Risk Perception and Communication
- A Study on How People Living in the Tisza River Basin, Hungary Perceive the Risk of Floods and How the Flood Risk Communication Between Authorities and the Public Could Be Improved

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**Abstract:** It has been stressed within social sciences that risk management has focused too much on technical solutions and in order to decrease the risks also social factors have to be taken into account, namely the way people perceive risk. Risk perception is an important research field working on these issues. The aim of the study was in the light of the diverging views between the two paradigms to understand which of the psychometric or the cultural theory paradigm that can to a larger extent explain the flood risk perception of people living in the Tisza River basin. Furthermore the aim was to understand how the gap between experts’ and the public’s view on flood risk communication can be understood as well as how the risk communication could be improved. Data was collected through a survey and interviews. The results show that risk perception can partly be explained by either paradigm. To better understand people’s risk perception studies need to be more empirically based, not treat people’s perception as something too abstract and understand the interaction between individuals, society and the environment. The gap between the public’s and experts’ views is not as large as expected. In order to improve flood risk communication, decision makers need a better understanding of citizens’ perceptions and the motivation to include public perception in flood risk management need to be based on the view that the public could have an important input into risk management.

Key words: Risk perception, Risk communication, Floods, Hungary, Tisza River basin.
Preface
This thesis was written to conclude a master program in geography at the Stockholm University, Sweden. The work of the thesis spans between January and May 2013 and data was collected during three weeks at the end of March and beginning of April.

Over the past nearly 8 years I have been to Hungary on longer and shorter occasions, between visits of half-years to only a few days. This has given me both knowledge and opened up an increased interest for the country. It has made clear from my experience that floods are something that is an important feature of the human-environment interaction in major parts of the country. After weeks of literature studies it is obvious that there is a gap of knowledge about how people in Hungary perceive the risk of floods. The topic of the study relates to the academic debate on risk perception, arguing that understanding and including public perception is increasingly important in risk management. From my geographical background it is believed that each place hold its specific environmental and social features.
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1. Introduction

1.1 Background

“Some of the largest and most transforming events in the Earth’s history were no disaster for
the simple reason that there was no one who could suffer - or report. In the original meaning
of the word disaster, a cataclysmic event is often a natural disaster in the sense that it is a
result of the Earth changing. Thus, human consequences are what make natural events an
accident” (my translation from Lundén 2006, p.8).

Societies today witness natural events such as floods, volcanic eruptions, earthquakes,
tsunamis, cyclones and storms that all could put different people at more or less risk. Natural
processes have always shaped and re-shaped the Earth’s surface. Agents like water and wind
wear down mountain ridges while endogenous forces build up new ones. Water masses and
even continents have moved and changed place as a result of the movement of tectonic plates
and fluctuating atmospheric conditions. Humans have only had the chance to witness a
relatively short period of time from the transformation of the earth. The risk of hazards itself
can be seen as a human construct or social representation (Moscovici 1988; Breakwell 2001;
Sjöberg 2003). This means that risks are partly something going on in the mind of people or
constructed in societies and cultures. A more nuanced perspective views risks and hazards as
both having natural and social dimensions:

“There is a danger in treating disasters as something peculiar, as events that deserve their
own special focus. It is to risk separating ‘natural’ disasters from the social frameworks that
influence how hazards affect people, thereby putting too much emphasis on the natural
hazards themselves, and not nearly enough on the surrounding social environment” (Wisner
et al. 2003, p.4).

Different natural hazards have been studied, for instance earthquakes (Da Cruz 1993; Shaw,
Kobayashi and Kobayashi 2004), landslides (Finlay, Mostyn and Fell 1999; Ming-Chou et al.
2008), cyclones (Islam, Ullah and Paul 2004) and volcano hazards (Perry, Lindell and Greene
1982). One of the most studied and scientifically most attentive natural hazards however are
floods. An important reason is that floods are considered one of the most significant natural
disasters when taking into account impact on humans and economic losses (Jonkman 2005).
This has made a lot of research and debates focusing on how to prevent or mitigate damages
from floods. The EU flood directive for example works on reducing the flood risk in water
courses and coastal areas within the European Union. In 2007 the EU flood directive
published directives amongst the parliament to reduce the risk of floods (See The European
Parliament and the Council 2007). Some of the points in the directive relate to damages
(fatalities, displacement of people, economic losses), that floods are natural phenomena and
that they cannot be prevented. It is stated that: “some human activities (such as increasing
human settlements and economic assets in floodplains and the reduction of the natural water
retention by land use) and climate change contribute to an increase in the likelihood and
Furthermore, it is claimed that effective measurements to reduce flood risk have to be made
for each river basin, on a communal level and strategies have to be coordinated throughout the
whole basin (The European Parliament and the Council 2007, p.1-2). This strongly calls for
an understanding of local populations in order to be able to manage the floods and
communicate about risk between citizens and decision makers (Breakwell 2000).

Jonkman and Dawson (2012) discuss several challenges in flood risk management and draw
the conclusion that sustainable and long term flood risk management has to be able to face
uncertainty and find solutions that work under different future scenarios: “Handling
uncertainty is therefore central to sustainable and successful flood risk management” (Jonkman and Dawson 2012, p.790). The analysis focuses mainly on structural and economic components like decreased cost of repair and recovery, but also social dimensions like increasing awareness of risk and training among the public are pointed out (Jonkman and Dawson 2012).

An important factor when dealing with hazards whether it is floods or any kind of hazard is vulnerability. Vulnerability can be defined as:

“The characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (an extreme natural event or process)” (Wisner et al. 2003, p.11).

In this perspective dealing with hazards such as mitigation and management strategies is in a large sense a way of reducing vulnerability of a population at risk, by either reducing the effects and damages by different means of flood protection or manage the floods in other ways. Messner and Mayer (2006) write that there is a paradigm shift going on in flood research from the view that floods have to be prevented as much as possible through flood protection, to the view that floods have to be managed in other ways:

“Flood risk management deals with a wide array of issues and tasks ranging from the prediction of flood hazards, through their societal consequences to measures and instruments for risk reduction. Due to this variety of aspects, management of flood risks needs systematisation and integration” (Messner and Mayer 2006, p.1).

Research on natural hazards has traditionally focused on the natural dimension. Hazards have been viewed as pure natural forces and observed in an objective way which is free from values and human perception. Da Cruz (1993, p.30) presents two views on the nature of disasters: the first, the dominant view can be regarded as the more traditional way of looking at disasters. This view is characterized by (from Da Cruz 1993, p.30):

- Definitions and explanations are originated in the physical world.
- Science is objective and free from values.
- The social reality is homogenous.
- Normality is productive, stable and ordered.
- Disasters are acts of mankind, extremes in nature (hazard), the unusual and the lack of knowledge and planning.
- Vulnerability deals with losses in people and/or elements at risk defined on a risk scale. Recovery has to be matter of experts, a way to preserve status quo and development. Underdevelopment makes disaster worse because it is a stage in development.

The second view, the so called alternative view is the view that disaster research has moved towards during the recent decade and is characterized by (from Da Cruz 1993, p.30):

- Definitions and explanations are originated in the hazard environment.
- Science is man-made, a construction.
- The social reality is rich in variation.
- Normality is change, conflict and totality a concrete reality.
- Disasters are acts of social development, periodical, specific and the result of lack of power and resources.
Vulnerability deals with risk exposure and capability of recovery. Recovery has to be controlled by the people at risk, a way to societal change and local control. Underdevelopment makes disaster worse because it is a stage in marginalization.

Many authors have pointed out the increased importance in understanding the perceptions and reactions of the everyday people when dealing with floods, not least when relating the discussion to the debate on climate change and future scenarios of more extreme weather. Those studies also state that flood prevention and mitigation strategies traditionally have focused mainly on expert judgments (so called objective views) and structural solutions (like building dams and dykes) (see for instance Messner and Mayer 2006; Ming-Chou et al. 2008; Armas and Avram 2009; Terpstra, Lindell and Gutteling 2009; Pagneux, Gíslandóttir and Jónsdóttir 2011; Bradford et al. 2012). Brilly and Polic (2005, p.345) states that: “There is lack of knowledge about hazards in general, but particularly about vulnerability that includes the people’s reactions”.

Another important factor that makes it important to understand people’s perception of risk is that flood defense structures and technological advancement could bring the public into a false sense of safety (Kellens et al. 2011). In a study on floods in Argentina dykes and other technical solutions have not negated the problem with floods that the inhabitants face (Ullberg 2006, p.157). A study from the San Francisco and Sacramento region in the USA show that people living in areas that have long been protected by levees clearly underestimate the risk of floods and that 75 % of the studied population were unaware of the risk of floods (Ludy and Kondolf 2012). An important factor in flood risk management according to Ludy and Kondolf (2012) is information to the public and awareness among the residential people:

“Informed individuals are more likely to take preventative measures than uninformed individuals. Further, where individuals can take measures to reduce risk, they can minimize consequences of a disaster such as loss of life and property damage. As such, if an individual voluntarily accepts a risk, he or she is presumed to have the option to avoid the risk [...] . It follows that if an individual is unaware of a risk, the individual cannot make a fully informed decision about taking the risk” (Ludy and Kondolf 2012, p.830).

Geographers are interested in how natural and human factors have an impact on the Earth’s surface and the relationship between humans and nature. Da Cruz (1993) discuss that humans have a double relationship with nature: The same time as humans are part of nature they are also transformer of nature and in this process also become transformed by nature. In other words the physical environment has an impact on humans and the humans have an impact on their physical environment in a two-way relationship.

The structure of the thesis has begun introducing the topic of risk and hazards in a more general context showing a changing focus in risk research and illustrating that risk is not only a natural phenomenon but shaped in the meeting between the environment, people and societies. In the following section the aim of this study will be presented (chapter 1.2). Chapter 1.3 will describe the methods used to gather data and how ideas from risk perception research will be applied in the setting of this study. In the last introduction chapter (1.4) there will be a presentation of the study area, the Tisza River basin and its natural and social features.

In chapter 2 there will be an explanation of the theories that will be used and how they will be applied in this study to explain people’s risk perception. Chapter 2.1 will treat risk perception that will begin defining risk and risk perception followed by explaining the research field of
risk perception and why and how research about risk perception emerged. Research about risk perception is today dominated by two different views: the psychometric paradigm and the cultural theory paradigm that will be explained in the following sections. Finally there will be a section on how the concept of risk perception will be applied in this study. It will further be argued that research about people’s risk perceptions need to take into account both natural and social features if to more truly explain people’s perception of risks. In chapter 2.2 there will be a theoretical presentation of risk communication giving definition of risk communication, research about risk communication and presenting how expert literature explain how risk communication between authorities and the public could be improved. To conclude the theoretical chapter there will be a section on how risk communication will be applied in this study.

In the last chapters the results will be a presentation of the results from the survey and the interviews (chapter 3), a discussion (chapter 4) and last the concluding remarks of the study (chapter 5).

1.2 Aim of the Study
From a geographical point of view this study aims to focus on how the actions of people are affected by their physical environment. A study will be carried out in the Tisza River basin in eastern Hungary that is annually stricken by floods. It is believed, from the discussion above that flood risk management has to take into account the perception of the everyday people and therefore this study will investigate how inhabitants in flood prone areas perceive the risk of floods. To do this the study will relate to the academic debate on the concept of risk perception. In light of the contradictions between the two major paradigms within the research field of risk perception, the aim of the study is to understand which of the psychometric or the cultural theory paradigm that to a larger extent could explain the flood risk perception of the people living in the Tisza River basin, Hungary.

An important reason to understand people’s perception of floods is to more effectively be able to manage the floods and to communicate between different actors, particularly between authorities and the public. It is believed that experts and decision makers on the one hand and the public on the other hand diverge in their perceptions on risk and how it should be managed. Therefore the aim of the study is also to try to explain how this gap between experts’ and the public’s view on flood risk communication can be understood and how it can be used to improve risk communication within the Tisza River basin.

The purpose of this study is to answer the following research questions:

- Which of the psychometric and the cultural theory paradigm can to a larger extent explain the flood risk perception of people living in the Tisza River basin?
- How can the gap between experts’ and the public’s view on flood risk communication be understood and how can the flood risk communication be improved between decision makers and the public?

1.3 Methods
To collect data the study will use both deep interviews as well as a survey (see appendix 1 for the interview questions and appendix 2 for the survey). The characteristics of the interviews will be qualitative with open-end questions only while the survey will consist of both qualitative and quantitative aspects with a mix of both close-end as well as open-end
questions. The interviews were conducted with people living in a village about 15 km from the Tisza River. The survey was distributed through several social networks and communities by people living in the Tisza River basin. All interviews and surveys were conducted in Hungarian and the answers have later been translated into English.

It is of course important to keep everyone who participated anonymous to the extent that they cannot be revealed. People participating in the survey will only be treated according to the information they provided and informants from interviews will be treated according to letters (interview A-E). When deciding to participate in the survey and interviews, respondents were well aware of the purpose of my thesis and agreed upon their information to be used in the report. This means that respondents were well informed about the purpose of the study as well as how information will be used before deciding to participate. Also all who participated were aware of that it is voluntarily and no one was forced to participate. When collecting data only perceptions from public people has been used and no sensitive or classified information that have any risk of being misused are included in my results.

When going to the methodology of earlier studies, the methodology of the psychometric paradigm has shown to be the most influential within the research field of risk perception (Oltedal et al. 2004; Sjöberg, Moen and Rundmo 2004), it has been able to show more correlations between variables and variance to a higher degree (Sjöberg, Moen and Rundmo 2004) and therefore a methodology that seem to have developed the most comprehensive method of capturing the risk perception of people. However as the rating scale is used many times, see for example Goszczynska, Tyszka and Slovic (1991) with answers where respondents should choose on a scale from 1 – 7 (for example 1=personal risk can be controlled and 7= personal risk cannot be controlled) does not seem entirely feasible. There are two main reasons for this.

First of all: An important attribute when creating surveys is that the issues should be understandable and clear to the respondents in a way that the questions in a fair way can capture the people’s perceptions, and give results that can later be processed and analyzed (see for instance Statistics Canada 2003). One way to do that is during the construction of each question, for example that they should have a language that can be understood by the respondents and that as a researcher one do not presume that respondents know everything that could be expected (Statistics Canada 2003). The choice of answers that are predefined will instead of letting respondents rate from 1 – 7 asking them to choose between for instance: “Very well”, “well”, “not well” and “not at all”. It is believed that it is easier for the respondents to give away answers when using words rather than numbers as a label of quantitative aspects. Since risk is about qualitative aspects it would be a less mismatch to use ratings in words rather than numbers for the respondents to express their perception in the survey. A second aspect that is important is that the type of questions used within the research field are expected to be too generally formulated and is therefore hard to apply to real life situations. This was apparent when the study was conducted. It was clear that all respondents had a hard time understanding and did not know how to interpret many of the question items when formulated too generally. It is important that if risk perception should be more empirically applicable the theory have to be better formulated to the situation studied.

The interviews and the survey will consist of very similar questions asking about the respondents’ experience from floods, how often they feel threatened by floods, what they think is the biggest threat from floods (for instance economic damages, damages on properties or deaths) as well as if the respondents ever thought about moving away from where they live. It is important to highlight that local conditions have to be taken into account (Goszczynska,
Tyszka and Slovic 1991) and that further factors will be added to the survey from what has not been studied before. In the case of Hungary in the Tisza river basin an issue that seems to be important in how people perceive a certain risk is how people perceive the risk of floods in relation to other risks. It has been shown by ICPDR (2008) that people living in the catchment area of Tisza face both risk of water quality as well as quantity aspects such as pollution from industries and agriculture and droughts. Therefore this study will also ask the respondents if they are more concerned about other risks more than the risk of floods.

