

**TRANSFERABILITY OF NON-
STRUCTURAL MEASURES IN
INTEGRATED FLOOD
MANAGEMENT FROM THE
NETHERLANDS TO BOSNIA AND
HERZEGOVINA**

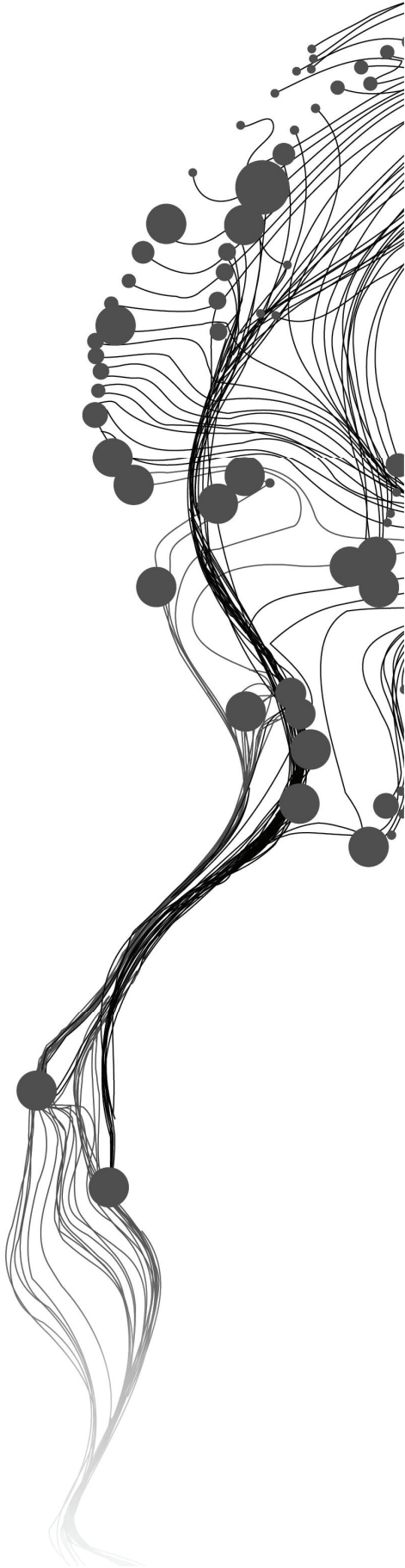
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February, 2015

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ABSTRACT

Floods are the most frequently occurring of all natural disasters and their number is increasing, particularly in the last 20 years. Limited capacities of flood control infrastructure, designed for predictable flood events, may not be able to prevent extreme flood events. Therefore, there is a need for integration of both structural and non-structural elements in flood defence systems.

Integrated Flood Management is a relatively new concept and a part of wider Integrated Water Management concept, and it presents a proactive approach and a shift from flood control to flood management. Non-structural measures in Integrated Flood Management include integration and inclusion of all relevant factors and resources such as spatial planning, land zoning and land use planning, water and environmental issues and policies, building capacities and capabilities of communities and institutions for coping with flood, in addition to establishing, maintaining and developing systems of early warnings and emergency preparedness and disaster recovery.

The city of Bijeljina, Bosnia and Herzegovina, is highly exposed to floods. Administrative area of the city covers the very north-east corner of Bosnia and Herzegovina, on a wide, low plain called Semberija, southern part of the big Pannonia Plain, at the confluence of Drina into Sava. In May 2014 an extreme flood, more than 50% of the City area was under the water and damages to local economy exceeded 10% of local GDP. In Bosnia and Herzegovina, a national flood management system does not exist at the state level due to a rather complex administrative structure (two entities and a district). Water management and flood management as a part of it exist at entity levels of Federation of Bosnia and Herzegovina and the Republic of Srpska. The city of Bijeljina is part of the Republic of Srpska entity. Flood management is treated in policy documents, but little attention is given to non-structural measures of flood management.

The Netherlands is a highly developed country with a long tradition of flood management. Although having good flood defence systems, flood risk in the Netherlands is growing due to climate changes. Having in mind that new flood defence infrastructure development would be expensive, Dutch researchers have also become more oriented towards developing non-structural elements for reducing flood risk.

Water management problems are similar in many countries, thus the international character and urgency of similar water problems imply a need to learn from experience of other countries. Within this context, the main purpose of this research is to assess and estimate the transferability of non-structural flood management measures from the Netherlands to Bosnia and Herzegovina.

This research is focused on spatial planning, early warning system and evacuation planning as non-structural measures in Integrated Flood Management. The transferability is analysed through a review and comparison of current state of development of above mentioned non-structural measures in both countries and influence of contextual differences on a potential transfer. The review was performed through a desk research of the existing legislation and policy documents, as well as through field visits and interviews with the actors in Integrated Flood Management. The data collected in research phase were analysed and the key similarities and differences between two countries pointed out in the comparison phase. The influence of key similarities and differences as contextual factors on transferability was applied to determine where the possibilities for the implementation of Dutch knowledge, technology and methodology in Bosnia and Herzegovina could be.

The results of the analysis showed that Bosnia and Herzegovina and the City of Bijeljina could implement measures and instruments of Integrated Flood Management, which would improve communication, cooperation and coordination between the actors in Integrated Flood Management, thus making the system more efficient and community more resilient to flooding.

Keywords: flood, Integrated Flood Management, non-structural measures, spatial planning, early warning system, evacuation planning, the Netherlands, Bosnia and Herzegovina

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1. INTRODUCTION

1.1. Background and Justification

Floods are the most frequently occurring of all natural disasters and their number is increasing, particularly in last 20 years (Jha, Bloch and Lamond, 2012). Flood risk comprises and implies a hazard, exposure of people/assets to the hazard, and vulnerability of people/assets exposed thereto (Birkholz, Muro, Jeffrey and Smith, 2014). Flood risk is higher in urban areas because of high density of population and assets affected. Potential damage and socio-economic consequences in urban areas are generally much higher than in rural ones, although the spatial scale of flood can be much larger in rural parts.

Even in cities with developed flood defence systems, flood control infrastructure can defend cities only up to a certain magnitude, depending on their design capacity (Liao, 2012). Limited capacities of flood control infrastructure, designed for predictable flood events, may not be able to prevent extreme flood events. Therefore, there is a need for integration of both structural and non-structural elements in flood defence systems.

Integrated Flood Management means that both types of flood management measures are developed and applied in an integrated manner in order to reduce flood risk. The two types of measures are not incompatible and mutually exclusive to each other; in most cases they are complementary and their combination should lead to reduction of flood risk. While the role of structural measures is to control the flow of water within and outside a settlement, the role of non-structural measures is to reduce flood risk through an improved planning and development management. Structural measures are mostly hard-engineered constructions, like dams, drainage channels and other flood defences, but there are also alternative and more natural solutions, like wetlands and natural buffers. Non-structural measures are focused on building the capacity of the community to cope with flooding. Some of non-structural measures, as early warning systems and evacuation planning, are designed as a first step in protecting people when there are no structural measures developed, but they also play important role in risk reduction after implementation of structural measures (Jha et al., 2012). More about non-structural measures is discussed in Chapter 1.4.1.1.

The city of Bijeljina, located in the north-east of Bosnia and Herzegovina (Figure 1), is highly vulnerable as to floods. Administrative area of the city is located on a wide plain at the confluence of two big rivers, Sava and Drina. The length of all rivers and canals in the city area is approx. 133km, out of which only 35km has been adapted to prevent floods by construction of levees. A recent estimate is that around 50,000 inhabitants of the city area (114,000 is the total population) are endangered by floods (Assembly of the City of Bijeljina, 2013). Big flood events occurred in December 2010 and again May 2014, having struck large surfaces of the city administrative area, while some villages were flooded more frequently.



Figure 1 - The Administrative Area of Bijeljina within Bosnia and Herzegovina (source: hr.wikipedia.org)

The Netherlands is a highly developed country with long tradition of flood management. Despite having one of the best flood defence systems, flood risk in the Netherlands is growing due to climate changes. Having in mind that new flood defence infrastructure development would be expensive, Dutch researchers have also become more oriented towards developing non-structural elements to reduce flood risk. For example, Neuvel and van den Brink (2009) explored whether spatial planning was or was not applied to reduce flood consequences. Also, the Netherlands conducted revision and reassessment of flood risk management policies, in relation to climate changes (Klijn, de Bruijn, Knoop and Kwadijk, 2012), while some researchers also explored how the integration of spatial planning, risk assessment, communication and policy can be achieved (Gersonius, Zevenbergen and van Herk, 2008) and how a combination of learning and decision-making could contribute to collaborative planning and influence governance (van Herk, Zevenbergen, Ashley and Rijke, 2011). There is also a relatively new resilient approach to flood risk management, where the resistance approach would be replaced with learning how to live with the floods, parallel to designing villages and buildings and to developing warning systems in a way that reduces potential damage (Vis, Klijn, De Bruijn and Van Buuren, 2003).

In Bosnia and Herzegovina, a national flood management system does not exist at the state level. Water management, and flood management within it exist at entity level of Federation of Bosnia and Herzegovina and the Republic of Srpska. The city of Bijeljina is part of the Republic of Srpska entity. The main strategic documents in the field of flood management are Basic Framework for Water Management Development in the Republic of Srpska (2006) and Integrated Water Management Strategy of the Republic of Srpska, until the Year 2024 (2012). These documents deal with flood management, but insufficient attention is given to non-structural measures of flood management.

Water management issues are similar in many countries worldwide, thus the international character and urgency of similar water problems imply a need to learn from experience of other countries (de Boer, Vinke-de Kruijf, Ozerol and Bressers, 2013). Within this context, the main purpose of this research is to assess and evaluate the transferability of non-structural flood management measures from the Netherlands to Bosnia and Herzegovina. To accomplish this objective, a method to compare and assess the role of non-structural elements in reducing flood risk in the countries should be developed. The case study area in Bosnia and Herzegovina is the village of Janja, located within the administrative area of the City of Bijeljina. In for the Netherlands, non-structural measures from different areas and different administrative levels will be analysed.

1.1.1. Flood Issued in Janja

Janja is a village and administratively part of the City of Bijeljina (former Municipality of Bijeljina). According to preliminary results of Census in Bosnia and Herzegovina (Agency for Statistics of Bosnia and Herzegovina, 2013), Janja has 12,233 inhabitants, 3,184 households and 4,272 dwellings. It is located 105m above the sea level, in the southern part of large Semberija plain. Janja is built on the banks of Drina's small tributary Janja (also known as Modran), near its confluence to Drina.

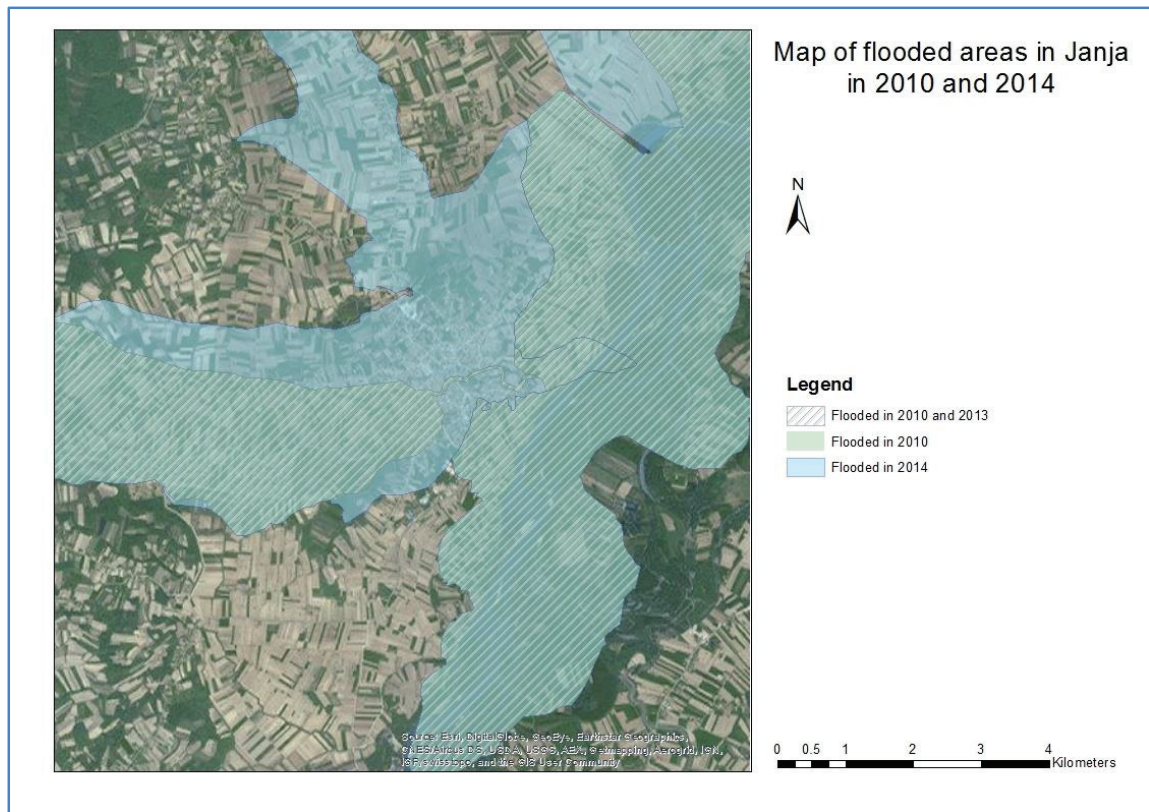


Figure 2 - Map of Flooded Areas in Janja in 2010 and 2014 (source: Public Institution "Water of Srpska")

The biggest recorded flood caused by the Drina River was in 1896, when maximum recorded water flow was 9500m³/s. Big flood events were also recorded in April 1907, November 1925, December 1968, and latest December 2010 and May 2014.

At the beginning of December 2010, 83.6km² of Bijeljina's area were flooded. Maximum recorded water flow in the Drina River was around 4000m³/s. Number of flooded residential objects in Municipality of Bijeljina was 869 and population affected was 9,761 (Construction Institute, 2014). Floods from May 2014 hit larger areas and more population, but official data is not yet available (Figure 2 and Figure 3).



Figure 3 - Flooded Janja, May 2014 (source: www.klix.ba)

Some parts of Janja village are located within 1km distance zone from the Drina River, and those parts are frequently flooded, almost every year, with maximum water flows of 1600-1700m³/s, that corresponds to maximum water flow of one or two years return period.

1.2. Research Problem

Non-structural measures of flood management are not treated sufficiently in flood management policies of Bosnia and Herzegovina, while this type of measures plays an important role and makes an integral part in flood management in the Netherlands. Developing non-structural measures is an important part of Integrated Flood Management, especially because these measures are less costly than structured measures, but still highly efficient.

Similarities between flood problems and their international character present a possibility of experience and knowledge transfer between different countries. Although there are a lot of similarities, there are also a lot of differences in the existing policies and governance systems. These differences can cause difficulties in transferring knowledge and experience. However, bearing in mind the international character of flood issues; coordination, communication, cooperation in regards with all the segments of flood management is a precondition for effective and efficient flood management. Water problems, including flood management problems, are often described as governance problems, not technical problems. Various actors, implementing various strategies and instruments, operate at various levels of water management. This complexity of water management systems is one of the major factors that complicate the transfer of knowledge in this field (de Boer et al., 2013).

Transferability is influenced by the relationship between the context it originates from and the one to be transferred to. That means that transfer process is mainly influenced by characteristics of actors involved, their cognition, motivation, resources and power. Also, transferability is influenced by many external factors. These factors form multilayered context, as shown in Figure 4 (de Boer et al., 2013).

Having in mind that Bosnia and Herzegovina is a less developed country in the process of joining the European Union and adjusting its laws and policies to European policies, there is a need to compare and

estimate transferability of non-structural flood measures from one of the European countries with high-developed flood management system, such as the Netherlands, and their applicability to Bosnia.

