulted with a lot of data obtained in the location in consultation with residents of the district, with the responsible persons in the respective municipalities, in different maps, different studies and researches. Then consultation with persons who are directly or indirectly involved in this field.

Among the main documents on which the expert was based are: “Risk Assessment and Mapping Guidelines for Disaster Management” dhe “Kosovo Flood Management Framework”

With the support of UNDP Kosovo the consultant undertook the data collection mission to Kosovo, including five field trips to affected municipalities in northern Kosovo. Consultant interviewed representatives from governmental agencies, municipal authorities, Hydrometeorological Institute of Kosovo, UNDP, IBER-LEPENC (hydrosystem) and MESP.

All received data and information were collated, reviewed, analysed for gaps and weaknesses and summarized according to the UNDP requirements and findings and outcomes are presented in this report.

Chapter I provides baseline data of three target municipalities, gives an overview of the disaster and response to it, describes situation development from time of disaster to the moment of report writing and compares the situation with lessons learnt from previous similar disasters.

Chaper II provides baseline dates for all riveres in three target municipalities, give overview of the rivers as area of the rivers, length of the streams and the map of the rivers network.

Chaper III provides general information on the causes of flooding and the types of flooding.

Charter IV provides information data of spots with highlighting for potentially damage in villages for each river of three municipalities, gives data for each river which is a potential for flooding as: risk category, the area threatened and infrastructurcal objects that are in that area. Also there are given the flood causes and recommendations for avoiding the flood. At the end of the report there is a summary recommendations given for each river and map of anti erosive activities to the three municipalities.
1. **Basic Statistical Data**

Picture 1. Leposaviq/Leposavić, Zveçan/Zvečan and Zubin Potok municipalities on Kosovo map

1.1. **Leposaviq/Leposavić municipality**

The municipality of Leposaviq/Leposavić is the northeast municipality in Kosovo. It covers an area of approximately 750 km² and includes Leposaviq/Leposavić town and 72 villages. According to the municipal administration the total population is estimated at 18,900 persons.

The whole territory of Leposaviq/Leposavić municipality is predominantly mountainous, with most of the settlements lying along the Iber/Ibar River and its tributaries in the valley and on the lower slopes.

The municipality borders with Zveçan/Zvečan, Mitrovicë/Mitrovica and Podujevë/Podujevo municipalities, although the longest border it has with Serbia (at the north, east and west).

The economy of Leposaviq/Leposavić municipality is mainly based on agriculture and small trade businesses. There is no reliable data on the number of registered businesses and number of people employed in private sector.

According to the OSCE municipal profile for Leposaviq/Leposavić municipality2, the overall status of infrastructure in the municipality of Leposaviq/Leposavić is assessed as poor. Roads, electricity and water supply are generally poor, although some renovations were made with international assistance.
1.2. Zvečan/Zvečan municipality

The municipality of Zvečan/Zvečan is located in northern Kosovo. It covers an area of approximately 122 km² and includes Zvečan/Zvečan town and 35 villages. According to the municipal website, the total population is estimated at 17 000.
Zveçan/Zvečan municipality borders with Zubin Potok, Mitrovicë/Mitrovica and Leposaviq/Leposavić municipalities and with Serbia in the west.

More than 60% of municipality’s territory lies on the altitude 500-600 m, other territories are lying lower along Ibër/Ibar and other rivers.

The economy of Zveçan/Zvečan municipality is mainly based on production of batteries and battery recycling, agriculture and small trade businesses. There are 117 registered private businesses operating in the municipality. There is no reliable data on the number of employed in private sector.

According to the OSCE municipal profile for Zveçan/Zvečan municipality, the overall status of infrastructure in Zveçan/Zvečan municipality is assessed as good. However, only 30% of the main roads connecting major villages with the urban centre are asphalted. Zveçan/Zvečan town and three out of 35 villages are connected to the Mitrovicë/Mitrovica regional water supply and sewage systems; other villages have their own water supply and sewage systems. All villages are connected to power supply system.

*Picture 3. Map of the Zveçan/Zvečan municipality*
1.3. **Zubin Potok municipality**

The municipality of Zubin Potok is located in northern Kosovo. It covers an area of approximately 333 km² and includes Zubin Potok town and 63 villages. According to the municipal administration, the total population is estimated at 14 900.

Zubin Potok municipality borders with Istog/Istok, Skënderaj/Srbica, Mitrovicë/Mitrovica and Zveçan/Zvečan municipalities and with Serbia in the north-west.

The economy of the municipality of Zubin Potok is mainly based on agriculture and small trade businesses. There is no reliable data available on the number of registered private businesses and people employed in private sector.

There are certain objects of technical risk on the area of the municipality: Ujman/Gazivoda water dam and power plant, Trans-European Motorway (E80) with a lot of traffic, including vehicles carrying hazardous materials.
According to the OSCE municipal profile for Zubin Potok municipality, the overall status of infrastructure in the municipality of Zubin Potok is assessed as good. All the main roads connecting major villages with the urban centre are asphalted. Zubin Potok town and villages are connected to water and sewage systems. Power supply is problematic, especially in remote villages.

*Picture 4. Map of the Zubin Potok municipality*
1.4. The Ibar River basin

The Ibar River that flows through eastern Montenegro, Serbia and Kosovo, with a total length of 276 km. The river begins in the Hajla Mountain, in Rozhajë/Rožaje, eastern Montenegro, then passes through Kosovo and flows into the West Morava River, Central Serbia, near Kraljevo.

It belongs to the Black Sea drainage basin. Its own drainage area is 8059 km², average discharge at the mouth 60 m³/s. The river is not navigable.

In its middle course the river passes through Ujman/Gazivoda reservoir and Zubin Potok municipality, reaching the city of Mitrovicë/Mitrovica. There it makes a sharp, elbow turn to the north flowing through Zvećan/Zvečan and Leposaviq/Leposavić municipalities, entering Serbia at the village of Donje Jarinje.
At Ujman/Gazivoda, the river is dammed, creating the artificial lake (area 11.9 km², altitude 693 m, depth 105 m). Right on its elbow turn, the Ibiër/Ibar receives its longest (right) tributary, the Sitnicë/Sitnica.

