

2012

Complex interdependencies in the Mekong River basin: explaining water cooperation



Judith Nijenhuis, S3009270
Bachelorthesis GPM
Faculty of Management
Radboud University
June 2012

Complex interdependencies in the Mekong River basin: explaining water cooperation

Judith Nijenhuis, S3009270
Bachelorthesis GPM
Faculty of Management
Radboud University
June 2012
Tutor: Henk Donkers

Foreword

Before you lies the result of a project that has drawn me into a region of the world that I was fairly unfamiliar with before. Half a year ago, the Mekong River Basin only brought words like 'conflict' and 'poverty' to my mind. But after immersing myself in the dynamics and complexity of the river basin, the words I would use to describe it now are quite the opposite: 'cooperation' and 'development'.

Immersing myself in this big project has been quite enjoyable and also quite challenging. Writing this thesis was also probably the most instructive part of my entire bachelor, as I did not only learn a lot about my research subject but also about planning and working independently for a long period of time.

I would like to thank some people who were of great help to me. First, my tutor Henk Donkers, who enabled me to make a flying start, and who kept supplying me with books and papers and good advice. I would also like to thank the people of my thesis study group, Jobke Heij, Susan Verbeij and Lesley Ter Maat, who were prepared at all times to answer my questions, and who helped me from the first steps of the research plan to the dots and comma's of my sources list. Finally I would like to thank my sister, Laura Nijenhuis, who borrowed me her English writing guide and was very helpful in answering my questions about English grammar and sentence structure.

Nijmegen, May 1st 2012

Judith Nijenhuis

Summary

Water is increasingly becoming a scarce resource. In the 1980's a number of authors argued water was becoming a major source of conflict. They supported the 'water war hypothesis' which states that nations are prepared to go to war in their competition over water. But nowadays the conventional perception in the academic world is that water can induce cooperation as well as conflict. The Mekong River basin is an example that demonstrates conflict over water is not inevitable. The Mekong riparians share a history of conflict, and have many characteristics associated with conflict, like rapid economic growth, unstable governments and high population growth rates. Nonetheless, some of the riparians cooperated in the field of water management, even in times of conflict. A body for river management was set up before any conflict related to the development of the common water resources occurred. And although there is a lot of discussion about the best course of action for the basin, the riparians are praised for their cooperative 'Mekong spirit', and Mekong river cooperation is regarded as rather successful. River cooperation helped to overcome the mistrust fostered by years of conflict, and was a start for cooperation in other fields as well.

The aim of this research is to explain the successful river cooperation in the Mekong river basin. In order to do this, it combines a systems perspective with a branch of international relations theory; liberalism. Liberalism offers the notion of complex interdependence, which holds that states are so dependent on each other in many fields, that it is too costly for them to go to war. Cooperation is a more favourable option, and liberalism predicts nations will form international organizations to manage their fields of interdependence together. Liberalism also offers assumptions about the drivers of cooperation, and puts forward some reasons why cooperation is so favourable. These liberalist assumptions are combined with insights from specific research on conflict and cooperation in river basins. The result is a list of fields of interdependence, from which this research starts exploring complex interdependence in the Mekong river basin.

To examine complex interdependence as an explanation for Mekong river cooperation, this research opts for a systems perspective. The basin is regarded as a complete system with many elements that are interrelated, a network of complex interdependence. Four fields of interdependence are examined:

- economic interdependence (includes variables like trade, poverty, employment, infrastructure, socio-economic disparities and economic growth)
- socio-environmental interdependence (includes variables like biodiversity, deforestation, subsistence farming, environmental degradation and stress on natural resources)

- political interdependence (includes variables like cooperation, enemy images, conflict, institutions, power inequality and integration)
- hydropower interdependence (includes variables like energy demand, dam construction and flood regulation)

For each field of interdependence a model is presented that visualises the variables and their connections. And as the fields of interdependence are also interrelated themselves, a general model of interdependence is also presented. The five interdependence models show the extreme degree of connectedness and interdependence in the basin. The Mekong riparians have highly interdependent economies, they depend on each other to sustain the balance between the social and the environmental, and they are highly interdependent when it comes to politics and hydropower.