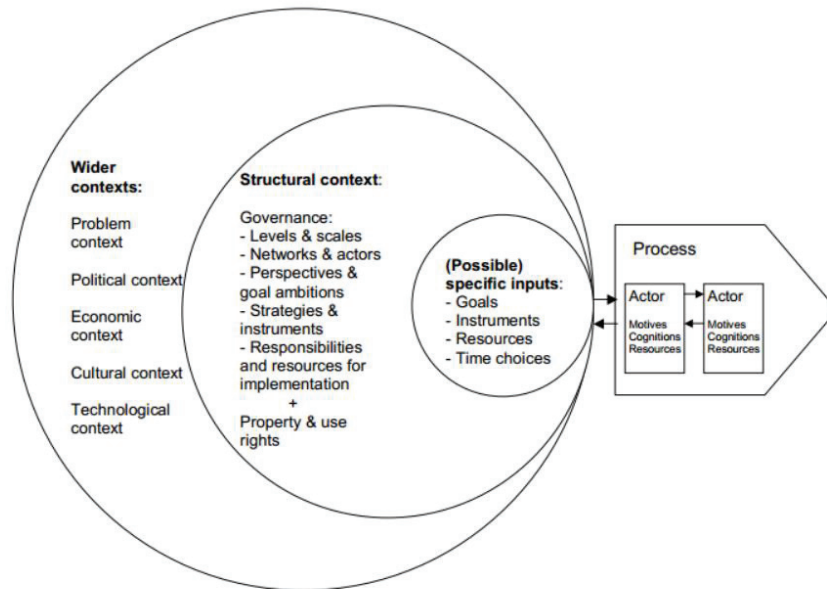


Figure 4 - Layers of Contextual Factors for Policy Transfer (source: de Boer et al., 2013)

1.3. Research Objectives and Questions

1.3.1. General Objective

The main idea behind this research is to contribute to an improved flood management in the City of Bijeljina, Bosnia and Herzegovina. The focus of the research are non-structural measures of Integrated Flood Management, so general objective can be formulated as: *improved flood management in the City of Bijeljina through an assessment of transferability of non-structural measures, knowledge and experience in Integrated Flood Management of the Netherlands to Bosnia and Herzegovina.*

1.3.2. Specific Objectives

In order to achieve general research objective, specific objectives are defined, as follows:

1. To review the present state of development of non-structural measures in Integrated Flood Management in the Netherlands.
2. To review the present state and level of development of non-structural measures in Integrated Flood Management in Bosnia and Herzegovina.
3. To compare the present levels of development of non-structural measures in Integrated Flood Management in the Netherlands and Bosnia and Herzegovina.
4. To analyse the influence of wider contexts, structural context and transfer process context on transferability, and to determine which non-structural measures in Integrated Flood Management could be transferred from the Netherlands to Bosnia and Herzegovina.

1.3.3. Research Questions

To achieve above mentioned specific objectives, a set of research questions is to be answered:

Specific Objective 1

1. What is legal framework for the development of non-structural measures in the Netherlands?
2. Which institutions are responsible for developing the non-structural measures in the Netherlands?
3. What is the current state of development of non-structural measures in the Netherlands?
4. What are the factors influencing the level of development of non-structural measures in the Netherlands?

Specific Objective 2

1. What is legal framework for the development of non-structural measures in Bosnia and Herzegovina?
2. Which institutions are responsible for developing the non-structural measures in Bosnia and Herzegovina?
3. What is the current state of development of non-structural measures in Bosnia and Herzegovina?
4. What are the factors influencing the level of development of non-structural measures in Bosnia and Herzegovina?

Specific Objective 3

1. What are the most important similarities and differences in spatial planning as a non-structural measure, between the Netherlands and Bosnia and Herzegovina?
2. What are the most important similarities and differences in early warning systems between the Netherlands and Bosnia and Herzegovina?
3. What are the most important similarities and differences in evacuation planning between the Netherlands and Bosnia and Herzegovina?

Specific Objective 4

1. What is the influence of wider contexts on transferability of non-structural measures from the Netherlands to Bosnia and Herzegovina?
2. What is the influence of the structural context on transferability of non-structural measures from the Netherlands to Bosnia and Herzegovina?
3. What is the influence of the transfer process context on transferability of non-structural measures from the Netherlands to Bosnia and Herzegovina?
4. Which non-structural measures and instruments developed in the Netherlands can be implemented in Bosnia and Herzegovina?

1.4. Research Design and Anticipated Results

1.4.1. Conceptual Framework

The main concepts in this research are transferability and non-structural measures in Integrated Urban Flood Management (Figure 5). Concepts of Integrated Urban Flood Management and its structural measures were already briefly explained in Chapter 1.1, while further explanation of transferability and non-structural measures in Integrated Urban Flood Management is given in this chapter.

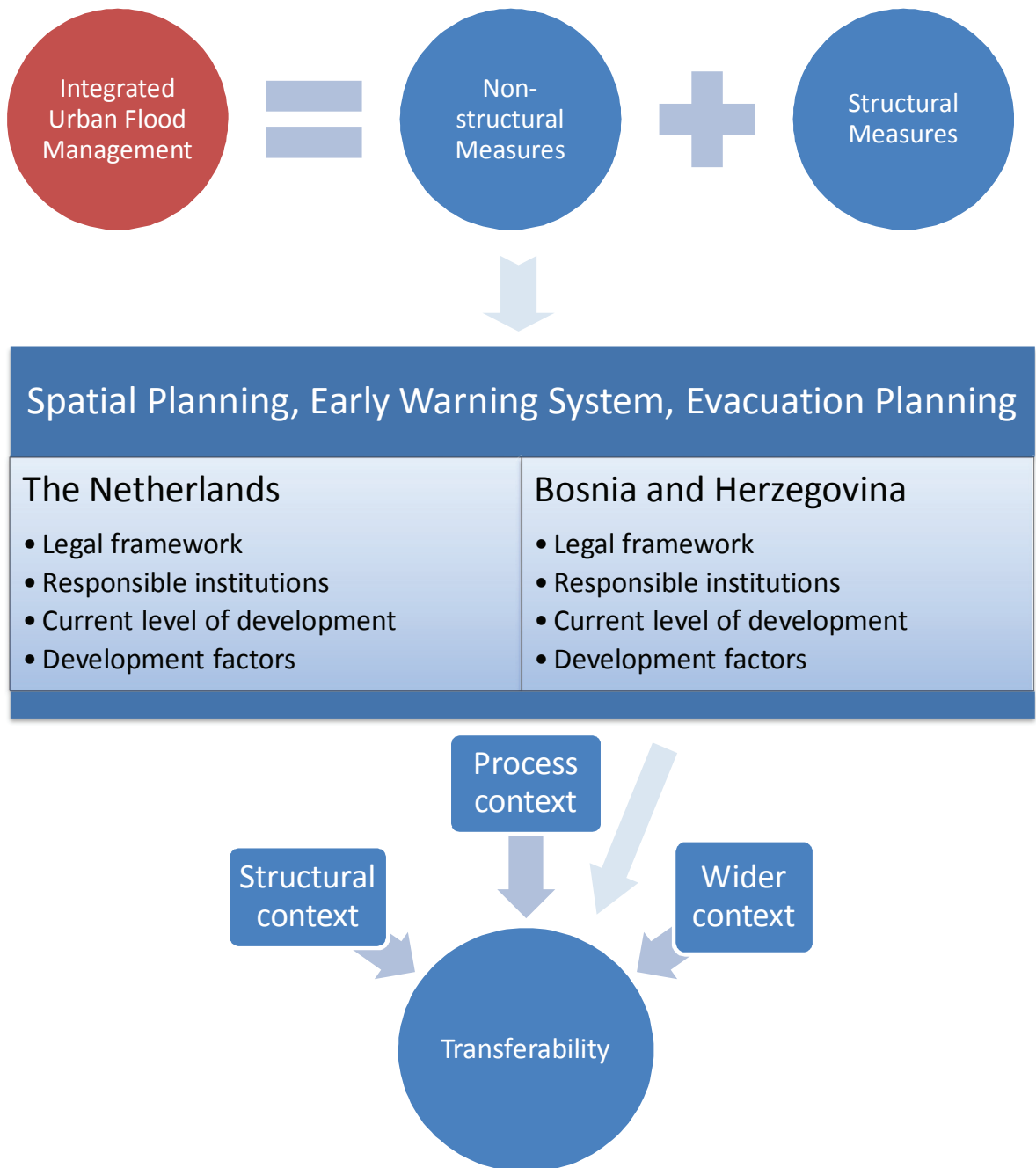


Figure 5 - Conceptual Framework

1.4.1.1. Non-structural Measures within Integrated Urban Flood Management

Structural elements of Integrated Flood Management are in use to control the flow of water, and they include both structural hard-engineering solutions and more natural and sustainable complementary or alternative measures, whereas non-structural elements have the role to reduce flood risk through improved planning and management of development. Integrated Flood Management implies the use of both types of measures. The main characteristic of heavily-engineered structural measures is that they tend to transfer flood risk from one location to another, more appropriate one, while non-structural measures may have lower impact on flood risk, but many of them have multiple benefits, not only in the field of flood management (Jha et al., 2012).

Non-structural measures in urban flood management include (Jha et al., 2012):

- Flood awareness campaigns;
- Health planning and awareness campaigns;
- Land use planning and flood zoning;
- Flood insurance, risk financing, compensation and tax relief;
- Solid and liquid waste management;
- Emergency planning, rescue, damage avoidance actions and temporary shelter provision;
- Planning the business and government continuity;
- Early warning systems;
- Evacuation planning;
- Flood recovery and reconstruction.

It is not easy to categorise non-structural measures, because many of them have a role in any stage of Integrated Flood Risk Management. Based on their role in flood management process, there are four main categories of non-structural flood management measures (Jha et al., 2012):

- Increased preparedness;
- Flood avoidance;
- Emergency planning and management;
- Speeding up recovery and using recovery to increase resilience.

The categories of non-structural measures in Integrated Flood Management can be matched to the phases of flood management. The flood management cycle has five phases (Van Herk, Zevenbergen, Gersonius, Waals and Kelder, 2013):

1. Protection phase: in this phase of flood management, measures to reduce likelihood of floods are taken, e.g. building flood defences or preventing high river discharges;
2. Prevention phase: in this phase, instruments such as spatial planning and adaptation of buildings to reduce possible damages in the case of a flood, are used;
3. Preparedness phase: in this phase, organizational preparation in the case of flood is improved through emergency plans, risk maps, early warning system, risk communication, flood insurance, etc.;
4. Emergency relief phase: in this phase, measures such as evacuation, erection of temporary flood defences and provision of medical help are taken to provide emergency relief in the case of flood;
5. Recovery and lessons learned phase: social and economic effects of the flood are analysed, as well as the response to the flood. The knowledge is used for better mitigation in future events of flood.

Flood management practices in Europe were traditionally predominantly focused on defensive approaches to reduce the probability of flooding, that correspondents to the protection phase of flood management. An increasing number of flood events and their larger magnitude have caused the shift to a more integrated approach in which flood risk is actively managed to reduce flood impacts (Van Herk et al., 2013). This integrated approach to flood management has lead to an increased attention to the later stages of flood management cycle. As we can see from Figure 6, the key is to use experience from the previous flood events for better preparation for future flood events.

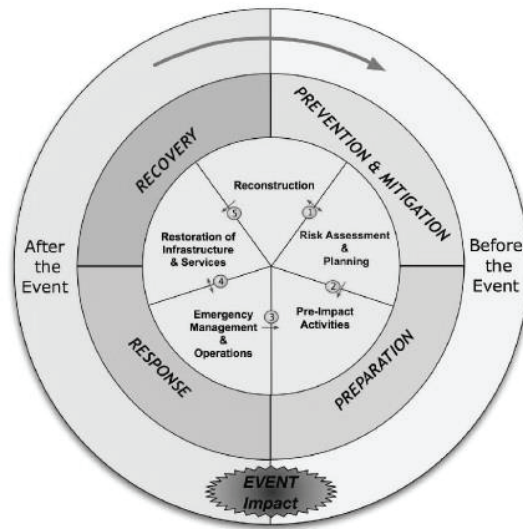


Figure 6 - Integrated Flood Management Cycle (source: www.floodsite.net)

Aiming to cover all the phases of Integrated Flood Management that occur before and during the flood event, this research is focused on spatial planning, early warning system and evacuation planning, as parts of the non-structural measures.

Spatial Planning

Spatial planning has a great importance in the prevention and mitigation phases of Integrated Flood Management. The aim of prevention and mitigations phase is to reduce the risk of damages to people, property and resources before the disaster strikes. The role of spatial planning as a disaster risk management measure includes the following actions (Fleischhauer, 2008):

- Keeping areas free from development;
- Differentiated decisions on land-use;
- Recommendations in legally binding land-use or zoning plans;
- Influence on hazard intensity and frequency.

Spatial planning has instruments to keep flood prone areas free from future development, that reduce the risk directly because the people and assets are not exposed to it. Also, spatial planning has instruments to decide which activities are acceptable in potentially endangered areas. This is done through land-use planning in accordance to the intensity and frequency of floods. Besides, the risk can be reduced through recommendations about construction requirements in specific zones. Spatial planning can influence hazard intensity and frequency through allocating space for this purposes, like flood retention areas or protective forests (Fleischhauer, 2008).

Integration of flood management into spatial planning is of a great importance in minimizing the risk and managing the impacts of flooding. Land-use planning, as a measure of spatial planning, provides a policy and regulatory mechanism which can integrate diverse and often conflicting objectives (Jha et al., 2012). Land-use planning can contribute to Integrated Flood Management through:

- identification of appropriate areas and locations for specific land uses;
- assessment of risks associated with specific land uses at specific locations;
- identification and assessment of important social or environmental features;
- defining the minimal requirements or expectations of particular land use types;
- defining what type of urban development is required and where.

Identification of flood zones and flood hazard mapping provide a spatial framework in which development could occur, and allows for flexibility in planning by restricting the development of highly vulnerable land-uses in areas with the higher flood risk (Jha et al., 2012).

However, role of spatial planning in flood management can be quite limited, because spatial planning can have significant influence only in the decision-making process about new developments, while its contribution is much lower in already built-up areas (Fleischhauer, 2008).

Early Warning Systems

Early warning systems are developed with the task to give notice of an impending flood. Usually, activation of early warning system is also a signal for activation of the existing emergency plans. Early warning systems can be set up at national, regional, local or at the river basin level. They can be used to warn authorities or the public, or both (Jha et al., 2012). The main characteristics featuring the quality of early warning system are the following:

- Detection of conditions that can lead to the flood;
- Forecasting how these conditions can translate into the flood hazard, by using historical comparisons, modelling systems and by preparing scenarios;
- Broadcasting the warning messages;
- Response of those who receive warning messages and their actions based on the instructions or prepared plans (Jha et al., 2012).

Effectiveness of the early warning system is highly dependent on available forecasting system, the quality of the emergency plans and the level of preparedness of the community. The quality of the forecasting system is very much dependent on the nature of the hazard. For example, flash floods caused by extreme rainfall are not so easy to predict.

Many stakeholders can be included in early warning system; starting with authorities at all levels of government, there are also emergency services and responders, local industry, the public affected, water management authorities, voluntary organizations, utility providers, etc. This large number of stakeholders requires an integrated design of an early warning system, so different users can use the information provided (Jha et al., 2012).

Problems with the early warning system can occur if more than one source of information exists. The best situation is to have only official warnings, from one source, with clear chain of responsibilities. Otherwise, separate and different alerts can cause confusion and panic (Jha et al., 2012).

Evacuation Planning

Evacuation is a flood management measure to reduce loss of lives at the time of a flood or threat thereof. If people leave the potentially exposed area or move to relatively safe places. like shelters on a higher ground, they are less exposed to flooding (Kolen and Helsloot, 2014).

Evacuation planning must include an interdisciplinary team, with high participation of the community. Interdisciplinary approach is needed because there are many emergency and other services necessary to successfully implement the evacuation, while high participation of the community is necessary to increase people's awareness and preparedness. It is very important to provide the personnel included in evacuation with at least basic training in emergency and rescue operation and medical care. Besides, evacuation drills should be held regularly to test the effectiveness of the evacuation plans.