After its elbow turn and receiving the Sitnicë/Sitnica, the Ibiër/Ibar flows through rather narrow riverbed under the western slope of the Kopaonik Mountains. There it receives numerous tributaries coming from mountain slopes. The biggest of them are rivers Drini/Drenska, Tvrdjanska, Jošanička, Leposavska, Sočanicë/Sočanska, Bistricë/Bistrička, Vuçë/Vučanska, Banjska. During rainy season, which occurs usually in March-April and sometimes in November, the water flow in the Ibiër/Ibar increases and represents a hazard for low-lying areas.

Due to abundant vegetation on its banks and lots of solid nondegradable waste thrown in its water, the river in its narrow flow becomes very congested, thus forming “bottlenecks”, which contribute to flooding. In many places water washes soil away from the banks so that bigger trees fall into the water. They represent twofold hazard: i) increase water congestion, and ii) born by quick water flow they hit bridge pillars, which may lead to their cracks and even breakoffs.
2. Basic Statistics for hydro economic data

2.1. Zubin Potok municipality

The Zubin Potok municipality is characterized with a developed river network.

River Iber /Ibar is the main river of the municipality. This river goes in the middle of the municipality and it divides it nearly in two equal parts. Like it was noted above, in this river is built a dam forming the Ujman/Gazivoda lake.

All rivers that belong to the municipality flow in Iber/Ibar river. So, they are branches of this river.

All branches of this river have torrential characteristics, which means that the imbalance between the minimal and maximal quantity of water that river brings is big. These rivers are dangerous in the time when precipitations are big and last for a short time. Therefore, residents are not prepared and the damages are big, in humans, buildings and agricultural lands.

Ujman/Gazivoda lake controls Iber/Ibar river and other rivers that discharge directly in the lake. So, about the risk of flood from rivers, this municipality is safe.

The main characteristics of the biggest rivers of Zubin Potok municipality.

<table>
<thead>
<tr>
<th></th>
<th>River</th>
<th>Catchment area (km²)</th>
<th>Stream length (km')</th>
<th>Higher level (m)</th>
<th>Discharge level (m)</th>
<th>Slope (%)</th>
<th>Note (discharge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dragocevska r.</td>
<td>15.5</td>
<td>7.5</td>
<td>1380</td>
<td>600</td>
<td>10.4</td>
<td>In the lake</td>
</tr>
<tr>
<td>2</td>
<td>Vranovicke p.</td>
<td>2.9</td>
<td>2.3</td>
<td>870</td>
<td>600</td>
<td>11.7</td>
<td>In the lake</td>
</tr>
<tr>
<td>3</td>
<td>Banjski p.</td>
<td>2.7</td>
<td>2.4</td>
<td>980</td>
<td>600</td>
<td>15.8</td>
<td>In the lake</td>
</tr>
<tr>
<td>4</td>
<td>Varaska r.</td>
<td>17.2</td>
<td>9.0</td>
<td>1140</td>
<td>600</td>
<td>6.0</td>
<td>In the lake</td>
</tr>
<tr>
<td>5</td>
<td>Kusevski p.</td>
<td>5.6</td>
<td>4.8</td>
<td>900</td>
<td>600</td>
<td>6.8</td>
<td>In the lake</td>
</tr>
<tr>
<td>6</td>
<td>Mededi p.</td>
<td>3.0</td>
<td>2.8</td>
<td>910</td>
<td>600</td>
<td>11.8</td>
<td>In the lake</td>
</tr>
<tr>
<td>7</td>
<td>Lucka r.</td>
<td>44.4</td>
<td>10.7</td>
<td>1280</td>
<td>590</td>
<td>6.4</td>
<td>In Iber</td>
</tr>
<tr>
<td>8</td>
<td>Jagnjenicka r.</td>
<td>20.0</td>
<td>9.1</td>
<td>1130</td>
<td>550</td>
<td>6.4</td>
<td>In Iber</td>
</tr>
<tr>
<td>9</td>
<td>Cabrancski r.</td>
<td>3.3</td>
<td>2.3</td>
<td>810</td>
<td>539</td>
<td>11.8</td>
<td>In Iber</td>
</tr>
<tr>
<td>10</td>
<td>Brnjacka r.</td>
<td>33.1</td>
<td>9.7</td>
<td>1400</td>
<td>600</td>
<td>8.2</td>
<td>In the lake</td>
</tr>
<tr>
<td>11</td>
<td>Cecevska r.</td>
<td>24.6</td>
<td>8.3</td>
<td>1660</td>
<td>600</td>
<td>12.8</td>
<td>In the lake</td>
</tr>
<tr>
<td>12</td>
<td>Zubin Potok</td>
<td>8.6</td>
<td>4.2</td>
<td>860</td>
<td>568</td>
<td>6.9</td>
<td>In Iber</td>
</tr>
<tr>
<td>13</td>
<td>Radovica p.</td>
<td>1.7</td>
<td>2.6</td>
<td>800</td>
<td>557</td>
<td>9.3</td>
<td>In Iber</td>
</tr>
<tr>
<td>14</td>
<td>Zubcanska r.</td>
<td>7.1</td>
<td>5.3</td>
<td>990</td>
<td>535</td>
<td>8.5</td>
<td>In Iber</td>
</tr>
</tbody>
</table>

Left branches of Iber/Ibar river

Right branches of Iber river

Picture 6. River network of the Zubin Potok municipality
2.2. Zvečan/Zvečan municipality

Zvečani/Zvečan municipality is not characterized with a developed river network.
The main river that passes in this municipality is Iber/ Ibar which divides this territory in two parts. The left side of the river includes about 80% of the municipality, whereas the other part is in the right side of the river. All rivers of this municipality discharge into Iber / Ibar River.

All branches of this river have torrential characteristics, which mean that the imbalance between minimal and maximal quantity of water is big. These rivers are dangerous in the time when precipitations are big and last for a short time. Therefore, residents are not prepared and the damages are big, in humans, objects and agricultural lands.

