

DRIVERS, BARRIERS AND OPPORTUNITIES FOR ADAPTIVE FLOODPLAIN GOVERNANCE IN THE HUNGARIAN TISZA RIVER BASIN

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ABSTRACT

Over the past 130 years the Tisza River was heavily modified. To cater for large-scale mono-agriculture and river transport the river was canalised and straightened and the floodplains drained. The reoccurrence and high visibility of floods caused resources to be funnelled into an extensive flood defence system. Already challenged by present flooding events, the recent predictions of an increased incidence of floods and droughts, has been a driving force behind numerous studies and elaborate water management plans. With high local participation the revitalization of floodplains has been enacted as the preferred adaptation strategy in integrated river basin management and rural development. EU accession and the accelerated implementation of European directives and legislation have added to the complexity of institutional responsibilities and mandates. Implementation of adaptation in water and land use management plans and regulatory schemes is seen to slow down. Existing government structures fail to deliver to the inhabitants of the region and people are losing faith in governmental organizations at all levels. This paper aims to add to our understanding on the design of institutions that facilitate adaptation to a changing world. It uses the conceptualisation of earth system governance that was proposed for the Amsterdam 2007 Conference. It aims to apply this conceptualisation to adaptive floodplain management in the Tisza region to i) draw lessons for institutions that facilitate adaptation in the Tisza region, ii) to identify opportunities and future research priorities towards sustainable development of the Tisza region, and iii) to comment on the application of the proposed conceptualisation. The paper shows that earth system governance when applied to floodplain management can help suggest institutional changes that support adaptation.

1 INTRODUCTION

>> *I asked the headmaster of literature, "Why are there so many headmasters and so few poets?" He said, "The emperor needs all the headmasters he can get. If a quarter of his people were headmasters he would be perfectly happy. But more than two poets would tear his kingdom apart."* << Five Letters from an Eastern Empire, 1979. Alasdair Gray

Adaptation will be necessary to address already unavoidable impacts of global warming. Impacts are expected to increase with rising global average temperature. At present there is no clear picture of the limits to adaptation, or the cost, partly because effective adaptation measures are highly dependent on specific, geographical and climate risk factors as well as institutional, political and financial constraints (IPCC, 2007). Analysis of adaptation to climate change frequently stops with the conclusion that adaptation is constrained institutionally. But what exactly does that mean? It is often emphasized that institutions play a major role in enabling adaptation (Matczak *et al*, 2007; Shepherd *et al*, 2006; Crabbé and Robin, 2006; Yohe, 2002), however what kind of role they play exactly is hardly understood. And how do institutions themselves react to climate change? What institutions are adaptive? Research on these and related questions is further complicated by the fact that concepts to analyze institutional adaptation are not yet well developed. At the same time practical experience with developing and implementing adaptation plans in different regions around the world is building up.

This paper builds on evidence from the Tisza River Basin. At present the vulnerability to climate change in the Tisza River Basin is caused by the natural conditions (location within floodplain), the socio-economic conditions and the institutional setting¹ (ADAM, 2007). The impacts of climate change (e.g.

¹ This paper follows North's (1990) demarcation between institutions and organizations. Institutions are the "rules of the game", consisting of both the formal regulatory rules and the informal social norms that govern individual behavior and structure social interactions. Organizations are the groups of people and the governance arrangements they create. Firms, Universities, clubs, unions are some examples.

floods) are closely connected with the social problems and the Tisza's history of heavy river regulation. Technical adaptations (e.g. flood protection) are not enough (Balogh *et al.*, 2005). Adaptation and mitigation strategies have to be designed in a complex web of interacting factors. Special attention has to be paid to the balance of local, regional and global benefits. Any intervention should support the livelihood of the local population. Increasingly actors in the Tisza region advocate adaptive floodplain management to build and support the capacity of the socio-economic system to adapt to climate change and to comply with mitigation goals (Molnár, 2002). The institutional and legal setting is crucial for the success of adaptation and mitigation. The new plan for adaptive floodplain management (New Vásárhelyi plan) offers an attractive case to better understand and facilitate adaptation in the Tisza region. Both in terms of public participation and integrated land and water management the plan is progressive and has the potential to increase the capacity of the area to cope with the impacts of climate change (ADAM, 2007). Yet, implementation does not comply with the initial design and is (partially) delayed.

This paper uses experience from the Tisza region to reflect on the concept, principles and challenges for earth system governance as proposed in Biermann (2007). Earth system governance can be defined as 'the sum of the formal and informal rule systems and actor-networks at all levels of human society that are set up in order to influence the co-evolution of human and natural systems in a way that secures the sustainable development of human society' (Biermann, 2007). Looking at adaptation to climate change from the perspective of earth system governance this paper aims to answer:

1. Does the Tisza region constitute an earth system governance problem in view of the problem structure proposed in Biermann (2007)?
2. If so, are the overarching principles for earth system governance met in the Tisza region and what lessons can be drawn for institutions that facilitate adaptation in the Tisza region?
3. Does the Tisza region suggest additional problems, principles or research challenges as compared to those in Biermann (2007)?

This paper begins by introducing the steps performed in confronting evidence from the Tisza region with earth system governance research (Section 2). Section 3 summarises the context for adaptation to climate change in the Tisza region. The drivers, barriers and opportunities for adaptive floodplain management in the Tisza River Basin are examined in Section 4. Section 5 draws lessons from the comparison of earth system governance and adaptive floodplain management in the Tisza region.