Evacuation plan needs to contain evacuation routes and modes of transport, as well as identification of spaces and buildings which can be used as temporary shelters. (Jha et al., 2012). An important part of the plan is to determine sources of supplies and supply distribution points, information centres, sanitary and medical facilities.

1.4.1.2. Transferability

Transferability in water management was explored by de Boer et al. (2013). The authors were investigating international policy transfers within the water management sector. The focus of their research was on knowledge transfer between actors representing different countries and/or different governance levels. As the authors believe that activities and interactions of actors are crucial, policy transfer is defined as *interactive process by which actors use knowledge (about water management and/or governance) that was developed in one context (country or governance) for the development of water management and/or water governance in another context.*

1.4.2. Approach and Methodology

This chapter describes the research approach and methodology applied to answer research questions. The research consists of four phases (Table 1) corresponding to the specific research objectives and research questions stated in Chapter 1.3.2 and Chapter 1.3.3.

Table 1 - Research Phases

Phase	Objective
Phase I	To review the present state of development of non-structural measures in flood risk management in the Netherlands
Phase II	To review the present state and level of development of non-structural measures in flood risk management in Bosnia and Herzegovina
Phase III	To compare the present levels of development of non-structural measures in Integrated Flood Management in the Netherlands and Bosnia and Herzegovina
Phase IV	To analyse the influence of wider contexts, structural context and transfer process context on transferability and to determine which non-structural measures in Integrated Flood Management can be transferred from the Netherlands to Bosnia and Herzegovina

1.4.2.1. Phase I

The first part of the research was a review of the current state of development of non-structural measures in flood risk management in the Netherlands. In order to accomplish this, research questions related to specific objective 1 were answered by a combination of desk research and expert interviews. The desk research consisted of the review of the existing legal acts, policy documents and planning documents in the Netherlands, relevant to the fields of water management, spatial planning, disaster and risk management (more in Chapter 2.2), while the interviews were held with experts from water management sector (Table 2). The interviews were held as exploratory interviews, where the question areas were pre-determined, but the respondents were allowed to answer in their own way. Although there is a lot of available literature about flood management in the Netherlands, the interviews were held with aim to analyse the situation in practice. In order to accomplish this aim, two experts from water boards, as responsible individuals (one current employee of the water board and another former employee) were interviewed. The main topics in the interviews were early warning system and evacuation planning in the Netherlands (Appendix 1), since the water boards have an important role in these systems. Experts also shared their experience in knowledge and instrument transfer, while spatial planning topic was covered only briefly.

Table 2 - Interviewed Experts in the Netherlands

Name	Institution	Topics Covered
Matthijs Overbeek	Water board Vechtstromen, Almelo	Early warning system, Evacuation planning, Transferability, Spatial planning (briefly)
Evelien van der Kuil	Senior adviser and manager, advice-group Water in Twynstra Gudde consultant company, Amersfoort; Former operational leader in Water board Groot Salland, Zwolle	Early warning system, Evacuation planning, Transferability, Spatial planning (briefly)

1.4.2.2. Phase II

The second phase of the research is a review of the current state of development of non-structural measures in flood risk management in Bosnia and Herzegovina. The review was conducted in the same manner as the one with the Netherlands, but with larger number of interviews due to lack of existing literature about the state of Integrated Flood Management and to low level of implementation of existing policy and planning documents. The interviews were held with a number of experts and other actors in Integrated Flood Management (Table 3), including citizens, in the area of the City of Bijeljina. The interviews covered two levels of authorities - entity authorities represented by Public Institution "Water of Srpska" and local institutions represented by departments of Civil Protection and Spatial Planning in the City of Bijeljina, as well as with the Directorate of City Planning and Development in Bijeljina and Local Community Office in Janja. Besides the authorities, the interviews covered private sector (Water Management Service, Bijeljina) and NGO sector ("Eco-way", Bijeljina). In order to have a better insight into the work of the system during most recent floods (May 2014), the interviews were held with volunteers and members of protection and rescue teams of Civil Protection, professors of Janja high school and representatives of large companies in Janja, that were endangered by the flood (Table 3).

Table 3 - Interviewed Actors in Integrated Flood Management in Bosnia and Herzegovina

Name	Institution	Topics Covered
Branislav Blagojević	Head of Protection from Water Sector in Public Institution "Water of Srpska", Bijeljina Former director of the Institution	Early warning system, Evacuation planning, Spatial planning, Transferability
Drago Ristić	Head of the Civil Protection Department within the City of Bijeljina, Bijeljina	Early warning system, Evacuation planning, Spatial planning, Transferability
Igor Ostojić	Head of the Spatial Planning Department of the City of Bijeljina, Bijeljina	Spatial Planning, Evacuation planning (briefly), Transferability
Branka Blagojević	Head of Planning Sector in Directorate of City Planning and Development in the City of Bijeljina, Bijeljina	Spatial Planning, Transferability
Ismet Safić	Secretary in the Local Community Office, Janja	Early warning system, Evacuation
Vujadin Blagojević	Water Management Service, Bijeljina	Early warning system, Evacuation planning, Spatial planning
Snežana Jagodić-Vujić	NGO "Eco-way", Bijeljina	Evacuation planning, Early warning system
Nebojša Zorić	Volunteer in Civil Protection, professional diver	Evacuation, Early warning system
Zdravko Stevanović	Volunteer in Civil Protection, Commander of the unit; Former executive in Water Service Bijeljina and Water Institute, Bijeljina	Evacuation, Early warning system, Evacuation planning
Savo Ivković	Professor of Janja high school	Early warning system, Evacuation
Jasna Ivković	Professor of Janja high school	Early warning system, Evacuation
Đoko Petrović	Executive in "BMD" private company in Janja	Early warning system, Evacuation
Zoran Tabajica	Director in "Blagojević Mill" private company in Janja	Early warning system, Evacuation

1.4.2.3. Phase III

The third phase of the research was a comparison of current levels of development of non-structural measures in Integrated Flood Management in the Netherlands and Bosnia and Herzegovina. The comparison was made based on the data collected in previous two phases of the research. The review of the existing legal acts, policy and planning documents, combined with interviews with experts and other actors gave a good insight into the current situation of Integrated Flood Management in both countries. An analysis of the data resulted in key characteristics of the Integrated Flood Management system in both

countries, and these characteristics were compared in order to identify key similarities and key differences in this field between the two countries.

Having in mind that the questions in interviews were already structured, but the interviews were conducted in an exploratory manner, the data collected through the interviews and the policy review was categorised according to the chosen non-structural measures. For each selected non-structural measure the existing legal and policy framework, responsible institutions, the current situation in practice and development factors were identified. These elements were used for comparison phase aiming to identify key similarities and differences between the development levels of non-structural measures in the Netherlands and Bosnia and Herzegovina.

1.4.2.4. Phase IV

In the fourth phase of the research, the influence of contextual factors on transferability was analysed. The contextual factors are divided in three layers - wider contexts, structural context and transfer process context (Figure 4). The influence of contextual factors was determined based on the comparison performed in the third research phase and on the analysis of key differences in the wider context. As a result of the analysis, non-structural measures and instruments of Integrated Flood Management developed in the Netherlands, which could be applied within relatively short time and without large financial investments in Bosnia and Herzegovina, particularly in the City of Bijeljina, were identified.

2. REVIEW OF THE PRESENT STATE OF NON-STRUCTURAL MEASURES IN INTEGRATED FLOOD MANAGEMENT IN THE NETHERLANDS

2.1. Introduction

The main reason for success of the Dutch flood management policy is not a reconstruction of large-scale flood defence structures. The main reasons for its success are changes in legislation, organisational structures and policy, the changes that made improvements through clear mandates and proper funding of the whole system (Slomp, 2012). Water governance in the Netherlands has evolved from the 13th century regional water authorities ("water boards") to modern, flexible institutions that have world-class engineering and participation of large number of stakeholders, included as proactive water managers (OECD, 2014).

About 60% of the Netherlands is flood prone, either from Rivers Rhine and Meuse or from the North Sea and large lakes, or combined. Besides, climate changes and technical or non-technical innovations present the challenges that are being treated in water management policies in the Netherlands (Slomp, 2012; OECD, 2014). Since the 1953 flood, the flood protection has a privileged status in the Netherlands. Over the last 50 years, large protective structures have been built to provide safety from floods, as a part of the Delta Works. More recently, a new Delta Programme is emerging innovative architecture, urbanisation and landscape solutions to build with the nature and live with water. This approach is well known as "The Room for the River" (OECD, 2014).

The new Delta Programme is based on a new type of water governance. This new type includes different layers of government, which join their interests. The main policy document in water management is National Water Plan (2009), that introduces a comprehensive strategy (Van Alphen et al., 2011) consisting of the following:

- protective measures against floods and droughts,
- better integration of water management and spatial development,
- a flexible approach, that is starting with "no regret" measures, and
- legal basis and long term funding to guarantee a long term implementation.

The central approach in flood risk management, as it is stated in National Water Plan (Government of the Kingdom of the Netherlands, 2009), is multi-layer safety. Multi-layer safety is a sustainable approach to address protection against water and limiting social disruption in the event of disaster. This approach consists of three layers:

- Prevention, based on levee system and "The Room for the River" measures,
- Sustainable spatial planning,
- Improved emergency response to floods.

Prevention measures should retain and store water before it drains, and therefore, reduce the flood risk. Sustainable spatial planning should limit the effect of a potential flood by planning the vulnerable areas and choosing locations for large-scale developments. Improved emergency response to floods should be achieved through a better organisation, coordination and cooperation in disaster and crisis management (Government of the Kingdom of the Netherlands, 2009).

2.2. Main Legal Acts and Policy Documents

Integrated Flood Management in the Netherlands is organised through a number of legal acts, policy documents and plans (Table 4). The main legal acts are the Water Act, Safety Region Act and Spatial

Planning Act, Provinces Act, Municipalities Act, Water Boards Act and Crisis and Recovery Act, are also relevant.

The Water Act (2009) defines roles, responsibilities and procedures regarding water management and flood risk management. The purpose of the act is to prevent and limit flooding, swamping and water shortage, and to protect and improve the chemical and ecological status of water systems. This act names the Ministry of Infrastructure and Environment as responsible for making a national water plan that should contain the main elements of national water policy, integrated in associated aspects of national spatial policy.

Ministry of Infrastructure and Environment is obliged to deliver information and warnings on high water levels that may constitute a danger to a primary flood defence structure, to the water authorities responsible and the provincial executives concerned.

Water authorities responsible for water systems in one and the same river basin district should make agreements stipulating mutual aspects of water management in order to achieve coordinated and efficient water management.

Supervision of primary flood defence structures of each province are a responsibility of the provincial executive. If a primary flood defence structure is located in more than one province, then the provincial executive concerned should make an agreement as to whose responsibility the supervision of that particular structure will be.

The provincial executive is to draw up one or more regional water plans that should contain the main elements of water policy to be pursued in the province, and the associated aspects of provincial spatial policy. Regional plans shall constitute master plans. Regional water plans should cover the entire territory of all the provinces. A water authority shall draw up a management plan for the water systems under its management. All plans should be revised once every six years (Water Act, 2009).

The Safety Regions Act (2010) has the purpose to achieve an efficient and high-quality organisation of the fire services, medical assistance and crisis management under one regional management board. Safety regions must be structured on the same scale as the police regions. The administrative structure of disaster and crisis management is defined through clear tasks and powers. Dividing the territory into equal regions creates an essential basis for multidisciplinary action in the event of a disaster or crisis. The municipalities will be continuously involved in the fire services and in disaster management through the structures of extended local government.

Safety regions are set up because disasters and crisis can exceed municipal boundaries and their coping capacities. The increase in scale enables improvement of the quality of disaster and crisis management, as well as multidisciplinary cooperation and coherent security policy. Combining the capacities, knowledge, experiences and finances is raising professionalism of organisations involved. The aim of safety regions is to better protect citizens against risks, to offer better emergency services and after-care in the event of disaster or crisis, to bring fire services, medical assistance and crisis management under one regional administrative authority and to reinforce administrative and operation effectiveness (Safety Regions Act, 2010).

The Spatial Planning Act (2006) regulates how spatial plans of the country, its provinces and municipalities, are created. The main innovation is that classic spatial plans at national and provincial levels are replaced by structural visions that include developments expected in the field of spatial planning for the given territory. At the municipality level, the main instrument is land-use plan and that is the level where actual spatial planning is happening. The main tool for planning is zoning. Municipality determines the zones for different types of land use, and it defines building regulations for those zones.

The main policy documents in the field of Integrated Flood Management at national level are National Water Plan, National Spatial Strategy, National Flood Protection Program and National Flood Crisis and Large-scale Evacuation Plan. Besides these documents, other authority levels have their plans: provinces have water plans and zoning plans, municipalities have their land-use plans, water boards have water

management plans and flood disaster management plans, while safety regions have disaster management plans and crisis coordination plans.

The National Water Plan (Government of the Kingdom of the Netherlands, 2009) is a formal government plan for national water policy. In the Water Act, it is stated that such a plan has to be formulated every six years by the central government.

The National Water Plan applies to the entire water system, including surface water, groundwater and the corresponding flood defence structures, banks and so on.

The central government has primary responsibility for the development and implementation of policy for the national spatial structure (the coast, the major rivers and the IJsselmeer lake). Through the formulation of general administrative orders and incorporation plans, the central government can ensure that national water policy carries over to spatial plans of lower-tier authorities.

The vulnerability of areas to flooding, seepage, water logging, drought or salinisation, and the associated risks, differ from area to area. This means that the water tasks differ too. For the reasons of safety, some areas such as those around the major rivers and parts of the coastline already require the reservation of space for the future management of the water system. In other words, water is normative for the spatial development in these areas. Other tasks will be fully included in the implementation of the spatial task.

A key instrument is the water test, which is regulated in the Spatial Planning Decree. The aim of the test is to guarantee the early involvement of water management authorities in spatial planning processes, to ensure that every objective of water policy is thoroughly considered in all spatial plans and decisions relevant to the water system. As such, the water test has a more process-oriented character than a regular test (Government of the Kingdom of the Netherlands, 2009).

Spatial reservation in the main water system and regional systems are necessary to withstand future consequences of climate changes. In order to sustain the area around the major rivers, long-term spatial reservations both outside and inside the dykes have already been laid down in the Key Planning Decision on Room for the River (Figure 7). These are reconfirmed in the National Water Plan and adopted in the first part of the General Administrative Order.

In addition to spatial reservation under the Spatial Planning Act, the instrument of protection zones under the Water Act is important to sustain the water system. This instrument is used to protect surfaces along primary flood defences, so that the coastal flood defences and those along the major rivers and lakes can be strengthened.

Together with the provinces, municipal councils and water boards, the central government is developing a flood risk zoning method for vulnerable areas. This method offers a framework for linking area-specific flood risks to the designated use and development of areas and functions. The aim is to arrive at a clear, unambiguous and robust description of a number of distinct risk zones for which specific aims and frameworks can be formulated (Government of the Kingdom of the Netherlands, 2009).



Figure 7 - Ongoing Flood Safety Implementation Projects (source: Government of the Kingdom of the Netherlands, 2009)

Table 4 - Flood Risk Management Instruments in the Netherlands (source: Slomp, 2012)

	Prevention	Protection	Preparation	Response	Recovery
Legislation	Spatial Planning Act	Water Act	Safety Regions Act		
	Provinces Act Municipalities Act	Water Boards Act	Municipalities Act		Disaster Compensation Act
Administrative Level	Ministry of Infrastructure and Environment		Ministry of Security and Justice		
State	National Water Plan, accent on protection and zoning				
	National Spatial Strategy				
		National Flood Protection Program			
			National Flood Crisis Plan and Large-Case Evacuations		
Provinces	Provincial Water Plan Zoning Plan				
Water Boards	Water Management Plan		Flood Disaster Management Plan		
Safety Regions			Crisis Coordination Plan Disaster Management Plan		
Municipalities	Land Use Plan				

2.3. The Main Actors in Integrated Flood Management

Basically, the Netherlands has four levels of government: European level, national level, provincial level and municipality level. There are 12 provinces and 408 municipalities in the Netherlands. Decentralisation is one of the principles implemented in water management. In addition to the four government levels, Integrated Flood Management in the Netherlands has one more institutional layer, consisted of regional water authorities in water management sector (Figure 8) and safety regions in disaster management sector.