**The main characteristics of the biggest rivers of Zvečan/Zvečan municipality.**

<table>
<thead>
<tr>
<th>River</th>
<th>Catchment area (km²)</th>
<th>Stream length (km)</th>
<th>Higher level (m)</th>
<th>Discharge level (m)</th>
<th>Slope (%)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Koriljska r.</td>
<td>7.8</td>
<td>4.1</td>
<td>800</td>
<td>498</td>
<td>7.3</td>
<td>Through city</td>
</tr>
<tr>
<td>2 Kozarevacka r.</td>
<td>26.8</td>
<td>14.1</td>
<td>1150</td>
<td>495</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>3 Banjska r.</td>
<td>55.1</td>
<td>19.0</td>
<td>1290</td>
<td>485</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>4 Seoska r.</td>
<td>13.4</td>
<td>7.7</td>
<td>890</td>
<td>482</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>5 Rađevacki p.</td>
<td>11.17</td>
<td>3.2</td>
<td>765</td>
<td>494</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>6 Doljanska r.</td>
<td>12.6</td>
<td>5.1</td>
<td>940</td>
<td>493</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>7 Bistrica *</td>
<td>16.80</td>
<td>27.2</td>
<td>1280</td>
<td>484</td>
<td>2.9</td>
<td></td>
</tr>
</tbody>
</table>

* The Bistrica catchment belongs to four municipalities: Zvečan/ Zvečan, Leposavić/Leposavić/ć, Mitrovic/Mitrovica dhe Podujeve/Podujevo. Therefore, flow of the river in the Iber/ Ibar river happens in Zvečan/Zvečan municipality.

![Picture 7. River network of the Zvečan/Zvečan municipality](image-url)
2.3. Leposavić/Leposavić municipality
The Leposaviq/Leposavić municipality is characterized with a very developed river network.

Ibri/Ibar river is the main river of the municipality. This river passes in the middle of the municipality and divides it nearly into to equal parts.

All rivers that belong to this municipality discharge into Ibër/Ibar river. So, they are branches of this river.

All branches of this river have torrential characteristics, which mean that the imbalance between minimal and maximal quantity of water is big. These rivers are dangerous in the time when precipitations are big and last for a short time. Therefore, residents are not prepared and the damages are big, in humans, objects and agricultural lands.

The main characteristics of the biggest rivers of Leposaviq/Leposavić municipality.

<table>
<thead>
<tr>
<th></th>
<th>River</th>
<th>Catchment area (km²)</th>
<th>Stream length (km')</th>
<th>Higher level (m)</th>
<th>Discharge level (m)</th>
<th>Slope (%)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vucanska r.</td>
<td>28.8</td>
<td>18.5</td>
<td>1270</td>
<td>458</td>
<td>4.4</td>
<td>Left branches of Ibër river</td>
</tr>
<tr>
<td>2</td>
<td>Grkajska r.</td>
<td>23.3</td>
<td>14.5</td>
<td>1250</td>
<td>456</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Josanicka r.</td>
<td>57.1</td>
<td>17.6</td>
<td>1145</td>
<td>447</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Borova r.</td>
<td>18.7</td>
<td>4.7</td>
<td>860</td>
<td>435</td>
<td>9.0</td>
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</tr>
<tr>
<td>5</td>
<td>Vracevska r.</td>
<td>38.6</td>
<td>10.9</td>
<td>1120</td>
<td>433</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Trebicka r.</td>
<td>11.2</td>
<td>7.4</td>
<td>880</td>
<td>435</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>7</td>
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<td>3.9</td>
<td>3</td>
<td>780</td>
<td>425</td>
<td>11.8</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bistrica *</td>
<td>16.80</td>
<td>27.2</td>
<td>1280</td>
<td>484</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Cerajska r.</td>
<td>22.1</td>
<td>12.3</td>
<td>1140</td>
<td>454</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Zrinjski p.</td>
<td>6.7</td>
<td>5.1</td>
<td>1040</td>
<td>452</td>
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<tr>
<td>11</td>
<td>Socaniska r.</td>
<td>42.2</td>
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<td>1550</td>
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<tr>
<td>12</td>
<td>Dobravska r.</td>
<td>28.4</td>
<td>14.8</td>
<td>1480</td>
<td>448</td>
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</tr>
<tr>
<td>13</td>
<td>Leposavska r.</td>
<td>27.4</td>
<td>13.5</td>
<td>1700</td>
<td>445</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Tvrđanska r.</td>
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<td>440</td>
<td>5.3</td>
<td></td>
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<tr>
<td>15</td>
<td>Drenska r.</td>
<td>61.8</td>
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<td>1230</td>
<td>438</td>
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<tr>
<td>16</td>
<td>Lesanska r.</td>
<td>6.8</td>
<td>4.0</td>
<td>900</td>
<td>432</td>
<td>11.7</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Zigoljski p.</td>
<td>4.1</td>
<td>4.8</td>
<td>1030</td>
<td>431</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Ostracki p.</td>
<td>5.8</td>
<td>5.2</td>
<td>930</td>
<td>430</td>
<td>9.6</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Kremenjacki p.</td>
<td>6.3</td>
<td>2.3</td>
<td>825</td>
<td>428</td>
<td>17.3</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Bistricka r.</td>
<td>31.4</td>
<td>12.6</td>
<td>1440</td>
<td>427</td>
<td>8.0</td>
<td></td>
</tr>
</tbody>
</table>

*The Bistrica pond belongs to four municipalities: Zveçan/Zvečan, Leposaviq/Leposavić, Mitrovica/Mitrovica dhe Podujevë/ Podujevo. Therefore, flow of the river in the Iber/Ibar river happens Zveçan/Zvečan municipality.*

*Picture 8. River network of the Leposaviq/Leposavić municipality*
3. TECHNICAL OVERVIEW OF FLOODS AND FLOOD RISK
The European Commission has identified that river floods are the most common natural disaster in Europe. Between 1998 and 2004, Europe suffered over 100 major damaging floods, including the catastrophic floods along the Danube and Elbe rivers in summer 2002. Severe floods in 2005 in Romania and the Alpine countries and the severe summertime flooding in Britain in 2007 further reinforced the need for concerted action. Since 1998 floods in Europe have caused some 700 deaths, the displacement of about 0.5 million people and at least €25 billion in insured economic losses. Catastrophic flooding was encountered in Albania in December 2010 close to the Kosovo border.

Catastrophic floods endanger lives and cause human tragedy as well as heavy economic losses. Floods are natural phenomena but with the right measures it is possible to reduce their likelihood and limit their impacts. In addition to economic and social damage, floods can have severe environmental consequences, for example when installations holding large quantities of toxic chemicals are inundated or wetland areas destroyed. The coming decades are likely to see a higher flood risk in Europe and greater economic damage.