Complex interdependence is then considered as an explanation for Mekong cooperation. Three explanations are offered to explain how complex interdependence induces cooperation. Firstly, as the interdependence models have shown, cooperation has a lot of positive effects on the river basin system, that range from infrastructure investments to flood monitoring. Non-cooperation would result in a disruption of these positive influences. Also, the riparians cooperate to fight cross-border issues and problems, like diseases and human trafficking. Non-cooperation would also mean a halt in the progress that has been made. And as it concerns problems that are not contained by national borders, the riparians would have a hard time dealing with them on their own. Secondly, the riparians face a number of challenges in the future. The first effects of climate change have presented themselves. The riparians have to find a balance between development and conservation, and meet the needs of many in a rapidly changing context. Thirdly, the sheer complexity of the interdependence relations between nations in itself can be considered as an explanation for cooperation, as non-cooperation would result in a disruption in the system, which would have unpredictable - but probably disastrous - consequences.

Looking at the river basin as a whole, and seeing it as a system leads me to conclude that the basin is an arena of trade-offs rather than an arena of competing interests. The people in the basin are highly dependent on their environment, and their lives are changing rapidly due to economic development, which also fuels hydropower development. Choosing a course of action for the riparians is difficult, as any choice they make will have multiple impacts on the system and some of these impacts may be considered unfavourable. Interdependence modelling can be of help when making (policy) decisions, as it visualises both long and short term consequences, and both intended and unintended consequences of interference in the system.

Table of contents

Foreword.....	3
Summary	4
1. Introduction	7
1.1 Project framework	7
1.2 Research aim and questions	9
1.3 Societal and scientific relevance	11
1.4 Structure	11
2. Theoretical framework.....	12
2.1 Water as a generator of conflict or cooperation	12
2.2 Liberalism.....	14
2.3 System dynamics (as a theoretical perspective)	16
3. Methodology	18
3.1 General characteristics	18
3.2 System dynamics (as a methodology)	18
4. The Mekong river basin.....	20
4.1 A first look at the river basin.....	20
4.2 The riparians and their interests.....	26
4.3 River cooperation in the Mekong river basin	27
5. Complex interdependencies in international river basins	30
5.1 Interdependence in liberalism	30
5.2 Interdependence in international river basin research	33
6. Complex interdependencies in the Mekong river basin	38
6.1 Economic interdependence	38
6.2 Socio-environmental interdependence	41
6.3 Political interdependence	45
6.4 Hydropower interdependence	48
6.5 Explanation and justification of the models	51
7. From interdependence to river cooperation	57
8. The added value of systems thinking.....	60
9. Conclusion	63
9.1 The Mekong river basin as an arena of trade-offs.....	63
9.2 Reflections and suggestions for further research and practical application	64
Sources	67
Appendix	73

1. Introduction

This chapter starts with an introduction to the main questions and concepts on which the research is based, and an introduction to the Mekong river basin. This results in a research aim and question, a number of sub questions and a research model. Also, the societal and scientific relevance of the research will be discussed.

1.1 Project framework

Omnipresent in the literature about water conflicts is the ‘water war hypothesis’, that states water is a substance that can be valuable enough to provoke war. The hypothesis has influenced political leaders, policy makers, the media and NGOs (Katz, 2008, p. 79). It has influenced researchers to investigate what factors help conflict emerge (Yoffe et al., 2004; Dinar et al., 2007; Gleick in Dinar et al., 2007, p. 35; Beach et al., 2000, p. 42-43). Recently authors have abandoned the water war hypothesis, as research indicates water is not only a source of conflict but also a source of cooperation (Wolf, 1998; Tvedt, 2011; Dinar et al., 2007; Katz, 2008). In recent history, cases of water cooperation outnumber cases of water conflict on a global level (Tvedt, 2011; Dinar et al., 2007, p. 18; Katz, 2008, p. 73-75).

The new challenge is to explain why nations would cooperate when it comes to their scarce water resources. The few authors who try to explain cooperation are either very specific or very general. Some authors try to determine which country characteristics correlate with cooperation, for example the political structure of a country (Anisfeld, 2010, p. 269), the level of development (Yoffe et al. and Gleditsch et al. in Anisfeld, 2010, p. 269; Beach et al., 2000, p. 42-43), and the presence of institutions (Wolf in Anisfeld, 2010, p. 270; Beach et al., 2000, p. 42-43). Other authors look at the general overview of relations and complex interdependencies between countries (Elhance, 1990; Gleick in Dinar et al., 2007, p. 35; Öjendal, 1995, p. 161-162) and shared interests (Wolf, 1998; Keskinen et al., 2008, p. 84).