Other questions that will be asked are how and how well the people have learned to live with the floods, what the respondents do personally to protect themselves from the floods and what they think they could do to better protect themselves from floods. The latter question will also be asked about the flood management of the authorities and how they better could protect the people from floods.

To understand the flood risk perception from a cultural theory point of view we need to know something about the social context and people’s relations. To do this questions will be asked about where the respondents get information about floods from, if they think that the flood risk management is more effective alone or by collective initiatives and how they think that they can protect themselves from floods alone compared to by the help of others.

In order to understand how the flood risk communication could be improved respondents will be asked if flood risk management mainly is a governmental or citizen issue and if flood risk decisions on local or governmental level to a larger extent can protect inhabitants from floods. Respondents will also be asked if they think that the flood risk management have to be improved or if they already are satisfied with the authorities’ work on flood risk management as well as asking how the flood risk management better can be a part of people’s everyday life. This is expected to indicate if the degree of trust people put in authorities and their work on floods. Finally, respondents will be asked how they think that the communication about floods could be improved. The last question is very important in the case of Hungary regarding the history of risk governance where the government has had a central role in the flood management, and because it has been shown by Vari (2002) that information is frequently not transparent and the public do not often ask for more information or insight into the flood management. It is believed and it has been pointed out in research about risk perception that it is important to know about how people perceive risks in order to be able to communicate and manage them. To compare the public’s view on flood risk communication the discussion will mainly link to the recommendations on risk communication found in Lang, Fewtrell and Batram (2001) and Sandman (2012). The most prominent aspects to improve flood risk management and risk communication are:

- **Shared control:** The issue is both regarding whether information is transparent and shared with the public as well as how authorities choose to let the public participate in the decision making process.
- **Acknowledgement:** What perception of risk do the authorities include in the debate and the decision making process? An important issue is whether people’s perceptions are included or if only experts’ objective views of the risk are presented.
- **Trust:** A very central part of risk communication is the component of trust. Trust could refer to either trust in institutions or trust in flood protection measures (for instance dykes and dams) (Kellens, Terpstra and Maeyer 2013).

Rowe and Frewer (2000) discuss that there is not really any benchmark in which to compare the effectiveness of risk management through risk communication between decision makers.
and the public because by the beginning of 21st century very few studies had been made on risk communication and how it could work effectively. Holmes et al. (2009) point out that within literature, few studies are made on the actual practice of risk communication. Even today, no extensive study has been found measuring the theoretical recommendations for example presented in Lang, Fewtrell and Batram (2001) and Sandman (2012).

There is of course the question about open or close-end questions. Vinten (1995) sum up the advantages and disadvantages with both types of questions: An important reason that many researchers prefer using open-end questions when dealing with qualitative information is that respondents have a higher chance to give away more genuine attitudes. Other advantages with open-end questions are that they give more freedom and researchers have an opportunity to probe especially for spontaneous answers (Vinten 1995). Drawbacks with open-end questions are that they can be very time-consuming, demand more from the respondents and could make the coding costly, slow and sometimes even unreliable (Vinten 1995). Advantages with close-end questions are that they require less time, are easy to process, make comparisons between groups or variables easy and are more useful for testing specific hypotheses (Vinten 1995).

The disadvantages with close-end questions are that there could be loss of spontaneous responses, answer categories could bias respondents, could sometimes be too crude and may even upset some respondents (Vinten 1995). Vinten (1995) also discuss that close-end questions reduce and sometimes almost eliminate coding time of respondents’ answers, and having open-end questions could make the coding of the respondents’ answers into something measurable very hard if there are too many different answers.

Statistics Canada (2003) also name similar advantages and disadvantages about open and close-end questions: open-end questions gives more freedom of expression than close-end, but this also results in that the open question could be interpreted in many different ways and require both more knowledge and time of the respondents. Also converting the answers from open-end questions into something measurable could be very hard, time consuming and even unreliable and error-prone. On the other hand, it is more time-consuming to create close-end questions because the researcher not only has to create questions but also has to define appropriate choice of answers (Statistics Canada 2003).

One important aspect pointed out by Statistics Canada (2003) is that the freedom for self-expression by open questions is mainly advantageous when exploring an issue that is less understood:

“One advantage of open questions is that they allow the respondent the opportunity for self-expression or elaboration. This is important when examining an issue that is not well understood or is very broad. Consequently, open questions are often used during questionnaire development and testing. For example, they are used in focus groups to obtain comments and opinions on the question presented and to generate discussion. Open questions also allow the statistical agency to obtain the respondent’s own ‘natural’ wording. This is important when examining question wording and response categories for a closed question” (Statistics Canada 2003, p.63).

It is important to point out that the field of risk perception and risk communication handled in this study is not a poorly known research area and the aim of the study is not to only explore, but rather apply well discussed theoretical aspects in a less studied environmental setting. For those reasons both open-end questions as well as close-end questions with predefined choice of answers have been chosen for this study.

It is believed that interviews could bring more information than surveys because you actually meet with the respondents and perhaps get a deeper understanding of issues studied (Statistics
It is also possible to rephrase a question if the respondent does not understand the question and to follow up by asking new questions that comes up (Statistics Canada 2003). However, the strength with surveys is that they should be able to be conducted faster than interviews, a larger sample can be collected and they can be filled in anytime, not requiring a physical meeting (Statistics Canada 2003). Another practical aspect is that many of the respondents do not know or know very little English. There will not be any interpreter available to the extent required for only conducting interviews and therefore surveys translated into Hungarian have a clear advantage to overcome the language barrier.

1.4 Study area – The Tisza River Basin

The study will focus on the Hungarian part of the Tisza River basin and will be delimited to people living within the Tisza River basin, Hungary (see figure 1 for an overview map of the study area).

![Figure 1: An overview map of the Tisza River basin, the main river and the Hungarian part of the river basin. Modified from Google Earth (2008)](image)

The Tisza river basin is the largest sub-basin of the Danube river covering 157 186 km² or almost 20 % of the Danube river basin (ICPDR 2008). The basin is shared by five countries: Ukraine, Romania, Slovakia, Hungary and Serbia and is home to around 14 million people (ICPDR 2008). The Carpathian mountain ridge forms a semicircle in the north and east and creates natural borders for the Tisza river basin. The Tisza river basin is often divided into two parts: the mountainous upper Tisza consisting of Ukraine, Romania and Slovakia while the flat lowland part consists of Hungary and Serbia. Living downstream inhabitants in Hungary and Serbia are highly affected by activities being pursued in the upper Tisza which makes flood risk management increasingly complex (ICPDR 2008).
Most of the precipitation is received in the mountainous upper Tisza with places getting up to 1600 mm annually, while the lowest values occur in the lower Tisza with about 500 mm and below annually (ICPDR 2008).

Land use within the Tisza River basin is dominated by forestry in the upper Tisza (Slovakia, Ukraine and Romania), while extensive farming dominate the lower flat parts; urbanization is also getting an increased importance (ICPDR 2008). In the Hungarian part of the Tisza River basin the largest cities are Debrecen with above 200,000 inhabitants and Miskolc with nearly 200,000 (ICPDR 2008).

Even if Hungary has among the least inhabitants employed in farming (around 5% of its population) among the five Tisza River basin countries it still considered the country to be most at risk for floods and its damages (ICPDR 2008). For Hungary the Tisza river basin covers almost half of the country’s area (46,213 km²) and more than 4 million from Hungary’s population of a little more than 10 million lives within the river basin (ICPDR 2008). Among the European countries Hungary only ranks behind the Netherlands in flood exposure and losses from floods within the river basin could reach up to a quarter of the GDP and nearly 10% of the country’s total GDP (Vari, Linnerooth-Bayer and Ferencz 2003).

According to ICPDR (2008) water management in the Tisza river basin faces several problems besides floods, such as droughts in summer, landslides, erosion and agricultural-and accidental pollution from industries. There was for example a cyanide spill in Baja Mare, Romania in year 2000 and due to the low precipitation in the lower Tisza extensive farming is not possible without human means like irrigation, canals and reservoirs for water distribution (ICPDR 2008).

Lóczy (2010) states that floods in Hungary are produced by both temporal and spatial features, due to the flat characteristics of the Hungarian plain and hydrological factors over time. Floods are possible to occur throughout the year, but the most of the floods occur during the warm period May to October (with 65% of all floods) and during the cold period November to April 35% of all floods occur (ICPDR 2008). Snowmelt in the mountainous areas result in so called “green floods” in April and May and in May and June floods is often the result of prolonged rainfall (Lóczy 2010). Due to more extreme weather oscillations snowmelt could be increasingly rapid resulting in an increased magnitude of floods in the future (Lóczy 2010).

In contrast to the rapid and short lasting floods in the mountainous upper Tisza the floods of the flat lower Tisza can be very long lasting and last up to 100 days (ICPDR 2008). To manage floods extensive regulations has been made along the Tisza River. The first regulations were made between 1833 and 1844 with the so called Vásárhelyi plan transforming the river with short cuts from a length of nearly 1400 km to 966 km that the river is today (ICPDR 2008). Before the regulations about 20% of the Hungary’s territory was permanently inundated. Today more than 97% of the floodplain in Hungary is controlled by different means of flood control, like levees and reservoirs (ICPDR 2008). According to ICPDR (2008) even the strengthened parts of levees have weak spots and do not reach all the safety criteria.

Recently floods have been increasingly extensive, possibly due to earlier regulations that were made, deforestation in upper Tisza increasing the runoff, building of higher dykes resulting in silt being trapped within the main bed and due to lack of coordinated mechanisms to mitigate the floods (ICPDR 2008). Vari, Linnerooth-Bayer and Ferencz (2003) state that several reasons for high risk in a large portion of Hungary is due to the development of farming
practices in the already exposed areas, deforestation in the catchment areas, other land use practices and the earlier regulation of the river. Also because most of Hungary’s rivers originate from other countries, Hungary only has a very little control in what happens in the upstream countries (Vari 2002) and flood risk management can only be effective by cooperating with the those countries (Vari, Linnerooth-Bayer and Ferencz 2003).

Between 1998 and 2001 four floods classified as extreme struck people along the Tisza River (ICPDR 2008). Other floods classified as extreme that have occurred during recent years were in 2005 and 2006 both occurring in April (ICPDR 2008). Figure 2, 3 and 4 show pictures from the 2006 year floods in Szolnok. According to ICPDR 2008) the most serious consequences of the floods are damage to agriculture, mainly to crops and to plan farming activities (Vari, Linnerooth-Bayer and Ferencz 2003). Traditionally Hungary’s government has taken most responsibility for the flood risk management including flood prevention and has invested huge amount of money in building levees. The government also takes full responsibility for private damages caused by levee breaching by floods (Vari, Linnerooth-Bayer and Ferencz 2003). One point that Vari, Linnerooth-Bayer and Ferencz (2003) make is that the levees would be insufficient with worsening flood conditions in the future and would continue to be expensive to maintain.

Figure 2: 2006 year floods in Szolnok. The dykes are reinforced with sandbags to prevent the floods from reaching people’s homes. Photo: Imola Tóth and Christer Svahn.
Figure 3: Floods in 2006 breaching the sandbag reinforced dykes in Szolnok. Photo: Imola Tóth and Christer Svahn.

Figure 4: Flooded home in Szolnok during the 2006 year floods. Photo: Imola Tóth and Christer Svahn.
Vari, Linnerooth-Bayer and Ferencz (2003) have investigated the view on flood risk management from stakeholders’ point of view in Hungary. Findings from the study show that there are mainly three different pathways for flood risk management in the future: first, the traditional path where the central government has the largest authority and responsibility; second, where more responsibility is moved towards the individual in a market path; and third, an ecological approach with fewer structural solutions and more pressure on local initiatives. The dominant view among stakeholders was still the first where central government continues to have authority and responsibility for flood risk management (Vari, Linnerooth-Bayer and Ferencz 2003). The traditional view would also include continued focus on technical solutions such as strengthening levees. It was shown by Vari, Linnerooth-Bayer and Ferencz (2003) that there are also conflicts regarding if the levees should be preserved to protect the inhabitants (mainly the view of water authorities) or if the river should be re-naturalized to enhance the ecosystems (mainly the view of the environmentalists). Solutions to decrease flood risk diversified among water-authority experts that mainly advocated heightening of the existing levees and environmentalists and mayors that advocated partly re-naturalize the flood plain by removing levees in some parts and instead create natural reservoirs (Vari, Linnerooth-Bayer and Ferencz 2003).

ICPDR (2008) claim that several initiatives have been made to facilitate public participation in water management issues, for instance as being observers or participate during expert meetings. ICPDR have also promoted themselves and their work in order to increase awareness among the public in relation to floods (ICPDR 2008). However the plans presented in ICPDR (2008) do not mention any need for public participation, understanding or input of public perceptions or awareness rising in the future.

There have been a very few studies and concern about public perception on flood risk, flood risk communication and its consequences in Hungary. In Vari, Linnerooth-Bayer and Ferencz (2003) it was shown that the most common precautions to floods by farmers was to diversify their practices to those that are less sensitive to floods like grow plum and walnut trees on the floodplain, process the crops (for example jam making), pursue home craft activities or use floodplains as grazing land. The scarce resources of local farmers were pointed out and it is believed from the study that a market approach with more individual initiative and responsibility would put an even larger burden on an already vulnerable population (Vari, Linnerooth-Bayer and Ferencz 2003).

According to Vari (2002) the public lack information and participation on floods and flood risk management because bureaucrats withhold information and the public do not choose to ask for it. The study by Vari (2002) claims that a gap in flood risk management exists as a result of a somewhat weakened centralized system of flood management that has not yet been filled by the public, mainly due to the lack of information provided (Vari 2002). Defence, evacuation and other plans are not accessible by the public nor did they show to be aware of any plan existing and therefore many people at risk of floods are expected to not be enough prepared (Vari 2002). The management strategy can be labelled “risk-based management” and is based on scientific assessment with technical solutions such as strengthening of levees which is argued not to be enough to handle uncertainty and floods expected to be more intense in the future (Vari 2002).
2. Theory

2.1 Risk perception

2.1.1 Definition of risk and risk perception

Before defining risk perception we first have to make clear what is meant with the concept of risk. Risk is often defined as “the likelihood that an individual will experience the effect of danger” (Sjöberg, Moen and Rundmo 2004, p.7). Fischhoff, Watson and Hope (1984) put forward that technical experts often make a distinction between subjective and objective risk, where the former can be explained by scientific research, statistical data and probabilistic risk analyses, while the latter can be explained as a non-expert view by the public that often contains values. Risk is not the same as hazard: “Risk is the possibility to encounter danger or harm, the exposure to a chance injury or loss, or the degree of such exposure. Hazard is the exposure in itself, the incurring possibility of loss and harm” (Da Cruz 1993, p.33).

Risk perception is a concept used to explain how people react to the risk of hazards and is today important due to the fact that public’s subjective judgments, affected by both cognitive and emotional factors, deviate from the experts’ “objective” risk judgment (Oltedal et al. 2004). Risk is all about thoughts, beliefs and constructs (Sjöberg 1979 in Oltedal et al. 2004) and "objective" risk is the risk that exist independent of an individual’s knowledge and worries of the source of the risk (Ulleberg & Rundmo 1996 in Oltedal et al. 2004). A more thorough definition on risk perception is presented by Messner and Mayer (2006):

“Risk perception refers to the intuitive risk judgments of individuals and social groups in the context of limited and uncertain information. These judgments vary between individuals due to different levels of information and uncertainty, due to different intuitive behavior, and also due to specific power constellations and positions of interest. As a consequence, the individuals of a community may assess the risk of being flooded very differently, because they do not have the same information about the probability of flood hazard events in their region, about flood mitigation measures and their effectiveness, and they perhaps have a different historical background regarding the experience of living in a floodplain and of being flooded. Due to their specific perception of flood risk individuals, social groups and also public persons like mayors, politicians and employees in the public sector dealing with flood protection and disaster management may handle this issue very differently” (Messner and Mayer 2006, p.154).