Analysis by the European Commission (Institute for Environment and Sustainability) suggests that climate change will intensify the hydrological cycle and increase the magnitude and frequency of intense precipitation events in most parts of Europe. Annual average flood damage for the period 2070 – 2100 (see Figure 1-1) is expected to increase by as much as 100% in many river basins in Europe.

3.1. Sources and Types of Flooding

3.1.1 Sources of Flooding

Flooding is a global phenomenon, and manifests itself in a wide range of forms. In the broadest sense, flooding occurs when the precipitation inputs to the catchment or the surface runoff volume exceeds either

i) the carrying capacity of the river channels or

ii) the storage capacity of catchment (which includes groundwater storage and storage reservoirs or wetlands) or

iii) both.

These distinctions are important to understand because the source and mechanism of flooding in a specific river basin may be different at different times in the year, or may be different in adjacent catchments at the same time of year. Therefore different flood management responses may be required in different river basins or at different times of the year.

3.1.2. Types of Flooding
Flood hazards and flood prevention or mitigation measures can be different, depending on the flood characteristics. According to the Kosovo Flood Management Framework, there are three principal types of flooding relevant to Kosovo:

1. Large-scale lowland flooding

2. Flash flooding in upland areas

3. Flooding from a Dam failure

1. This type of flooding is encountered generally only in the lower parts of major river basins. It generally results from a long period of excess rainfall, often combined with high groundwater levels. Typically, the flood is slow to rise (days), but at its peak can cover a vast area of land (generally the lower and flatter parts of the river basin), and the flood depths can persist for many days. This type of flooding is often encountered in the late autumn period (October to December) where higher rainfall reduces the soil moisture deficit to a minimum.

   From a management point of view, this type of flooding can often be predicted some time in advance (3-10 days), allowing for mitigation measures to be implemented but the floods can persist for many days or weeks, which can immobilize the communication infrastructure (power, telecommunications and transport) and place huge demands on the social infrastructure (evacuation, rescue and medical services and housing of displaced persons).

2. The floods most perceived by the public are the large-scale river floods; however, there is evidence that the most dangerous floods are those with short warning times – flash floods. These floods pose great challenges to the national meteorological services, the emergency services and local communities, in the area of flood forecasting, warning, emergency preparedness and response.

   The recently published result of the Fourth Assessment Report under the Intergovernmental Panel on Climate Change (IPCC) indicates that Europe is likely to see more flash floods in future.

   Flash floods are particularly hazardous to life and property because i) typically they develop in steep upland areas and reach their peak within a matter of hours, so there is limited time for warning, mitigation and evacuation ii) being in upland areas, the river channel gradients are steeper than normal and the river corridor is narrow, so the velocity and the depth of the flow are high, meaning they have high destructive potential.

   A particular feature of flash floods is that they often occur in summer months as a result of high intensity thunderstorms. This may be a period when people least expect flooding, and are therefore even less prepared than usual.

3. Where a large reservoir is constructed, there is a permanent risk of catastrophic flooding downstream of the Dam. Large reservoirs (such as Ujemani/Gazivodo) have the potential to hold huge quantities of water. Such storage can be used to absorb high volumes of
catchment runoff to prevent flooding. However, Dam in Ujemanj/Gazivode is intended for public water supply, irrigation water and hydro-electric power generation. In these cases the preferred status is to maintain the reservoir at a high storage level, especially in autumn and winter months to capture as much runoff as possible. Therefore, although theoretically the Dam could be used for flood alleviation, in practice, because of the need to maintain storage, the reservoir is often full during winter months. Therefore most of the time a full reservoir actually represents a flood risk, not a flood preventer.

For example, a full reservoir has no further storage, so it will pass all incoming inflow directly downstream. As a greater flood hazard, a full reservoir which is being overloaded may either i) release large quantities of water to save the Dam, and this release can actually increase the flooding downstream e.g. Albanian Dams, 2010 or ii) the Dam may fail completely, in which case a huge volume of water will be passed within minutes into the downstream river valley, known as a ‘Dam-break’.

Consequently, a Dam-break situation is the worst of both worlds i.e. large volumes of water discharged in a very short timescale. Dam-breaks are therefore especially hazardous to life and property, and require special emergency measures, in particular the preparation of flood inundation maps and emergency evacuation plans.

In Leposaviq/Leposavić, Zveçan/Zvečan and Zubin Potok municipalities can appear three cases that are noted above.

The first case is the flood in Ibër/Ibar valley, the second case is when the floods can happen from the rivers of the Ibër/Ibar branches of river and the third case is if the floods can happen because of the damage of the Ujman/Gazivoda dam.

The subject of this document is to value floods of the first case and the second case, since the third case is specific and the possibility to happen is very small.
4. SPOTS WITH HIGHLIGHTING FOR POTENTIALLY DAMAGE IN VILLAGES

In most rivers where floods occur in these three municipalities are due to following phenomena:

1. Cutting of trees in the upper basin

   In the upper part of the river basin the trees have been cut. With the cutting of trees the surface of vegetation was reduced and possibility of erosion is increased. Thus from the upper part of the river basin the river brought the alluvium with great speed and the alluvium was deposited in the bottom of the river.

2. Garbage in the river

   In many segments of the river there are different garbage which have reduced the surface of cross section of the river, i.e the transport ability of the river is significantly reduced and in certain places natural "dams" are created from which small "lakes" are created. Also this garbage has raised the bottom quota of river bed.

3. Planting of trees in the river route

   The owners, in order to protect their land, planted trees on both sides of the river. The trees have been planted in the river route by which the cross section of the river bed was reduced, i.e the ability of the river for transport of water was reduced.

   These trees have been planted in different places and in some of those places they have deviated the river by losing its normal flow. Thus they created curves with very small radius that has enabled the flood wave to hit the shores of the river and in some places these shores have been badly damaged by creating new river route.

4. Non maintenance of river

   The garbage in the river bed was added on daily basis and no one cared to remove it. Also the branches of trees on the river banks were increased and in many locations have such big density than has decreased the cross section of the river.

It is concluded that the floods have happened as a result of erosion in the upper part of the river basin and alluvial sedimentation of these alluvial in lower part of the river. Human activities have influenced this phenomenon (waste, trees, etc.) and also their inactivity (not maintenance of the river) has been the main factor that has contributed to flooding.
4.1. **Zubin Potok municipality**

Since in this municipality is the Ujman / Gazivode Lake in which discharged most of the rivers are only three cases where flooding can occur.