Experience from the Tisza river basin suggests that:

- Regional experience from adaptation to climate change can inform earth system governance research
- Biermann's (2007) conceptualisation of earth system governance covers well the main drivers, barriers and opportunities for adaptive floodplain governance in the Tisza region.
- Interdependencies are not (only) a problem. Creating and restoring mutual dependency could be an important element of earth system governance.
- Credibility and stability are key governance principles next to subsidiarity, creating networks and cooperation across scales, open access to information, risk mitigation, benefit sharing and compliance.
- For the Tisza region the research area 'agency beyond the state' is particularly relevant. It explicitly includes both formal and informal institutions.

This paper presents the early results of an investigation towards governance for adaptation. By looking at early research results from the perspective of Earth System Governance research, the paper explicitly calls for discussion and feedback from participants of Earth System Governance 2007 Amsterdam and other readers. The authors hope that the dialogue in Amsterdam will mutually enrich our work, towards a more sustainable and adaptive future.

2 COMPARING EARTH SYSTEM GOVERNANCE AND ADAPTIVE FLOODPLAIN MANAGEMENT

This paper applies the conceptualisation of earth system governance proposed in Biermann (2007) to study institutions for adaptation to climate change in the Tisza region. The key elements are:

1. *Problem structures*: uncertainly, functional, spatial, temporal interdependence and extreme effects;
2. *Governance principles*: credibility, stability, adaptiveness and inclusiveness;
3. *Research challenges*: architecture, agency, adaptive state, accountability and allocation.

For a full description of the conceptualisation of earth system governance and the terminology used the reader is referred to Biermann (2007).

This paper builds on data collected through interviews with stakeholders from national and local organisations (ministries, water authorities, physical planning, environmental NGOs, academic institutions) in Hungary; a workshop with local stakeholders of the Tisza basin, and analysis of documents on the New Váshárhelyi Plan and other projects prepared for the region.

The development and implementation of the New Váshárhelyi Plan (VTT) was taken as a main object of investigation and source of information. In particular this paper uses four sets of information that were produced from a series of interviews and a workshop. This information consists of the views of different actors on:

- Main problems in the Tisza region that spurred the development of the VTT plan and the relative importance of climate related risks among these
- The development process of the VTT plan & its appropriateness
- (Barriers to) the implementation of the VTT plan
- Options to facilitate implementation of the VTT towards adaptive floodplain management

The information collection included seven semi-structured face-to-face interviews. The interviews were conducted in English and Hungarian, taped and summarised under the discussion topic listed above. The interviewees were selected based on previous contacts and experience. Though aiming at speaking with a variety of actors of different professional backgrounds, the authors do not claim that the interviews are fully representative for the issues covered by earth system governance. Rather this paper reports on the first set of interviews that is scoping the authors' future work. The authors hope that applying concepts from earth system governance research will shed new light on researching institutional adaptation of floodplain management in the Tisza region. The interviews and workshop did not explicitly use the terminology and conceptualisation of earth system governance. This paper confronts evidence from the Tisza region with earth system governance research in three steps:

- 1) Compare the key water and land-use related problems in the area to the key problem structure of earth system governance to assess whether adaptive floodplain management in the Tisza region constitutes an earth system governance problem.
- 2) Compare the development and (barriers to) the implementation of the VTT plan with the key earth system governance principles to assess whether these governance principles (or the lack thereof) explain the successful development and the retarding implementation and/or whether additional principles are suggested.
- 3) Compare options to further the implementation of the VTT to the research challenges for earth system governance to assess whether earth system governance research –when guided by these research challenges- will support these options and / or suggest new directions for the development of institutions for adaptive floodplain management.

3 CONTEXT: THE TISZA RIVER BASIN

This section describes the system of interest in the Tisza river basin. The description includes: background information, main impacts of climate change, the institutional setting and images of the Tisza region.

3.1 Background

The Tisza river is the largest tributary of the Danube, receiving water from the Carpathian Mountains in Romania, Slovakia and Ukraine. The Tisza flows through the Pannonian flood plain of eastern Hungary and then south into Serbia and Montenegro. Almost fifty per cent of the Hungarian territory is covered by the Middle and Lower Tisza. The Tisza is unique in terms of wetlands and conservation areas, its much regulated river bed and frequent floods.

Until the 18th century the Tisza floodplain area was utilized in a complex way providing sufficient income for the communities along the river. Activities were mainly organized around the operation of “fok” -

channels between the river main bed and the floodplain, cutting through the natural levee. Since then the Tisza River was heavily modified. To cater for large-scale mono-agriculture and river transport the river was canalised and straightened and the floodplains drained. The major changes of the Tisza River were introduced by the Vásárhelyi Plan initiated in the 19th century. Dikes were built. 32 % of the river length was regulated and the floodplain was drained, decreasing the total naturally flooded area by 84 %. These changes meant the destruction of the traditional 'fok' system together with the decline of the region. The reoccurrence and high visibility of floods caused resources to be funnelled into an extensive flood defence system. Next to the flooding there are other environmental problems such as draught, salinization, degradation of peat lands, wetlands. The area also suffers from socio-economic problems, high unemployment rate, ageing, migration, minority problems. The communist era supported the large-scale intensive agriculture in the region. The privatisation at the beginning of 1990s led to a dramatic drop in efficiency of the irrigation systems (large drainage, irrigation channels). At present large areas still have an unclear property status and unresolved responsibility for water system maintenance and taxes (KIOP, 2006). Figure 1 illustrates the project area. The numbers on the map in Figure 1 refer to the pictures at the end of this section taken between on the 27th and 28th of October 2006.