From this point we can assume that people perceive different components in their environment, such as the risk of floods differently as a result of both cognitive and emotional factors. From this perspective it is also important to assume that people’s perceptions cannot be seen as objective.
2.1.2 The research field of risk perception

The research field of risk perception arose during the 1960s, mainly as a determinant for evaluating and handle an unexpected opposition by the public against technology, in particular nuclear power (Sjöberg, Moen and Rundmo 2004). A work from Starr (Starr 1969 in Sjöberg 2003) illustrated that public risk perception was seen as an obstacle to more rational decisions by experts. This founded the basis for the conflicted views between experts and the public from 1960s, and still during the 1970s the two camps of experts on the one hand and public on the other became increasingly polarized (Sjöberg 2003). Still today there is a divergence in the perception of risk between the public and experts, and decision makers call for a better understanding of the public’s view on risks in order to improve the effectiveness of risk communication and management of hazards (Breakwell 2000).

However, Starr’s work also awakened interest in issues on how people perceive and tolerate risk. An important concept from Starr’s study was “voluntary risk” (Sjöberg, Moen and Rundmo 2004). During the 1970s a group of cognitive psychologists became interested in how people react to factors of risk. The assumption was that risk is about probabilities and therefore experimental studies on how people react during lotteries and other gambles measured by psychological scaling procedures were an important contribution to the field of risk perception (Sjöberg 2003). Going back to Starr’s concept of voluntary risk an important contribution to the field during the 1970s was the findings that people seem to tolerate risk at a higher rate when engaging in voluntary activities. Controllability therefore became an important factor in research about perception of risks, meaning that people who recognize that they are more in control also have a lower perception of risk (Sjöberg, Moen and Rundmo 2004). According to Brun (1994) risk can be seen as an insufficient level of controllability. Several decades of research within the field of risk perception was dedicated to similar psychological work that developed during the 1960s and 70s. Today mainly two different paradigms dominate the research field of risk perception: the psychometric paradigm and the cultural theory paradigm (Sjöberg, Moen and Rundmo 2004).

Since the research field of risk perception emerged during the nuclear power debate throughout 1960s it has been used in a variety of areas, such as health risks and everyday risks like the risk of traffic accidents and smoking (Sjöberg 1998). A lot of attention however has turned towards the risk of natural hazards, such as earthquakes (Da Cruz 1993; Shaw, Kobayashi and Kobayashi 2004), landslides (Finlay, Mostyn and Fell 1999; Ming-Chou et al. 2008), cyclones (Islam, Ullah and Paul 2004), volcano hazards (Perry, Lindell and Greene 1982) and floods (Olczyk 2004; Brilly and Polic 2005; Armas and Avram 2009; Terpstra, Lindell and Guteling 2009; Pagneux, Gíslandóttir and Jónsdóttir 2011).

There has been criticism against both paradigms within the field of risk perception. Sjöberg (2000) for example argue that the cultural theory is based on too abstract routine:

“The reason why this approach fails is probably that the social context is construed in a very abstract, farfetched manner, and that social context per se by no means is the sole determinant of risk perception” (Sjöberg 2000, p.9).

Miller (1997) also put forward the argument that the concept of culture in itself is very complex. Criticism towards the cultural theory also suggests that it is more fruitful to distinguish between risk that affects individuals and that affects groups (Oltedal et al. 2004) and that people may be so different that it is not possible to group them together according to strict rules (Miller 1997). Originally cultural theory was mainly focusing on differences between cultures, today however, it is rather recognised that there are differences within cultures (Oltedal et al. 2004). Oltedal et al. (2004) also put forward that much criticism
against the cultural theory has been on studies that have put too much focus on the grid-group typology which has led to some simplifications on behalf of these studies.

Sjöberg, Moen and Rundmo (2004) criticise the results of studies from the psychometric paradigm for not being based on enough empirical data and appropriate analyses. Originally studies from the psychometric paradigm sought to find universal attributes to risk perception that could be shared among all people (except the distinction that was made between experts and the public). Today however it is believed within the psychometric paradigm that results can be found by both doing aggregate and individual studies (Sjöberg, Moen and Rundmo 2004). Windschitl and Wells (1996) argue that the psychometric paradigm does not make any fruitful predictions and can therefore be questioned on its utility. Another drawback discussed by Windschitl and Wells (1996) is the use of numeric measures on uncertain qualitative aspects which could result in a more rule-based thinking. However the validity of the psychometric paradigm is not questioned.

Despite criticism on both the psychometric and the cultural theory paradigm both have been fairly successful. Sjöberg, Moen and Rundmo (2004, p.27) for example discusses three reasons for the success of the psychometric paradigm within academic researchers and policy makers:

- The model is very simple, easy to understand and close to common sense.
- It provides answers that are politically desirable.
- And, it seems to supply a final answer. The results are usually perceived by the impression that the risk perception is explained.

Oltedal et al. (2004) also put forward the fact that the psychometric paradigm has been superior in explaining variance in risk perception.

It seems that a majority of studies that can be found today on risk perception is on the theoretical level and there is a discussion being made between both of the paradigm’s point of view. The empirical studies that have been made are dominated by evaluating the risk perception of urban populations, and the most studies found are focusing on west Europe or more developed countries. Only a few studies have been found investigating the risk perception on rural populations.

There is a lot of discussion on different factors involved in risk perception and the importance of those factors. Armas and Avram (2009) study on floods in Romania show that the most important factors contributing to people’s risk perception is the control perceived, that varies due to resilience factors like the amount of given resources and expected support from others. Individuals that relied on personal forces to overcome critical situations (what the author calls internal place of control) generally had a lower vulnerability level. Those individuals relying on external controls showed a higher level of anxiety and worry about the risk of floods and the subjects that showed a lower level of expecting support from others where those being most active and having most initiative during the critical events of floods. Armas and Avram (2009) conclude that maladaptive behaviors were strengthened by the lack of own resources and lack of faith in support, both from close family, relationships and from authorities.

Sjöberg (1998) discusses that the ability to protect one-self is an important determinant in people’s risk perception, which is closely related to the control perceived and own resources that is discussed by Armas and Avram (2009). Sjöberg (1998) study show that worry can be correlated to perceived risk, but it is discussed that one have to discriminate between emotional and cognitive reactions to hazards and that risk judgements are often related to
cognitive reactions, not so often emotional. In another study Sjöberg (2000) discuss that factors such as real risk (based on statistical data of for example damages and fatalities), direct and indirect experience (i.e. experienced yourself or had someone told you about an experience of a hazard) could affect the risk perception of people. Kellens et al. (2011) argue that direct experience evoke stronger emotions and is more accessible in memory than indirect which makes the former to have larger effect on people’s risk perception. Sjöberg (2000) argue that it is important to distinguish between risk targets: “People do not make the same estimate when they rate the risk to themselves, to their family, or to people in general” (Sjöberg 2000, p.2), where it is showed that people tend to perceive a risk as less threatening when talking about general risk compared to personal risk directed towards oneself or close relatives. Terpstra (2011) suggests that it is important how people interpret their experience: “The effect of hazard experience depends on how people interpret their experiences or what they have learned from them” (Terpstra 2011, p.1659) and study whether it is useful to distinguish between people who experience positive affect, those who experience negative affect, and those who are left emotionally unimpressed when evaluating the effects of flood hazard experiences in the Netherlands.

Another factor that is being discussed is the role of media in bias or distortion of people’s risk perception, making them underestimating or overestimating the risk (Da Cruz 1993; Sjöberg 2000), or informing public about a certain hazard (Da Cruz 1993). Terpstra (2011) also discuss the role of media and stress the role it could have on emotional factors. Wahlberg and Sjöberg (2000) argue that the role of media mainly have an impact on risk perception in the short term and is only one factor among many. Ideology is a factor discussed by Sjöberg (2000). Sjöberg (2000) mean that, with example from attitudes towards nuclear power that people in favour of nuclear power usually see a lower risk about nuclear power whereas people against show a higher level of perceived risk.

Additional factors that have been studied are awareness, information and knowledge about the risk event. Pagneux, Gíslanndótir and Jónsdóttir (2011) studied those factors together with worry to see how they correlate with risk preparedness towards ice-jam floods in Iceland. It was shown that past experience from ice-jam floods was the main source of knowledge about the hazard but worry did not correlate with preparedness (Pagneux, Gíslanndótir and Jónsdóttir 2011). Ming-Chou et al. (2008) study how the characteristic of a hazard can affect people’s risk perception by comparing people living with known risk of landslides with people living at risk of floods in Taiwan. The results of the study show that people from the flood risk group perceived the risk differently than those from the landslide group. Concern and controllability were important factors explaining the difference and according to the results controllability were negatively correlated to perceived risk of landslide but not for flood risk (Ming-Chou et al. 2008). Flood victims were mainly concerned about economic losses that are hard to entirely avoid with current mitigation projects, while people at risk of landslides were mainly concerned about fatalities that could be avoided by preparedness and evacuation measures (Ming-Chou et al. 2008). It is discussed by Da Cruz (1993) that experience, control over one’s life, kind of hazard and information available plays a role in how people perceive risks. Another factor that is discussed by different authors is trust in authorities and institutions (see for instance Da Cruz 1993; Terpstra 2011). Terpstra, Lindell and Gutteling (2009) argue that flood control works such as dykes can decrease people’s risk perception.

Whyte (1986) in Brilly and Polc (2005) identify three groups of factors that influence the amplification of perceived risk: (1) personal characteristics like lower educational level, gender and age; (2) situational factors like whether the event is under control of the individual, non-voluntary exposure, recent dangerous events, inadequate own resources, lack
of confidence in authorities and media attention; and (3) risk characteristics like immediate threat, direct health consequences, low probability of danger and unknown new danger.

There have been contradictions between results of different studies regarding the actual importance of several factors in risk perception. It is also important to have in mind that different factors have gained different attention over time; for example trust had a lot of attention during the beginning of 21st century (Oltedal et al. 2004) and feeling of dread was long in focus of the psychometric paradigm (Sjöberg 2003). By getting better knowledge about what factors and the importance of different factors that are involved in people’s risk perception risk managers could get better insight into underlying mechanisms and have a greater success in reducing the risk of a hazard:

“Knowledge about which aspects or characteristics of the risk source which is important for subjective risk judgements may influence such demands and hence also political actions aimed at reducing the risk” (Oltedal et al. 2004, p.12).

A very important point in understanding the public’s perception of risks is to be able to manage the hazards more effectively, particularly through communication, information and increasing awareness among inhabitants (Breakwell 2000). Pidgeon (1998) presents several arguments in favour of and against the role of risk perception in risk management. The most important arguments against are (from Pidgeon 1998, p.8-10):

- **Risk perception is noise/bias**: risk evaluations should be based on scientific and experts’ views for rational decisions and everyday people do not have enough or appropriate knowledge to evaluate risks accurately. The lack of knowledge also makes them more susceptible to bias than experts’ perceptions.
- **Public attitudes are prejudiced/discriminatory**: risk perception of the public may reflect prejudices against certain groups in society which certainly can be an ethical issue in many settings.
- **Managing risk merely entails managing public perceptions**: risk managers could choose to manipulate and abuse the view of the public. This means that instead of reducing risk of a hazard risk managers could work on convincing people, by for example communicate to the public that the threat is much smaller than it is.
- **The public is not homogenous in its risk perceptions**: it is often the case that the society is treated as one single unit sharing the same perception among all people. However, society is not homogenous where all people perceive their environment and think the same. It is built up by different sectors with different risk representations.
- **If risk is a social construction, can social science avoid being one too**: The whole concept of risk is problematic seen from a more objective point of view. If risk is only something perceived in the mind of people, it put the findings of social sciences in a difficult position.

When discussing arguments in favour of public risk perception Pidgeon (1998) distinguish two different views. The first is a normative one based on moral and ethical grounds where it is important in a democratic society to include different perceptions into policy and increase public participation in decision making. The second view is epistemological based on the fact that public perception can add new knowledge to risk assessment and evaluations (Pidgeon 1998). The most important arguments presented in favour of risk perception are (from Pidgeon 1998, p.10-12):

- **Public should have input into risk decisions that affect them**: this is a clearly democratic principle where the public should be included into decision making. It is
also argued that risk evaluation not only should include scientific knowledge but also different views and beliefs.

- **Public perceptions reflect basic values**: factors in risk perception do not only reflect public lack of knowledge, but rather people’s true preferences and underlying values about risk and should therefore have a priority in risk management.

- **Perceptions have consequences**: the perception of people result in actions that have direct consequences and therefore cannot be ignored in policy making about risks.

- **Experts can be biased to**: during 1970s and 80s there was a sharp distinction between assessment of objective risk by experts and subjective and biased assessment by the public. However, it is believed today that risk assessment requires elements of values and judgments, even when performed by experts.

- **Public risk perspectives can enrich expert analyses**: even if experts often are in a more privileged position by possessing more information, the public can enrich the experts’ views by adding more relevant information and knowledge. Experts’ risk perception is more often than not based on calculations from formal facts. Taking into account risk perception from the public could for example add values on the outcomes and enrich with knowledge about social factors.

Pagneux, Gíslandóttir and Jónsdóttir (2011) argue that an insight in public perception is important in communication to the public about hazards and to facilitate a democratic flood risk management.

There is a strong consensus that risk perception is being increasingly important in managing the risk of different hazards. An important reason for studying risk perceptions relates back to what has been pointed out by plenty of studies on hazards: structural and technical solutions are no longer enough to successfully reduce the risk and potential damages from hazards, rather strategies to reduce risk have to take into account the risk perception of the public (Messner and Mayer 2006; Ming-Chou et al. 2008; Armas and Avram 2009; Terpstra, Lindell and Gutteling 2009; Pagneux, Gíslandóttir and Jónsdóttir 2011; Bradford et al. 2012).

> “An awareness of risk perception will provide decision makers with insight into the impetus for individual and community response and behaviour during disaster events; thus enhancing hazard and disaster management” (Olczyk 2004, p. 10).

Another important reason for this is that “disasters do not arise from nature per se but from the interaction man-environment” (Da Cruz 1993, p.27). For this reason, to understand hazards it is not enough to only observe and measure the natural components, but more important is it to see also the social factors making up the risk of hazards:

> “The crucial point about understanding why disasters happen is that it is not only natural events that cause them. They are also the product of social, political and economic environments (as distinct from the natural environment), because of the way these structure the lives of different groups of people” (Wisner et al. 2003, p.4).

### 2.1.3 The psychometric paradigm

According to the psychometric paradigm, that have its roots in psychology, risk can be understood as a function of general properties of the risk object and that there are several hallmarks in a risk object that build up people’s risk perception (Sjöberg 1996 in Ol tedal et al. 2004). Risk is viewed as subjectively constructed by individuals that are influenced by psychological, social, institutional and cultural factors (Sjöberg, Moen and Rundmo 2004).
The psychometric paradigm also stresses that there are individual differences and associations between stable personality traits and risk behaviour (Llewellyn 2008). The psychometric paradigm assumes that most of the factors involved in people’s risk perceptions can be quantified by survey instruments (Sjöberg, Moen and Rundmo 2004). Risk is defined as the way people perceive it, but studies usually do not specify the risk target (i.e. personal or general) (Sjöberg 2003).