Öjendal (1995, p. 161) describes the interdependence idea as follows: *‘different states should be so dependent on each other that none of them can afford to resort to violence to solve conflicts’*. Elhance acknowledges complex interdependence as an important factor that explains interstate conflict and cooperation: *‘The hydrology of an international river basin also links all the riparian states sharing it in a complex network of environmental, economic, political, and security interdependencies, in the process creating the potential for interstate conflict as well as opportunities for cooperation among the neighbors’* (1990, p. 13). In his book Elhance combines interdependencies and basin specific characteristics to explain conflict and cooperation in six international river basins.

He identifies a lot of interdependencies in many different fields, but describes them in a rather loose, narrative way, instead of providing a systematic overview. He concludes the interdependencies explain cooperation or conflict, but does not state which interdependencies led to peace and which led to conflict, and how the interdependencies influence each other. A systematic overview of the interdependencies in an international basin where successful cooperation is taking place may provide new insights in the nature of interdependencies, how they are related and how interdependencies lead to cooperation.

The Mekong River basin (figure 1) has been mentioned by many as a showcase of good cooperation (Wolf et al., 2005, p. 85; Beach et al., 2000, p. 44; Gajaseeni et al., 2006; Phillips et al. & Jacobs in Keskinen et al., 2008, p. 79). The successful cooperation is especially surprising because the Mekong River basin has many of the characteristics that have been identified as typical for situations of water conflict. For example, it is a very unstable area with high population growth (Pech & Sunada, 2008, p. 219; Asian Development Bank, n.d.; Keskinen et al., 2008, p. 82), uncontrolled urbanization (Asian Development bank, n.d.; Keskinen et al., 2008, p. 82), a rapidly changing economy (Elhance, 1999, p. 197; Keskinen et al., 2008, p. 82), poverty (Chomchai, 2005, p. 139; Öjendal, 1995, p. 149; Fox & Sneddon, 2007, p. 244) and unstable governments (Öjendal, 1995). The region has experienced many conflicts, also in the recent past and enemy images still remain (Öjendal, 1995).

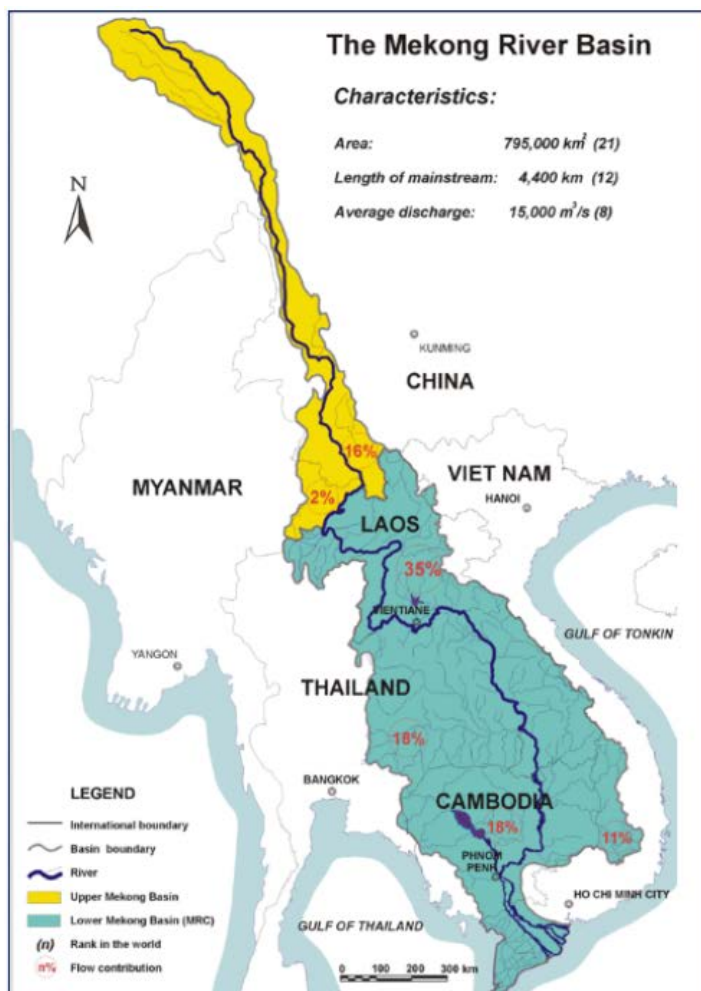


Figure 1: The Mekong river basin, (From: Cooley et al., 2009, p. 20).