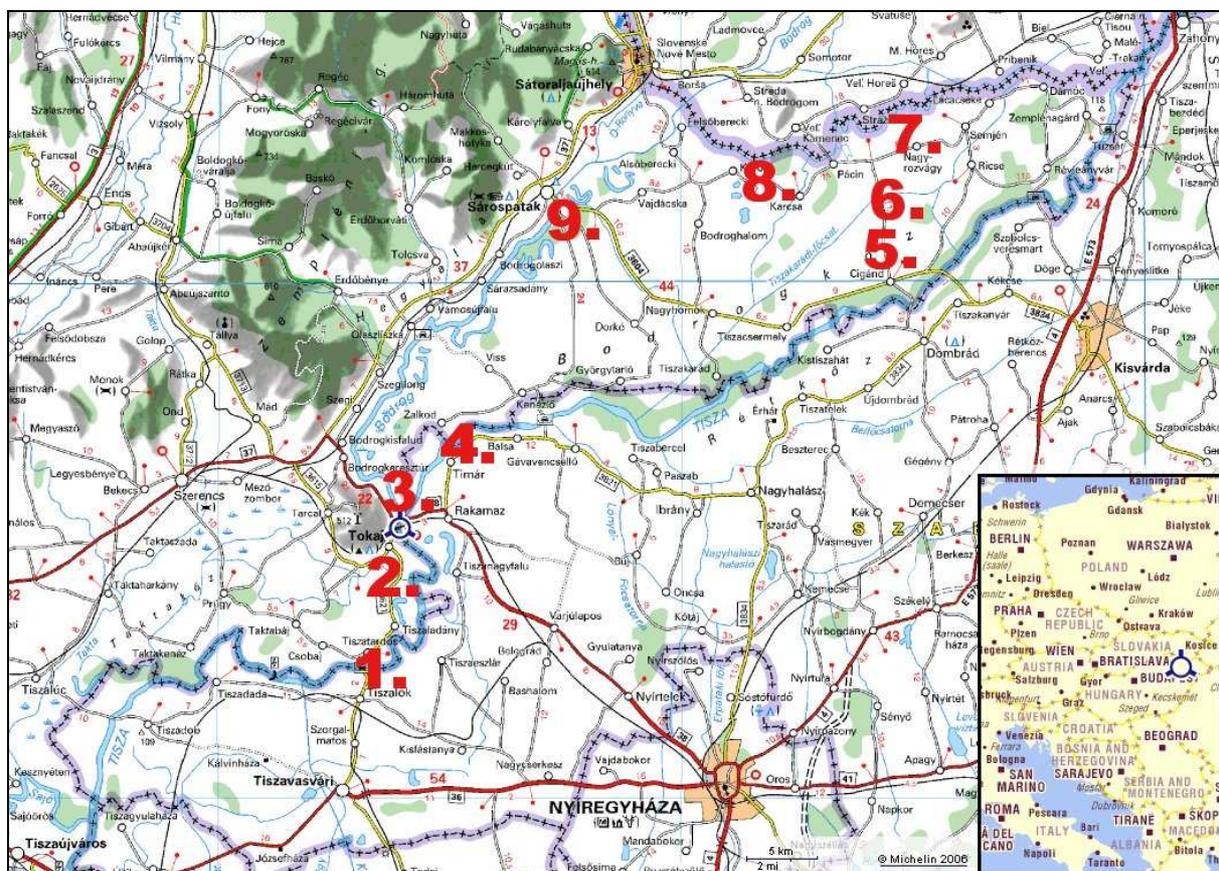


Figure 1: Tisza region: Tokay and Bodrogköz Area

3.2 Main impacts of climate change

The main signs of climate change are variation of precipitation and temperature. In the Tisza region, these result in a higher frequency and intensity of (extreme) floods and droughts. During the last 6 years there was at least one severe flood each year, of a magnitude that previously happened once per 100 years. At the same time, the plains between Danube and Tisza are especially drought prone. The predictions suggest more irregular rainfall and a warmer climate in the Carpathian basin (Láng, 2006). Climate change is connected to the three main water related problems of the Tisza regions 1) floods; 2) in-land water stagnation; 3) droughts. Current policy plans aim to address these problems together, e.g. through the retention of water combined with appropriate land use management.

3.3 Policy response to climate change impacts: the New Vásárhelyi Plan

Already challenged by present flooding events, the recent predictions of an increased incidence of floods and droughts, has been a driving force behind numerous studies and elaborate water management plans. Among the first policy responses to climate change at the national level has been the VAHAVA project (Láng, 2006). The main objective of the project was to assess the needs for adaptation and mitigation in Hungary. The VAHAVA project delivered a set of more detailed recommendation and regionally-oriented programs. Among others, it stresses the significance of the implementation of the new Vásárhelyi Plan as a program to deal with future flood risks and rural development at the same time.