Fischoff et al. (1978) in Sjöberg, Moen and Rundmo (2004) have suggested 9 general dimensions of risk characteristics, measured on a 1 – 7 scale, that are commonly used in studies from the psychometric paradigm point of view (from Fischoff et al. 1978 in Sjöberg, Moen and Rundmo 2004, p13):

- **Voluntariness of risk**: do people get into these risky situations voluntarily? If for a single item some of the risks are voluntary undertaken and some are not, mark an appropriate spot towards the centre of the scale (1 = voluntary; 7 = involuntary).
- **Immediacy of effect**: to what extent is the risk of death immediate – or is death likely to occur at some later time (1 = immediate; 7 = delayed).
- **Knowledge of risk**: to what extent are the risks known precisely by the persons who are exposed to those risks (1 = known precisely; 7 = not known precisely).
- **Knowledge of risk**: to what extent are the risks known to science (1 = known precisely; 7 = not known precisely).
- **Control over risk**: if you are exposed to the risk of each activity or technology, to what extent can you, by personal skill or diligence, avoid death while engaging in the activity (1 = uncontrollable; 7 = controllable).
- **Newness**: are the risks new, novel ones or old, familiar ones (1 = new; 7 = old).
- **Chronic – catastrophic**: is this a risk that kills people one at a time (chronic) or a risk that kills a large numbers of people at once (1 = chronic; 7 = catastrophic).
- **Common - dread**: is this a risk that people have learned to live with and can think about reasonably calmly, or is it one that people have great dread for – on the level of gut reaction (1 = common; 7 = dread).
- **Severity of consequences**: when the risk from the activity is realized in the form of a mishap or illness, how likely is it that the consequence will be fatal (1 = certain not to be fatal; 7 = certain to be fatal).

Those dimensions of risk can be understood as the foundation of the risk perception research from the psychometric paradigm point of view where perceived risk is believed to be a result of properties of the hazard and the person at risk.

### 2.1.4 The cultural theory paradigm

The cultural theory paradigm originates from sociological research and “aims at explaining how people perceive and act upon the world around them. More specifically the theory claims that this is largely determined by social aspects and cultural adherence” (Oltedal et al. 2004, p.17). It is further stated that:

“Risk perception is not governed by personality traits, needs, preferences, or properties of the risk objects. It is a socially, or culturally, constructed phenomenon. What is perceived as dangerous, and how much risk to accept, is a function of ones cultural adherence and social learning” (Douglas 1978 in Oltedal et al. 2004, p.16).
The foundation of the theory originates from Douglas grid-group typology. To understand the variation in social participation the group refers to “whether an individual is member of bonded social units and how absorbing the group’s activities are on the individual” (Oltedal et al. 2004, p.17). Grid refers to “what degree a social context is regulated and restrictive in regard to the individuals’ behaviour” (Oltedal et al. 2004, p.18). The grid-group typology classifies people in four different groups with different worldviews that will result in being more or less concerned about different types of hazards (Douglas 1978 in Oltedal et al. 2004; Sjöberg 2000):

- **Egalitarians:** technology and the environment. Mainly prioritize risks that could increase inequalities among people and sees the nature as fragile. They are often skeptical to expert knowledge and believe that institutions might misuse their authority.
- **Individualists:** war and other threats to the markets. Mainly prioritize risks that limit the individual freedom. Individualists support market liberalism, think that everyone is self-preserving and do not care much for how the nature is treated.
- **Hierarchists:** law and order. Hierarchizes has a large faith in experts’ knowledge and authorities. They see nature to a large extent as self-preserving, but within limits of human impact and accept risks as long as they are justified by authorities and experts.
- **Fatalists:** with none of the above. The fatalist feels restricted by social groups and what a fatalist fear is mainly decided by the individual itself and not social interactions. They try to not worry about risks they feel they cannot do anything about anyway.

An individual’s social adherence and social learning determines what is perceived as hazardous. This means, according to the cultural theory that people will perceive risk, not as an effect of properties of the risk object, but according to social participation and to the social environment. A central concept is “way of life” that consists of an individual’s cultural bias (shared values and beliefs) and social relations (Douglas 1978 in Oltedal et al. 2004).

### 2.1.5 Application of risk perception

The theoretical framework of this study will be based on findings within the field of risk perception, from both the psychometric paradigm and the cultural theory paradigm point of view, since it will be assumed that people’s risk perception is a result of both characteristics of the risk as well as social processes. This study will use the following definition of risk perception:

“Risk perception is the subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences. To perceive risk includes evaluations of the probability as well as the consequences of a negative outcome. It may also be argued that as affects related to the activity is an element of risk perception. Perception of risk goes beyond the individual, and it is a social and cultural construct reflecting values, symbols, history, and ideology” (Sjöberg, Moen and Rundmo 2004, p.8).

This definition captures the fundamental elements from both the psychometric paradigm as well as the cultural theory paradigm. Another important feature that has to be taken into account is that different risk perceptions should result in different behaviour outcome by individuals, as pointed out by Messner and Mayer (2006):
“Due to their specific perception of flood risk individuals, social groups and also public persons like mayors, politicians and employees in the public sector dealing with flood protection and disaster management may handle this issue very differently” (Messner and Mayer 2006, p.154).

Figure 5 gives a quite simplified but still a feasible explanation of how risk perception can be understood. First it is believed that people’s risk perceptions are the result of both internal and external factors. Internal factors (box 1) are those originating from the individual, and can be experience, knowledge and embodied in the individual’s memory. The external factors (box 2) are those originating from the individual’s surrounding, like characteristics in the environment, social and cultural factors and the exposure of a risk. Those two are explained by the upper two boxes (box 1 and 2) and affect the risk perception of the individual (box 3). The second assumption is that the risk perception of the individual result in actions that will have some kind of consequences. Therefore, from how the individual perceive the risk of a hazard the individual will make decisions (box 4) over time that will result in certain behaviors (box 5) and that will have consequences for how the risk of a hazard will affect the individual. An important feature is that the behavior should not be seen as an absolute; rather the outcome of the behavior will send a feedback back to the total risk perception and further effect how the individual perceive the risk.

Figure 5: An overview model of how risk perception will be used in this study. The model explains that both internal factors (box 1) and external factors (box 2) is expected to affect the risk perception of an individual (box 3). The risk perception will have consequences by affecting what decisions that are made (box 4) and resulting in certain behaviors (box 5). Another important feature is that the outcome of the behavior will have an effect on the further risk perception. Adapted from Krallis and Csontos (n.d. electronic resource).

The core ideas from the psychometric paradigm as well as the cultural theory paradigm will be used to understand the people’s perception of flood risk. However, applying the dimensions of risk characteristics by Fischhoff et al. 1978 in Sjöberg, Moen and Rundmo (2004, p.13) to explain people’s perception of risk and the the grid-group typology to classify people in different groups according to Douglas 1978 in Oltedal et al. (2004) of straight appears both to simplified and problematic. It has been shown by for example Ming-Chou et
al. (2008) that characteristics of the risk of a disaster are important factors and it is also believed that each case is unique. Both the characteristics of the floods as well as other natural and cultural conditions are expected to not be the same as other studies from for instance in Netherlands (Terpstra, Lindell and Gutteling 2009) or Taiwan (Ming-Chou et al. 2008). It is therefore believed that aspects of the psychometric as well as the cultural theory paradigm have to be more adapted to local conditions, not being operationalized in a too general manner.

2.2 Risk communication

2.2.1 Defining risk communication

The study will use the definition of risk communication found in Lang, Fewtrell and Batram (2001, p. 317): “Any purposeful exchange of information about risks between interested parties”. It is also assumed that risk perception is both the risk related information being transmitted between actors as well as how it is done: “Risk communication’ is the label used to refer both to the content of any message concerning a hazard and the means of delivering that message” (Breakwell 2000, p. 110).

Risk communication may have several roles: to inform, influence direction of decisions, calm a worried public or motivate action (Atman et al. (1994). Lang, Fewtrell and Batram (2001, p. 320) name additional roles or functions that risk communication could possibly fulfil:

- **Enlightenment role**: to improve risk understanding among target groups.
- **Right-to-know**: to disclose information about hazards to those who may be exposed.
- **Attitude modification role**: to legitimise risk-related decisions, to improve the acceptance of a specific risk source, or to challenge such decisions and reject specific risk sources.
- **Legitimate function**: to explain and justify risk management routines with a view to enhancing the trust in the competence and fairness of the management process.
- **Risk reduction role**: to enhance public protection through information about individual risk reduction measures.
- **Behavioural change role**: to encourage protective behaviour or supportive actions towards the communicating agency.
- **Emergency readiness role**: to provide guidelines or behavioural advice for emergency situations.
- **Public involvement role**: aiming at educating decision-makers about public concerns and perceptions.
- **Participation role**: to assist in reconciling conflicts about risk related controversies.

The question remains however: How is it done?

2.2.2 How to improve risk communication according to expert literature

It has been highlighted that in order for risk management to be successful, public’s perception of risk has to be taken into account: “Since the risk perspective of an actor forms his/her fundamental understanding of risk, it can affect his/her risk communication” (Veland and Aven 2012, p.35). An important aspect in risk communication is the different view between experts and decision makers and the public, where it is still believed that components in risk
and risk communication are perceived different between those actors (Atman et al. 1994; Veland and Aven 2012; Sandman 2012).

A key point here is information (Breakwell 2000). In order for decision makers to know something about the public’s perception of risk it is required that they acquire information about their risk perceptions. “In order to understand the impact of risk communication, it is useful to know something about the basis for risk perception” (Breakwell 2000, p. 111). For the public to be aware, have knowledge about risks at hand and to take safe measures it is required that they can obtain information about the risk and how to manage it (Breakwell 2000; Veland and Aven 2012). Risk communication is therefore both explaining what is communicated and how it is communicated (Breakwell 2000).

The process of transmitting information in risk communication is not a linear process from decision makers telling the public what to do that was earlier seen as the case, but rather a cyclic process with a two-way communication between different actors (Lang, Fewtrell and Batram 2001). Breakwell (2000) discuss that risk communication can be considered effective if it informs the public what is hazardous, informs about the extent of the hazard and what should be done to protect oneself. Sandman (2012) name two different processes that are fundamental challenges in risk communication between authorities and the public: alert the public on the risk of hazards and to calm the public down. In order for risk management to be effective several challenges have to be dealt with (from Lang, Fewtrell and Batram 2001, p.318):

- Provision of information when science is uncertain.
- Explanation of the risk assessment process.
- Accounting for different concepts and views
- Provision of information that assist people in their decisions.
- Maximize appropriate public response to a hazard.

Important regarding the information is whether it is understandable by the receiver (Palenchar and Heath 2002; Veland and Aven 2012; Sandman 2012) and how accessible the information is (Lyytimäki, Assmuth and Hildén 2011).

Transmission of information and the communication process could be restricted for different reasons. Lyytimäki, Assmuth and Hildén (2011) discuss several reasons:

- Deliberate non-disclosure: for example authorities actively withhold information that they do not want to share with the public because of unwanted consequences.
- Accidental or unintentional non-disclosure: unintentional withhold information, for example authorities are willing to share information but do not have skills or resources to do so. There might for instance be lack of effective platforms to share information or that is not accessible by other actors or simply lack skills to deliver information in an appropriate and understandable way.
- Conscious rejection: a person or authorities choose not to obtain information because they think it is useless information or that there is not enough time because there is information that is prioritized as more important.
- Innocent omission: occur when there is lack of information and directions to search for additional information. One reason could be due to lack of accessibility to obtain the information. Here is also mentioned the effect of cultural beliefs and processes that could work as a filter of information access.
Naturally it is not enough to only add more information in order to improve the communication. The effectiveness of messages communicated about risk is a function of risk perception of the audience, the source of message where competence and trustworthiness is the most important, and the content of the message itself (Lyytimäki, Assmuth and Hildén 2011). Therefore risk communications attempts need to take into account both motivational as well as informational aspects (Breakwell 2000). It is also important through which medium risk information is sent (Rowe and Frewer 2000). Knocke and Kolivras (2007) suggests educational programs in their study on flash floods to increase information, understanding and awareness of the hazard as well as probability that people take safe measures in response to hazards. Martens et al. (2009) argue that authorities need to take heterogeneity into account when communicating to the public about risks because everyone will not perceive or understand the message in the same way and therefore respond differently. The study made by Martens et al. (2009) however does not give any suggestion on how it should be done.

One of the most important factors for communication to work is that people put trust in the source of information (Breakwell 2000; Veland and Aven 2012; Sandman 2012). “Low levels of confidence and trust between the actors represent a core barrier to establishing a common understanding of risk between them” (Veland and Aven 2012, p.38). If the risk is poorly known or authorities give an uncertain view of the risk, information can be negated by the receiver and trust decreased in the source of information (Lyytimäki, Assmuth and Hildén 2011). If there is lack of available information about risk and trust in the source it could lead to that the public seek information from less credible sources (Lang, Fewtrell and Batram 2001).

Risk communication has to be adjusted to the specific need of the public (Kellens, Terpstra and Maeyer 2013) and authorities also need to present a less uncertain view of the risk to the public (Veland and Aven 2012). Furthermore, decision makers need also to acknowledge the perceptions of the inhabitants in order to gain trust, not only give an objective view on how to manage hazards (Sandman 2012). An important aspect of trust is that it is easy to lose, but much harder to regain (Sandman 2012). Risk communication should aim to be bidirectional, but this has not been the case before when experts’ views have been perceived as the correct that should educate the people, which of course have an impact on public’s trust in authorities (Kellens, Terpstra and Maeyer 2013).

People are expected to perceive a higher risk if they are not involved (Sandman 2012). An important aspect is the perceived control that is related to involvement and how people feel that they can affect decisions made on risk management (Rowe and Frewer 2000). Rowe and Frewer (2000) distinguishing different levels of public participation in the involvement of public in risk management: the lowest level that consists of top-down communication with a one way dispersion of risk related information and the highest level that the authors characterize by a two-way exchange of information with an input of public perception of risk. Less Perceived control and knowledge about a risk means that people will seek information and be more motivated to communicate about risks (Palenchar and Heath 2002). The study made by Palenchar and Heath (2002) also discuss that people want to take part in decision making process about risks. An important aspect, not least for building trusts is that public perceive that their participation really has an impact on decisions on how to manage risks:

“Participation methods--such as referenda and public hearings - often seem to be employed simply in recognition of a need to involve the public in some way, assuming that involvement is an end in itself, rather than a means to an end” (Wiedemann and Femers 1993 in Rowe and Frewer 2000, p.10).
Sandman (2012) argue that people with power often do not want to share their power with other people, therefore the public is often mainly excluded from the decision making process: “The problem is that it is hard to want to share control” (Sandman 2012, p.39). The more power someone has the less sense it makes for him or her to collaborate with others (Sandman 2012). Sandman (2012, p.78) put forward different factors that will increase people’s concern and outrage towards hazards:

- The risk is man-made, not natural.
- The risk is novel, not familiar.
- There is memory from authorities’ mistakes.
- There is uncertainty and disagreement among experts.
- The control is not shared.
- The authorities cannot be trusted.
- Information is withheld from the public, local customs are violated and concerns are responded technocratically.