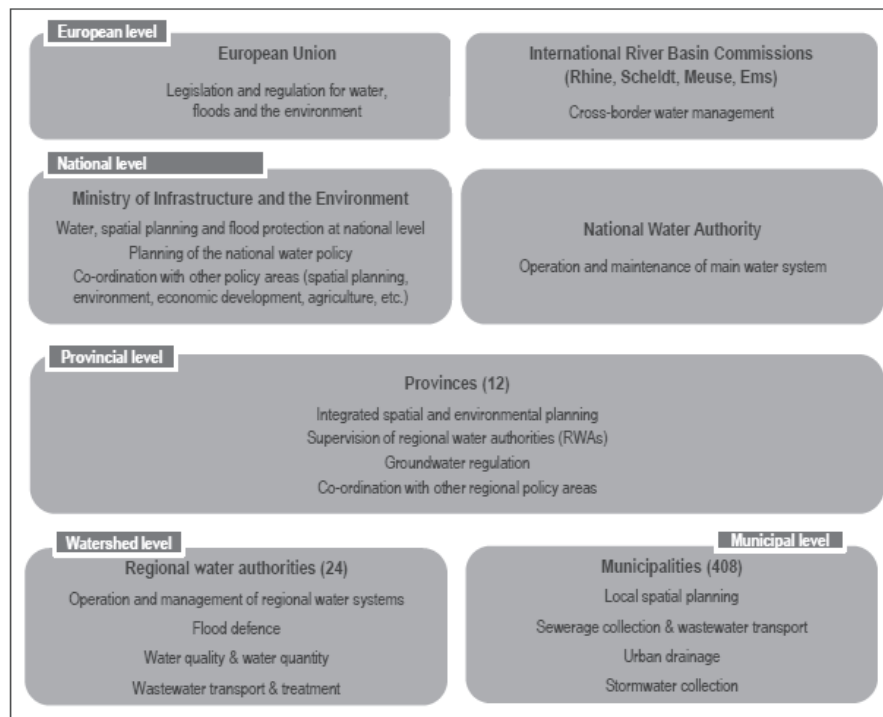


Figure 8 - Institutional Layers of Water Management in the Netherlands (source: OECD, 2014)

The main actors in Integrated Flood Management at the national level are the central government and its ministries (Ministry of Infrastructure and the Environment, Ministry of Interiors and Kingdom Relations, Ministry of Security and Justice) and National Water Authority (*Rijkswaterstaat*). The Ministry of Infrastructure and the Environment is responsible for the development of national water policy and coordination and agreement with other sectors and their policies (spatial planning, nature conservation, agriculture, economic development, etc.). The Ministry of Interiors and Kingdom Relations is involved in the development of national water policies and disaster management through coordination of disaster management at lower levels of government. The Ministry of Security and Justice is responsible for emergency services, civil protection issues and annual risk assessment. *Rijkswaterstaat* is the agency of The Ministry of Infrastructure and the Environment responsible for operation and maintenance of the main water systems in the Netherlands (Slomp, R., 2012; OECD, 2014).

There are 12 provinces in the Netherlands. These administrative units are responsible for integrated spatial and environmental planning, groundwater plans and regulation and supervision of water boards. The provinces issue construction permits for large infrastructure projects, such as dikes.

The Netherlands is consisting of 408 municipalities responsible for spatial planning at the local level (land use plans and building permits), sewerage collection systems, urban drainage and storm water collection.

Regional Water Authorities, or Water Boards, are one of the oldest public authorities in the Netherlands. There are 23 water boards in the Netherlands, operating independently of national government and their responsibilities are flood defences, water quantity and water quality management and wastewater treatment (OECD, 2014).

Safety Regions are non-administrative units, created from emergency services and public health authorities for better disaster management. Safety regions are coordinating fire fighting, public order and safety, disaster and crisis management and medical assistance in accidents or disasters. There are 24 safety regions in the Netherlands and their area of responsibility matches to police regions (Slomp, R., 2012).

Besides the actors mentioned above, a number of agencies, committees and other organisations are included in Integrated Flood Management in the Netherlands. A wide scope of the included stakeholders ensures democracy principles in decision making process and presents basis for innovations (Figure 9).

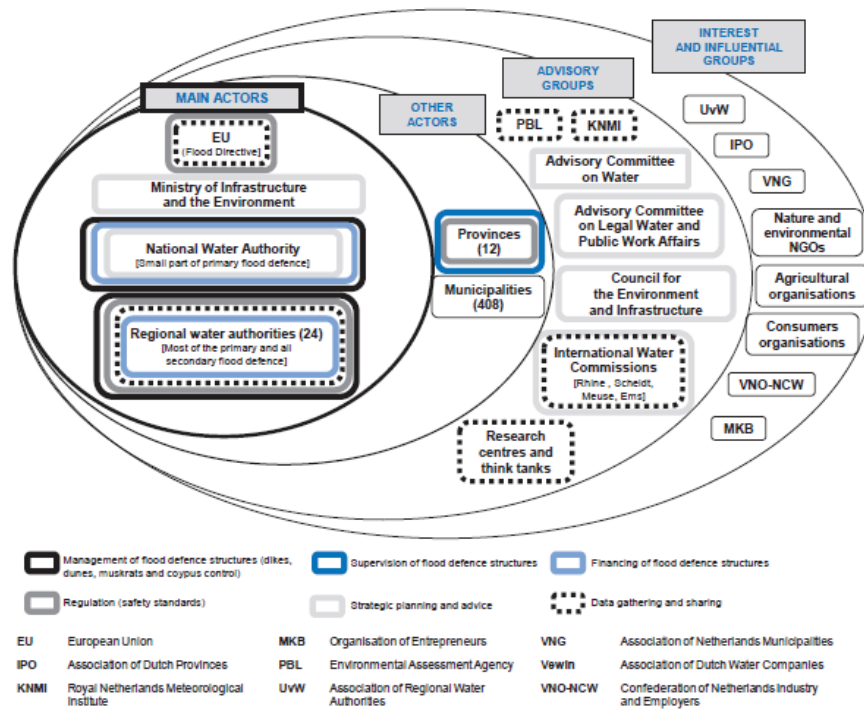


Figure 9 - Institutional Mapping for Flood Management in the Netherlands (source: OECD, 2014)

2.4. Spatial Planning as a Flood Management Measure

2.4.1. Legal Framework

Spatial planning in the Netherlands is performed at three levels: national, provincial and local. Standard spatial plans at all three levels are replaced by structural visions. Basis of a planning is zoning scheme. Zoning scheme is a plan created by municipal council and every municipality is obliged to cover its whole territory with this plan. It is possible to create integration plans of provincial or national level, if there is an interest for (Spatial Planning Act, 2006).

2.4.2. Responsible Institutions

The Ministry of Infrastructure and Environment is responsible to develop a structural vision for the spatial development in the Netherlands. Structural vision is presented in the National Spatial Strategy, the main policy document in spatial planning sector (Spatial Planning Act, 2006).

Provincial government is responsible to establish one or more structural visions for the territory of the province, thus determining spatial policy in the province. Provincial government can establish an integration plan if there are provincial interest that require integration plan (Spatial Planning Act, 2006).

The municipality council is obliged to establish one or more structural visions for the entire territory of the municipality. Structure vision is setting out essentials of planning policy in the municipality. The municipal council is responsible to cover the whole territory of the municipality with zoning scheme. Whole municipality has to be covered with land-use zones that determine use of the land and building regulations. Land-use plans shall be revised within period of ten years (Spatial Planning Act, 2006).

2.4.3. Existing Plans

The National Spatial Strategy is main policy document in the spatial planning sector in the Netherlands. The main vision of the strategy is that economy should have greater role and more space for the development should be created. Provincial and municipal councils, institutions of civil society and even individual citizens have greater responsibility for action then it was before.

One of the main challenges in spatial planning in the Netherlands is water management. As a result of climate change, problems as rising sea levels, extreme precipitation and high water levels in rivers will be addressed by giving more space to the water to pass through the country. It means that the existing space available for the river discharge in the flood plains will not be used for other uses, and that this space will be expanded where the expansion is necessary and possible. As a result, space along the main rivers is reserved for future needs. It is necessary to include this measures in provincial and municipality spatial plans (Ministry of Infrastructure and the Environment, 2011).

One part of **the National Water Plan** is chapter dedicated to the spatial aspects of water policy in the Netherlands. Taking water management requirements into consideration for spatial development is essential for the development of a sustainable and climate-proof water system. The integration of water management and spatial planning is performed through inclusion of water management sector in decision-making system in the earliest phases. The result is already mentioned policy of preserving space for the water. The central government has role to secure inclusion of water-related spatial policies in provincial and municipal spatial plans and to coordinate their actions (Government of the Kingdom of the Netherlands, 2009).

Room for the River is a package of spatial planning measures that represents shift from limiting rivers between high dikes to reserving space for river discharge in flood plains. The package named Spatial Planning Key Decision Room for the River is drawn up in 2006 with the main objectives of flood protection by 2015 and improved overall environmental quality in the Rhine River basin region.

Measures in the basic package are designed for each of the Rhine branches - Waal, Lower Rhine-Lek, IJssel and Lower Reaches. The measures are displacing dikes, depoldering, creating flood channels, removal of obstacles, deepening of forelands, summer bed enlargement, lowering of groynes and dike improvement. These measures require space that is presently inside the dikes. Room for the river is great infrastructural project that requires coordination between many actors in water management sector, spatial planning sector and other sectors (Government of the Kingdom of the Netherlands, 2009).

2.4.4. Present Situation

Spatial and water management planning are linked in the Netherlands. The Water Act (2009), with its spatial aspects of water policy, is regulating that water plans in national and regional level are at the same spatial plans. At the municipal level, land-use plans have to meet the requirements of the included water management issues.

A key instrument for integration of water management and spatial planning is The Water Assessment, regulated by Spatial Planning Decree. This test is guaranteeing the early involvement of water management authorities in spatial planning process and decision making. The character of the test is more process-oriented than a regular test.

Coordination between different actors is ensured during the preparation phase of the plans. The water boards are obliged to review all new urban developments concerning water management and flood risk management issues. When national or regional water plan involves spatial aspects of water policy it becomes structure plan (Government of the Kingdom of the Netherlands, 2009).

All existing strategic plans (water plan and structure vision, and plans from other sectors, e.g. environment, agriculture, etc.) should be replaced with one integrated plan from the central government and provinces. These changes are set up by the forthcoming Environmental Planning Act.

2.4.5. Development Factors

The interviewed water management experts pointed out that the key development factors for spatial planning as a Integrated Flood Management measure are integration of spatial planning and water management sectors in all phases of planning and policy making and high level of implementation of existing plans.

2.5. Early Warning System

2.5.1. Legal Framework

Disaster and crisis management in the Netherlands is regulated by the Safety Region Act (2010). Safety regions are formed because the proper response to disaster and crisis events requires bigger organisational scale than the municipal scale.

The aim of the Safety Region Act (2010) is to achieve an efficient organisation of disaster and crisis management under one regional management. Safety regions have to be structured on the same scale as the police regions, thus making coordination between police and other services easier. The administrative structure of the management is defined with clear tasks and powers and presents extended form of a local government, that guarantees involvement of municipalities.

Setting up security regions is raising professionalism of organisations by combining capacities, knowledge, experience and finances of the included municipalities. It also improves multidisciplinary cooperation and coherent security policy.

Safety regions are responsible for adopting policy documents in the sector of disaster and crisis management. Those documents are risk profile, policy plan, crisis plan and disaster management plan.

The risk profile is adopted by the management board of the security region and it contains a list of high-risk situations in the security region and a list of types of fire, disaster and crisis which can occur. Analysis of the potential consequences of those events is also part of the plan. Plan should be revised every four years. The risk profile is a basis for the policy plan and it is made in coordination with municipalities, water boards, and other partners (Safety Regions Act, 2010).

The policy plan is made in coordination with the neighbouring safety regions, involved water boards and police. The policy plan contains elaboration of national goals, information about operational services and organisations involved, drill policy plan, coverage plan with the response time and a description of the intended operational performance of the services and organisations of the security region, regional police and municipalities. It is reassessed every four years.

The crisis plan gives information about the general organisation of disaster and crisis management in the security region, setting out the tasks, powers, agreements and responsibilities related to the prerequisites, reporting and alerting. The crisis plan has to be aligned with the crisis plans of neighbouring regions or countries.

The disaster management plan is not mandatory plan for the safety region. It is mandatory only for the companies that fall under Major Accidents Decree. This plan sets out the measures that should be taken in the case of a specific risk object and its environment (Safety Regions Act, 2010).

2.5.2. Responsible Institutions

KNMI (National Hydro-Meteorological Service) is responsible to provide warnings to the water boards and Rijkswaterstaat about the forthcoming increased rainfalls.

Rijkswaterstaat (The Water Management Centre) is responsible to match the different input data collected from regional centres and monitoring stations and to send out the warnings to the water boards and safety regions (Slomp, 2012).

Water board executives are included in work of safety regions during an emergency situation. Water board is monitoring the situation in the smaller rivers in their areas and providing an early warning system if there is an possible flood. The water boards are planning their actions based on the levels of water height. Safety regions are responsible for disaster and crisis management. The safety region management board is responsible for drawing up plans for disaster and crisis management and for coordination of services and organisations in the safety region (Safety Regions Act, 2010).

Municipality is responsible to inform public and media about the potential danger and to organize relief and care during the emergency response. Fire department is responsible for the final alarming of the people, while police department is responsible to vacate and evacuate the population (Safety Regions Act, 2010).

2.5.3. Present Situation

Early warning system in the Netherlands is based on the monitoring system that can forecast storm surges and river floods a number of days ahead. Hydro-Meteo centres and the meteorological service KNMI are providing warnings to the water boards and Rijkswaterstaat (The Water Management Centre). Rijkswaterstaat, located in Lelystad, is responsible to send out the warnings and to match the different inputs from the regional centres. Rijkswaterstaat is responsible for warning in the case of possible storm surge or possible flooding in the largest rivers, while water boards have responsibilities for smaller rivers in their areas.

Flood warning services for river floods are located in Maastricht (for the Meuse River), Arnhem (for the Rhine River and three Rhine branches Waal, IJssel, Nederrijn-Lek), Rotterdam (for the Rhine-Meuse estuary) (Slomp, 2012).

Population is alerted by use of air raid sirens, while local radio and television networks are also informing the inhabitants. The networks are provided an annual fee for this service. There is also a website that is informing the public before and during the crisis. "NL Alert" is the cell broadcasting system that can reach all mobile phones in a specific area and send messages to the people. Water boards are providing the safety regions with official warnings, and tight cooperation between those institutions is preventing occurrence of different information from different sources.

2.5.4. Development Factors

Interviewed experts have emphasized the importance of training and exercise in early warning system. The water boards are having at least two joint exercises with other actors included in disaster management. These obligate exercises are organised by safety regions. Other institutions are also organising exercises with other actors in disaster management or volunteers. For example, water boards are organizing exercises with volunteers during slightly higher water levels.

Coordination is a key factor for success of early warning system, according to experts. Better coordination is achieved through already mentioned joint trainings and exercises, but also through constant communication with other actors in the disaster and risk management system. The communication should be performed both in pre-event phase and during the event. Besides the fact that is needed to act by the plan, the disaster management is much easier if the actors in the system know each other, their abilities and responsibilities. This constant communication leads to better understanding and better cooperation between responsible actors in the early warning system and other phases of disaster and crisis management.

Success of early warning system is also determined by forecasting the events and testing the whole system.

2.6. Evacuation Planning

2.6.1. Legal Framework

Evacuation planning is part of the disaster and crisis management. Disaster and crisis management is in responsibility of the safety regions in the Netherlands. The safety region is formed of several municipalities. The municipal executive has basic responsibility for general disaster and crisis management. The safety region is drawing up the crisis plan stating responsibilities of all actors on regional level of disaster and crisis management (Safety Regions Act, 2010).