4.1.1. **Lucka reka**

*Picture 9. Surfaces threatened by river Lucka Reka*
Floods from this river happen often. Potential floods are in two characteristic places:

1. **In the place where Vrbljanski river discharges into Lucka river.**

Floods in this segment happen because of above noted phenomenon. Therefore, transverse profile of the river is reduced a lot and it can not accept the amount of water that river brings.

In this segment the village school floods and also the structure below it.

Recommendation:

- To avoid these floods the river bed in this segment has to deepens and to widen and also in specific places of the river bed to place rapids concrete to reduce the speed of the river.

*Picture 10.floods in the point where Vrbljanski discharges into ruver Lucka reka*

<table>
<thead>
<tr>
<th>Category</th>
<th>Area</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hight</td>
<td>4544.83 m²</td>
<td>School, road, business building</td>
</tr>
<tr>
<td>Low</td>
<td>7558.21 m²</td>
<td>School, road, business building</td>
</tr>
<tr>
<td>Medium</td>
<td>433.58 m²</td>
<td>School, road, business building</td>
</tr>
</tbody>
</table>

2. **In the down part of the Lucka river**

In this segment river has done the erosion of the earth in the left side of it. The reason of erosion is the great speed and the small transverse profile

- To avoid these floods the river bed in this segment has to deepens and to widen and also in specific places of the river bed to place rapids concrete to reduce the speed of the river and in the left coast of it to place rapids concrete or stone
4.1.2. Zubin Potok

The River Zubin Potok passes in the middle of the Zubin Potok city. To build asphalted road, a segment of this river is introduced under the asphalted road. River under the road flows in two concrete pipes with diameter $\varnothing 1500$ mm.

The flood happens in the place where river is introduced under the road. The water increase and goes out of his bed, flooding big areas where the objects, gardens and roads are.

There are some causes of flooding: the section of the river above the road is too small, different rubbish in the river and damages that take place in the place where riverbed goes from opened to closed bed.

To avoid these floods the river in segment from the bridge on road Zubin Potok - Mitrovice has to deepens and widen, to clean the riverbed and to rehabilitate the connecting point where the river passes from opened to closed bed.
Picture 12. River under asphalt road river Zubin Potok
Picture 13. Vulnerable areas from river Zubin Potok

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Area</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>25287 m^2</td>
<td>Administration Building, residential building, Road, Yards</td>
</tr>
<tr>
<td>Low</td>
<td>32749 m^2</td>
<td>Administration Building, residential building, Road, Jards</td>
</tr>
</tbody>
</table>
4.1.3. Jagnjilicka reka

River Jagnjilicka reka in the down part passes close to residential complex. To pass from the side of the complex to the other, there is built a bridge from concrete pipes Ø1000mm. These pipes are damaged and full of rubbish that the river has brought or the residents have thrown. Therefore, the level of the water in that place increase and passes the bridge risking objects nearby.
Picture 14. Vulnerable areas from River Jagnjilicka reka

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Area Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>1109 m²</td>
<td>Agricultural Land, Bridge</td>
</tr>
<tr>
<td>Low</td>
<td>3467 m²</td>
<td>Agricultural Land, Bridge</td>
</tr>
<tr>
<td>Medium</td>
<td>137 m²</td>
<td>Agricultural Land</td>
</tr>
</tbody>
</table>
- To avoid these floods there has to be built a new bridge with proper dimensions and the segment of the river from the bridge in this place to the village bridge, the riverbed had to deepens and widen and has to be clean.

4.2. Zvečan/Zvečan municipality

`In this municipality there are three rivers that cause floods and are potential in new ones.

4.2.1. Koriljska reka

River Koriljska reka passes through the Zveqan/Zvečan city. The segment of the river that passes in the residential parts of the city is regulated and doesn't have floods. Flood from this river happened in the segment upstream from regulated river bed.

Floods happen because of the rubbish thrown in the river and also from the residents nearby. River floods agricultural lands in the left side of the river and doesn't risk any residential building.
To avoid these floods the river has to be changed the route and the riverbed has to be deepend and widen, to clean the river from the rubbish and to cut the trees that obstruct.

*Picture 15. Vulnerable areas from River Korijska reka*
4.2.2. Kozarevacka reka

River Kozarevska reka every year floods lands nearby

Floods happen because the transversal profile of the river is reduced a lot. The reduction has happened because the people working the land have sent soil from the fields to the river, have planted trees on the river bed and have thrown different rubbish in the river.

Floods happen in the arable lands and not in any building.
- To avoid these floods, the riverbed has to deepen and widen, to cut the trees that are in the riverbed and notably to clean the river from the rubbish and to cut the trees that obstruct.

*Picture 16. Vulnerable areas from River Kozarevska reka*
4.2.3. Banjska reka

River Banjska reka, in the segment from the school bridge to around 500m above school, very often there are buildings and agricultural lands flooded. In this segment there is the village school and other residential object.

Floods happen because people that live nearby have reduced the transversal profile of the river, by filling it with soil and by throwing rubbish in the riverbed.

- To avoid these floods, the riverbed has to deepend and widen, to cut the trees that are in the riverbed and notably to clean the river from the rubbish and to cut the trees that obstruct. For greater security in the large bed bends, must be built a protective wall from concrete or stones.

These measures are temporary until a final resolution, which is the regulation of the riverbed with strong material.

*Picture 17. Vulnerable areas from river Banjska reka*
Picture 17. Vulnerable areas from river Banjska reka

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Area</th>
<th>Objects in High Risk Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>7999 m^2</td>
<td>School, Residential building, Road, Yards, Agricultural Land</td>
</tr>
<tr>
<td>Low</td>
<td>13212 m^2</td>
<td>School, Residential building, Road, Yards, Agricultural Land</td>
</tr>
</tbody>
</table>

![Vulnerable areas map from river Banjska reka](image-url)
4.3. **Leposaviq/Leposavić municipality**

Municipality of Leposaviq/Leposavić has great problems with floods, since it also has the most rivers belonging to this municipality. In the territory of Leposaviq/Leposavić municipality there are eight rivers of which flood or have the potential for flooding of land and buildings.