Even if the hazard is low (by objective evaluation), people will still perceive the risk as high (what Sandman 2012 calls outrage). It is therefore suggested by Sandman (2012, p.81) that risk communication can be improved between authorities and the public if decision makers:

- Make the risk more familiar to the people.
- Acknowledge the way that the risk is memorable and explain also the bad news and mistakes made.
- Take the catastrophe seriously. It is better to overestimate a risk that later is shown to not be so catastrophic than underestimate a risk that later is shown to be more catastrophic than previously thought.
- Increase public knowledge about the risk.
- Share the control and information with the public.
- Build trust.
- Respond to the public openly.
- Acknowledge different views, also the public’s perception.

Sandman (2012, p.101) put forward three groups of barriers that inhibit a good risk communication and outrage reduction on the public:

- Cognitive barriers: For instance everything is working well so there is no need to change; address an outrage could make things worse. Outrage of people is often caused by activists, outrage is irrational and it is unscientific and dishonest to exaggerate a hazard.
- Organizational barriers: Explained in four stages where the first (the stonewall stage) is characterized by an unwillingness to communicate with the public, the second (the missionary stage) by a view that it is important to “educate” the public, the third (the dialogue stage) by a two way communication between public and authorities and the fourth (the organizational stage) by the view that goes beyond that it is only important to communicate with the public but rather how to be organized to be able to do it in a good way.
- Psychological barriers: To understand that decision makers do not differ that much from the public. They are affected by the same psychological pressures and distortions as any other people.
Studies made often focus on very narrow aspects and deal with the recommendations individually, such as: knowledge where Knocke and Kolivras (2007) suggesting an increased knowledge about flash floods through educational programmes in Virginia USA, or that effective risk communication require that the risk message to the public has to be understandable by everyone (Martens et al. 2009). Petts (2008) conclude that trust is important to build a dialogue between authorities and the public, while Holmes et al. (2009) conclude that recommendations towards more effective risk communication should include an understanding of the public’s beliefs and understanding of risk and forums or similar meeting places should be included in a two-way communication about risks as well. Furthermore, Frewer (2004) point out the importance of transparency to the public on risk management decisions as well as adopt public views into the decision making process. Those recommendations summed up in Lang, Fewtrell and Batram (2001) are naturally based on studies made on risk communication and in the later writing by Sandman (2012) they are still being recognized as the most determent in the success of risk communication between authorities and the public.

In short the effectiveness of risk communication is “a function of the interaction of: (i) characteristics of the audience; (ii) characteristics of the source of the message (most importantly its perceived competence and trustworthiness); and (iii) content of the message” (Breakwell 2000, p.113). Kellens, Terpstra and Maeyer (2013) discuss that few authors have clearly addressed risk communication in their research about risk management, but rather made recommendations towards risk communication. Studies on risk perception have shown that people who receive relevant risk related information were more aware of the hazard than people who did not get any information (Keller et al. 2006 in Kellens, Terpstra and Maeyer 2013; Raaijmakers et al. 2008 in Kellens, Terpstra and Maeyer 2013). Therefore, how well risk communication works has an important impact on how prepared people are in event of hazards (Kellens, Terpstra and Maeyer 2013), that could be considered as one of the main purposes of establishing a successful risk communication between authorities and the public.

### 2.2.3 Application of risk communication

From the factors that are being explored it is expected that the communication will primarily be affected by trust in authorities and authorities’ evaluation of the risk, information, knowledge, control, involvement and acknowledgement of the public’s view. Earlier studies have discussed those factors and from their findings it is assumed that risk communication can be improved between authorities and the public if authorities (from Sandman 2012, p.81):

- Make the risk more familiar to the public.
- Acknowledge the way that the risk is memorable and explain also the bad news and mistakes made.
- Take the catastrophe seriously and rather overestimate a risk that later is shown to not be so catastrophic than underestimate a risk that later is shown to be more catastrophic than previously thought.
- Increase public’s knowledge about the risk.
- Share the control and the information with the public.
- Build trust among the public.
- Respond to the public openly.
- Acknowledge different views, also the public’s perceptions.
It will also be assumed that in order to improve risk communication between authorities and inhabitants primarily the following aspects are important to have in mind when communicating with an audience (from Lang, Fewtrell and Batram 2001, p.327-328):

- Credibility: the public need to have confidence and trust in agencies as well as its competence.
- Context: the social environment has to be acknowledged and effective communication needs an understanding of the social environment.
- Content: The content of the message should be relevant and have compatibility with the public’s value system.
- Clarity: The message has to be understood by the public and should mean the same to the public as the agency.
- Continuity and consistency: Communication requires to be repeated.
- Channels: Establish channels that can be accessed and trusted by the public.
- Capability of audience: Availability of information and knowledge of the public.

The most prominent aspects and that will be focused on in this study from Lang, Fewtrell and Batram (2001) and Sandman (2012) is shared control, acknowledgement of the public’s view as well as trust in authorities work on floods.

Those theoretical recommendations discussed in previous literature will be seen as a benchmark on how the flood risks communication could be improved in the Tisza River basin. The recommendations from experts will be compared to how the public perceive that the risk communication is working and how they think it could be improved.

3. Results

3.1 Results from the survey

A total of 488 persons participated and 228 filled in the whole survey that was distributed through social networks over the internet to inhabitants living in the Tisza River basin in Hungary. However, those respondents that did not fill in the whole survey did only give away answers about age, gender and place of residence and left the rest of the survey unanswered. The results will only treat the respondents that at least filled in half of the survey and responded that they live within the Tisza River basin, which corresponds to 229 participants. From those participants filling in at least half survey questions there were 121 (52.8%) female and 108 male (47.2%) and the average age of the sample was 35.4 years, with a minimum age of 17 and maximum of 73 years. Please note that participants that did not give away any answer will not be presented in the diagrams.

When asked about how often respondents are worried about the risk of floods, a majority answered yearly (146 answers and 64.04% of the answers) and never (74 answers and 32.46% of the answers), while daily, weekly and monthly gave 1, 2 and 5 answers respectively. On the question “what do you think of the risk of floods along the river Tisza”, the largest proportion of answers covered large to moderate (85 and 86 answers and 37.78% and 38.22% of the answers) while 26 people or 11.56% of the respondents answered very large and 22 respondents or 9.78% answered small risk. There were also 2 respondents that answered that there is no risk. The kind of harm that respondents associate with the floods were mainly economic and damages on properties (69 and 70 answers or 30.80% and 31.25% of the answers), while 47 (20.98%) answered deaths, 29 (12.95%) other and 9 “I don’t know”. Among “other” the most common answer when respondents specified was naming “all three”
meaning that both economic, damages on properties as well as deaths may be of importance while some named economic and damages on properties or deaths of both humans and animals. There were also a few naming spiritual harm, uncertainty and fear.

Another type of answer had a more ecological standpoint. Participants answered for instance: “The river and floods often bring waste that get stuck and pollute the river”, “environmental” or “The fields are increasingly dry but the floods from Tisza are increasingly high. We are going towards an ecological disaster”. Also a few people blamed the poor water management: “it is not directly the floods causing damages but the faulty water management”, or “In event of disasters the damages will be greater because of speculators rather than nature”. Also some respondents blamed the humans for building properties on areas affected by floods: “Many houses were built on the flooded areas because it was cheaper and now a lot of houses are destroyed. Maybe the water takes back what is his” or “I am not afraid because it was the humans that built on the flooded areas”.

**Figure 6**: Results showing that respondents mainly worry about the risk of floods yearly and never.

**Figure 7**: Results showing that respondents mainly perceive the risk of floods along the river Tisza as moderate to large.
Figure 8: Results showing that respondents mainly associate floods with economic damages and damages on properties. It is also a relatively large group that answered deaths.

Only 24 answered that they had thought about moving away from the flood hazards while as many as 200 or 89.29% of the respondents answered that they have not thought about moving away because of the floods. In the following up question respondents were asked to specify why they have not thought about moving away due to the risk of floods. The responses on why respondents did not think about moving was either due to that they feel safe (often live in a city, feel they do not live in a dangerous area, live on high ground or their flat is located on a high floor), trust the flood protection and the authorities responsible for it or feel an emotional bound to the place where they live. Almost all respondents who gave the reason that they trust flood defenses or trust authorities responsible for the flood protection lived in a city. The people living in rural settlements often gave the reason that they feel an emotional bond and a few that they live on high ground, such as a hill. Among others people answered for instance that they can live with the floods because their ancestors have done that before them, they can live in harmony with the nature or that floods have an ecological value and should be seen as something special. Only two respondents told that they did not move because they do not have any choice, for instance because of the lack of economic resources.

Figure 9: Results showing that the most common reason why people living in the Tisza River basin did not move because of the risk of floods is that they feel safe living in a city. There is also a relatively large group answering that they do not feel threatened, that they trust flood defenses or that they feel attached to the place.
When asked if they are more concerned about other environmental risks than the risk of floods a majority of 114 answers or 53.37% of the answers wrote yes, while 35 people or 16.36% answered no. There was however a large proportion of 30.37% of all respondents that answered that they did not know. If answered yes, respondents were asked to specify. The answers show that people are most often more concerned about ecological risks which includes, soil, water or air pollution, garbage, waste, cyanide spill, waste management, habitat shrinkage, garbage coming upstream from Romania and climate change. Respondents also showed to be more concerned about droughts and storms. Among other, which is a relatively broad group people answered earthquakes, frostbite, fires, that floods are equal risky as all disasters, hail, extreme weathers, lightning or nuclear radiation from Paks nuclear power plant. Often respondents specified that for instance earthquakes are disasters that are hard to predict or defend against.

![Figure 10: When asked if they are more concerned about other risks besides the risk of floods most respondents that answered yes specified that they are more concerned about human caused risks such as ecological risks.](image)

The answers from the question “how can you learn to live with the risk of floods” could be grouped according to respondents who think that collective preparations have to be made (66 answers), such as building defense structures, trust authorities work on flood protection or help each other out, own preparations (51 answers) such as prepare yourself, keep yourself informed, be involved or be aware of the danger. There was also a large group writing that you have to accept or tolerate the floods or see floods as something natural that you do not have to worry about (58 answers). A group of 27 respondents answered that you cannot learn to live with floods.
Figure 11: Results showing that respondents who think that one can learn to live with the risk of floods mainly answered that it is done together with others, by own preparations or that you need to accept or do not worry about the floods all the time.

When respondents were asked if they think they can protect themselves from the potential risk of flooding and if they think they could do more 131 answered that they cannot protect themselves alone. Among the 29 respondents that answered that they can most answered that they can make own preparations such as keeping themselves informed, be prepared to move or move to higher places.

Related to interactions with other people and flood risk management respondents were asked if they think that the floods are better handled alone or together with others. A clear majority of 189 respondents or 89.57% answered that floods are better handled together with others. Only 3 respondents answered alone, 11 thought that it depends on the situation and 8 respondents answered that they do not know. On the question how you can protect yourself from floods alone, 131 respondents answered that “you cannot”, “hard” or “not at all” indicating that it is not possible to defend yourself alone against the floods. Those answering that you can defend yourself alone (29 respondents) mainly answered “pack sandbags” or “be prepared to help others”, which can be considered as a more community responsibility. Other answered “escape”, “make preparations”, such as primary defense, “be prepared” or “do not move to dangerous areas”. There were also 67 respondents who did not fill in the question and 5 that answered that they do not know.
Figure 12: Results showing that a large majority think that floods are most effective handled together with other people.

On the question “Which do you think would be more effective: if the government or the local communities make decisions about flood risk management” a majority of 147 respondents or 69.67% of the answers thought that it can only be effective if both the government and local communities make the decisions on flood risk management. 41 respondents or 19.43% of the answers thought it is most effective if the local communities handle the decisions on floods and only 20 respondents or 9.48% answered the government. When asked if they think that flood protection mainly is the government’s or the citizen’s problem, a majority of 148 respondents or 70.81% thought it is both the government’s and the citizen’s problem while 33 (15.79%) and 25 (11.96%) answered the government’s and the citizens’ respectively.

The questions “are you satisfied with the authorities work on flood protection, if not how do you think that the authorities work could be improved” showed that 90 respondents or 44.55% are satisfied with the authorities’ work on flood protection while 65 respondents or 32.18% thought it could be improved. There was also a relatively large proportion of 23.27% that filled in that they do not know. The respondents who answered that they think it could be improved specified that there have to be more or larger flood defense structures, such as dams (21 answers), there have to be continuous and not only during time of actual flooding (19 answers) or that authorities have to have better understanding of local conditions or that local inhabitants have to be more involved in flood management (17 answers). A small amount of answers showed that flood risk management have to be more focused on long term solutions (6 answers) or that the river have to be returned more to its natural state (5 answers). Among “others” respondents gave answers such as that they are satisfied, but that there always are place for improvements, that authorities have to be more organized, change the way they think about flood management or that they need more money to improve their work on floods.
Figure 13: Results showing that respondents mainly think that it is more effective if the government together with local communities make decisions about flood risk management.

Figure 14: Results showing that most respondents think that flood protection both is a governmental and the public’s problem.
Figure 15: Results showing that most respondents who thought that authorities could do more to protect people from floods answered increase flood protection, continuous flood management and local understanding by authorities. However respondents’ answers showed a large diversity.

Respondents were asked if they think that the communication between local authorities and inhabitants could be improved. 86 respondents or 47.25% thought the communication could be improved, while 33 respondents or 18.13% answered no. This question also resulted in a proportion of 34.62% answering that they do not know. Respondents were then asked how they think that the communication could be improved with the authorities. The most common answers relate to information and medium of communication transfer (41 answers). Those were answers such as faster, continuous or more accurate information and more information through internet. 24 answered that the public need to be more participant in the communication through for instance forums. 23 answered that communication have to be made on a local level. There was also a group of 18 respondents pointing out education and that awareness has to be increased among the public while a group of 14 thought that there have to be a better understanding of the local populations’ views. Among other the most common answer was that communication between authorities and the public should not only be during time of disasters.
Figure 16: Results showing that respondents showed a large diversity in their answers on how the communication about floods between local authorities and the public could be improved. Most answers relates to information and medium such as using modern channels to a larger extent.

People were then asked how they think that the communication with authorities can be improved. First of all there was a large proportion not giving any answer (112 respondents). 20 respondents answered that they do not know. From the respondents who specified their answers 49 answered that they think there is a need for more modern communication channels such as internet forums, official information sites about floods or just more information about floods through the internet. 31 answered that there is a need for dialogue between locals and authorities while 25 thought that decision makers have to be more trustworthy, competent or communicate with credibility. There were also smaller groups answering need for more information (16 answers), awareness rising of the public (12 answers), and that communication have to be continuous (9 answers). Continuous communication means that respondents think that communication should not only occur during disaster times. Only a very few thought that information has to be more understandable (5 answers) and 13 answered “other”.

![Bar chart showing how respondents think the communication between local authorities and the public could be improved]
Figure 17: When asked how the communication with authorities could be improved respondents showed a large diversity in their answers but the most common answer was to use internet and more modern channels as well as more room for public participation and communication dialogue.

Relating to risk communication people were also asked if there is any communication forum where they have the possibility to participate in decision-making on floods and if they would like to participate if there were. Together 165 respondents or 81.68% answered that they do not know of any communication forum. From those 75 respondents or 37.13% answered that they would participate if there were and 90 respondents or 44.55% that they would not like to participate even if there were any. 37 respondents or 18.32% answered that they do know of any communication forum and only 12 respondents (5.94%) that they like to participate.

Figure 18: Results showing that most respondents do not know of any communication forum through which they could participate. Furthermore, most respondents would not like to participate even if there were any forum through which they could participate.
Respondents were also asked where they get their information about floods from. It was here possible to choose multiple alternatives, including “other” where people could specify any other source besides the ones included. The result show that people mostly get information about floods through media (182 answers or 38.48% of the answers) followed by own experience (107 answers or 22.62%) and family/friends (88 answers or 18.60% of the answers). People get least information from authorities; 11.42% answered local authorities and only 3.17% from the government. Furthermore 5.07% answered other. Among “other” respondents answered internet (12 answers) or university/education (12 answers).