2.6.2. Responsible Institutions

The mayors of the Dutch municipalities are responsible for emergency planning in their communities and safety region. The mayors are included in the decision-making process from its beginning. In addition, the mayor is responsible for providing information to the population in his/her municipality and the various emergency services active in an actual disaster and crisis (Safety Regions Act, 2010).

Evacuation planning and evacuation itself is performed by safety regions. Water boards are included in evacuation planning in the case of floods by forecasting possible flood and expected water levels.

Several ministries organised the first national exercise on flooding and mass evacuation "Waterproof" in November 2008. This exercise was held after two-year programme for flood preparedness improvement and its focus was on practice of collecting and processing information, decision-making processes, crisis communication and cooperation between different levels of authority and between flood management responsibility chain and public safety responsibility chain. Around 15,000 professionals participated in the preparation and the exercise itself. The plan is to hold this exercise every five years (Slomp, 2012).

2.6.3. Present Situation

Evacuation planning is performed at national level and regional level (safety region level). The Ministry of Security and Justice elaborates the National Evacuation Plan and the National Crisis Plan. The National Crisis Plan contains responsibilities of all involved actors in preparation phase for the plans made by safety regions and operational process during a crisis. The National Evacuation Plan gives recommendations for each safety to prepare systematically for all types of disasters. The most important issues are preparing tools and training of personnel. Every safety region is preparing based on its own characteristics and available assets and capabilities (Safety Regions Act, 2010).

Evacuation is prepared based on the scenarios. Disaster/incident scenarios are prepared based on the risk assessment. Evacuation planning is consisted of advice on proposed interventions related to the chosen scenarios.

The main problem with evacuation planning in the Netherlands is the fact that emergency response teams need 72 hours to evacuate the most vulnerable population, and the flood cannot be easily predicted that early. Also, there is a difficulty since people do not always behave according to the instructions provided by the institutions. Social effects and behaviour of people cannot be easily predicted and included in models and scenarios. This makes evacuation planning harder. Also, it is still unclear whether mayors can force someone to evacuation or their role is only to provide warnings.

2.6.4. Development Factors

The key factor for successful development of evacuation planning and successful evacuation is in performing evacuation exercises and simulations. Besides, communication between responsible actors is a key for understanding roles and responsibilities of other actors in the system. Proper information is a baseline for appropriate reaction and it is necessary that all actors have access to all relevant information.

3. REVIEW OF THE PRESENT STATE OF NON-STRUCTURAL MEASURES IN INTEGRATED FLOOD MANAGEMENT IN BOSNIA AND HERZEGOVINA

3.1. Introduction

Bosnia and Herzegovina is a state consisted of two entities - Federation of Bosnia and Herzegovina, and the Republic of Srpska - and one district - District of Brčko. These administrative units have a wide administrative and institutional autonomy and water management is within their responsibilities. It means that Bosnia and Herzegovina does not have unique national or state-level water and flood management system, but, instead there are three separate water management systems, two for the entities and one of the district. International agreements and foreign policy related to water management are performed on state level of Bosnia and Herzegovina, within the Council of Ministers. National government is thus responsible for preparation and adoption of international agreements, while entities and the district are responsible for the implementation of those agreements (CCI, 2014).

Janja, as a part of the City of Bijeljina, is located in the Bosnia and Herzegovina entity the Republic of Srpska. Since two entities of Bosnia and Herzegovina have separate water management systems, and Janja together with the City of Bijeljina belongs to the Republic of Srpska entity, the water management system of the Republic of Srpska is analysed in this report.

3.2. Main Legal Acts and Policy Documents

Main legal act that regulates Integrated Water Management field in the Republic of Srpska is The Water Act, while Emergency Situations Protection and Rescue Act is regulating phase of response to the event (Table 5).

The Water Act (2006; changes in 2012) is the legal act that regulates integrated water management within the territory of the Republic of Srpska entity. According to the Water Act, integrated water management includes: protection of water, use of water, water defence, regulation of rivers and other water bodies and water public goods. This act also regulates financing of governance bodies, public services and institutions in water sector in the Republic of Srpska.

One of the purposes of this act is to organise flood defence and defence from other harmful impacts that can be caused by water. Also, this act ensures public participation in decision making process in water sector.

This act names Public Institution "Vode Srpske" ("Water of Srpska") responsible for water management, public water good management, water structures and hydro technical objects and systems management management of rivers, streams and lakes in the territory of Republic of Srpska.

Basic territorial unit for water management is regional river basin (district). Territory of the Republic of Srpska is divided in two regional river basins: Sava regional river basin and Trebisnjica regional river basin. Public institution "Water of Srpska" is responsible for water management in both regional river basins.

Table 5 - Main Legal Acts and Policy Documents in Integrated Flood Management in the Republic of Srpska

	Prevention	Protection	Preparation	Reaction	Recovery
National Legislation	Spatial Planning Act	Water Act	Protection and Rescue in Emergency Situations Act		
Plans and Policy Documents					
Entity	Integrated Water Management Strategy 2012-2024				
	Water Management Development Framework Plan				
	Flood Risk Sustainable Management Plan in River Danube Basin with application to River Sava sub basin, area of the Republic of Srpska				
	Spatial Plan		Annual Flood Protection Plan		
Municipality/ City	Spatial Plan		Evacuation Plan		

Emergency Situations Protection and Rescue Act (2012) arranges system of protection and rescue in emergency situations, protection and rescue actors and forces, rights and obligations of republic governance units and other units, local community units, companies and other corporate bodies, rights and obligations of citizens, state of emergency and behaviour during the state of emergency, organisation and activity of Civil Protection in the system of protection and rescue, planning and financing of the system of protection and rescue.

The protection and rescue system is conjoint form of management and organisation of actors and forces of protection and rescue in implementing preventive and operational measures and actions for protection and rescue of people and goods from consequences of natural disasters, technical-technological disasters, catastrophes, epidemics, war actions, terrorist actions and other endangering situations for population, material or cultural goods or environment.

Strategy for Integrated Water Management in the Republic of Srpska until 2024 (Water Management Institute, 2012) is the main policy document for the water management sector in the Republic of Srpska. The main goal in water management is to achieve integrated, managed and completely coordinated water regime in the area of the Republic of Srpska. Main flood protection goals determined by this strategy are:

- to protect population, settlements and material goods from floods and other harmful impacts of water;
- to define spatial requirements for water infrastructure development, as a branch that has the most strict spatial demands for proper development;
- to provide more reliable planning;
- to define connections and inter-dependencies of all plans in water management sector with requirements of spatial planning and environmental protection sectors.

According to this strategy, systematic solving of flood problems in Bosnia and Herzegovina started in the final years of XIX century. Flood protection of urban and agricultural areas was the main activity of water management organisations in whole XX century, until the war in 1990s. Flood risk was reduced in many river valley, especially in urban areas, by extensive regulation works during this period. However, due to lack of planning measures and incautious behaviour in flooding zones (location of settlements, road connections and commercial activities in potentially affected zones, even in the inundation zones), flood risk has increased in some areas. This trend was especially significant after the war 1990-1995, when the new settlements, built for migrating and displaced population, were often located in the endangered areas, because those areas were cheaper and unoccupied.

Flood protection in the Republic of Srpska is mostly performed by passive construction measures (dikes and levees in river valleys), and rarely by active measures that would regulate and increase possible water flows in the river beds or reduce and slow down the runoff from the catchment.

Flood risk has increased significantly in the Lower Drina valley, in Semberija plain, area of Bijeljina. In the time of making General Project for Lower Drina Regulation (1998), the wider inundation zone of Drina was rarely settled and built up, and protection of these areas by constructing dikes and levees was not economically justified. Meanwhile, a lot of new population was settled in the area of Bijeljina, and the built-up land cover has increased a lot. Even some areas of potentially hardly defended zones, like former swamps and depressions in the surroundings of Bijeljina, were settled without any control and protective measures. Even in the situation when floods are the most important and most possible danger for the population and economy in the area of Bijeljina, responsible institutions had not conducted necessary actions for the protection of flood zones (Water Management Institute, 2012).

One part of the strategy is dedicated to non-structural measures in flood management. It is stated that those measures, called non-investment and organisational measures, do not need large resources. Implementation of these measures requires well organised state, with defined spatial policy in land-use and organisation of behaviour in the areas around water bodies, in order to reduce flood risk.

Non-structural measures, also named *hydro-technically directed urbanisation* that should be implemented through spatial and master plans and building regulations in flooding zones, are missing. As a consequence, endangered zones and flood plains are uncontrolled built-up and settled. Now, those areas need extensive and very expensive flood protection measures (Water Management Institute, 2012).

Non-investment and organisational measures can be sorted in two groups:

a) Long-term measures in land-use planning. These measures were marked as most-efficient, without requirements for large investments, but with requirements for well organised state and strict implementation of the planning documents. Measures in this group are:

- to map flood risk zones with probability higher than 1%, in accordance to EU Flood Directive;
- to input all recognised flood risk zones in all spatial plans and plans of detailed regulation, as a zones with special conditions and limits for land-use;
- to provide technical regulations for building in flood risk zones, in order to minimize possible damage.

b) Management improvement measures. These measures are addition to the planning measures. They are focused on management improvement by organising forecast, warning, alert and management optimisation during high waters. Measures in this group are:

- to provide prognostic models, based on modern monitoring systems with data collection in real-time, in order to evacuate people, material goods and cattle from endangered zones timely by early warning system;
- to provide modern management systems that would allow reducing of flood risk through coordinated management of accumulations, retention basins, channels and other infrastructure.

Sava River Basin Management Plan (International Sava River Basin Commission, 2013) is created in accordance with EU Flood Directive. This plan is following methodology and actions implemented in

Danube River basin, agreed by the countries in that basin (Figure 10). Sava River Basin Management Plan is establishing principles of integrated water management, including integration of water protection in development activities in the river basin. Flood protection is an important part of this project, and the Action Programme for Sustainable Flood Protection in the Danube River Basin, as a part of the project, assumes cooperation of the countries in:

- preparation of the Program for Development of the Flood Risk Management Plan in the Sava River Basin;
- undertaking of the Preliminary Flood Risk Assessment;
- preparation of the flood hazard and flood risk maps;
- development of the Flood Risk Management Plan in the Sava River Basin;
- establishment of the flood forecasting, warning and alarm system in the Sava River Basin;
- exchange of information significant for sustainable flood protection.

As the final step, the parties shall prepare the Flood Risk Management Plan for the Sava River Basin. This plan should define the goals of the flood risk management, measures to achieve these goals, mechanisms of coordination on the basin-wide level and a mode of joint cooperation in flood defence emergency situations.

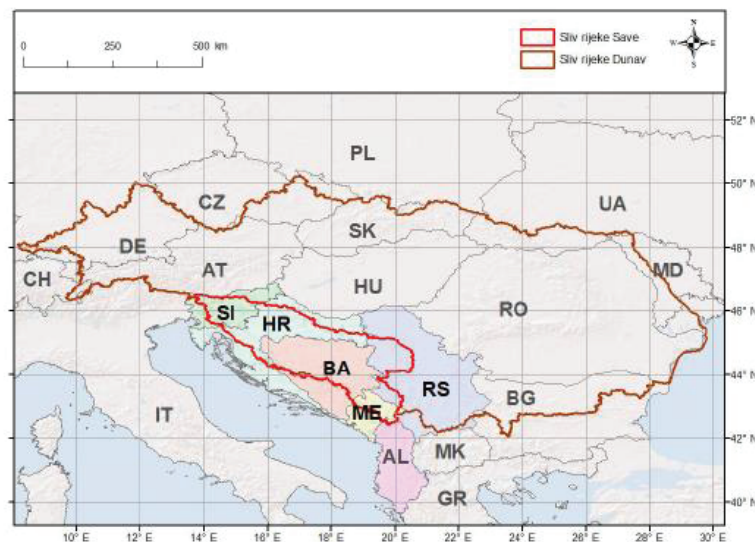


Figure 10 - Sava River Basin within the Danube River Basin (source: International Sava River Basin Commission, 2013)

3.3. Main Actors in Integrated Flood Management

3.3.1. Main Actors in Flood Management

Flood management in the Republic of Srpska is performed at two administrative levels: the level of the Republic of Srpska entity of Bosnia and Herzegovina, and local administrative level, where the unit of local administration is city or municipality.

Institutions responsible for water sector are defined by the Water Act (2006, changes in 2012) and by the Republic Administration Act. The main actors in water management in the Republic of Srpska are:

- The Government of the Republic of Srpska;
- The Ministry of Agriculture, Forestry and Water Management;
- Public Institution "Water of Srpska";

- Other ministries (the Ministry of Health and Social Protection, the Ministry of Urbanism, Housing-communal activities, Construction and Ecology, the Ministry of Transportation and Connections, the Ministry of Interior);
- Local institutions.

The Government of the Republic of Srpska has a responsibility to define policies in flood management sector in the Republic of Srpska. These policies are being defined through proposition of Integrated Water Management to the National Assembly and adoption of plans and programmes in flood management sector. The Government decides on establishment or termination of the public institutions in the water management sector.

The Ministry of agriculture, forestry and water management is authorized for administrative and technical duties in the field of water management. According to the Water Act, in its jurisdiction is organizing and preparing of Integrated Water Management Strategy and other plans and programmes in flood management sector. The Ministry also prepares and proposes legislation documents in this sector and adopts bylaw legislation acts concerning water management sector.

Public Institution “Water of Srpska” is founded by the Republic of Srpska Government in January 11, 2013. This public institution is responsible for integrated water management, public water good management and management of hydro-technical objects and systems, management of rivers, streams and lakes in the Republic of Srpska, prescribed by the Water Act. This institution is successor of the former Water Directorate and Water Agency. As a professional institution, “Water of Srpska” participates in preparation of strategies, plans and programmes in flood management sector.

The institutions at the local level (in the cities or municipalities) have authorities in the issuing of licensing, regulation of melioration areas and similar activities that do not exceed local level in terms of complexity and importance of the objects. Local authorities are responsible for implementation of flood protection measures in the areas and objects that are not in responsibility of government bodies of the Republic of Srpska (Water Act, 2006, changes in 2012).

3.3.2. Main Actors in Protection and Rescue System

Protection and rescue in Bosnia and Herzegovina is organized and performed at two levels: the entity level and local level. The main actors of protection and rescue system in the Republic of Srpska entity are (Emergency Situations Protection and Rescue Act, 2012):

- The Ministry of the Interior and the Republican Administration of Civil Protection (the Directorate of Civil Protection)
- other government administrative bodies and bodies of local self-government,
- companies, other legal entities, entrepreneurs and
- citizens, associations, and other professional organizations.

The responsibilities of the actors in protection and rescue system regarding early warning system and evacuation planning are described in chapters 3.5.2. and 3.6.2.

3.4. Spatial Planning as a Flood Management Measure

3.4.1. Legal Framework

Spatial planning in Bosnia and Herzegovina is under the responsibility of the entities. Legal act or development strategy for spatial planning on the national level of Bosnia and Herzegovina does not exist. Spatial planning is treated and regulated on entity level of the Federation of Bosnia and Herzegovina and the Republic of Srpska. Each entity has its own legal acts defining spatial policy in their own territories (GAP, 2013).

In the Republic of Srpska, spatial planning policy is defined by the Act of Spatial Arrangement (2010). Spatial planning is implemented at the two government levels: entity level of the Republic of Srpska and local community level (municipality or city).

The bylaw defining content of spatial and master plans does not clearly indicate that flood protection has to be a part of spatial plan. Still, information about water bodies, water regimes, climate, water problems and water management in treated area are obligatory in the analytical part of the plan, as a basis for spatial decision-making process.

3.4.2. Responsible Institutions

National Assembly of the Republic of Srpska is responsible to provide Spatial Plan of the Republic of Srpska, which is an obligatory plan, as well as spatial plans for areas with specific purposes (national parks, infrastructure corridors, water accumulations, etc.) (Spatial Arrangement Act, 2010).

Assembly of the local community (city or municipality) is responsible to provide spatial plan of the local community unit, master plan for cities and urban villages and regulatory plan for other villages (Spatial Arrangement Act, 2010).