But somehow, despite all these characteristics the Mekong demonstrates peaceful cooperation is possible. Öjendal (1995, p. 161-162) mentions complex interdependencies as one of the explanations for the Mekongs cooperative situation, but does not develop this idea any further. Other authors mention examples of complex interdependencies in the Mekong river basin, although they do not identify them as such. For example, Gajaseni et al. (2006, p. 54) describe how improved navigation would be an important impulse to trade, but would also mean a change in the rivers ecological characteristics, with a negative impact on biodiversity. Phillips et al. (2006, p. 97) point out how on one hand, the poor could benefit if the rivers potential was developed, but on the other hand the poorest communities are those who are most dependent on the rivers ecosystem for their survival and income. Jacobs (1994) illustrates how hydropower development could provide clean energy as an alternative to fuel wood use, and thereby help to slow down large scale deforestation. But hydropower projects up till now have also had negative environmental and social impacts due to ill planning.

These examples indicate complex interdependencies are present in the Mekong river basin, connecting the river to the environment, the inhabitants and the economy in a complex system. The Mekong river basin seems to be a suitable case to analyse complex interdependencies in a systematic way, and see which insights this approach can add to present theory.

1.2 Research aim and questions

With this research I hope to refine theory, I will not try to intervene in a practical situation. My aim is to refine the currently little developed insights on the role of complex interdependencies in situations of water cooperation, through systematic analysis.

The aim of the research is further refinement of the theory of complex interdependencies as a factor that contributes to water cooperation, by examining the role of complex interdependencies in the real life situation of the Mekong river basin.

To achieve this aim, the following main question has to be answered:

Which complex interdependencies are currently present in the Mekong river basin and how do these interdependencies induce cooperation instead of conflict?

This main question has been split up in four sub questions:

1. Which interdependencies may induce (water) cooperation between nations?

The purpose of this question is to indicate which interdependencies are relevant to determining a

situation of (water) cooperation or conflict, by examining liberalist hypotheses on which and how interdependencies induce cooperation and looking at the assumptions made about water cooperation and conflict in the literature on conflict and cooperation in international river basins. Answering this sub question results in a list of generally relevant interdependencies, which will be examined in the case of the Mekong river basin by the next question.

2. Which interdependencies play a role for the Mekong riparians?

With this question I try to identify the main interdependencies for the Mekong riparians. The list of generally relevant interdependencies will be checked with the practice of the Mekong river basin, which may result in slight changes in the list due to the specific situation of the Mekong.

Interdependencies influencing the state of conflict and cooperation in the Mekong river basin will be systematically represented in models. The accompanying chapter describes and justifies the models.

3. How do these interdependencies induce cooperation instead of conflict?

This question bridges the gap between the descriptions and models of the interdependencies and explaining cooperation. Answering it involves analysing the models.

4. (How) can complex interdependencies be a valuable addition to theory about water cooperation?

This question serves as feedback to the theory, because my research aim is to use my insights to refine theory.

The general structure of the research is visualized in figure 2, a depiction of the research model.