![Bar chart showing where respondents get their information about floods from.](chart.png)

**Figure 19**: Results showing that respondents mainly get their information about floods from media. Also a large group answered from own experience or family and friends.

Finally respondents were asked how they think the flood risk management can be more a part of people’s everyday lives. The results show that most respondents think that students have to be more educated about floods and that knowledge about floods has to be more actively part of the educational curriculum (62 answers). Other respondents answered that authorities have to have more local understanding or work more with floods on a local level (29 answers), that people have to pay more attention and respect to the environment (22 answers) or that people have to be more actively involved in flood risk management (21 answers). There was also a group answering that flood risk management does not need to be more part of people’s everyday lives (19 answers). Those respondents mainly motivated that there are more serious problems to think about or that flood risk management is the responsibility of the authorities. There was a relatively large proportion of respondents not giving any answer to the question (89 persons) while 12 respondents answered that they do not know.
3.2 Results from the interviews

In total 5 deep interviews were conducted: 4 with farmers living in a village in western part of the Tisza River basin in Hungary and 1 interview with a human geographer.

When asked about their experience from floods interview respondents all explained that they had participated in building and maintaining the dam around the village to protect it from floods. None of the respondents showed any major fear of floods any longer and did show a large faith in the defensive structures against floods. One of the respondents said for instance:

“There is risk for floods when the snow is melting in the spring. However, before building the dam the risk for floods was much bigger. The original forest slows the waters. Although there is a bigger risk for inland water that covers the gardens sometimes”.

Interview respondents thought that the major damages from floods are economic ones. On the question “What is the biggest threat from floods: economic damages, damages on properties or deaths or other” a respondent answered:

“It is definitely financial because it destroys the corn, because it is rotten. It can also be damages on property, if the house is situated lower so that the flood can reach it. It does not risk the people’s life, because the village lies on higher ground”.

Interview respondent E answered that floods are not only disastrous in the Hungarian great plain, but they also bring possibility because they bring needed additional water to the agriculture. There is another risk however, that people still misinterpret the land and water management.
It was also clear that none of the respondents had thought about moving away because of the floods, motivated by that they lived there all their life and that they did not perceive the risk to be that severe. Partly because of the dams protecting the village, partly because they perceived other risks as more dangerous: such as thunderstorms and storms (respondent A, B, and D). Respondent C also named earthquakes, although it is not very probable to happen in Hungary. Respondent E put forward the industrial land use and the poor drainage water system of greater concern than the floods itself.

When asked how people can learn to live with the risk of floods all respondents answered that it is not possible, but that you have to live with it. “It is not possible to get use to the danger, just to live with it. People have to build their houses on higher ground”, answered one of the respondents. To protect themselves from floods, respondents A-D answered that they have built house on concrete ground and increasing the gardens height with soil. However, as farmers they did not see any way to protect their fields alone from floods. The interview respondents also thought that the flood risk management is more effective together with others, that everyone should do what they can and that there are several persons whose job is to take care of the dykes in the village. Also respondents named that it is not possible to protect yourself from the floods alone and only possible together with others. Respondents put forward that inhabitants in the region have to cooperate to protect the villages. Interview respondent E answered that people better have to understand their environment in order for the flood risk to be smaller. Respondent E also said that “People moving from rural to urban areas are torn apart from the substance of nature, gaining a new value system” and that the risk of flooding could be a good source of income if managed well, as for instance using water for irrigation to solve problems with drought.

When asked if flood risk management is people’s or authorities’ problem people, respondents answered that it is both together: “Both sides have to look for possible solutions” answered one of the respondents. Respondent E said that it is rather an issue regarding people’s worldview/value system about the environment. The interview respondents told that they are partly or not satisfied with the flood risk management, and that authorities often choose easier short term solutions rather than more effective long-term solutions. There was also the argument that flood risk management is more effective on governmental level because there are more financial possibilities and support with for instance technology and machines. It was also said by a respondent that authorities should help people in flood prone areas more with voluntary help, building dams and higher roads.

Interview respondents did not give any idea about how flood risk management to a larger extent can be a part of people’s everyday life, however they did think that it has to be: “It have to become a part of people’s life, because people have to be prepared to solve the problems” said one of the respondents. Respondent E said that in order for flood risk management to be more part of people’s everyday life people need to pay more attention and be more engaged in their environment as well as getting experience from floods.

The most common ways of acquiring information about floods according to the interview respondents were from TV, radio, newspaper and a local council loudspeaker. Respondents thought that communication about flood risk has to be improved with the authorities. One of the main points that was put forward was the need for better understanding of the local conditions and that citizens and the authorities have to find common solutions on how the floods and the environment should be managed. Respondent E for instance told: “The population should have a real power to their own environment and the authority would receive true knowledge of the landscape and the intent of real local interest”.
4. Discussion

It has been discussed that understanding public’s perception of risk is one of the conditions to be able to effectively communicate about and manage hazards (see for instance Messner and Mayer 2006; Ming-Chou et al. 2008; Armas and Avram 2009; Terpstra, Lindell and Guttinger 2009; Pagneux, Gislandóttir and Jónsdóttir 2011; Bradford et al. 2012). Risk perception is important because it is believed that public’s subjective judgments deviate from the experts’ “objective” risk judgment (Oltedal et al. 2004). Another aspect that has to be pointed out once more is what Da Cruz (1993, p.27) writes that disasters not only are the result of natural processes, but arise in the interaction between humans and their environment. This is what Messner and Mayer (2006) partly stresses when discussing that there is a paradigm shift occurring in flood risk research and what Wisner et al. (2003, p.4) refers to when writing: “It is to risk separating ‘natural’ disasters from the social frameworks that influence how hazards affect people, thereby putting too much emphasis on the natural hazards themselves, and not nearly enough on the surrounding social environment”. This means that hazards cannot be managed by only observing the natural processes through an “objective” scope, but one also have to have an understanding of the social environment and how it interacts with the natural environment.

An important attribute of risk perception is if people worry about a certain risk (Sjöberg 1998; Armas and Avram 2009). In Armas and Avram (2009) it is discussed that people relying on aid from others show a higher level of worry about the risk of floods and people that less expected support from others where those being most active and having most initiative during the events of floods. In this study respondents were not only asked if they worry about the risk of floods, but how often. The results show that nearly 65% of the people answering worry about floods yearly while 30% do not worry at all about floods. Almost no people answered that they worry daily, weekly or monthly. It has been shown in ICPDR (2008) that floods often occur during the warm period of the year after the snowmelt. This could indicate an effect of the characteristics of the floods on people’s risk perception, since people do not need to worry during less risky periods, meaning that floods should have what Fischhoff et al. (1978) in Sjöberg, Moen and Rundmo (2004) calls delayed effect, a risk that is predicted to happen at a later time. Also on the question how people can learn to live with the risk of floods, a relatively large group answered that you simply do not have to think about the floods all the time because the floods do not happen every day. From people’s experience from floods it makes clear that floods are not a novel phenomenon in the Tisza River basin.

Together nearly 80% of the respondents answered that the risk of flood is large to moderate in the Tisza River basin, showing that the floods indeed are perceived to have a significant effect on people’s life. When perceiving what kind of harm the floods could lead to, most respondents named economic damages and damages on properties. Looking at the characteristics of risks explained in Fischhoff et al. (1978) in Sjöberg, Moen and Rundmo (2004), the perception of flood risk damages can be understood as having chronic rather than catastrophic effects, meaning that people do not perceive the risk as having immediate fatal damages. On the other hand, around 20% of the people answered death, which could be fairly surprising due to the characteristics of the floods not expected to bring any sudden impacts on life. One reason could be that respondents think that the floods could result in death of people, not directly, but indirectly by first having effects on people’s economy and property, ruin their livelihood and for that reason bring death. Another reason to this pattern of answer could be that people recall the characteristics of floods in northern Hungary closer to the mountains where the floods could have more sudden effects. Cioban (2011) study on flood risk in Suceava, Romania for instance show that floods in 2010 have killed 10 people. A third reason
is that people interpret the question in more general terms, where floods in other parts of the world have shown to bring deaths. By not having the possibility to follow up the answers from the survey it is hard to know exactly where the true answer lays.

Looking at the risks that people in the Tisza River basin are more concerned about than the risk of floods, it can be surprising that several people answered for instance earthquakes. This also points out that some people did interpret some questions in more general terms. However, a majority of respondents who were more concerned about other risks than the risk of floods gave answers associated with ecological risks and human impact on the environment. One important reason for this type of answers could be the major cyanide spill from Romania in year 2000 that a large proportion of the respondents recalled. Even if it was now thirteen years ago and something that is not expected to happen very often, it still should have been very dramatic leaving a strong impact in people’s memories. In contrast to the floods that inhabitants meet almost annually and perhaps “learned to live with” in a sense, major cyanide spill is beyond people’s ability to control, especially if it originates from outside the country’s borders. Another reason could be a large proportion of young respondents that either have a strong concern for the environment due to that have been increasingly stressed during school or the increased information flow through for instance the internet. In this case it is shown that people’s perceptions of risk are formed by social learning and formed within the social group, something that Douglas (1978) in Oltedal et al. (2004) calls cultural bias, consisting of shared values, beliefs and social relations.

Only about 10% of all respondents answered that they have thought about moving away from floods. The strongest reason why people have not moved away from the place because of the floods was that they live in a city, in which respondents often answered that they do not feel threatened by floods and trust the flood defence systems such as dykes surrounding the city. Another important reason that respondents gave was the emotional tie to the place or city. Furthermore, several respondents took into account attributes of their environment when evaluating the risk of floods. Respondents were for instance less worried about floods because they live on higher ground such as on a hill or higher parts of the village/city, where the flood is not expected to reach. There is reason to believe that there are more resources available to flood defence and more motivation to defend a denser population living in cities that could result in a more active flood risk management from the authorities. As almost no one answered that they still live with the risk of floods because they cannot move, it can be concluded that most inhabitants participating in the study live with the risk voluntarily. Living with a risk voluntarily is expected from the psychometric paradigm point of view to decrease people’s risk perception about a certain risk (Sjöberg 2003; Fischoff et al. 1978 in Sjöberg, Moen and Rundmo 2004).

Looking at the factor “control over risk” explained by (Sjöberg 2003; Fischoff et al. 1978 in Sjöberg, Moen and Rundmo 2004) it makes clear that a majority of respondents perceive that they cannot control the risk of floods alone but together with others. That people tend to feel safer about floods in relation to other people or expect to get help if they need indicates that there is a social dimension to people’s risk perception as well. Going to the grid-group typology explained by Douglas 1978 in Oltedal et al. (2004) it makes clear that there would be a very few if not none of respondents that would be classified as fatalists, that feels restricted by social groups. Looking at the results however, it tends to be very hard to classify people into strict groups. A large proportion of respondents answered that they are more concerned about technological and ecological risks and put forward the need to help other inhabitants during risk showing traits from the egalitarian groups, while a large group still put faith into authorities work on floods and defensive structures, indicating traits of the
hierarchists group. There is room to question the utility of sorting people into strict groups in order to understand their perception of risks. Oltedal et al. (2004) discuss criticism towards the cultural theory and suggests that it is fruitful to distinguish between risks that affect individuals and that affects groups and Miller (1997) argue that people may be so different that it is not possible to strictly group them together. The social dimension clearly seems much more complex to understand, as pointed out by Sjöberg (2000) that the cultural theory is based on a too abstract routine and that the social contexts not necessarily is the determinant for people’s risk perception. Miller (1997) also discuss that the concept of culture in itself is very complex making it difficult to study risk perception according to the cultural theory. If research on people’s perceptions of risk should not only be something explanatory, but instead something that can be utilized to increase the effectiveness of risk management, it is not fruitful striving to sort people into egalitarians, individualists, hierarchists and fatalists but rather more in depth understand the social context of the location studied.

People living in villages tend to live closer to their environment and people living in cities should have most of their livelihood provided and do not need to worry that much about what is happening to their environment, as for instance pointed out by interview respondent E. One concern even in cities is of course the extreme floods that several respondents put forward in their experience from floods. The characteristics of the floods are not seen to have any direct fatal damages, but rather what Fischhoff et al. (1978) in Sjöberg, Moen and Rundmo (2004) call chronic effect. People whose livelihood is dependent on agriculture are more vulnerable to floods that will either delay or shorten the season when crops can be cultivated. Vari, Linnerooth-Bayer and Ferencz (2003) show that the most serious consequences of the floods in Hungary are damage to agriculture, by indirect effects on crops and to the planning of farming activities. For this reason it can be assumed that people living in villages are more dependent on what conditions are provided by natural forces and as a result will generally be more worried of the risk of floods.

Having a closer relation to their environment people living in villages are perhaps more aware of their natural environment and of the risks associated with it. This indicates similarities of risk characteristics that can be found in the study by Ming-Chou et al. (2008), where flood victims showed to be mainly concerned about economic losses that are hard to entirely avoid with current mitigation projects, while people at risk of landslides were mainly concerned about fatalities that could be avoided by preparedness and evacuation measures. In general the results show that people trust flood protection to a relatively high extent and the authorities behind the responsibility of flood control. Also interview respondents discussed that many people from the village take part in building and maintenance of the dams, but do not necessarily show less trust in authorities to do so. People are part of a social context and it cannot be negated that people’s perception of risk is formed not only by natural forces (in this case floods), but also by exchanging information with other people.

I do argue that (flood) risk need to be more strongly managed on a local level, with cooperation between the public and authorities. One of the strongest reasons is that risk is something that is formed in the relation between people and their environment (Da Cruz 1993; Wisner et al. 2003). It is discussed in for instance Breakwell (2001) that risks are partly something going on in people’s minds and that the risk of hazards can be seen as a human construct or social representation. It is important to keep in mind that the perception of risk does not arise from nothing but in the meeting between people, societies and its environment. Results from this study indicate that there are both characteristics in the environment and the actual hazard as well as characteristics in the society and the social environment that have
effect on people’s perception of risks. For this reason it may seem unfeasible to still have such a broad theoretical discussion between the two paradigms.

A relatively large proportion of the respondents answered that they are not worried about the risk of floods. The question arise if there is a problem that people are not enough informed and aware of the risk of floods. Kellens et al. (2011) and Ullberg (2006) for instance point out that flood defense structures and technological advancement could bring the public into a false sense of safety. According to the interviews the building of dykes indeed seems to have stopped most of the floods entering the village and respondents only recall earlier extreme events decades ago before any defensive structure was built. In one perspective it could be a result of underestimation as noted in Ludy and Kondolf (2012) study from USA, indicating that there is a need to educate the public in order to increase their knowledge and awareness of floods. If one observe the big picture of the pattern on how respondents filled in their survey, it is clear that a large proportion of the respondents does feel safer about the floods due to the defensive structures and are in favour of increasing the defensive structures in order to manage the floods more effectively. On the other hand, ICPDR (2008) points out that even the strengthened parts of dams have weak spots and do not reach all the safety. Furthermore, Vari, Linnerooth-Bayer and Ferencz (2003) stresses that the dams against floods in Hungary would be insufficient with worsening flood conditions in the future and would also continue to be expensive to maintain.

According to the respondents some places seem to have negated the effect of floods by extending their dykes while floods in some places remain a large problem. A problem before was for instance that people built houses within the flood prone areas, probably as a result of lack of knowledge (ICPDR 2008). For instance several interview respondents’ states that the dykes clearly have stopped the floods damages on properties and people no longer build houses in the areas affected by floods. In all of the interviews, respondents explain how floods no longer extend the protective dams or have been an extensive problem recently and respondents recall older extreme cases of floods during for instance the 1960s or 70s, rather than floods that have occurred in recent years.