New flood control measures development has started in the frame of the New Vasárhelyi Plan (VTI) (1st phase of planning: 1999-2002, 2nd phase: 2003-2005). The plan's main aims are to reduce the flood risk, improve the prevention by introducing flood polders (retention areas) as well as increasing the water flow in the main riverbed. It identifies micro regions for water retention (flood polders and the tradition 'foks') and enacts the revitalization of floodplains as the preferred adaptation strategy in integrated river basin management and rural development (VÁTI, 2003). Three stages of the Vásárhelyi water management plan (VTI) have to be distinguished:

1. Announcement and first design of plan by water authority. The first plan consisted mostly of classical flood protection measures (dikes, drainage, mono-purpose reservoirs) (2000)
2. Protests against plan mostly on environmental grounds. Alteration of the plan in a cooperation of environmental and water bodies. Introduction of the concepts of floodplain management and rural development (2002)
3. Implementation of plan. Currently underway with a focus on classical flood protection measures and some environmental concerns. The regional development side of the plan is lacking behind (present)

The initial plan was developed by the water management authorities and planning agencies. Next civic organizations (e.g. WWF Hungary) have been involved to review and comment the plan. In autumn 2002 the Bokartisz Public Utility (www.bokartisz.hu) in collaboration with other civic organizations along the Tisza asked for a review of the plan and tried to enter cooperation with the national planning bodies with small success. Their integrated concept (Bokartisz, 2005; Figure 2) was at that time already developed (in collaboration with VÁTI Ltd.) and negotiated with local municipalities for the Bodrogköz area. Two national research groups - the Budapest Technical University and the RISSAC HAS - were involved in the conceptualisation, testing and further development of the concept. The first results convinced the VTI planning panel in February 2003 that the on shallow flooding based floodplain revitalization concept (floodplain revitalization) can be an alternative for the classical flood protection measures in the first version of the plan. A more integrated approach could provide more benefits in the long term for the Tisza region (e.g. Flachner, 2005).

In the second phase, the VTI plan was modified into a complex, integrated plan. The major decisions were taken at the inter-ministerial panel where regions and civic organizations were also invited. The Ministry of Environment and Water led the cooperation with the Ministry of Agriculture and Rural development, the Regional Development Agency and other ministries (social, labour). For two years the decision-making bodies in the Ministry of Environment and Water and the inter-ministerial panel collaborated intensively with the planning agencies, research institutions, local civic groups and other stakeholders. With high local participation the revitalization of floodplains was enacted as the preferred adaptation strategy in integrated floodplain management and rural development. Until the formulation of the government decree (1107/2003) on the implementation of VTI the inter-ministerial panel was quite active. Sometimes twice a month meetings were organized and intensive discussions took place. The government decree contains the planning of the first six flood retention reservoirs with floodplain revitalization where local stakeholders agreed, and integrated rural development program for the region and all involved micro-regions (130 billion Ft / 520 million euro) (www.kvvm.hu). The planned flood retention areas are multifunctional and aim to:

- ◆ Contribute to the reduction of flood risk,
- ◆ Provide water for floodplain revitalization over the year by controlled outflow,
- ◆ Implement land use change for areas at high risk of water logging and low soil quality
- ◆ Serve nature protection through sustainable land use and water use
- ◆ Create the basis of integrated rural development.

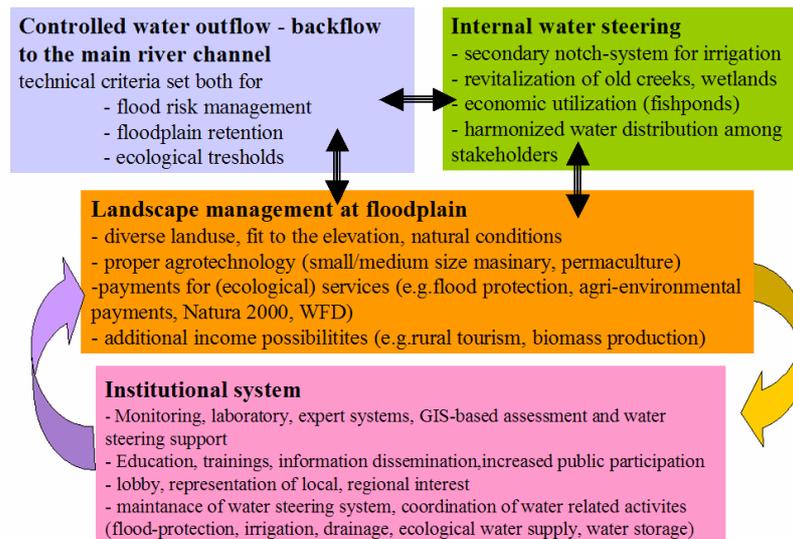


Figure 2: Integrated Floodplain management (IFM) (After: Last strow program; Bokartisz, 2005)

During the last (on-going) stage, water infrastructure is under planning and the first polders are being implemented. The related measures such as integrated rural development, special floodplain production cycles – e.g. extensive fishing, utilizing biomass of water related areas, floodplain orchards – are not introduced, or with many delays. Many reasons have been identified for the delays. The implementation of the plan faced problems with land acquisition, getting the authorisation of the measures and high flood risk during the spring of 2006. Fragmentation of responsibilities and funding and the lack of a strong management body impeded implementation and caused its comparatively low ranking in national development priorities. There is a lack of political awareness and measures that support the process and create a positive economic-social atmosphere for floodplain revitalisation and rural development. EU accession and the accelerated implementation of European directives and legislation have added to the complexity of institutional responsibilities and financial flows. Divergence in the objectives and mandates of institutions slows down the implementation of cross-sectoral initiatives. The severe budget deficit forces the Hungarian government to cut expenses. At the same time, EU standards and practices for agriculture and water management offer an opportunity to make existing institutional and planning practises more effective and sustainable.

As existing government structures fail to deliver to the inhabitants of the region, people are losing faith in governmental organizations at all levels. It is against this background that this paper looks at the barriers of implementing the VIT plan from the perspective of earth system governance.