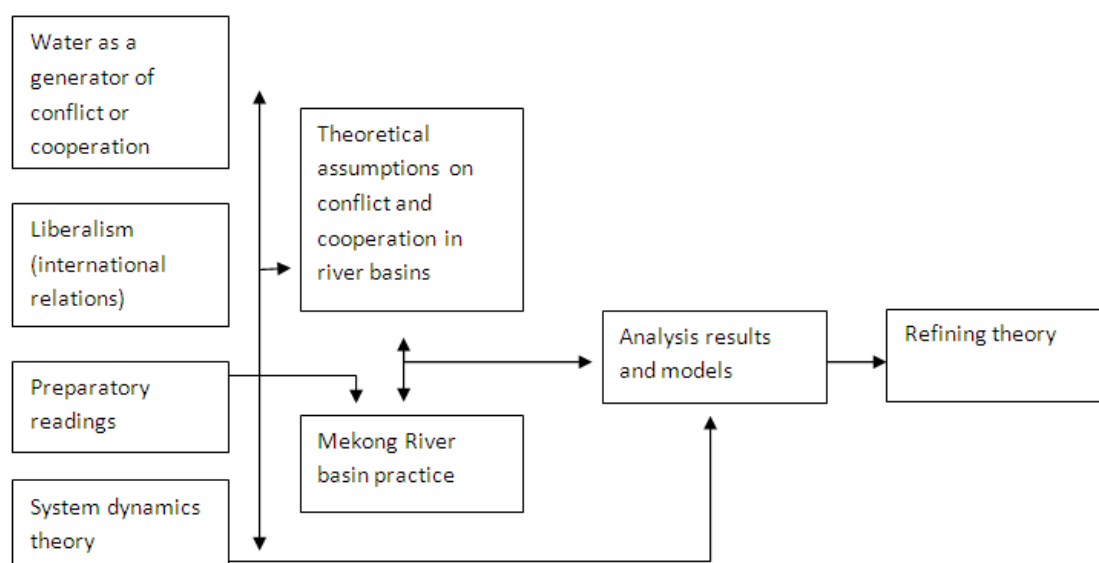


Figure 2: the research model

1.3 Societal and scientific relevance

This research has scientific relevance in a direct way, as I aim to refine present theories that name complex interdependencies as a factor that is probably a large incentive for cooperation instead of war. The notion of complex interdependencies remains vague and little developed, but this research aims to find out which interdependencies are relevant in determining river cooperation in a specific case. The insights of this systematic approach to the notion of complex interdependencies serve can be a contribution to present theory.

This research does not aim to solve a practical problem, it will be a contribution to theory. Therefore the question of social relevance is the question of how theory can help to improve the lives of people. With this research I hope to develop our understanding of a factor that is important for cooperation. I assume cooperation is something positive for society, and it should be preferred over a state of conflict. By refining our insights on a concrete factor that encourages cooperation, I hope this will be a step (although a very, very small one) towards promoting cooperation in river basins and thereby be beneficial to society. Countries should realize that if they enter into a system of complex interdependencies the chances of war with their neighbors will decrease. If they have already entered a system of complex interdependence, awareness of this system might make them hesitant to start any type of conflict, as it may negatively affect themselves. If riparians acknowledge they are part of a system, developing interdependence models may help them when determining policy and dealing with trade-offs.

1.4 Structure

Chapter 2 presents the theoretical framework of this research, it discusses general theory on water conflict and cooperation, liberalism and the theoretical ideas behind system dynamics. Chapter 3 discusses the general methodological characteristics of the research, and explains the use of system dynamics as a method. Chapter 4 introduces the Mekong river basin, its characteristics, the riparians and its history of cooperation. In chapter 5, it is decided which interdependencies are of influence to a situation of water conflict or cooperation. Liberalism and literature on conflict and cooperation in river basins are combined to establish 4 strands of interdependence. Chapter 6 follows the development of interdependence models for each field of interdependence. Chapter 7 sheds light on the grounds for cooperation, based on an analysis of the role of cooperation in the interdependence models. Chapter 8 serves to illustrate the new theoretical insights this study has provided. It illustrates the advantages of a systems perspective for studying river basins. Conclusions are drawn in chapter 9, which also offers suggestions for further research.

2. Theoretical framework

This research draws on different theories and theoretical insights. Firstly, the scientific debate on the role of water as a generator of conflict or cooperation. For years, the 'water war hypothesis' linked international rivers to conflict, but recent studies suggest water may be more likely to induce cooperation. This is the theoretical debate I am trying to contribute to by examining the role of complex interdependence in river cooperation. Secondly, liberalism will be introduced, a stream of thought from international relations theory that assumes there is a global society of people who are interacting and interconnected. Liberalism is a useful theory for this research because it explains cooperation by pointing out interdependencies and interconnectedness, for example through international organizations. Thirdly, I will briefly introduce system dynamics, which is important to my research because it proposes to see things as part of a system, a central idea to my approach of modeling complex interdependencies.

2.1 Water as a generator of conflict or cooperation

There are two main streams of thought about the influence of water on international relations (Anisfeld, 2010, p. 266). The first stream of thought emphasizes the vital importance of water for national security and assumes nations will fight over water. The second stream of thought argues that water does not necessarily cause conflict, water can just as well be a source of cooperation. Anand (2007, p. 4-9) summarizes their positions as 'water divides' versus 'water unites'.

The water war hypothesis originated in the 1980's, when a range of academic articles were published which predicted that water scarcity would cause conflicts concerning water (Katz, 2008, p. 67). Cooley (1984) for example discusses water conflict in the Middle East and states that '*Long after oil runs out, water is likely to cause wars, cement peace, and make and break empires and alliances in the region*' (p. 10). Other examples are Starr and Stoll (1988) and Naff and Matson (1984). These articles were quoted by international leaders, received a lot of attention in the media and were picked up by development organizations. Wolf (1998) explains they mainly saw water as a very unpredictable but irreplaceable substance for which hardly any legal principles existed.