The main actors in spatial planning in the City of Bijeljina are local bodies Department of Spatial Planning and Directorate for City Construction and Development.

Department of Spatial Planning is responsible for professional and administrative jobs in the scope of work of the City concerning preparation of documentation for urban planning, development plans, issuance of urban permit and construction permit, technical reviews and the use-permit of the built objects, and control of investment-technical documentation and legalisation of built objects (Administration service, 2014).

Directorate for City Construction and Development is local public enterprise responsible for acquisition and adaptation of urban construction land, organisation and management of important investments in the city, and implementation of environmental protection actions (Administration service, 2014).

3.4.3. Existing Plans

Flood protection is not specifically treated in Spatial Plan of the Republic of Srpska (Institute of Urbanism of the Republic of Srpska, 2008) while Spatial Plan for the Municipality of Bijeljina (Directorate for City Construction and Development, 2003) treats flood management only through recommendation for construction works.

Spatial Plan of the Republic of Srpska states the basic orientations in the water management sector. That orientations are:

- water becomes the strategic economic resource, which means that water is resource with highest importance for the development;
- integrated water management will be implemented;
- water sector, that is not significantly spatially determined shall be coordinated with all other sectors that have interests in relation with water use or they are of importance for water quality;
- water management sector have priority in all aspects of land-use, meaning that there is no construction in flood zones, in groundwater zones, that used water should not be discharged in groundwater, that settlements and large commercial objects should not be located in potentially flood zones, that space for accumulations will be reserved, etc.
- water management sector has priority in land purchase in zones of special interest for water management;
- spatial interests of water management sector are protected by water management planning and spatial planning.

The first measure in implementation of these orientations is revitalisation and modernisation of all existing water management systems in the Republic of Srpska and further development of these systems according to European normative in water management sector (Institute of Urbanism of the Republic of Srpska, 2008).

In order to accomplish this, it is necessary to establish water monitoring system and systematic coordinated modernisation of the technology in water sector. By implementing these measures, water will become economic resource with its price, and price of water will be based on the usage and the price of water protection, protection from water, water sources protection, erosion protection and other.

3.4.4. Present Situation

During the civil war (1992-1995) and in post-war period, spatial planning in Bosnia and Herzegovina was marginalised and it had experienced complete failure, according to the experts from water management sector. This failure is most easily noticed in the way of settling the refugees and other migrating population. Migrating population was settled in frequently flooded areas. Land in those areas was unoccupied and it presented the cheapest solution.

Basic orientations for water management sector stated in the Spatial Plan of the Republic of Srpska are not implemented. Revitalisation and modernisation of existing water management systems (monitoring, flood protection) was not conducted. Water management sector does not have priority in land-use aspects and spatial interests of this sector are not protected by water management planning and spatial planning, as can be seen from the Bijeljina Municipality Spatial Plan and from the interviews with experts. Flooding zones for different return periods are not determined, thus potentially flooded zones are being occupied with residential and commercial objects.

Progress was made towards implementation of integrated water management because existing policy documents are treating problems in this sector in an integrated manner. But, in practice, institutions from different levels included in water management sector do not coordinate and water management sector does not have significant coordination with other sectors in relation with water use.

3.4.5. Development Factors

The most important factors that are causing this low importance of spatial planning and its weak connection with flood management sector are lack of financial resources, lack of coordination and cooperation and inefficient spatial planning.

Economic and political crisis that is almost permanent state of Bosnia and Herzegovina in war and post-war period, is causing great instability at all levels. This instability is causing lack of continuous planning. Every time when there is some change in government or authorities, policies are also radically changed. Even the good ideas and projects of the previous authorities have been abandoned. This kind of situation is also causing lack of cooperation and coordination between responsible institutions and actors in both horizontal and vertical direction. The lack of cooperation and coordination mostly affects the implementation phase of planning documents. According to interviewed experts, Bosnia and Herzegovina does not lack expert knowledge or policy documents, but there is great shortage of implementation capacities, mostly because of lack of funds and lack of properly prepared operational plans.

3.5. Early Warning System

3.5.1. Legal Framework

Early warning system in the Republic of Srpska is regulated by two legal acts: the Water Act (2006, changes in 2012) and the Emergency Situations Protection and Rescue Act (2012). Fact that two legal acts are trying to regulate this important system could be one of the causes for low efficiency of this system. It is not clear who has the responsibilities for monitoring, observation, forecast and early warning in the case of natural disasters, in this case floods. Also, coordination and cooperation between responsible institutions is not clearly arranged, and, according to the interviews held with experts, that coordination is very weak.

According to the Water Act (2006, changes in 2012), Public Institution "Water of Srpska" is responsible to develop the system for observation and forecast of emergency hydrological situations in regional water

areas, and to ensure early warning for endangered areas, except in the cases when the operator, owner or user of the object is responsible to conduct observing and forecasting.

Hydro meteorological Service of the Republic of Srpska is responsible to develop the system for observation and forecast of emergency meteorological situations and to send the forecast and notification to the waters information system of the Republic of Srpska.

All water-protection objects owners, operators and users are obligate to conduct observations and send information to the waters information system of the Republic of Srpska.

According to the Emergency Situations Protection and Rescue Act (2012), observation, reporting and alerting is a set of organized activities for the collection, processing and transmission of the data about phenomena in nature and events in the environment that can exert a harmful and dangerous effects on people and property, informing and animating the competent authorities, institutions and citizens in order to take preventive and operational measures for protection and rescue, and, where appropriate, their alert system.

The main task of monitoring, notification and alert system is to detect, track and collect data on all types of hazards that may threaten people, the environment, material and cultural goods. Holders of telecommunication systems and equipment are required to secure priority use of links to operative communication centre in an emergency.

3.5.2. Responsible Institutions

Actors in monitoring, notification and alarming are the following: operative communication centre; institutions of the Republic; the organizational unit of the Ministry; companies and other legal entities that are dealing with monitoring, recording, analyzing and predicting the occurrence of certain conditions and in hydro-meteorology, seismology, fire protection, water management, chemical and radiological protection, health, agriculture, electric power industry, transport and other areas, in the course of their ordinary business.

The Republic Hydro-meteorological Service and the competent government authority for water management and public water companies, according to reports and forecasts, are informing operative communication centre and responsible headquarters for emergency situations about water levels, proclaimed phase of the defence, the development of the situation and the measures taken.

In the Emergency Situations Protection and Rescue Act (2012) it is stated that, in order to detect and monitor the risk of natural disasters and other accidents, information and warning, the Directorate of Civil Protection is organizing a unified system of monitoring, notification and alarms. The main tasks of the system are:

- the receipt, collection, processing and transmission of data relevant for protection and rescue, and performing of other tasks related to the protection and rescue,
- informing and alerting people to imminent danger and giving instructions for the personal, interpersonal and collective protection and
- informing and activating forces and other entities that implement the protection and rescue and transfer decisions of the competent authority for the implementation of protection and rescue.

3.5.3. Present Situation

Early warning system is part of the responsibility of Civil Protection. Subdepartment for Civil Protection in Bijeljina is cooperating with government institutions in order to monitor the situation. Those institutions are Republic Civil Protection and Republic Hydro-meteorological Service.

Early warning is performed by direct terrain work and through mass media and public information system. Early warning is performed based on the needs, and after the recent large floods, early warning is performed even more often, when there is even a little chance for the floods.

There are a lot of problems in early warning system in the Republic of Srpska. The first problem is lack of monitoring. There is lack of automated measurement stations, and they are not maintained well and their

profiles are not continuously updated, so the information is not relevant. In the area of Bijeljina there is no any automated measurement station, so the water-flow during the most recent floods was not known. Very important issue in protection and rescue system is outdated "General Operational Plan for Flood Protection". This plan was done based on the documents and data before the civil war (25 years ago), when all the companies were state owned. Today, the same companies are stated as responsible for monitoring and alarming as before, although some of them do not exist anymore, due to bankruptcy or reorganisation (example of Water Management Enterprise "Semberija" Bijeljina).

Lack of communication and coordination between actors in the protection and rescue system and between responsible institutions and population is pointed out as the main problem in this system. According to the Civil Protection volunteers in Bijeljina, Mr. Zdravko Stevanović and Mr. Nebojša Zorić, the Civil Protection teams did not have proper communication equipment and they were dependent on mobile phones, that became useless in situation without electrical power. Responsibilities between institutions were not clearly divided and the system is not functional. Population is totally unprepared and uninformed, and in the first moment they were refusing to act according to evacuation call because of possible robberies.

Local Community Offices have a role to inform the Civil Protection about the location of possible shelters for evacuated population, about the evacuation priorities and responsibility to spread the information to the population. Personnel of the Local Community Offices did not have any type of training in the case of emergency and there is no training with the local population. As a proof of rather low level or lack of communication between Civil Protection and population, there are statements of teachers of Janja high school, Mr. Savo Ivković and Mrs. Jasna Ivković, who confirmed there was no any type of lecture, debate, training or practice related to the behaviour in the case of floods. Mr. Đoko Petrović from "BMD", a parquet factory in Janja, and Mr. Zoran Tabajica from "Blagojević Mill" near Janja, both enterprises located in flooded area, said that their enterprises were not included in any activity related to flood protection, had received no trainings nor information from responsible institution. Only information provided to them was about enforcement of emergency situation. They were not informed about their responsibilities, expected water levels, potentially flooded areas, not even about the road connection with surrounding villages. The interviewed companies do not have any kind of brochures, instructions or contact list in the case of emergency.

3.5.4. Development Factors

The key factors that are influencing early warning system are capacities, experience and knowledge of the Civil Protection headquarters and protection and rescue teams. Experience and preparedness of the inhabitants is very important too. Cooperation with other institutions, other municipalities, companies and mass media is also one of the key factors.

3.6. Evacuation Planning

3.6.1. Legal Framework

Evacuation is a measure of safety and protection that represents planned, organized and temporary relocation of people and goods from the areas that are estimated to be affected by natural disasters and other accidents, or from areas affected by natural disasters and other disaster to non-vulnerable or less vulnerable areas of the same, neighbouring or other municipality or city, provided that other measures of protection and rescue are not possible to protect people and property (Emergency Situations Protection and Rescue Act, 2012).

Depending on the degree of vulnerability of certain areas of the municipality or city, evacuation may be full or partial, and runtime timely or subsequent. A complete evacuation includes the evacuation of the entire population from the municipality or city that may be affected by natural and other disasters. Partial evacuation covers evacuation only certain categories of the population such as :

- disabled and infirm citizens,
- pregnant women,
- mothers with children under seven, or two or more children under ten years of age,
- children and pupils of primary schools,
- important scientific and cultural workers and
- other persons who are deemed not to have living conditions and effective protection in the affected area of the municipality or city (Emergency Situations Protection and Rescue Act, 2012).

3.6.2. Responsible Institutions

Evacuation of the population and material goods is ordered by the mayor in the case of the evacuation from one to another area of the municipality or city, and the Prime Minister in the case of evacuation from the area of several municipalities or cities.

Preparation and implementation of evacuation is performed by headquarters for emergency situations of the municipality or city that plans evacuation and headquarters for emergency situations in municipality or city that accepts the evacuated population. In addition to the headquarters for emergency situations, evacuation is performed by municipal or city departments that are responsible for spatial planning and construction, transportation, health care and social security and other legal entities in the municipality or city (Emergency Situations Protection and Rescue Act, 2012).

During the implementation of the evacuation, it is cooperated with the Armed Forces of Bosnia and Herzegovina, the relevant organizational units of the Ministry, humanitarian and other organizations and companies that can assist in the effective execution of the evacuation.

3.6.3. Present situation

The evacuation plan is created according to the Emergency Situation Protection and Rescue Act (2012), and evacuation is ordered by the mayor. Evacuation is performed at the level of the municipality/city and it is responsibility of the local institutions. Civil Protection subdepartment creates and recommends the evacuation plan, but the mayor, as a head of the headquarters in the emergency situation, is responsible for the plan adoption. The evacuation plan of the Bijeljina area is made in 2002, but it is updated and arranged every year. New plan, according to the new law, is not yet made. First task is to make risk assessment, and in later stages, the other plans will be made based on this risk assessment.

Main goal of the evacuation planning is timely evacuation of the people and material assets from endangered areas.

Connection between spatial planning and evacuation planning is not significant. Evacuation planning is the responsibility of the Civil Protection and it will not be treated in the new spatial plan, but Civil Protection subdepartment will be contacted and included in decision-making process. Members of the headquarters for emergency situations are from different branches, and they provide links with other institutions.

3.6.4. Development Factors

Prof. Ristić evaluates evacuation planning as very important measure, and thinks that evacuation was very efficient in both planning and implementing phase during floods in 2010 and 2014. He stated that during 2010 floods around 2,000 inhabitants were evacuated, while in 2014 floods around 7,000 inhabitants were evacuated. All of them had shelter and food, medicine and other help. Also, experience from 2010 helped in 2014, because there was no such a big flood event for a long period and responsible institutions did not have similar experience. In both cases (2010 and 2014) there were no fatalities and there were not forced evacuations.

Key factor for the development of the evacuation planning is vulnerability level to the different natural disasters and other accidents. Evacuation plan stated the responsibilities of all and institutions involved in the activities. During the 2014 flood more than 7,000 people was evacuated.

4. COMPARISON OF NON-STRUCTURAL MEASURES IN INTEGRATED FLOOD MANAGEMENT IN THE NETHERLANDS AND BOSNIA AND HERZEGOVINA

Based on the review of the present state of development of non-structural measures in Integrated Flood Management in the Netherlands and in Bosnia and Herzegovina, the key characteristics of two systems can be determined and compared (Table 6).

In both countries spatial planning is more strategic at national level (in Bosnia and Herzegovina entity level), while the spatial planning base is at municipal level. Every municipality in both countries is mandatory to have a spatial plan. The Netherlands has a regional level of spatial planning, constructed in the similar manner as national level, where spatial plan is actually a structure vision. Key differences between the spatial planning system of the two countries are in the level of integration with water management and in the level of implementation. Integration of water management in spatial planning in the Netherlands is on high level, with cooperation between two sectors in all planning phases, while in Bosnia and Herzegovina water management sector is only included in preparation phase of planning. Besides, spatial plans are weakly implemented in Bosnia and Herzegovina because of lack of resources and lack of political will of the authorities.

Early warning system in the Netherlands is performed at regional level, while in Bosnia and Herzegovina it is performed at entity level and at the level of local authorities (municipality/city). There is a large difference in the development of monitoring network. While in the Netherlands the monitoring network is highly developed, Bosnia and Herzegovina lacks basic automated monitoring stations. Besides the lack of network, it is unclear who is performing monitoring and early warning in Bosnia and Herzegovina, while in the Netherlands the responsibilities of national and regional level of authorities are strictly defined. The actors in disaster and risk management in the Netherlands have joint trainings, exercises and system tests, resulting with better preparedness, coordination and cooperation, while in Bosnia and Herzegovina the cooperation is relatively good only in the "cold" phase of disaster and risk management, and actual preparedness is weak because of lack of training, equipment and exercises, leading to weak coordination during the emergency. Weak communication and cooperation in Bosnia and Herzegovina is also proved with a number of different information from different sources about the water levels, flood extents, etc., while in the Netherlands institutions share the relevant data and the general public gets one information from one relevant source.

Evacuation planning is performed at regional level in the Netherlands, while in Bosnia and Herzegovina it is performed at the local level. In both countries, evacuation planning is done based on different scenarios, with rather good cooperation and coordination between the responsible actors. The most important difference between two countries is the lack of exercises in Bosnia and Herzegovina, causing lower preparedness for the evacuation.