1. (Left) Oxbow lake at Tiszalök with Tokaj Hill in background
2. (Right) Winery between Mád and Tokaj with old mansion & award winning new production facilities



3. (Left) Meeting of river Tisza and Bodrog at Tokaj

4. (Right) Oxbow lake at Timár



5. (Left) Construction of dike along retention reservoir in Bodrogek at Cigánd

6. (Right) Project site retention reservoir in Bodrogek at Cigánd (part of VTT plan)



6. (Left) Spillway of retention reservoir in Bodrogek North of Cigánd

7. (Right) Village of Nagyrovagy. Traditionally houses are build on higher alleviation against flood risk



8. (Left) Monument with Tokay Hill in background

9. (Right) River Bodrog at Sárospatak

Figure 3: Pictures of the project region: Tokay and Bodrogköz Area

4 DRIVERS, BARRIERS AND OPPORTUNITIES FOR ADAPTIVE FLOODPLAIN GOVERNANCE IN THE TISZA RIVER BASIN

This section looks at the development and retarding implementation of floodplain management in the New Vásárhelyi plan (VTI) from the perspective of earth system governance (Biermann, 2007).

4.1 Problem structure: drivers for adaptive floodplain governance

This sub-section aims to assess whether the institutional development of adaptive floodplain management in the Tisza region constitutes an earth system governance problem. It compares the key water related problems reported by interviewees and workshop participants in the Tisza region to the definition and key problem structure of earth system governance.

The workshop with representatives from the Tisza region discussed the vision that the participants have for the region. The workshop participants carry the vision that it is a possibility to make land-use more sustainable and climate proof using the natural capacity of the floodplain, locally adapted agricultural practices and local markets. Land-use and water management would build on the traditional ‘fok’ system, reducing flood and drought risks and creating diverse local job opportunities. Such a shift –however- would have to be supported institutionally and financially from the national and regional level. The connection between science, planning and the needs of the locals is weak at present. Science is challenged to bridge the gap between the “official” science and local daily practices (that developed over centuries and have a potential to cope with changing conditions in a more flexible and effective way). Institutions likewise have to bridge the gap between national planning and local realities and capacities. The vision of sustainable floodplain management and the quest for institutions that can support this vision agree well with the general definition of earth system governance in Biermann (2007). Below the typical problems identified by the interviewees and workshop participants are presented, using Biermann’s problem structure.

4.1.1 Uncertainty

Individual, social and political uncertainty is increasing. There is an important connection between the hydrological regime and land-use/land-cover condition of up- and down-stream areas along the Tisza river. Consequently, the climate related risks in the climate-sensitive Tisza river regions are increasing and include not only flood or drought risks but also water quality, income inequalities (e.g. direct impacts on agribusinesses and indirect through access to compensation schemes) and social tension (e.g. Roma minorities often live in flood prone areas). All interviewees stressed that social and economic conditions have to be taken into account, since the economic conditions determines the level of vulnerability to climate change. Due to the relatively poor socio-economic conditions in the Tisza region, the region is more sensitive to climate change and has less means to improve adaptive capacity. Uncertainty about compensation schemes, property rights, the virtual non-existence of insurance schemes as well as non-compliance with existing regulation add to the individual uncertainty and the willingness of individuals to

engage in community action. The retarding implementation of nationally agreed programs like the VTT adds to the political uncertainty.

4.1.2 Temporal/Intergenerational Interdependence

Current land-use patterns conflict with the natural capacity of the area to adapt to (climate) change. The river and its floodplains have been heavily modified over the past 130 years. To cater for large-scale mono-agriculture and river transport the river was canalised and straightened and the floodplains drained. The reoccurrence and high visibility of floods caused resources to be funnelled into an extensive flood defence system. These changes have disrupted the natural river system and the ecosystem services it delivers. The buffering capacity for flood mitigation has been reduced as well as the diversity and abundance of local products like fish and fruits. Thus the historical context of the problems and traditional experience of coping with floods and droughts are of great importance.

4.1.3 Functional Interdependence

The area is struggling socio-economically; local markets are weak and the attachment of local people waning. Globalisation and monoculture have disrupted local markets and the interdependence between the rural and urban subsystem. Local parties respond to the interests of “outside” parties exploiting the area rather than to local markets. The interests of the local population in participation and solving problems weakened. There is a strong tendency to abandon the area. The relatively isolated and poor socio-economic position of the area requires regional development to be incorporated in any intervention, including mitigation and adaptation to climate change. Water and land-use management are tightly connected to regional development through o.a. agricultural production, energy production, transport and markets for local products.

4.1.4 Spatial Interdependence

Development of the region does not have a high national and regional priority. The area depends on local, regional, national and transboundary cooperation. The part of Tisza region covered in the VTT lies in the far eastern part of the country. It stretches over three administrative regions. In each of these three it lies in the periphery. National and local attitudes to the socio-economical and environmental problems of the Tisza area differ. Planning and budget allocation are highly centralized. This causes systematic under-funding and not enough support at the national and regional level (e.g. not effective design and implementation of the development policies and regulations). Spatial interdependencies reach from the waning local cooperation to the national and transboundary setting. Deforestation in Ukraine and toxic spills in Rumania influence the water quantity and quality in the Hungarian part of the Tisza river. Institutionally the region is subjected to policies and regulations from the global and EU level down to the local level.

4.1.5 Extreme effects

Extreme events are more frequent. The more frequent and irregular floods and droughts in the region are an important driver to call for more adaptive floodplain management in combination with regional development as advocated in the VTT plan. The new VTT plan signifies a paradigm shift from the engineering based approaches that dominated water management in the Tisza for over a century.