In support of the water war hypothesis

Several political leaders have stated that water is indeed a resource they would start a war over, and even if leaders did not state the importance of water of such, it was often on the political agenda (Darwish, 2003). Especially in the turbulent Middle East there seems to be a realistic threat for nations to go to war over water. The water war hypothesis has therefore been taken seriously by the

political and academic world. The water war hypothesis was included in the 'Our common future' report by the Brundtland commission and US intelligence services were inspired by the hypothesis to compose a list of areas with high prospects of water wars (Katz, 2008, p. 68). Empirical research has shown there are statistically significant relations between scarcity and militarized conflict (Furlong et al., 2006; Hensel et al., 2006) and that countries that share a river are more likely to experience violent conflict than neighbouring countries that do not share a river (Toset et al., 2000; Furlong et al., 2006).

Refuting the water war hypothesis

There is however also a substantial body of literature that rejects the water war hypothesis. Some authors criticize the content or methodology of pro water war research, arguing the focus on scarcity is too narrow, other variables should be included as well (Katz, 2008, p. 72). Other criticism includes the use of case studies which are nearly always focussing on the Middle East, an area where conflict is indeed present, but where so many other tensions are present besides water scarcity. Conflict and water shortages are present but this does not necessarily indicate a causal relation. The focus on the Middle East leaves doubts if the gloomy predictions can be generalized to the global scale. Finally one may wonder if incidents from the past can be used to support general predictions of war for the future.

Some researchers tested the water war hypothesis by simply counting cases of water war and water cooperation, and found out wars were far outnumbered by cooperative situations (Wolf, 1998; Yoffe et al., 2004, p. 7). Dinar et al. (2007, p. 18) conclude that at least for the last two decennia cooperation around water has significantly been on the rise and conclude that *'the rich history of cooperation over water, demonstrated in thousands of documented treaties, not only outweighs the few examples of water-wars, and military skirmishes over water, but also demonstrates that shared-water resources may ultimately induce cooperation rather than conflict'* (p. 36). Wolf (1998, p. 251) concludes that *'War over water seems neither strategically rational, hydrographically effective, nor economically viable. Shared interests along a waterway seem to consistently outweigh water's conflict-inducing characteristics. Furthermore, once cooperative water regimes are established through treaty, they turn out to be impressively resilient over time, even between otherwise hostile riparians, and even as conflict is waged over other issues.'*

From predicting war to explaining cooperation

These days the water war hypothesis has few supporters among academics, and it is generally acknowledged that water can lead to cooperation as well as conflict. But now an explanation is needed to explain why exactly countries would opt for cooperation. Different disciplines have tried

to answer this question. Economists pointed out the huge economic costs, comprising military expenditure, cost of human lives and the costs of a disrupted economy. Building desalinization installations, or importing (virtual) water is undeniably cheaper. Economists have also used game theory to explain cooperation, producing matrixes for specific situations that indicate working together can actually be a more rational choice than fighting over water (overview of game theory applications for water resource issues is provided by Dinar et al., 2007). From international relations theory, liberalist theory was put forward to explain cooperation in international river basins (see e.g. Kalbhenn, 2011) and point out the influence of organizations and institutions (see e.g. Duda & La Roche, 1997). Zeitoun & Warner (2006) have developed the concept of hydro hegemony, based on international relations theory, an analytical concept that points out the options of riparians that deal with the interplay of water and power and choosing their position on the scale between cooperation and conflict. Other explanations for cooperation came from the field of international law, pointing out the legal aspects of river resource sharing (Dinar et al., 2007, p. 30), and negotiation theory, focussing on the influence of third party interventions and how negotiations are influenced by power, culture, geographical position and many other variables (Dinar et al., 2007, p. 40).

2.2 Liberalism

The contributions of international relations theory to explaining water cooperation have been mentioned shortly in the previous section. After a brief introduction of international relations in general I will discuss liberalism, the particular strand of international relations that has influenced this research.