Table 6 - The Most Important Characteristics of Non-structural Measures in the Netherlands and Bosnia and Herzegovina

Non-structural Measure	The Netherlands	Bosnia and Herzegovina
Spatial planning	<ul style="list-style-type: none"> - three levels of authorities; - structure visions; - zoning scheme and municipal level as a planning basis; - water management as one of the main challenges; - high level of integration of spatial planning and water management; - The Water Assessment; - high level of implementation. 	<ul style="list-style-type: none"> - two levels of authorities; - more classic spatial plan; - low level of integration of spatial planning and water management; - low level of implementation; - lack of continuous planning.
Early warning system	<ul style="list-style-type: none"> - disaster and crisis management performed on regional level (safety regions); - first warning - Rijkswaterstaat and water boards; - clear tasks about the first warning; - water boards included in work of safety regions; - one information source; - developed monitoring network; - training, exercises, testing; - good coordination and cooperation. 	<ul style="list-style-type: none"> - two levels of authorities; - first warning - Civil Protection, Water of Srpska; - unclear tasks about the first warning; - weak monitoring network; - relatively good communication in "cold" phase; - bad cooperation and coordination in emergency situation; - lack of training, equipment, exercises, testing; - outdated planning documents; - several sources of information.
Evacuation planning	<ul style="list-style-type: none"> - performed by safety regions; - exercises on national and regional level; - planning based on scenarios; - good communication, coordination and cooperation; - proper information. 	<ul style="list-style-type: none"> - performed on local level; - lack of exercises; - planning based on scenarios; - relatively good communication, coordination and cooperation; - proper information.

5. DISCUSSION ON TRANSFERABILITY

Context is understood as a conditions and circumstances that influence a transfer process, the setting of a transfer. The setting of a transfer includes the political, institutional, cultural, economical, geographical and biophysical contexts (de Boer et al, 2013). Modern water management is often more faced with governance problems than technical problems, mostly because water is managed through the interactions between a number of interdependent actors that operate at various levels, with different perceptions and objectives, strategies, instruments and resources (de Boer et al., 2013). This variety of conditions and circumstances is the reason why transferability has to be analysed with careful consideration of contexts in which the knowledge, technology and methodology is developed, as well as consideration of contexts where the knowledge should be transferred.

5.1. Wider Contexts

Wider contexts, as presented in Figure 4, is the least specified layer of contexts and it includes the political, economic, cultural, technological and problem context (de Boer et al., 2014). This wider context gives a context for the structural context (Bressers, 2007), which means that governance structure and relations are influenced by the state of contexts included in wider layer of contexts. Still, as these layers of contexts are overlapping entities, it is possible that changes in a more specific layer of context can cause changes in less specific layer. Therefore, wider context has large influence on transferability process, but can possibly be changed with successful transfer and changes in governance system. Still, the wider context stays the least adaptable layer of context (de Boer, 2012).

5.1.1. Problem Context

Flood protection has privileged status in the Netherlands since the floods in 1953 (Slomp, 2012). This flood, caused by a storm surge, changed the flood risk policy in the country. The Delta Committee was formed, assigned to analyze the flood and find solutions for the future. They introduced scientific methods, developed cost-benefit analysis and set new standards for dike reconstruction, and also changed the way of floods prediction and the way of informing and alerting the population (Slomp, 2012). The changes in the policies resulted in the way that 55% of the territory of the Netherlands is within the areas protected by dikes, while only 4% of the Netherlands is outside the dike rings and endangered by the floods (Slomp, 2012). Flood management and water management are integrated in the Netherlands, with precise funding sources. The raising awareness of climate changes and higher risk in future caused a preparation of the new Delta Programme and appointment of Delta Commissioner in 2010 (Slomp, 2012). It is well known that area of Bosnia and Herzegovina is vulnerable to floods, having in mind large floods in 1896, 1907, 1925, 1968, 2010 and most recently 2014. The floods in May 2014 caused large economic damage, but also infrastructural, agricultural, environmental damage and caused health problems and loss of people's lives. There is a general opinion that damage could not be completely avoided, but could be much less if there was one functional and efficient flood protection system in place (CCI, 2014). The system for protection and rescue in Bosnia and Herzegovina proved as unable to respond to the needs and to secure the lives and property of the citizens of Bosnia and Herzegovina (CCI, 2014). As was described in Chapter 3., Bosnia and Herzegovina is facing inter-entity and inter-ministry division, planning fragmentation, uneven financing and organizing of protection measures, lack of continuous planning and delays in creation and adoption of policy and planning documents. Structural flood defences are mostly in bad condition, either because they are outdated and not reconstructed, or they were damaged during the war. The funds dedicated to water management and flood protection, as well as for the protection and rescue systems, were spent for other purposes, mostly to improve governmental budgets (CCI, 2014).

The huge difference in problem context between the Netherlands and Bosnia and Herzegovina is obvious. However, the legislation on flood risk and crisis management was driven by disasters in many countries (Slomp, 2012), so there is some hope that flood management will be less marginalised in Bosnia and Herzegovina in the future. This change could be supported through the process of accession of Bosnia and Herzegovina to European Union.

5.1.2. Political Context

Legislation analysis and the reaction of institutions during the recent flood proved that existing water management and protection and rescue system in Bosnia and Herzegovina is too complex, hardly manageable, insufficiently equipped and insufficiently functional (CCI, 2014). The political situation in Bosnia and Herzegovina caused that the state of natural disaster was not proclaimed on the level of the whole country. As a result, there was no condition to activate help in protection and rescue from European Union. Besides split entity system, fragmentation in planning, uneven financing and implementation of protection measures, the lack of continuous planning and delays in creation of water management system documents and strategies are among main reasons for inefficient flood management system (CCI, 2014). Political situation and dominating political interests in the Republic of Srpska entity was suspected to be one of the causes for low level of coordination between responsible institutions and the lack of integrated approach in crisis management. For example, the City of Bijeljina is governed by political party in opposition to the Entity level, and the coordination between the Entity and local institutions was very weak in this area heavily hit by 2014 flood.

5.1.3. Economic Context

There is a huge gap between the Netherlands and Bosnia and Herzegovina in economic development. With an area of 41,543 sq km and population of 16,8 million, the Netherlands has 699.7 billion \$ GDP in 2013, that makes around 43,300\$ GDP per capita (The World Factbook, 2015). On the other hand, Bosnia and Herzegovina has an area of 51,197 sq km and population of approx. 3,8 million. The country's GDP in 2013 was 32.16 billion \$, or 8,300\$ GDP per capita (The World Factbook, 2015).

The "Delta committee" considered in 1960 that 1% of the Netherlands GDP should be spent on flood defences after the large floods in 1953 (Slomp, 2012). As the GDP of the Netherlands grew, the percentage for flood protection is diminished to about 0.2% of GDP. Water management in the Netherlands in 2010 was financed with approx. 5.2 billions € (Table 7). The majority of the funds (50%) is coming from the taxes collected for water boards.

The water boards are self-financing, except for the large dike reconstruction projects, and the financial resources are collected from the taxes for maintaining the waterways and flood protection measures (Slomp, 2012). National taxes cover the state tasks in financing water management, with share of 21% in financing water management in 2010 (Table 4). Municipalities are collecting their financial resources for water management through taxation for their water related responsibilities, where the most important responsibility is the sewage system. Provinces, the authority level that has the smallest share in financing water management, are collecting their financial resources from charges for ground water extraction (Slomp, 2012).

Table 7 - Financing Water Management in the Netherlands in 2010 (source: Slomp, 2012)

Organisation	Millions of €	%	Main Tasks
National Government	1,070	21	The Ministry: development of water and spatial planning policy. Rijkswaterstaat: - Lake, River and Coastal Management - Maintenance and reconstruction of dams and structures, large navigational waterways, inspection.
Provinces	230	4	Spatial planning, water management planning on a regional level; Maintenance of provincial navigational waterways, inspection, permits for dike reconstruction.
Water Boards	2,600	50	Management of 55.000km waterways, 18.000km of dikes, 360 sewage treatment plants
Municipalities	1,300	25	Sewer systems and some local waterways
Total	5,200	100	

Institutions of the central government in Bosnia and Herzegovina are not responsible for the water management, and financing of water management is separated by entities (CCI, 2014). Flood protection in the Republic of Srpska entity is financed from resources gathered by water charges, but annulment of water management charge in this entity in 2000 lowered income for about 40% and caused stagnation of water management sector in the Republic of Srpska (CCI, 2014).

The Water Act states that water management sector is financed from special water charges, income from renting public water goods, budget of the government and local government unit and from donations; 70% of the collected financial resources is distributed to the water management sector, while 30% is distributed to the local government units for special purposes. Those special purposes were 55% for water management, 15% for environmental protection related to water and 30% for other purposes.

The budget of Public Institution "Water of Srpska" in period 2011-2014 (until 2012 it was two water agencies for two water basins) was from 4,000,000 to 6,500,000€ approximately, but majority of the funds was used for the work of institution and not for the construction, maintenance, reconstruction and adaptation of water management structures (Table 8).

Table 8 - Budget of the Public Institution "Water of Srpska" for period 2011-2014 (source: CCI,2014)

	2011.	2012.	2013.	2014.
Investment works	2.850.000€	1.250.000€	200.000€	500.000€
Work of the institution	3.550.000€	2.900.000€	3.875.000€	3.575.000€
Budget total	6.400.000€	4.150.000€	4.075.000€	4.075.000€

*values are rounded and translated to EUR from BAM currency

Decreasing the water management budget every year and increasing the operational expenses of the institution instead of the investments is absolutely contrary to the official policies and strategies that are proposing additional attention and larger investments in water management, and especially in flood protection projects (CCI, 2014).

Protection and Rescue in Emergency Situation Act (2012) is regulating the financing of protection and rescue system in the Republic of Srpska. The main sources of financing are budgets of the Republic, city or municipality, as well as donations. Municipality or city are obliged to plan 2% of their annual budgets for protection and rescue system. 50% of those resources should be invested in taking preventive actions, while 50% for training and education of personnel included in protection and rescue system. The government of the Republic is obliged for the institutions of Civil Protection on the entity level, while local government units are responsible for the Civil Protection institutions in their area.

It is clear that the different economic contexts could play a key role for the transferability of non-structural measures in integrated flood management from the Netherlands to Bosnia and Herzegovina. The differences in the level of economic development between two countries and in amount of financial resources available for flood protection and water governance in general is huge. However, Bosnia and Herzegovina could follow the example of the Netherlands where every level of authority has direct source of financing in taxation for different services in water management.

5.1.4. Cultural Context

Based on the interviews held with water management experts in the Netherlands and water management experts and population in Bosnia and Herzegovina the key cultural difference related with integrated flood management is confidence in authorities on all levels.

Good water management system and absence of large flood events caused low awareness of possible flooding in the Netherlands. Besides that, even when smaller-scale flood occurs, the population is mostly willing to react according to the instructions and the general belief is that the authorities will take care about everything. According to the interviewed experts, there is a possibility for future shift in the policy that would lead to higher responsibility of citizens in crisis management. This new approach would possible increase awareness about the flood risk, increase preparedness and lower the cost for the whole system.

On the other hand, population in Bosnia and Herzegovina has little confidence in the authorities on any level and form. This is caused by long-term political and economical crisis in last 25 years. The state and its institutions are not always considered as factors created to protect the interests of citizens. The example that could be followed from the Netherlands is to increase the communication between water management institutions and general public. This can be done through brochures, modern and regularly updated web sites, more transparent work, training and exercises with the population, organisation of annual safety day in local community, etc. This changes in approach would not ask for a lot of resources, but still would give better insight to citizens about the responsibilities and abilities of different authorities, increase awareness and preparedness, and also increase confidence in the authorities.

5.1.5. Technological Context

The Netherlands has highly developed technology applied in water management and flood management as a part of it. This strong reputation in the field of technology is earned through innovative solutions in Eco-engineering, Water Safety, Smart Dikes, Liveable Delta and other programmes (Delta Technology, 2014).

Modern technologies are used in forecasting and monitoring phase, for modelling the effects of the floods based on the scenarios, for sharing the information and communication between the actors included in flood management and disaster and crisis management. Situation in Bosnia and Herzegovina is not that bright. For example, in the Republic of Srpska, flood prediction models are implemented only in the far south area of Trebišnjica River, while for the other river basins models are not prepared yet. Largest difficulties are outdated data (population, forestation, etc.) and lack of digital terrain models.

Implementation of modern technologies available in the Netherlands in Bosnia and Herzegovina requires significant financial resources and time for training and education. Still, global technological advance and growing variability of technological solutions will for sure have effect in Bosnia and Herzegovina. The

authorities and experts in Bosnia and Herzegovina should use all the available opportunities to learn about the application of modern technology in water management from highly developed countries in this field, like the Netherlands, also through the participation in EU programs for this field and various international projects opened for Bosnia and Herzegovina.

5.2. Structural Context

The structural context comprehends the influence of governance conditions and circumstances (de Boer, 2012). It is consisted of five elements of governance (Bressers, 2007):

- Levels and scales of governance;
- Actors in policy network;
- Problem perception and policy objectives;
- Strategy and instruments;
- Responsibilities and resources for implementation.

Besides the five elements of the governance, structural context is comprised of the valid property and use rights system related to land, water and other resources (de Boer, 2012). The structural context cannot be easily influenced and changed by the individual policy transfers, knowledge and measures implementations. However, continued actions and interdependencies between the elements can lead to the changes in the structural context much easier than in elements of the wider context (de Boer et al., 2013).

5.2.1. Levels and Scales of Governance

Levels and scales of governance, as an element of the structural context, are influencing transferability through the role of the different levels of governance. The key is to determine which levels of governance are conducting policy, what is the relation with the administrative levels of government and how the interaction between those administrative levels has been arranged (Bressers, 2007).

As already presented in Chapter 2., the Netherlands has four levels of governance: European level, national level, regional level and local level. All these governance levels are present in water management and in disaster and crisis management. On the other side, Bosnia and Herzegovina has three levels of governance: national level, entity level and local level, while in the entity of Federation of Bosnia and Herzegovina has one more level - cantonal level. However, we can talk only about two levels of authority in water management sector and in disaster and crisis management: entity level and local level. European level of authority exists in elements, because Bosnia and Herzegovina ratified many agreements of European Union but have not used all the potentials of cooperation with member countries still.

Changes in levels and scales of governance in Bosnia and Herzegovina are not really possible because of lack of political will for decentralisation. Generally, decentralisation as an idea in any governance sphere is being refused, especially in the Republic of Srpska, because it is seen as an attempt of taking over the entity's responsibilities and sovereignty. There was an attempt to organise water management in the Republic of Srpska in two water agencies responsible for two river basins, Sava River basin and Trebisnjica River basin, but after six years (2006-2012), the water agencies were merged in Public Institution "Waters of Srpska". This inflexibility of water management system in Bosnia and Herzegovina could prove as a stumbling for implementation of knowledge and measures from other countries.

5.2.2. Networks and Actors

Networks and actors are the elements of structural context, with the main task of identifying all actually involved and their roles, positions and responsibilities. After determination of actors, the structural inclination of the actors to cooperate should be determined. (Bressers, 2007). This element deals with position of the general public, experts, politicians and implementers and their inter-relations in the network (Bressers, 2007).

Figure 11 is showing the large number of actors involved in integrated flood management in the Netherlands. In addition to four official levels of government, establishment of water boards as regional water authorities is of great importance and they are considered as one of the main actors. A number of advisory groups, such as institutes, research centres, councils and committees are included in strategic planning and data gathering phases of integrated flood management. Also, many interested and influential groups, such as NGO's and civil organizations are included in decision-making and planning phase (Figure 9). Number of actors in water management is even larger. Large number of actors is the result of the idea that "the dikes make up the state" that shaped water affairs as essentially a core public activity (OECD, 2014). The governance system is organised in the way that three public components of the sub-national level, provinces, water boards and municipalities, are mutually dependant. The provinces are supervisors of the regional water authorities (water boards), while both provinces and water boards are obligate to coordinate with municipalities, which must include water management into their spatial decisions (Figure 11).