4.3.1. **Cerajska river**

River Ceraska reka, in the segment from the bridge in Mitrovice-Leposaviq road to discharge into Ibër and 200m above the bridge, very often floods alnds and the road to Manastir. The road floods in length of 25m.

Floods happen because people that live nearby have reduced the transversal profile of the river, by planting trees in the riverbed and by filling it with soil and by throwing rubbish in the riverbed.
### Picture 19. Vulnerable areas from River Cerajska reka

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Area (m²)</th>
<th>Land Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hight</td>
<td>3394</td>
<td>Agricultural Land, Roads</td>
</tr>
<tr>
<td>Low</td>
<td>14918</td>
<td>Agricultural Land, Roads</td>
</tr>
<tr>
<td>Medium</td>
<td>406</td>
<td>Agricultural Land, Roads</td>
</tr>
</tbody>
</table>

- **Road for Monastery**
- **Bridge in road Mitrovica-Leposavic**
- To avoid these floods, the riverbed has to deepen and widen, to cut the trees that are in the riverbed and notably to clean the river from the rubbish and to cut the trees that obstruct. For greater security in the length of 25m where the road is flooded, must be built a protective wall from concrete or gabions.

4.3.2. River Vucanska reka

River Vucanska reka in the segment from its discharge into Ibër to about 1000m above, very often lands flood, a house that is very near the river and a fish basin that is a private business.

Floods happen because during the rainfall the river brings great alluvium from the upper part of basin. This alluvium deposited in the flat part of the river and creates a natural “dam” and the river comes out of its bed forming new route floods lands. Another reason is also reduction of transversal profile because people trying to protect from floods, they plant trees near the river and also throw rubbish in the river.

- To avoid these floods UNDP has taken activities in the segment where the floods have taken place more often.
In the segment from the village bridge and 700m upstream, alluvium are removed from the riverbed, the river is back in his old route, trees has been cut and also the riverbed has been deepens and widen. While in the dangerous curves there are placed gabions to protect the shoreline.

This river rehabilitation is temporary until a final resolution.

*Picture 20. Regulated riverbed of Vucanska river*

*Picture 21 vulnerable areas from River Vucanska reka*

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Area</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>25769 m^2</td>
<td>Agricultural Land, Bridge, Roads</td>
</tr>
<tr>
<td>Low</td>
<td>38053 m^2</td>
<td>Agricultural Land, Bridge, Roads, Residential building, fish pond</td>
</tr>
</tbody>
</table>
4.3.3. Socanicka reka

River Socanicka reka, in the segment from discharge into Ibër in length of 1.5 km upstream very often floods lands.

Floods happen because during the rainfall the river brings great alluvium from the upper basin. This alluvium deposited in the flat part of the river and creates a natural “dam” and the river comes out of its bed forming new route and floods lands. Another reason is also reduction of transversal profile because people trying to protect from floods, they plant trees near the river and also throw rubbish in the river.

- To avoid these floods UNDP has taken activities in the segment where the floods have taken place more often.
In the segment from the village bridge and 700m upstream, alluvium are removed from the riverbed, the river is back in his old route, trees has been cut and also the riverbed has been deepens and widen. While in the dangerous curves there are placed gabions to protect the shoreline.

This river rehabilitation is temporary until a final resolution.

*Picture 21. Regulated riverbed of river Socanicka reka*
Picture 22 Vulnerable areas form River Soqanicka reka

HIGHT RISK AREA
MEDIUM RISK AREA
LOW RISK AREA

Hight 17213 m^2 Agricultural Land
Low 30141 m^2 Agricultural Land
4.3.4. Josanicka reka

River Josanicka reka, in the segment from school and upstream about 300m, the river erodes the road, risking the road and substation and floods the agriculture lands.

Floods happen because people that live nearby have reduced the transversal profile of the river, by filling it with soil and by throwing rubbish in the riverbed.
Picture 23 Vulnerable areas from River Josanicka reka

- **Hight Risk Area**: 6689 m^2, Agricultural Land, Road, Substation
- **Low Risk Area**: 10332 m^2, Agricultural Land, Road, Substation
- **Medium Risk Area**: 654 m^2, Agricultural Land
To avoid these floods, the riverbed has to deepen and widen, to cut the trees that are in the riverbed and notably to clean the river from the rubbish the trees that obstruct. For greater security nearby the road and substation, must be built a protective wall from concrete or stones.

4.3.5. **Tvrdanska reka**

River Tvrdjanska reka, in the segment from its discharge in Iber/ Ibar upstream in length of 1100m floods areas and it risks buildings and agriculture lands.

River is much polluted, because from Trepca (separation plant) all the polluted water discharges into the river.

People who live nearby the river, to protect from floods have planted trees and have built high walls, reducing a lot the transversal profile of the river and have enabled floods in the other side of the river. Rubbish (mostly agriculture) has helped the floods.
Picture 24 Vulnerable areas from River Tvrdjanska reka

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Area (m²)</th>
<th>Land Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>23599</td>
<td>Residential buildings, Road, Yards, Agricultural Land</td>
</tr>
<tr>
<td>Low</td>
<td>45966</td>
<td>Residential buildings, Road, Yards, Agricultural Land</td>
</tr>
<tr>
<td>Medium</td>
<td>1909</td>
<td>Agricultural Land</td>
</tr>
</tbody>
</table>

HIGHT RISK AREA

MEDIUM RISK AREA

LOW RISK AREA
To avoid these floods, this segment that passes the village has to deepens and notably to widen in the right side since because in the left side passes the asphalted road and also the trees that are in the riverbed has to be cut and the river has to be clean from the rubbish. As an additional protection, nearby the road there has to be built a protective wall from concrete or gabions.

4.3.6. Drenska reka

River Drenska reka floods in three segments:

1. The segment from the bridge in Mitrovica-Leposavić road to discharge point in the Iber/Iba.
2. The segment in length about 200mm downstream from the school.
3. The segment in length about 500m in Mekinice village downstream from the village bridge.

In these three segments the river floods agricultural lands, but in segment 2 the river floods well too, from which people supply with water.