Going back to the statements that have been made that flood risk management no longer only can rely on technical solutions and also take into account people’s perception of risk do not mean that understanding of public’s perceptions when managing risk should stand in total conflict with building defensive structures like dykes. It is believed that flood risk management cannot negate the defensive structures, especially not in the Tisza River basin where for instance as ICPDR (2008) explain that around one fifth of Hungary’s area was permanently covered by inland water before the regulations during the 19th century. Instead flood risk management need to include local inhabitants and their perceptions when managing hazards. However, there is still the conflict between the view that flood defence have to be more intense and the view that the river has to be more returned to its natural state. Those major views were explained among decision makers in Vari, Linnerooth-Bayer and Ferencz (2003). Also among the survey respondents there were both people who think that flood risk management need to include more extensive defensive structures and those that thinks that the river should be returned to its natural state. What we can see here is of course the result of how people perceive their environment differently and as a result find diverging solutions on what is the most appropriate way to handle the environment. It is also a result of beliefs formed in a social context.

The result of the different views can of course be discussed. Vari, Linnerooth-Bayer and Ferencz (2003) discuss three different paths of flood risk management in Hungary: the
traditional, market and ecological approach. According to Vari, Linnerooth-Bayer and Ferencz (2003) the market approach should be the least effective approach since it would leave people to their own problems to a larger extent and the government would be less involved in the flood risk management. This is put in contrast to the traditional view where the government keeps its responsibility for flood risk management. According to Vari, Linnerooth-Bayer and Ferencz (2003) the traditional view would also include continued focus on technical solutions such as strengthening of dams while the ecological approach would result in less structural solutions and more pressure on local initiatives.

It might seem obvious that a less active government following the market path would also decrease the communication with the public. However, as shown by the results most respondents answering that the communication are mostly on local to regional level and thought that flood risk communication need to be more local and therefore the role need to be filled by more local initiatives among people and local decision makers. In contrast the traditional path with a continuously strong central governed flood risk communication and management should follow the same pattern as shown by the results at this point. For this reason a less active central government could leave more space for local authorities and inhabitants to participate in the flood risk management. It is however believed that this does not happen all by itself. Observing the results where a vast majority do not desire to take part in the decision making process about flood risk management there need to be some kind of motivation to include people in flood risk management. The ecological approach is least explained in Vari, Linnerooth-Bayer and Ferencz (2003), especially regarding why and how the ecological approach would put more pressure on local initiatives to work on flood risk management.

Martens et al. (2009) argue that authorities need to take heterogeneity into account when communicating to the public about risks, because everyone will not perceive or understand the message in the same way and therefore respond differently. This is however, a mere recommendation and it is not given any concrete solution on how this should be made. In order to facilitate local management of flood risk management and public participation the overarching management need to come from the central government like for instance to finance the flood management while decisions on how the floods should be managed need to bring more local initiatives, both by local authorities and the public. People therefore need to be more aware of floods and the environment. The solution that could be relevant from this study is how people ask for more education about floods in school, in order for the floods to be more part of people’s everyday life.

If looking at the answers of the respondents, more than 70% answered that flood protection is both the government’s and the public’s responsibility and nearly 70% of the respondents answered that flood risk management only can be effective if both the government and local communities make the decisions on flood risk management together. This is in line with what would be suggested for the flood risk management in Hungary and perhaps other places as well. For the flood risk management to work more effectively, flood risk management need to be more anchored on a local level and cooperation between authorities on a central and local level need to be stronger as well as the cooperation with the public. In a country where such a large amount of the country’s finances are affected by damages from floods and large amount of money directed towards flood protection (ICPDR 2008), some regions may or may not alone have the ability to finance the management and initiatives needed to more effectively manage the floods. For this reason the overarching financing need to come from the central authorities.
It is claimed by ICPDR (2008) that several initiatives have been made to facilitate public participation in water management issues, for instance letting the public be observers or participate during expert meetings and authorities promoting themselves and their work in order to increase awareness among the public in relation to floods (ICPDR 2008). According to Pidgeon (1998) arguments in favour of involving public perception in decision making on how to manage hazards have two explanations: a normative/moral one and an epistemological one. The first means that in a democratic society inhabitants have the right to participate in decisions that affect their daily life, while the latter are based on the fact that public’s perceptions could have an important input in risk management (Pidgeon 1998). In the case of Hungary there are two reasons from the findings in this study that indicates patterns for the normative/moral explanation: First, there is nothing in the plans presented in ICPDR (2008) that mention any need for public participation, public perception or awareness in the future. Secondly, according to the results of this study more than 80% of the respondents answered that they do not know of any communication forum through which they are able to participate in the decision making process on flood management and more than half of the participants answered that they do not like to participate. It is of course reason to question whether people feel that they have possibility to affect the decision making process?

According to Rowe and Frewer (2000) public participation in flood risk management can be distinguished on different levels: from top-down communication on the lowest level to a two-way communication on highest level where information about public perception of risk is acknowledged in the decision-making process. Palenchar and Heath (2002) discuss that people want to take part in decision making process about risks. This is of course from an expert point of view and does not assume that people do not feel any need to participate in decision making. An important aspect however, is that public need to perceive that their participation have an impact on decisions. The results from this study shows diverging views among people where a clear majority of respondents do not know of any communication forum or similar where they can take part in decision making on flood risk management and do not perceive any need to participate either. The question is of course why the results show this pattern. One reason could be that people do not feel that their perceptions are taken into account or that authorities do not listen to what people have to say. This could be the result of decision makers taking a normative stance towards public perceptions and lack faith in that people could have an important input in how to manage the floods. Another reason could be people’s experience from floods where people do not feel threatened by floods or that they are more concerned about other risks. For this reason people do not perceive floods as important as for instance obvious human caused environmental risks, such as pollution and contamination. Another reason could be public’s trust in authorities where people feel that authorities do manage the floods well. There could also be a lack of trust that makes the public perceive that there is no use to communicate with authorities that they cannot trust anyway.

The earlier study by Vari (2002) on flood risk communication in the Tisza River basin showed that the public lack information about floods and do not participate in flood risk management to any significant degree partly because authorities withhold information and partly because the public does not demand more information nor to influence the decision making process about floods. Vari (2002) also claims that a gap in flood risk management exists as a result of a somewhat weakened centralized system of flood management that need to be, but has not yet been filled by the public or local initiatives. The reason for this according to Vari (2002) is mainly due to the lack of information provided by the authorities. The results of my study clearly shows that people do not see any possibility to manage the
floods alone and a large proportion of respondents put forward need for public initiatives to manage floods.

Risk communication is about transmitting risk related information often between authorities and the public; however this does not mean that only increasing the amount of information is enough to improve the risk communication (Lyytimäki, Assmuth and Hildén 2011). What should be important is the intent of the communication as for instance discussed in Pidgeon (1998) and the quality of the communication, rather than the quantity. Breakwell (2000) discuss that risk communications attempts need to take into account both motivational as well as informational aspects (Breakwell 2000). There are several recommendations in literature explaining how risk communication could be improved: for instance the need to build trust as a foundation for dialogue between authorities and the public (Petts 2008), more understanding of the public’s views and formation of forums where the public can be included in the risk management enhancing a two-way communication (Holmes et al. 2009) or adopt public views in decision making and have transparency in the decision making process (Frewer 2004). The main recommendations found in expert literature to improve risk communication include: credibility, context, content, clarity, continuity and consistency as well as channels and capability of the audience (see Lang, Fewtrell and Batram 2001, p.327-328). There is however, a lack of studies actually examining how recommendations on how risk communication could be improved in real situations (Holmes et al. 2009), showing what is pointed out earlier in Rowe and Frewer (2000) that there is no real benchmark in how to improve risk communication.

When attempting to learn about how the public thinks that the flood risk communication could be improved it was shown that the most common answer related to information and communication channels and those answering mainly specified faster, continuous or more accurate or understandable information, where more information should be given mainly through internet and modern channels such as discussions on forums and information on official homepages. Respondents also answered that there has to be a communicational dialogue and the public need to be more involved in the communication for instance through forums, that communication need to be made on local level and that awareness has to be increased among the public. Furthermore there was a group of respondent answering that they think that authorities need a better understanding of the local populations’ view and that communication should occur not only during time of floods. In general the public showed fairly heterogeneous perceptions on how they think that risk communication is working and how it could be improved. Given that respondents showed very diverging views it is of course place to question the reliability of the results. It is believed that the heterogeneity shows the nature of people’s risk perceptions and that the public cannot be treated as one single unit. This is the case since risk perception is a subjective assessment affected by for instance experience as pointed out in for example Sjöberg, Moen and Rundmo (2004). Also Martens et al. (2009) argue that heterogeneity need to be taken into account when communicating about risks because everyone will not perceive the message in the same way and therefore respond differently.

The gap between the public’s and experts’ views on how risk communication can be improved may not be as large as expected, rather the results indicate that there is a lack of understanding and motivation to include public perceptions in flood risk management in the Tisza River basin. Also in order to increase the effectiveness flood risk communication the heterogeneity of the public have to be taken into account. The public should not be treated as one unit, with uniform perceptions, values and beliefs, and for this reason studies on risk perception need to be increasingly anchored to the local reality where perceptions are studied.
One important limitation of this study is due to the fact that there was no possibility to compare the public’s view with actual decision makers’ and representatives from authorities’ views.

So how can the perception of flood risk of people living in the Tisza River basin be explained by the psychometric and the cultural theory paradigm? If each case is unique with its social and environmental settings, the lot of studies efforts on discussing which factors are most important on a general basis may be put into question. Discussing which factors are important in a specific place, with its specific social and environmental conditions may be useful in understanding how people perceive a specific risk. Goszczynska, Tyszka and Slovic (1991) for instance addresses that local condition have to be taken into account when studying people’s risk perception. Also for instance Sjöberg, Moen and Rundmo (2004) have criticized especially studies from the psychometric paradigm to lack empirical data and appropriate analyses as well as earlier studies to have searched for universal answers on people’s risk perception.

From this background, trying to find universal solutions for which factors are most important do not appear very useful nor plausible. This could be one of the reasons why a lot of studies on risk perception cannot agree upon what factors are the most important, and also that studies from the opposite paradigms’ point of view do not find any agreement on how people’s perception of risk can be explained. Oltedal et al. (2004) have addressed that different factors of risk have had more or less attention at different times. One important solution that can be seen in light of the experience of earlier studies and this study is that studies have to be more adapted to the specific place that is studied and more focus has to be put on a local level if the main ideas about risk perception are to be fulfilled: to gain knowledge about also the social factors making up risks and therefore with more success reduce the risk of a hazard. Also the results from this study showed a large heterogeneity of answers and it is believed that flood risk management can not entirely be prepared on a larger scale, but rather locally, together with the population. As Wisner et al. (2003, p.6) writes: “the spatial variety of nature provides different types of environmental opportunity and hazard”, also the natural side of the risk has a spatial dimension. Also the European Parliament and the Council (2007) state that more effective flood risk management have to be made for each river basin and on a communal level. Furthermore, Breakwell (2000) argue that a better understanding of the local population is needed to be able to manage floods and communicate about risk between the public and decision makers.

It is believed that the type of questions used within the research field usually are to generally formulated and is therefore hard to apply to real life situations. This was apparent before the actual study when there was a pilot study conducted on a small group of people. The questions that were more in line with many earlier studies within the research field and it was clear that respondents had a hard time understanding the main ideas about the questions and did not know how to interpret many of the question items when formulated in a too general manor. It is apparent that if risk perception should hopefully have an important input in flood risk management, theories and concepts have to be better formulated to the situation studied and be more empirically applicable.

For further studies it would be interesting to go more into depth into different local places and compare people living in cities and villages more in detail since the socioeconomic climate should be different as well as the perception of risks and solutions on how risk could be managed most effectively. Also it would be interesting to compare people living in northern part of Hungary with people living more south because the characteristics of floods as well as
the social climate are not exactly the same. In northern parts closer to the Carpathians the
floods are usually more sudden and harder to predict (ICPDR 2008). This is clearly relevant
since for instance Ming-Chou et al. (2008) have shown that risk characteristics could play an
important role in people’s perception of risks. The more sudden nature of floods in the north
could also have an effect on how the flood risk communication should work.

From the discussion about open and close-end questions in Statistics Canada (2003) open-end
questions gave more freedom for respondents to express themselves than close-end.
Respondents both had the possibility and also did develop their answers when asked with
open-end questions. The drawback to this resulted in that the open-end question had the risk
to be interpreted in different ways and required a lot more time and skill to be processed.
There is also the risk that converting the respondents’ answers from open-end questions into
measurable units could be very hard and unreliable due to errors. It is believed that what you
can do as a researcher is to take as much caution as possible not to distort the answers and
keep them as true as possible. So should one keep all questions close-end to negate the risk of
distorting the answers? The results from a study is mere a reflection of ones methods and
what answers one will get is decided in a large sense limited by what questions are asked. I do
for these reasons believe that if one choose only close-end questions when studying people’s
perception, the results will only be a scratch on the surface of the people’s real perceptions.

Distributing the survey through communities on the internet was a very efficient way to
gather responses. There were different kinds of people with different age and from different
parts of the Tisza River basin giving away answers. However, one issue that came up was that
many people, about one third of total participants only filled in information about age, gender
and place of residence, but left the rest, or a major part of the survey unanswered. The
question is of course why this happened and what should be done to tackle the issue. I believe
that the most prominent reason for this was the length of the survey. The survey included 21
questions. The number of question itself may not be too much a problem, but if one includes
that nearly half of the question items had an open-end characteristic it is not too unexpected
that this pattern arose. Open-end questions should in general take a significantly longer time
than close-end to complete and therefore it is fair to believe that such a large proportion of the
respondents chose to leave the majority of the survey unanswered.

Choosing to focus on a more narrow type of questions and have fewer open-end questions or
fewer questions altogether are natural solutions for making more people complete their whole
survey. However, this would also result in less information provided by respondents. It is also
discussed in for instance Brennan and Xu (2009) about giving incentives to respondents in
order to get higher response rates, where the authors draw the conclusion that sending for
example a bar of chocolate significantly increases the response rate. It is of course worth
asking if sending incentive with the survey would have any positive effect on the quality of
the answers or only the number of respondents completing the survey. In the end the survey
did bring more than 200 participants that filled in whole their survey in only a few days
without any kind of incentive, indicating that people still found motivation to complete the
survey and giving relatively developed answers.

There are some further ethical issues to be discussed. Regarding research about public’s
perceptions Pidgeon (1998) for instance discusses that public attitudes can be prejudiced or
discriminatory to certain groups in society. It is believed that in order to tackle this problem as
a researcher, one has to include a wide group of different people. The results from this study
have included people well distributed over both genders, people at different age as well as
those living in cities and rural areas, meaning that a wide group of people within the Tisza
River basin have been included. The results from each respondent have been evaluated the same and have not been used in any way to discriminate any kind of social group. Also Pidgeon (1998) discuss that managing risk merely entails managing public perceptions. Even if the transcription of the interview and survey responses have been without any deliberately distortion and treated without any attempts to manipulate the perception of the public it is possible that all responses may not be an entirely true reflection of people’s perceptions.