4.2 Lack of governance principles: barriers for adaptive floodplain governance

This section compares the barriers to the implementation of the New Vásárhelyi plan (VTT) that interviewees identified with the key earth system governance principles to assess whether these governance principles (or the lack thereof) explain the retarding implementation and/or whether additional principles are suggested. With the VTT, the Tisza region focuses on adaptive floodplain management as an integral strategy to build and support the capacity of the socio-economic system to adapt to climate change and to comply with mitigation goals. Notwithstanding their diverse background, the interviewees agreed unanimously that the VTT is a promising plan that puts flood protection measures and land use changes in the overall perspective of regional development. Both in terms of public participation and integrated land and water management the plan is progressive and has the potential to increase the capacity of the area to cope with the impact of climate change. Yet, implementation does not comply with the initial design and is (partially) delayed. Interviewees pointed at the lacking institutional support, (financial) participation and political consensus as main reasons for the delays. Below more specific barriers for implementation of the VTT are discussed in their relation to Biermann’s (2007) governance principles.

4.2.1 Lack of Credibility

The different parts of the VTT plan are implemented at different speeds. The implementation of the agro-environmental elements is lacking behind implementation of the flood protection measures. Although the VTT was a highly appreciated program it did not receive the appropriate funding (it was one of the two 'high appreciated' programs, the other -a highway program- received most resources). Financing depends heavily on the state budget. The focus of the national government in using EU funds does not support implementation of the VTT (e.g. on transport sector for cohesion fund and on Pillar I in the common agricultural policy of the EU). After the first enthusiastic approval, the cost of the measures (e.g. financial support, reallocation of land), were considered too high. In addition there were problems with contracting: some partners were paid late or not at all.

4.2.2 Lack of Stability

From an expert program the project became a political debate. Authorisation of plans took longer than expected. Although (fragments of) the VTT's regional development plan are included in the new national development plan, it is not included in the (regional) operational programs that are crucial for the allocation of funds. The focus in the implementation is on short-term events & solutions. Flood prevention measures can be realised relatively quick, whereas the implementation of agro environmental schemes requires intensive cooperation of many farmers, which takes a long time to realise. In addition prioritisation is dominated by disaster relief and not by prevention / proactive measures. For example after a flood -understandably- traditional flood protection measures are prioritised.

4.2.3 Lack of Adaptiveness

The sectoral approach and disagreement between ministries on how to prioritise regional plans and spend the available finances at the start of the implementation led to an impasse. Existing subsidies have not been changed to support floodplain management but continue to favour monoculture and non sustainable land use (e.g. compensation for agriculture in waterlogged areas). In addition the change to a more adaptive sustainable regional land use with lower flood risk is barred by the high influence that the needs of urban regions and other external influences have on the rural sector and the related land use.

4.2.4 Lack of Inclusiveness

There are gaps in the institutional structure. There is no clear body responsible for the implementation, for securing finances or for facilitating the cooperation between different parties (at all levels of governance). Actors are pointing at each other for implementation and finances. Communication is disrupted. The different sectors that were involved in the design of the plan have not been prepared for its implementation in an equal way. NGOs actively involved in development of plan but less in the implementation. Nor have the NGOs made the transition to becoming a partner in implementation. (Financial) decisions about the implementation are taken centrally without taking into account (the interests of) local people and processes.

Overlapping interests and disagreement between sectors in the past resulted in a situation where every actor (e.g. sectors, enterprises, government) tried to exploit the area in the interests of its own neglecting the concerns of the others and the area at whole. A detailed land use vision and land consolidation plan are missing. People living in the area cannot find their interests in its development and sustainable use. Landownership and nature conservation hindered the selection of the most efficient polders from a water management perspective. Cooperation with local inhabitants and landowners proved difficult as is expropriation. The problems started when the government said it would pay for land use change and the farmers were found to ask a very high price. Although not mentioned explicitly in Biermann (2007) another element of the inclusiveness could be that information on planning and on risks and benefits is not shared equally among actors.

4.2.5 Other barriers

Most barriers that the interviewees mentioned can be associated with a lack of one of the four governance principles above. Other barriers are reported here. Planning is difficult as the roots of 130 years of bad water management in the Tisza have to be addressed. After the development phase of the VTT the expectations in the region were very high. Interviewees from the region reported delays that are not recognised by interviewees at the national level. Interviewees also reported that the area of the VTT plan lies in the far eastern part of the country, which is traditionally neglected by the national government.

The different organizational level mandates and interest overlap and are often conflicting. This has not been resolved in the development of the plan. In addition the area of the VTT plan lies in three different

regions. Thus the plan has to be included in three regional operational programs. In each of these regions it is in the periphery getting low priority.

4.3 Research challenges: opportunities for adaptive floodplain governance

The interviewees have identified different options to further the implementation of the VTT and facilitate adaptive floodplain management institutionally. This section aims to assess whether earth system governance research –when guided by the research challenges in Biermann (2007) - supports these options and / or suggests new directions for the development of institutions for adaptive floodplain management. Below options identified by the interviewees are presented under the research structure of Biermann (2007). Future work in the Tisza region will have to detail, discuss, test and evaluate promising sets of options.