Floods happen as a result of rubbish thrown in the river and from building bridges with no adequate dimensions.
Picture 25: vulnerable areas from River Drenska reka – The segment from the bridge in Mitrovica-Leposaviać road to discharge

<table>
<thead>
<tr>
<th>Category</th>
<th>Hight Risk</th>
<th>Medium Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Land</td>
<td>4313 m^2</td>
<td>6617 m^2</td>
<td></td>
</tr>
</tbody>
</table>
Picture 26: Vulnerable areas from River Drenska reka – the segment from school about 500 mm downstream

Picture 27: Vulnerable areas from River Drenska reka – the segment in Mekinice village about 500mm
To avoid these floods there has to:

1. The segment from the bridge in the road Mitrovica-Leposavić to the discharge of it into Iber/ Ibar has to be clean from trees and has to be widen.
2. The segment in length of 200m downstream from the school. This segment has to deepen and notably widen in the left side because in the left side shadoofs are placed. As additional protection, nearby the bridges has to be built walls from concrete or gabions so that the water doesn’t pass in streets.
3. The segment in length of 200m in Mekinice village downstream from the village bridge. This segment has to deepen and notably widen in the left side because in the left side wells are placed. As additional protection, nearby the bridges has to be built walls from concrete or gabions so that the water doesn’t pass in streets.

4.3.7. Vracevska reka

River Vracevska reka, in the segment from the bridge in the village road upstream in length about 200m floods agricultural lands.

People who are close to the river, to protect from flooding have planting trees and have built high walls so they reduced the transverse profile of the river causing floods in the other side of the river. The floods happened also from throwing rubbish (especially agriculture) in the riverbed.
Picture 28. Vulnerable areas from River Vracenska reka

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Area Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>2771 m²</td>
<td>Agricultural Land</td>
</tr>
<tr>
<td>Low</td>
<td>17327 m²</td>
<td>Agricultural Land, Bridge</td>
</tr>
</tbody>
</table>

Bridge in village
- To avoid these floods, riverbed has to deepens and notably to widen in this segment and also the trees that are in the riverbed has to be cut and the river has to be clean from the rubbish. As an additional protection, nearby the bridge there has to be built a protective wall from concrete or gabions.

4.3.8. Bistricka reka

River Bistricka reka, in the segment from the bridge to the road Mitrovica-Leposavić the river widen downstream in length about 200m and floods agricultural lands.

Floods happen because in that part the river widen and in the middle of the river there are trees which have created ADA ("islands") so the water passes by the agricultural lands, and the other reason are the rubbish (mostly agricultural) thrown in the riverbed.
Picture 29. Vulnerable areas from River Bistricka reka

<table>
<thead>
<tr>
<th>Type</th>
<th>Area (m²)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hight</td>
<td>4331 m²</td>
<td>Agricultural Land</td>
</tr>
<tr>
<td>Low</td>
<td>6931 m²</td>
<td>Agricultural Land</td>
</tr>
</tbody>
</table>

Bridge on road
Mitrovica-Leposaviq
- To avoid these floods, the riverbed in this segment has to be clean from rubbish, trees and alluvium that river has brought.

4.4. River Iber

Iber / Ibar River is the main river that passes in these three municipalities. In this river a dam is built in Ujeman/Gazivode creating the lake. This lake provides the control over the river for floods. But in two segments river goes out of the bed and floods agriculture lands.

1. First segment – downstream from discharge of river Sitnica in length about 5.0km
2. Second segment – downstream from discharge of river Cerajska reka in length about 7.3m

In general due to abundant vegetation on its banks and lots of solid nondegradable waste thrown in its water, the river in its narrow flow becomes very congested, thus forming “bottlenecks”, which contribute to flooding. In many places water washes soil away from the banks so that bigger trees fall into the water. They represent twofold hazard: i) increase water congestion, and ii) born by quick water flow they hit bridge pillars, which may lead to their cracks and even breakoffs.

4.4.1. First segment – downstream from discharge of river Sitnica in length about 5.0km

Iber/ Ibar river in this segment lies in the middle of two roads: motorway Mitrovice-Leposavić and the railway. These two roads are river borders that can’t be passed. However, floods can occur on the surface between the two roads. Therefore, people didn’t build objects nearby, apart places where are secured from floods. So in this segment only agricultural lands flood.

Floods occur because Sitnica River brings large quantities of alluviums and increase the water level also rubbish from the Trepca raises the level of water.
Picture 30. A tree trunk flown by the river

In this segment over this river are built two motorway bridges: in Srbovac and Grbovac villages
To avoid these floods, the riverbed in this segment has to deepen, widen, also the trees that are in the riverbed has to be cut and the river has to be clean from the rubbish. As an additional protection, nearby the bridges there has to be built a protective wall from concrete or with gabions.
4.4.2. Second segment – downstream from discharge of river Cerajska reka in length about 7.3m

In Ibić river, in this segment discharge some rivers:

- in the left side of it discharge: Vucanska river and Grakajska river
- in the right side of it discharge: Ceraska river, Zrinjski potok, Socanicka river and Dobravska river.

The right side of the river is restricted to the motorway.

Since in this segment of river, floods occur more often, people do not have built buildings or have built building in the outer area that is not threatened by floods or have built protective walls as shown in the fig. below. Therefore, floods occur only in Agricultural Land

Flooding happens because in this segment in the riverbed there are a lot of trees and people plant in the river shore.

These are reasons of reducing the transverse profile of the river that directly affects flooding.
Vulnerable areas from Ibër River in segment downstream from discharge of river Ceraska reka Sitnica in length about 7.3km

- To avoid these floods, the riverbed in this segment has to deepen, widen, also the trees that are in the riverbed has to be cut and the river has to be clean from the rubbish. As an additional protection, nearby the bridges there has to be built a protective wall from concrete or with gabions.
5. SUMMARY OF RECOMMENDATIONS FOR FLOOD PROTECTION

5.1. General Proposal to remove the causes of flooding

To avoid the causes of the flooding a long term and comprehensive planning should be made as well as a big-budget. To achieve the aim different experts must be engaged such as engineers, agronomists, foresters, economist etc. Besides technical experts local and central administration should be engaged because to solve this problem, a budget is needed which cannot be handled only by the municipal level.

To remedy the causes of flooding the following measures should be taken:

1. Technical-construction Measures
   - Placing of concrete or stone thresholds in certain places along the river or its branches

2. Technical flood-way measures
   - Checking for the possibility of building a catchment (small reservoir) which could be used for other purposes (drinking water, recreation, electricity production, irrigation, etc.)