There is of course a risk that respondents do not give away the entire truth, but the only way the results can be treated is of course according to the information that respondents give. An important factor regarding truth and openness in respondent’s replies is your role as a researcher. Some factors could be how one introduces him or herself to respondents, what position one has or if the subject is a sensitive one to the respondents. Introducing yourself as an outsider there is of course the risk that people would give very brief or lack credibility in their answers, or ignore answering all together. During interviews I was met with a high degree of openness and friendliness and I found people very helpful when asked if they would like to participate in the study. A majority of the respondents tend to give relatively explicable answers about their perception on most issues. Also several people asked to know of the results when the study would be closed, indicating that there is an interest for the subject among the people living in the Tisza River basin.

Finally, what value do the results from this study hold? The results from this study indicate that people’s perception of risk should be the result of both social conditions as well as characteristics of the natural environment. This have been pointed out in the academic debate on risk perception (see for instance Sjöberg, Moen and Rundmo 2004) but studies rarely seem to take both the nature and the social context into account. Taking both into account would mean that studies could get a more accurate picture of people’s risk perception if not taking a stance from either the psychometric or the cultural theory paradigm, but trying to capture both the natural and social aspects building up people’s perception of risk. I do hope that the results from this study can be used to enlighten further research to be more based on empirical data. The idea is not that research should lose its tie to the theory, rather there has to be a stronger understanding for the real social and environmental conditions as well as interactions between the environment and societies where the study is conducted. For this reason in order to capture people’s perception of a certain risk local conditions have to be taken into account. For instance, questions asked to the respondents should be more adapted to place specific conditions and not asked in a too general manor. What people think about floods or any other risk in general could be difficult to utilize for the purpose of increasing the effectiveness of risk management.

Vari (2002) for instance has named the flood risk management strategy in Hungary “risk-based management” based on experts’ views including technical solutions such as strengthening of dykes and lack of public information and participation is argued not to be enough to handle uncertainty of floods in the future. It is therefore desirable if decision makers on flood risk management in Hungary and the Tisza River basin could get a better insight into how different people perceive the risk of floods and how they think that the communication could be improved in order to increase the effectiveness of flood risk management through communication between authorities and the public. Returning to arguments in favour of people’s risk perception in decision making on hazards found in Pidgeon (1998), one can argue that public perception can add new knowledge to risk assessment and evaluations and that it is important in a democratic society that different perceptions are included into policy. If risk communication, that is an important part of the management of risk should be more efficient, decision makers need to have a better
understanding of different people’s perceptions and include them in the decision making process about floods. Finally, the public should not only be involved in risk management on normative and moral reasons, but with the belief that public perceptions could have an important input in a more effective risk management.

5. Conclusions
Within research about risks there is a large agreement that technical solutions alone are not enough to decrease the risk of hazards, rather an understanding of people’s perception of risk is important to effectively be able to communicate and manage hazards. There is still however a debate within the research field of risk perception between the psychometric paradigm claiming that people’s risk perception are the result of characteristics of the hazard and the person itself and the cultural theory paradigm claiming that the social context is the most important to understand people’s perception of risks.

The aim of the study was in the light of the diverging views within the research field of risk perception to understand which of the psychometric and the cultural theory paradigm that can to a larger extent explain the flood risk perception of people living in the Tisza River basin. Furthermore, the aim was to understand the gap between experts’ and the public’s views on risk communication and how risk communication could be improved between decision makers and the public. Data was collected through deep interviews and a survey distributed over the internet.

The results of the study show that the flood risk perception of people living in the Tisza river basin is a reflection of the characteristics of the floods and the environment as well as indicating that there is also a social dimension affecting people’s flood risk perception. This concludes that both the psychometric and the cultural theory paradigm can explain aspects of the flood risk perception of people living in the Tisza River basin. However, there are difficulties in trying to sort people into strict groups following the grid-group typology and the social context also appears to be more complex to understand than following the framework of this study. In addition it can also be concluded that an understanding of the public’s perception of one risk needs to take into account perceptions of other risks as well.

Respondents answered with large variation indicating that the public cannot be treated as one single unit. Instead of studying the whole basin it would be more appropriate to delimit the study to one or a few local places in order to get a better understanding of people’s risk perception. The results indicate that studies need to be more based on empirical data and not treat people’s risk perception as something too abstract. Examples from earlier studies show that there is strength in both paradigms explaining people’s risk perception on a general basis, but the results from this study indicate that both paradigms have difficulties explaining more complex phenomena and local environmental and social factors that are unique for each place. Rather than following rule based abstract thinking characterising the two major paradigms, studies need to go more in depth understanding the place specific social context and the environmental factors as well as the interaction between individuals, society and the environment making up the foundation of people’s perception of risk.

Finally the results indicate that the gap between the public’s and experts’ view on how risk communication can be improved is not as large as expected in previous studies on risk communication. In addition to expert literature it would be desirable for further studies to compare the public’s views with representatives from authorities as well, something which is absent from this study. It can be concluded that in order to improve the risk communication
within the Tisza River basin the decision makers would need a better understanding of people’s perceptions and the motivation to include public’s perception in flood risk management need to be due to the view that public’s perceptions could have an important input into risk management.
References


Other sources


Appendix 1 - Interview questions (English and Hungarian)

1. What is your experience from floods? / Milyen árvízi tapasztalatokkal rendelkezik?
2. How often do you feel threatened by floods? / Milyen gyakran aggódik az árvízveszély miatt?
3. What is the biggest threat from floods: economic damages, damages on properties or deaths or other? / Milyen fajta kártól fél a legjobban az árvízzel kapcsolatban? (gazdasági kár, tulajdonában esett kár, haláleset, egyéb).
4. Did you ever think about moving away from here? / Gondolt esetleg valaha arra, hogy elköltözik a veszélyeztetett területről?
5. Do you feel more threatened by other risks than the risk of floods? If yes, from what? / Jobban tart esetleg más katasztrófáktól, mint az árvíztől, ha igen, mitől?
6. How and how well do you think that you learned to live with the floods? / Hogyan lehet megtanulni együtt élni az árvízveszéllyel?
7. a) What do you do personally to protect yourself from floods and what could you do better protect yourself from floods? / Hogyan próbálja megvédeni magát és környezetét az esetleges árvízveszélytől? Ön szerint mit tehetne még?
   b) What do the authorities do to protect the people from floods and what could they do to better protect the people from floods? / Mit tesz a hatóság, hogy megvédje az embereket? Miben kellene fejlődniük?
8. Where do you get the information about floods from? / Honnan értesül az árvízi információkról?
9. Do you think that the flood risk management is more effective alone or by collective initiatives? / Ön szerint az árvíz okozta veszélyt hogyan lehet jobban kezelni? Egyedül vagy egységesen mindenkire vonatkozóan?
10. a) How could you protect yourself from floods alone? / Az árvíz ellen hogyan tudna egyedül védekezni?
    b) How could you protect yourself from floods by collective initiatives? / Hogyan tudna az árvíz ellen védekezni együtt összefogva másokkal?
11. What could best protect you from floods: governmental decisions, local decisions, or both together? / Ön szerint melyik tud hatásosabb lenni? Ha kormányzati vagy ha helyi közösségek szintjén születnek meg a döntések az árvízvédelemről?
12. Do you think that flood risk management mainly is a governmental or the citizens’ problem? / Mit gondol az árvízvédelem leginkább kormányzati vagy társadalmi probléma?
13. Does the flood risk management have to be improved or are you already satisfied with the authorities work on flood risk management? / Ön elégedett a hatóságok árvízvédelmi munkájával? Ha nem, ön szerint hogyan lehetne fejleszteni a hatóságok árvízvédelmi munkáját?
14. How could the flood risk management better be a part of the people’s everyday life? / Ön szerint hogyan válhatna az árvízvédelem jobban az emberek mindennapjainak részvévé?
15. How could the communication about floods be improved? / Ön szerint hogyan lehetne fejleszteni a hatósági kommunikációt?
Appendix 2 – The survey (English)

Personal details

Age: _________

Gender:   Female □   Male □

Place of residence: ____________________

Perception of floods

1. What experience do you have from floods?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2. How often are you worried about the risk of floods?
Everyday □   Weekly □   Monthly □   Annually □   Never □

3. What do you think of the risk of floods along the river Tisza?
Very large □   Large □   Moderate □   Small □   No risk □   I don’t know □

4. What kind of harm is most related to the floods?
Economic □   Properties □   Deaths □   Other □   _____________   I don’t know □

5. Have you ever thought about moving away from the flood hazard?
Yes □   No □

6. If no, why not?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

7. Is there any other environmental risk that you are more concerned about than the risk of floods?
No, I am most concerned about the floods □   Yes □ (Please, briefly specify):
________________________________________________________________________
I don’t know □

8. How can you learn to live with the risk of floods?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
9. How do you try to protect yourself and the environment from the potential risk of flooding? Do you think you could do more?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

10. What do the authorities do to protect the people from floods? Could they do more?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

11. Do you think that the floods are better handled alone or together with others?
    Alone ☐ Together with others ☐
    Depends on the situation ☐ (Please, briefly specify): ________________________________
________________________________________________________________________
I don’t know ☐

12. How can you protect yourself from the floods alone?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

13. How can you protect yourself from floods with the help from others?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

14. Which do you think would be able to more effectively: if the government or the local communities make decisions about flood risk management?
    The government ☐ Local communities ☐ Both together ☐ I don’t know ☐

15. Do you think that the flood protection mainly is the governments or the citizens problem?
    The government ☐ Citizens ☐ Both problem ☐ I don’t know ☐

16. Are you satisfied with the authorities work on flood protection? If not how do you think that the authorities work could be improved?
    Yes, I am satisfied ☐ I am not satisfied ☐ (please briefly specify how it could be improved): ________________________________
________________________________________________________________________
I don’t know ☐

17. Do you think that the communication between local authorities and the citizens could be improved?
    Yes ☐ (Please specify how the communication could be improved):
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
18. How do you think the flood risk management can be more a part of people's everyday lives?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

19. Do you know if there is any communication forum through which you could participate in the decision-making on floods? And would you like participate if there were?
Yes, and I would like to participate ☐
Yes, but I do not like to participate ☐
No, but I would participate if there were ☐
No, and even if there were I would not like to participate ☐

20. Where did you get the information on floods from? (It is possible to select several boxes!)
Own experience ☐ Media ☐ Local authorities ☐
The government ☐ Family/friends ☐ Other ☐ (Please briefly specify):
I don’t know ☐

21. How do you think that the communication can be improved with the authorities?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Appendix 3 – The survey (Hungarian)

Személyes adatok

Életkor:_______

Nem:       Nő □       Férfi □

Lakhelye:________________________

Az árvizek megítélése

1. Milyen árvízi tapasztalatokkal rendelkezik?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. Milyen gyakran aggódik az árvízveszély miatt?
Minden nap □       Hetente □       Havonta □       Évente □       Soha □

3. Ön szerint mekkora kockázatot jelentenek az árvizek a Tisza mentén?
Nagyon nagy □       Nagy □       Közepes □       Csekély □       Nem jelent kockázatot □
Nem tudom □

4. Milyen fajta kártól fél a legjobban az árvízzel kapcsolatban?
Gazdasági kár □       Tulajdonában esett kár □       Haláleset □       Egyéb □ __________________
Nem tudom□

5. Gondolt esetleg valaha arra, hogy elköltözik a veszélyeztetett területről?
Igen □       Nem □

6. Ha nem gondolt, miért nem?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

7. Van-e más olyan környezeti kockázati tényező, amelyet Ön fontosabbnak tart az árvizeknél?
Nem, engem az árvizek foglalkoztatnak leginkább □       Igen □ (Kérem, röviden fejtse ki): _____________________________________________
Nem tudom □

8. Hogyan lehet megtanulni együtt élni az árvízveszéllyel?

________________________________________________________________________

________________________________________________________________________
9. Hogyan próbálja megvédeni magát és környezetét az esetleges árvízveszélytől? Ön szerint mit tehetne még?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

10. Mit tesz a hatóság, hogy megvédje az embereket? Miben kellene fejlődniük?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

11. Ön szerint az árvíz okozta veszélyt hogyan lehet jobban kezelni? Egyedül vagy egységesen mindenki vonatkozóan?
   Egyedül □     Egységesen mindenki vonatkozóan □
   Az adott helyzettől függ □ (írja le röviden):

________________________________________________________________________

Nem tudom □

12. Az árvíz ellen hogyan tudna egyedül védekezni?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

13. Hogyan tudna az árvíz ellen védekezni együtt összefogva másokkal?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

14. Ön szerint melyik tud hatásosabb lenni? Ha kormányzati vagy ha helyi közösségek szintjén születnek meg a döntések az árvízvédelemről?
   Kormányzati □      Helyi közösségek □      Csak együtt működhet □
   Nem tudom □

15. Mit gondol az árvízvédelem leginkább kormányzati vagy társadalmi probléma?
   Kormányzati □      Társadalmi □      Mindkettő □      Nem tudom □

16. Ön elégedett a hatóságok árvízvédelmi munkájával? Ha nem, ön szerint hogyan lehetne fejleszteni a hatóságok árvízvédelmi munkáját?
   Igen, elégedett vagyok □      Nem vagyok elégedett. Alábbiakat fejleszteném □

Nem tudom □
17. Ön szerint kell-e a helyi hatóságok és a lakosság közötti kommunikáció javítani?
Igen □ (Ön szerint milyen módon lehetne javítani a kommunikációt):

                                        __________________________________________________________________________
                                        ____________________________
Nem □                                        Nem tudom □

18. Ön szerint hogyan válhatna az árvízvédelem jobban az emberek mindennapjainak részvé?
                                        __________________________________________________________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________

19. Tudomása szerint van-e valamilyen kommunikációs fórum, amelyen keresztül Ön részt vehetne az árvízvédelmi döntéshozatalban? Ha lenne szívesen részt venne benne?
Tudomásom szerint van és szívesen részt is vennék a döntéshozatalban □
Tudomásom szerint van, de nem vennék részt a döntéshozatalban □
Tudomásom szerint nincs és nem is vennék részt a döntéshozatalban □
Tudomásom szerint nincs, pedig szívesen részt is vennék a döntéshozatalban □

20. Honnan kapja az információit az árvizekkel kapcsolatban? (többet is megjelölhet!)
Saját tapasztalat □       Média (pl. TV/rádió) □       Helyi hatóságok □
Kormányzat □       Család/barátok □       Egyéb □ (Kérem, röviden fejtse ki):
                                        ________________
                                        ____________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________

21. Ön szerint hogyan lehetne fejleszteni a hatósági kommunikációt?
                                        ____________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________
                                        ____________________________
Appendix 4 – Information about the respondents

Interviews

The interview took place 2013.03.15 and 2013.03.18 (interviews A-D) and on 2013.03.22 (interview E). The interviews took between 1h 30min and 2h each.

Interview A: Man, around 80 years old. Living in village of Jászalsószentgyörgy, just next to levees. Previously farmer and owned corn fields and orchards in the outskirts of the village. Helped to build and maintain the levees during the 1950s and 60s.

Interview B: Woman, around 80 years old. Living in village of Jászalsószentgyörgy, just next to levees. Previously farmer.

Interview C: Man, around 60 years old. Living in village of Jászalsószentgyörgy. Farmer and own cereal fields in the outskirts of the village and cattle next to the home.

Interview D: Woman, around 50 years old. Living in village of Jászalsószentgyörgy. Farmer. Wife of man from interview C.

Interview E: Man around 50 years old. Geographer and expert in hydrology and human-environmental interactions within the Tisza River basin. Lives in eastern part of the Tisza River basin, Hungary.

Survey

229 respondents from people living in the Tisza River basin took part in the survey. The survey was distributed over the internet to different groups within the Tisza River basin and was available between 2013.03.18 and 2013.03.24.