4.3.1 Architecture

The interviewees agreed there is a general need to evaluate the current institutional setting for its support of adaptive floodplain management. This includes both the architecture of the mandates and responsibilities of the parties involved at different organisational levels as well as detailed elements of the legislative structure, e.g. how land is classified under the agri-environmental schemes. With respect to the architecture of adaptive floodplain governance, three options get most attention in the interviews:

1. Clarify the roles of different parties in VTT implementation (at all levels of governance including civil society) and create a mandated organisational structure responsible for a.o. the implementation, securing finances, facilitating the cooperation between different parties (at all levels of governance) and/or norm control to see whether project implementation matches the project plan.
2. Establish national coordination through e.g.: i) One strong coordination office above the ministries that sees to it that the elements of the national development plan are included in the regional operational programs, ii) Revitalise the inter-ministerial panel (for strategic coordination and harmonisation. With representatives of ministries, regions, NGOs and planners) and support it by an (operational, sufficiently mandated) coordination unit, iii) A working group set up by the national development agency with representatives from the operational programs to coordinate the national high level priorities.
3. Integrate climate proofing and strategic (environmental) assessment and mainstream climate change adaptation with a.o. national policies and programs on transportation, infrastructure, local energy production, regional development, spatial planning and the EU & Hungarian UNFCCC implementation. Amend existing water management schemes for (future) impacts of climate change.

4.3.2 Agency beyond the State

In relation to the evaluation and the architecture of the institutional setting most interviewees stressed the importance to include and clarify the roles of non state actors. To prepare for climate change, interviewees suggested an informed multi-stakeholder approach (e.g. dialogues) at national, basin and regional level to prepare action plans for adaptation and to strengthen regional and local representation (e.g. after the Bokartisz Public Utility). Nation wide an “Hungarian Water and Climate Alliance” could be established as a national umbrella to continue building bridges between the climate and water sector, encourage capacity development to better cope with climate impacts and facilitate obtaining financial support for national, basin and regional level adaptation plans. An alternative to national coordination of the VTT implementation (see the Section ‘Architecture’ above) is to establish a multi-stakeholder implementing agency with half political representation, half other stakeholders. The Tisza Alliance (elotisza.hu) that was established in June 2006 could play a role in representing regional and local actors.

Next to redefining formal relationships, governance and participation, the interviews brought forward options to strengthen informal relations and cooperation with agencies beyond the government. These include on one hand awareness raising about a.o. impacts of climate change, flood risks and saving energy. On the other hand interviewees stressed the importance of local and regional markets and private sector initiatives. One option is to find new partners and encourage local investment in flood protection and river revitalisation. Another to interest urban areas to support the development of rural regions, taking local interests and unique local practices into account to make the system of agricultural land-use more sustainable. Interviewees suggested the promotion of sustainable local markets and a fair economic relationship between urban and rural areas. This requires promoting local products, micro credit program to build local markets, and intensifying the capital transfer between local producers and consumers. At the same time long distance transportation of produce could be discouraged. Local markets also have a role in

enabling land use change by supporting the full chain of land use related products. For example if grazing is increased, milk and meat production will also increase and markets are needed for these products. Finally biomass from floodplain management and local waste could be reserved for small household heating systems.

The role of formal and informal institutions for adaptation is treated in a separate paper at the Earth System Governance 2007 conference (Matczak *et al*, 2007).

4.3.3 Adaptive state

Many options were suggested to change the state architecture especially in relation to architecture and allocation (see below). Although some of these options aim to make non-state actors more adaptive, few options were mentioned to create an adaptive state. At a general level it was proposed to develop national, basin and regional capacities (policies, strategies, research and implementation) and secure financial support for preparation and implementation of regional adaptation plans. In addition positive learning examples should be provided by realising integral implementation of the regional development plans at the first planned sites and pilot projects (e.g. in the Bodrogeköz area). A concrete example of how the state could become more adaptive is in allowing location specific characteristics to be taken into account in land classification schemes underlying agri-environmental subsidies. For example by encouraging local initiatives to classifying water logged areas as 'less favourable areas'.

4.3.4 Accountability

A number of options were proposed to improve accountability. Interviewees reported a need to strengthen the nation wide consensus about the measures in the development plans, including a proper land use vision and land consolidation program together with its legislative support. In addition the link to other policy goals could be strengthened like that with mitigation through bio-fuel and biomass production on locations with a higher flood, drought or waterlog risk. Likewise it is important not to undermine other policies for example by the deforestation of pristine forests in areas contributing to flood control.

4.3.5 Allocation

With respect to the allocation of resources, interviewees suggested to strengthen the link of the VIT and the so-called regional Complex Programs, in particular the Operation Program "Environment" & "Agricultural Development". The allocation of resources is closely connected to the land consolidation challenge that the Tisza region is facing. The costs and benefits of land use change and floodplain management have to be shared between many parties at different scales. A re-evaluation of resource allocation is crucial and should include i) Subsidies for sustainable agriculture and land-use management, ii) Subsidies for renewable energy, levelling the price difference between renewable energy & average energy price, iii) Agro environmental schemes and removing damaging current subsidies like compensation schemes for farmers in areas at risk of inundation, iv) Allocation of block maps & classify water logged areas as less favourable areas, v) Property rights, and iv) regulation of the use of EU funds in several sectors of the Hungarian economy (e.g. CAP to support Pillar III agro-environmental schemes, EU cohesion funds (although current focus of government is on transport rather than agriculture) and Natura2000). Finally policies should aim to connect to peoples everyday economic activities for example through local markets as mentioned under 'Agency beyond the State' above.

5 DISCUSSION & CONCLUSIONS

This paper applies Biermann's (2007) conceptualisation of earth system governance to institutional adaptation of floodplain management in the Hungarian Tisza River basin.