3. Technical –forestry measures
   - Stopping of cutting trees in the entire river basin and planting new seedlings

4. Educational and propaganda measures
   - Awareness of residents through lectures at schools, promotion of documentary films, books and printing of different brochures
   - Prohibition of disposal of garbage in the river bed
   - Maintenance of the river basin and space

The aforementioned activities are mainly related to defense planning from erosion that has been a major flood factor of the river in the above mentioned segment.

According to the Kosovo Law on Waters the primary reference to flood management responsibilities are defined under Section VIII – Article 46 – Competencies for Flood Protection:

- Primary responsibility for flooding in urban areas is the remit of Municipalities – 46(1)
- Primary responsibility for flooding in the wider river basin is the remit of the River Basin Units (RBUs) (within the Ministry of Environment) – 46 (2).
- Municipalities and the RBUs share the responsibility for the maintenance and regulation of flood protection infrastructure in their respective areas – 46 (3)
- The Ministry (MESP) has overall responsibility for the coordination of flood mitigation activities between Municipalities and RBUs – 46(5) • All flood mitigation activities by Municipalities or RBUs should be in accordance with national strategy and River Basin Management Plans – 46 (6)
Under **Section VIII – Article 47 - Flood Protection Program**:

- The flood protection programmes are the joint responsibility of the Municipalities (urban areas) and the River Basin Units in other areas, coordinating as necessary with other stakeholder organisations – 47(1)

- The Ministry (MESP) should through secondary legislation prepare guidance on the scope and the procedures of the flood mitigation programme(s).

We conclude that the Water Law adequately defines the division of flood management responsibilities between the River Basin Units and Municipalities.

Therefore municipalities have the primary role in protecting local citizens from flood damage under the Kosovo law. This approach is supported at European level, where it is recognised that local Municipalities are the most appropriate competent authority to manage local flood issues through their spatial plans and emergency preparedness measures.

The River Basin Units within MESP have a coordinating role over Flood Risk Management Plans (FRMPS) at the level of the river basin. There is an urgent need for MESP to produce national standard guidance to Municipalities with regard to the preparation of floodplain surveys and FRMPS.

Municipalities should each prepare their own formal FRMP. The FRMP should cover all aspects of flood management; both long-term and short term. Long-term measures include using the local spatial plan to prevent inappropriate construction in floodplain areas and consideration of properly evaluated flood alleviation schemes. Short-term measures include maintenance of river channels, and preparation for emergencies, including flood protection and evacuation plans.

Also for the Government of Kosovo must be the priority to identify and manage the risks associated with future floods, so that flood emergencies can be planned for, and the negative impacts minimised as far as possible.

To date there has been very little published output with regard to flood risk management in Kosovo. Institutional support ending in 2010 provided technical guidance to the Ministry of Environment and Spatial Planning on the preparation of Flood Risk Maps and Flood Management Plans, but there is no evidence that the Ministry has sufficient technical capacity or resources to take these forward.

The institutional support of this project also ignored the additional inputs of hydrometric data collection, flood forecasting, and municipal responsibilities for flooding.
5.2. **The recommendations list**
The recommendations listed below for each river. Order of rivers is by municipalities and priority depending of damages that will be caused by possible floods:

<table>
<thead>
<tr>
<th>River</th>
<th>Priority</th>
<th>Damages</th>
<th>Activities</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zubin Potok (Zubin Potok Municipality)</td>
<td>1</td>
<td>Road, buildings, yards</td>
<td>Riverbed should be cleared, deepened and widened;</td>
<td>Adaption of the profile where the river passes from open profile to the under road (pipes)</td>
</tr>
<tr>
<td>No.</td>
<td>River Name</td>
<td>Municipality</td>
<td>Important Buildings</td>
<td>Required Action</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------</td>
<td>-------------------------</td>
<td>---------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>2</td>
<td>Lucna reka (Zubin Potok Municipality)</td>
<td>2</td>
<td>School, Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>3</td>
<td>Jagnjenjicka r. (Zubin Potok Municipality)</td>
<td>3</td>
<td>Residential buildings</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>4</td>
<td>Banjska reka (Zvečan/Zvečan Municipality)</td>
<td>1</td>
<td>School, Residential buildings</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>5</td>
<td>Kozarevska r. (Zvečan/Zvečan Municipality)</td>
<td>2</td>
<td>Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>6</td>
<td>Korijska reka (Zvečan/Zvečan Municipality)</td>
<td>3</td>
<td>Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>7</td>
<td>Josanicka r. (Leposaviq/ć Municipality)</td>
<td>1</td>
<td>Road, substation and agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>8</td>
<td>Tvrdjanska r. (Leposaviq/ć Municipality)</td>
<td>2</td>
<td>Residential buildings, agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>9</td>
<td>Vucanska r. (Leposaviq/ć Municipality)</td>
<td>3</td>
<td>Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>10</td>
<td>Socanicka r. (Leposaviq/ć Municipality)</td>
<td>4</td>
<td>Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>11</td>
<td>Drenska r. (Leposaviq/ć Municipality)</td>
<td>5</td>
<td>Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>12</td>
<td>Cerajka r. (Leposaviq/ć Municipality)</td>
<td>6</td>
<td>Road L=25m, Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>13</td>
<td>Vracevska r. (Leposaviq/ć Municipality)</td>
<td>7</td>
<td>Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>14</td>
<td>Bistrica (Leposaviq/ć Municipality)</td>
<td>8</td>
<td>Agricultural land</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>15</td>
<td>Ibër 2 (Zvečan/Zvečan &amp; Leposaviq/ć Municipality)</td>
<td>1</td>
<td>Agricultural land, Roads, Bridges</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
<tr>
<td>16</td>
<td>Ibër 1 (Leposaviq/ć Municipality)</td>
<td>2</td>
<td>Agricultural land, Roads, Bridges</td>
<td>Riverbed should be cleared, deepened and widened;</td>
</tr>
</tbody>
</table>

**Notes:**

- Rivers 12-16 are highlighted in green because they are agricultural land.
- Rivers 2-5, 7, and 10-11 are highlighted in blue due to their location near significant buildings or structures.

**Additional Information:**

- All bridges on the road Mitovica-Leposaviq/ć are not threatened because of flooding, but they are quite old and should be rehabilitated or built new.