International relations

International relations is the study of the relations between states. It studies both conflict and cooperation (Stein, 1990, p. 12). There are four main points of view within the study of international relations (Nye & Welch, 2011, p. 4-9):

- **Realism**, which has been the dominant stream of thought for centuries, assumes the central actors in international politics are states. An important notion in realism is the concept of the 'balance of power', which states are always trying to influence. States always seek to maximize their power and will use whatever means, including war, to do this. Cooperation is unlikely according to realism, and states will only cooperate for national gains. Treaties and organisations will be forgotten when they are no longer profitable to a state.
- **Liberalism**, which originated in the 18th century, assumes there is a global society, connected by interactions such as trade and communication. This society functions alongside states and

forms a context for state action. So unlike in realism, liberalism assumes there are more relevant actors than just states. International organizations are considered to be very important in liberalism. Liberals claim their view is appropriate in a world with growing economic interdependencies and can explain interactions in a transnational global society. New liberals also take into account ecological interdependence and claim this will cause the current system of states to evolve into a world without borders.

- **Marxism** focuses on economics and the class society which exists in capitalist states. It assumes capitalist states will always be greedy and this will cause their role in international politics to be an expansionist one. In the end, a socialist revolution will destroy the capitalist system.
- **Constructivism** emphasizes the role of culture, identities and ideas in shaping reality and discourse in international politics. Not just material interests but also norms, identities and a sense of morality motivate the decisions of political leaders. Constructivists argue that norms, identities and cultures change over time. Also our thinking in terms of states and sovereignty is constructed, not given.

Stein (1990) compares realism and liberalism and argues the main difference is that realism assumes conflict is the natural state of things and cooperation is an exception, whilst liberalism holds peace is the norm and conflict is based on misperceptions and miscalculation (p. 8). He points out that both liberals and realists acknowledge the absence of central authority above nation states, but liberals refrain from calling it anarchy because this has connotations of chaos and conflict (p. 9). Another important point he makes is that we should remember that both realism and liberalism assume behaviour is self-interested, purposive and self-calculated (p. 10).

Frameworks based on international relations have been used for research on transboundary water issues, although not very often (Zeitoun & Warner, 2008). Some examples are Kalbhenn (2011), Zeitoun & Warner (2006) and Verweij (1999).

Focus on liberalism

Of these four perspectives, liberalism is most suitable to examine the situation of the Mekong. This is because interactions and interdependencies are acknowledged by liberalism as a context for state action. Liberalism is also the most likely to provide insights into cooperation. It has a conviction that international relations can be cooperative rather than conflictual (Jackson & Sorensen, 2007, p. 97). There are different strands of liberalism, that have different foci for their explanations of peace and cooperation (Nye & Welch, 2011, p. 58-60; Moravcsik, n.d., p. 1; Jackson & Sorensen, 2007, p. 100-115):

- Economical strand: heavy focus on trade (Nye and Welch, 2011, p. 58). Moravcsik calls this strand commercial liberalism.
- Social strand: focuses on person-to-person contacts on a transnational level. These contacts are supposed to reduce conflict and promote understanding (Nye & Welch, 2011; Jackson & Sorensen, 2007, p. 100-102).
- Neoliberalism: emphasizes the role of institutions and international law. Institutions are important for four reasons (Nye & Welch, 2011, p. 60): they provide a sense of continuity, they provide an opportunity for reciprocity, they provide flows of information and they provide ways to resolve conflicts. Moravcsik calls this strand regulatory liberalism. Jackson and Sorensen call this strand institutional liberalism.
- Pluralist liberalism: argues that deep social cleavages and misdistribution of social power can cause international conflict (Moravcsik, n.d., p. 1).
- Republican liberalism: values democracy as democratic nations are less likely to go to war (Moravcsik, n.d., p. 1; Jackson and Sorensen, p. 111). However, the link between the democratic nature of a nation and its propensity to go to war is disputed (Nye & Welch, 2011, p. 61-62).
- Interdependence liberalism: looks at how people and governments are affected by what happens elsewhere (Jackson & Sorensen, 2007, p. 103)

Instead of choosing between these different strands of liberalism, this research combines the many foci of liberalism. Choosing a particular strand would narrow this study down to solely economic or institutional interactions. Republican liberalism however is excluded, because the link between democratic nature and the probability of going to war is, as Nye and Welch (2011, p. 61-62) point out, very disputed. Also, the focus on democracy as an explanation for cooperation may not be of much use for the Mekong riparians, who are famed for their cooperation despite the fact that not all of them are very democratic.