The key *problem structure* of earth system governance covers well the key water related problems in the Tisza region. The major problems that interviewees and participants identified can all be associated with one or more of the key problems for earth system governance. In addition workshop participants confirmed that the overall objective of adaptive floodplain management and the VIT is to support sustainable livelihoods in the region. It is concluded that the Tisza region constitutes an appropriate case for studying earth system governance. The following observations are made with respect to the different components of the problem structure. In line with Root (2005) it may be helpful to distinguish between risk (measurable probabilities) and *uncertainty* (un-measurable probabilities). Political, social and individual uncertainty make it difficult to price climate related risks and use traditional cost benefit approaches to prioritise adaptation options and for people to accept and implement land consolidation schemes. Special

attention may be given to how uncertainty is distributed and transferred between actors. The *functional interdependencies* in the Tisza often have a *spatial* and *temporal* component. To what extent distinguishing between these interdependencies adds to the analysis is unclear. An important extension of the temporal interdependence is that the root cause of the present problems, vulnerabilities and inequalities often lies in unsustainable management of resources and state coordinated interventions in the past. Institutional adaptation may require a deeper change than maintaining the current resource base for future generations. Another interdependency highlighted in the Tisza case is that of urban and rural areas, where the former are increasingly dominating the latter. The Tisza region suggests that interdependencies are not (only) a problem, but creating and restoring mutual dependency could be one of the key principles for earth system governance.

Reflecting on the four ***governance principles*** proposed in Biermann (2007), the following observations are made. The barriers to adaptive floodplain management that actors report on in the Tisza region are well explained by a lack of the principles. From the four principles, *adaptiveness* was mentioned least. The lack of *stability* is seen as a bigger barrier to the realisation of adaptive floodplain management. This can be explained from the perceived uncertainty and the lack of inspiring examples of adaptive governance. Limited legislative support for long term preventive actions is an important barrier for adaptive floodplain management. The lack of *credibility*, coordination and appropriate cooperation between organizations was perceived as the largest barrier. Evidence from the Tisza region suggests negotiated land use patterns are not necessarily the most efficient from a floodplain management and adaptation perspective. Adaptive floodplain management has to be addressed at the landscape scale, requiring cooperation of many actors, land consolidation programs and compensation. The benefits and costs of floodplain management are often difficult to compare or share between actors. To convince local partners as well as national development agencies to cooperate, the cost and benefits of multifunctional land use in the floodplain have to be evaluated against mono culture and traditional flood protection. To remain credible any governance system will have to deal with enforcement and in the case of floodplain management possibly expropriation. Evidence from the Tisza region suggests additional attention for subsidiarity, creating networks and cooperation across scales, open access to information, risk mitigation, benefit sharing and compliance.

Comparing the Tisza region to the five ***research challenges*** in Biermann (2007) yields the following conclusions. Guided by the research challenges, earth system governance research will be able to inform many options to facilitate adaptive floodplain management. The assignment of options to the different research challenges was found to be somewhat arbitrary as the research challenges are perceived to be overlapping. The fact that all research challenges are recognised by actors in the Tisza region indicates not only that they are all relevant but also that they cannot be studied in isolation but have to be addressed together. From the five research challenges options for an *adaptive state* were mentioned least. It should however not be concluded that the adaptive state or the overarching concept of adaptive governance (Folke *et al*, 2005) is less relevant, as it explicitly aims to respond to the key problem characteristics of earth system governance that are well recognised in the Tisza region. Rather the results from the Tisza region suggest that the adaptive state is a relatively new concept that needs to be demonstrated to gain in appreciation. Its institutions will have to be designed and research on this topic may inspire new options to be considered in adaptive floodplain management. Experience from the Tisza region suggests a particularly strong interest in research on *agencies beyond the state*. This explicitly includes both formal and informal institutions. The first can mainstream adaptation and is required to include adaptation in longer term planning, investment & large scale infrastructure. The latter are crucial in strengthening autonomous adaptation and adaptive capacity (see also Matczak *et al*, 2007). The *allocation of resources* is closely related to the land consolidation challenge that the Tisza region is facing. The costs and benefits of land use change and floodplain management have to be shared between different parties (at different scales). The appropriate mix of compliance and compensation has to be established.

Summarising it is concluded that regional experience from adaptation to climate change can inform earth system governance research. Biermann's (2007) conceptualisation of earth system governance explains well the main drivers, barriers and opportunities for adaptive floodplain governance in the Tisza region. It does however not help prioritise barriers or identify research areas of particular importance. This paper did not aim to distinguish between different actors and levels of governance in their contribution to

adaptive floodplain governance. An interesting topic for future research is the description of the past, present and future governance system, giving extra attention to the drivers of stability and change. These explicitly include formal and informal institutions from the global and EU level down to the local level. An important question is the role of developing and implementing a floodplain management plan like the VIT in the adaptation of governance. At present, state actors and non-state actors try to cooperate in the Tisza region to set up informal institutions and realise an agency beyond the state that supports sustainable livelihoods in the Tisza region. The Tisza Alliance that was established in June 2006 is an example. Many challenges lie ahead for credible, stable, adaptive, and inclusive floodplain governance. The authors of this paper look forward to discussing these challenges with the participants of the Amsterdam conference.

6 ACKNOWLEDGEMENT

The work has been supported by a grant from the European Commission through the EU research project ADAM (Project no. 018476-GOCE). The authors would like to thank research partners Istvan Láng, Zsolt Harnos, Márton Jolánkai, Péter Balogh and Géza Molnar for their support in the Tisza region. We thank all interviewees and participants of the Tisza region workshop for sharing their experience on institutions and adaptation in the Tisza region. Research partners, especially Jochen Hinkel and Rik Leemans have been a source of inspiration.

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