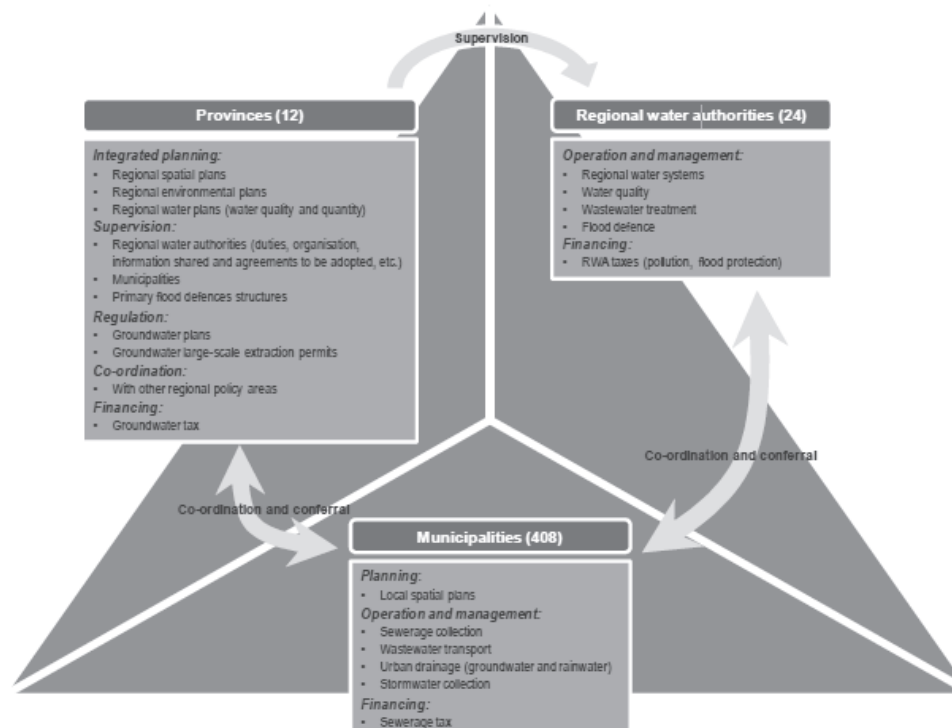


Figure 11 - Mutual Dependency across the Provinces, Water Boards and Municipalities in the Netherlands (source: OECD, 2014)

Bosnia and Herzegovina can learn a lot from the Netherlands in term of networks and actors in integrated flood management. It is possible to improve participation of experts and interested public in decision making through legislation, also through more active participation in strategy building and revision process. Besides, the legislation should provide more interdependencies between the actors in the system. Most recent floods in the Republic of Srpska have shown the lack of proper coordination and cooperation between the entity level and local authorities in flood management and in disaster and crisis management. The absence of cooperation resulted in accusation of the parties for the weak performance of the system during the flood. Also, integration of flood management into the other governance fields should be regulated by the legal acts. As already presented in Chapter 3, integration of water management and spatial planning exist in the main policy documents as an idea, without proper ways and models of its realisation and implementation in the lower hierarchy plans.

5.2.3. Perspectives and Goal Ambitions

Perspectives and goal ambitions, as an element of structural context, covers the influence of problem perceptions and definition of objectives (Bressers, 2007). For example, the same problem can be more or less seriously considered in different places, or can be considered as a problem only for the individuals or as a problem for the whole community. Goal ambitions are influencing transferability through differences in set-up standards, accepted degrees of uncertainty, recognised points of intervention, objectives accepted, etc. (Bressers, 2007).

Perspectives and objectives identified in the main policy documents on flood protection and disaster and risk management do not differ too much in the Netherlands and in Bosnia and Herzegovina. Also, the ambitions of interviewed experts do not differ significantly. However, taking in account the wider context, as described in Chapter 4.1.1., the perspectives and objectives stated in policy documents in Bosnia and Herzegovina seem quite unrealistic. More realistic approach oriented to better developed operational plans and mid and shorter-term actions would result in higher level of implementation, especially in case of rather unstable political and economic situation as it is in Bosnia and Herzegovina.

5.2.4. Strategies and Instruments

Characteristics and flexibility of the instruments planned within the policy strategy also influence transferability. It is necessary to determine instruments that are available for application, as well as requirements for those instruments and what are their target groups (Bressers, 2007).

Spatial planning and water management are integrated in the Netherlands, thus spatial planning performs as a non-structural measure in integrated flood management. On the other side, spatial planning and water management have very low level of integration in Bosnia and Herzegovina, and spatial planning itself has a very low level of implementation. Those are the reasons why spatial planning cannot be considered as developed non-structural measure in integrated flood management. The state of art in spatial planning in Bosnia and Herzegovina gives a lot of potential for transfer of knowledge and practices from the Netherlands. The best example to follow is obligatory inclusion of water management in all phases of spatial planning, as well as consideration of spatial impacts in water management planning documents. One of the main tools for the integration of spatial planning and water management is The Water Assessment (Chapter 2.4.4.), prescribed by policy documents, could be implemented in Bosnia and Herzegovina to assess how water management is included in spatial planning process.

The main problems in early warning system during May 2014 flood were low level of coordination between institutions, lack of monitoring stations and unprepared and uninformed population (Chapter 3.5.3.). Experiences from the Netherlands that can be used and applied to improve the situation in early warning system in Bosnia and Herzegovina mainly consists of training and exercises and communication in preparatory phase of disaster and risk management. Interviewed Dutch experts put an emphasis on importance of joint exercises of institutions included in flood management, stating that implementation of this instrument could improve coordination between actors included in flood management in Bosnia and Herzegovina. Besides, organisation of education, training and exercises with population would increase level of participation, as well as level of information and preparedness of population. Improvements in communication could also result in improvements in monitoring system, because better communication, cooperation and coordination with water management institutions in neighbouring countries and between water management institutions of the both entities of Bosnia and Herzegovina could lead to better prediction of flood events.

Improvements in evacuation planning in Bosnia and Herzegovina are similar as for early warning system. The key instrument for the development of this measure in the Netherlands is testing of the system and joint exercises of the involved. Besides, availability of relevant information to all involved actors is of great importance. The availability of the information is improving coordination between the actors and it enables providing of general public with similar information from one source. This prevents confusion and panic caused by the different information from multiple sources.

5.2.5. Responsibilities and Resources for Implementation

Transferability is influenced by responsibilities and available resources in implementation phase. It is important to determine actors responsible for the implementation of the policy, authorities and other resources available to these actors, as well as possible restrictions (Bressers, 2007).

Lack of implementation or weak implementation of legal acts, policy and planning documents is one of the largest governance problems in Bosnia and Herzegovina. The lack of implementation is especially pointed out by the interviewed experts when the spatial planning as a non-structural measure was discussed. The lack of mechanisms and instruments for the implementation of policies could seriously affect potential transferability of non-structural measures in integrated flood management from the Netherlands to Bosnia and Herzegovina.

5.3. Transfer Process Context

If policy development processes are viewed as social interaction processes, then they are also driven by the characteristics of the actors involved in the processes (de Boer et al., 2013). Motivations and cognitions of the actors have strong influence on the transfer processes as they are setting-up productive or non-productive environment for the process, while resources of the actors provide them with capacity and power to implement the transfer (de Boer et al., 2013). One part of this research was devoted to investigation of motivation of the local experts to take active part in potential transfer of knowledge, measures and policies from the Netherlands to Bosnia and Herzegovina. Interviewed experts were also willing to share their experience from previous transfers.

5.3.1. Motivation of Actors

Generally, interviewed water management experts are very motivated to be involved in knowledge transfer and already have a decent experience in this field. As one of the global leaders in water management, the Netherlands has broad cooperation with countries all over the world in solving water management issues. Interviewed Dutch experts were included in policy, knowledge and instruments transfer and cooperation with other developed countries, as Germany, Canada, the United Kingdom, etc., as well as with the countries that had similar transition phases as Bosnia and Herzegovina, such as Russia or Slovakia. During the interviews it was pointed out that the motivation of actors involved was on high level, but elements of the wider contextual layer were playing very important role in the implementation phases of the projects. Interviewed experts from Bosnia and Herzegovina also have large experience in cooperation with experts and institutions from the other countries. Besides the knowledge sharing, experience and best practices transfer, Bosnian experts are aware that participation in international projects is the most realistic way to access the financial resources needed for improvements in the integrated flood management system. Therefore, actors from both sides of potential transfer are generally motivated to participate in similar projects.

5.3.2. Resources

Actors in water management in Bosnia and Herzegovina do not lack capacities to adapt and implement knowledge, instrument and measures developed in other countries, in this case in the Netherlands. This opinion is given by the experts interviewed in both countries. The opinion of Dutch experts is based on their experience in knowledge and instruments transfer to other countries with similar situation as that in Bosnia, while the opinion of Bosnian experts is formed based on their experience in international projects and cooperation. The main problem is lack of implementation mechanisms and resources at the level of governance system in Bosnia and Herzegovina, and more generally, political and economic crisis in Bosnia and Herzegovina.

6. CONCLUSION

Flood management in the Netherlands is at much higher level of development than it is in Bosnia and Herzegovina. The Netherlands has a strong system of structural flood protection measures and well coordinated and integrated system of non-structural measures within flood management. On the other side, many structural flood protection measures in Bosnia and Herzegovina were devastated during the civil war and neglected in the post-war era, with coordination and cooperation between actors in disaster and crisis management being very weak.

This large difference in the development between the Netherlands and Bosnia and Herzegovina as itself gives an opportunity to Bosnian water management sector to learn from the experiences, practices and examples from the Netherlands; thus creating and opening a possibility for improving the status of water management in Bosnia and Herzegovina, through implementation of non-structural measures and instruments of integrated flood management developed in the Netherlands.

Having in mind the large differences in economic, political, cultural and problem perception contexts between the two countries, it is clear that implementation of modern monitoring systems, application of new software for modelling and other purposes, as well as changes in governance structure and decentralisation, is not quite achievable within a shorter time. However, there is a number of measures and instruments which do not require large financial investments, but still can improve the flood management system and disaster and crisis management system in Bosnia and Herzegovina.

This research was focused on three non-structural measures of integrated flood management: spatial planning, early warning system and evacuation planning, and their performance in the Netherlands and in Bosnia and Herzegovina, particularly in the area of Janja village within the City of Bijeljina. The analysis showed that main reasons of failure regarding this three measures in the case of Bijeljina and Janja were: an insufficient integration of spatial planning in the flood management, very low level of coordination and cooperation between institutions of water management and disaster and crisis management in both vertical and horizontal direction, and very low level, or even complete absence of work with population. The recognised failures of the system can be mitigated by implementation of Dutch experiences and instruments used in overcoming these problems in integrated flood management. Low integration of spatial planning and water management can be addressed through better legislation, inclusion of water management in all phases of spatial planning, and inclusion of spatial aspects in water management policies. Weak coordination and cooperation between the authorities included in integrated flood management can be addressed by clearly defined roles and responsibilities, by setting up the chain of responsible actors and the communication and coordination lines, and by defining the activities on building the capacities, such as organizing joint meetings, conferences, trainings and exercises. These would lead to a better insight into responsibilities, capacities and activities of the key actors, as well as better mutual understanding and higher level of confidence between them. Also, it is necessary to test the disaster and crisis response system. Weak communication and absence of work with population can be improved through workshops, trainings and exercises with volunteers, students and other target groups, as well as organization of Safety Day manifestations or similar. These instruments would increase preparedness of both institutions and population, and possibly result in higher confidence between citizens and the authorities. Regarding this, it is also recommended to establish a system of exchanging information between all relevant authorities in order to provide general public with relevant and reliable information from one source.

From the analysis presented, interviews conducted and facts collected through this research, it is obvious that, although less developed, the Republic of Srpska entity has all necessary institutions and instruments for non-structural flood management measures development put in place and functional on certain level. Also, from the analysis carried out for this research and from the interviews held with relevant experts and

public segments, main issues in this field are lack of funds, weak cooperation and coordination between the actors, and poor implementation of strategies and plans. Therefore, having in mind already mentioned analyses and current situation in Bosnia and Herzegovina, as well as EU funding programmes and IPA and other programmes available to pre-accession countries including Bosnia and Herzegovina, the transferability of non-structural measures from developed countries, such as the Netherlands, to Bosnia and Herzegovina and more precisely Bijeljina region, could be realistic.

The recommended instruments developed in the Netherlands, if applied in Bosnia and Herzegovina, could contribute to improvement of the status of integrated flood management in this country without large financial investments. It might be necessary to prioritise measures and to use bottom-up approach, from promotion and raising awareness on non-structural measures within the powers of local government to higher levels, with multiple beneficial effects. Besides, improved coordination between institutions at all governance levels could result in a number of joint flood management projects that could further contribute to development and upgrading of the system and its better and faster integration in the European waters and flood protection system.

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Water Act, 2009.

Legal Statutes and Acts in Bosnia and Herzegovina:

Emergency Situations Protection and Rescue Act, 2012.

Spatial Arrangement Act, 2010.

Water Act, 2006. changes in 2012.

APPENDICES

Appendix 1: Example of the interview with the actors in Integrated Flood Management in the Netherlands and Bosnia and Herzegovina

Part 1: Personal information

Name

Surname

Institution

Position

Education

Years in service

Part 2: Experience with non-structural measures

Q1: Are you familiar with the term "non-structural measures" in Integrated Flood Management?

Q2: What types of non-structural measures are used in your country?

Q3: How important are non-structural measures and why?

Q4: Have you ever had experience in developing and applying non-structural measures of Integrated Flood Management? If yes, which measures?

Q5: What are the key factors influencing development and using of non-structural measures?

Part 3: Spatial Planning

Q1: How can spatial planning contribute to Integrated Flood Management?

Q2: Do you know about some examples where spatial planning contributed to flood management and how these practices have evolved?

Q3: What were the key factors influencing evolution of these practices?

Q4: How would you assess the connection between spatial planning and flood management in your area?

Q5: How important is spatial planning in flooding zones in reducing the flood risk (in your working area)?

Q6: How would you rate the efficiency of spatial planning in flooding zones as a Integrated Flood Management measure?

Part 4: Early Warning System

Q1: Which institutions are responsible for the first reaction in the case of flood? What kind of actions do they take?

Q2: How are water boards communicating and getting information from those institutions?

Q3: Which actions are taken by water board in the case of flood?

Q4: Is there an early warning system in your area?

Q5: What is the role of the water board in Early Warning System in the case of floods?

Q6: Who gives the information to your institution about the potential disaster?

Q7: What are the steps that have to be taken after the information is received?

Q8: How often the Early Warning System is used and what actions enable it to function?

Q9: How familiar are the citizens what are their obligations in the case of emergency and what was the response of citizens?

Q10: Who is responsible to inform the citizens about the potential danger and its scope?

Q11: How would you rate preparedness of institutions in the case of floods?

Q12: How would you rate preparedness of population in the case of floods?

Q13: How would you rate coordination between responsible actors in the Early Warning System?

Q14: How would you rate implementation of existing policies in the Early Warning System?

Q15: What are the key factors influencing development of Early Warning System in your area?

Q16: Did Early Warning System proved as a effective Integrated Flood Management measure?

Q17: What kind of improvements can be made in Early Warning System in your area?

Part 5: Evacuation Planning

Q1: Is there Evacuation Planning in your area?

Q2: What are the key factors influencing the design of Evacuation Planning?

Q3: What are the objectives of Evacuation Planning?

Q4: What are the responsibilities and who is in charge in Evacuation Planning?

Q5: Is there a connection between spatial planning and Evacuation Planning in your area? (Explain)

Q6: Did Evacuation Planning proved as a effective Integrated Flood Management measure?

Q7: Are there any improvements required for the present Evacuation Planning?

Part 6: Floods experience

Q1: Have you experienced flooding events during your career and, if yes, when?

Q2: Which other non-structural measures are taken by the water board in the case of emergency?

Q3: How the performance of non-structural measures in the most recent flooding events influenced their further development?

Part 7: Transferability of water management policy and practices

Q1: Does your company have experience in knowledge transfer? (Examples)

Q2: Have you ever taken part in projects involving transfer of water management knowledge, instruments and practices during your career? (Examples)

Were these successful?

Q3: If yes, what do you consider as a key factors for successful transfer? If not successful, what caused the failure?

Q4: How did the general context issues (political, economic, cultural, technological) for the success of transfer?

Q5: How did the structural context issues (governance levels and scales, policies, goals, networks, responsibilities and implementation resources) for the success of transfer?

Q6: Do you consider the inter-personal relationships between key actors involved in transfer as a crucial factor for the success of transfer? Why?