The main contribution of liberalism to this research is the notion of complex interdependence; that encompasses thinking of a transnational society, that interacts by trade and communication, and that lives in a world of growing interdependence. This interdependence may explain their cooperation.

2.3 System dynamics (as a theoretical perspective)

System dynamics is used to study complex and unstructured systems. It helps to provide a better understanding of our world, the models are not intended to be used for exact predictions (Garcia, 2006, p. 21). Garcia (2006, p. 19-21) and Forrester (section 3.1) point out that building computer

models has several advantages over working with mental models. By building a computer model of the system, dynamic consequences of the interactions within the system are visualized. Building a model forces you to formulate things in an exact and careful way, mental models are often ill-defined and we keep changing the content without realizing we have done so. Instead of thinking of causes and consequences in a simple, linear way, feedback has to be indicated in the model. Producing a model forces you to consider loose ideas and relations as part of a system.

System dynamics is a valuable addition to this research because it answers the shortcomings of the other theories used in this research. Literature about water conflicts tend to focus on a single specific factor in relation to the probability of conflict, to be able to provide concrete and quantified answers (eg. In so many percent of water conflicts, countries with a GDP lower than X were involved). This type of research often ignores other relevant factors, and even if more variables are tested this is often done completely separately. There are some authors who focus on processes such as climate change or population growth (Vörösmarty et al., 2000; Cooley et al., 2009) and how these developments could influence the likeliness of conflict in the future. Examining processes provides a better picture but I would like to take it one step further and look at water cooperation as part of a system. Looking at specific factors or a single process provides useful information but always results in presenting an incomplete picture. System dynamics also solves the main deficiency of international relations liberalism approach, which is criticized for not being able to explain fundamental change (for example by Verweij, 1999). System dynamics models are not static but incorporate changes and developments in the system.

In figure 3, the main theoretical notions from the theories discussed in this chapter are combined to a schematic theoretical framework.

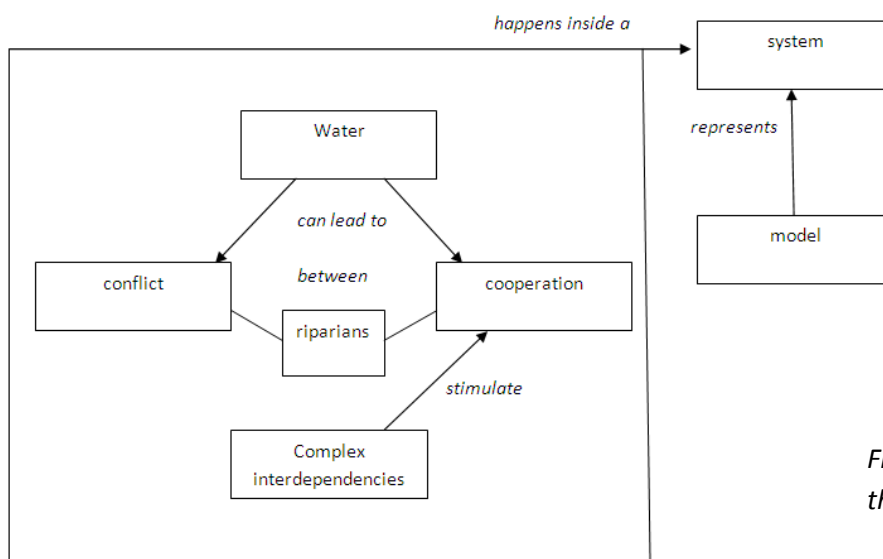


Figure 3: the schematic theoretical framework

3. Methodology

This chapter aims to explain the general methodological characteristics of the research, and clarify the use of system dynamics as a methodology.

3.1 General characteristics

This research has a broad character rather than being in depth. This is because the research subject is the Mekong river basin that covers a large area and contains several nations. Looking at complex interdependencies in different fields (economical, ecological etc.) on this scale means a certain level of abstraction is necessary.

The research has a contemplative and interpretative nature. The results do not contain calculations and ‘hard’ numbers. Even if I wanted to provide those I would not be able to. The models used in this research serve to visualise relations between variables, not to quantify variables or relations. A quantifying approach does not sort with my research aim and question, which require contemplative verbal explanation.

This research is based on literature and knowledge gathered by others. Doing desk research means I will collect information from others but combine and rethink it to produce new insights. This approach is common for research that aims to contribute to theory, as Verschuren and Doorewaard (2007, p. 207) remark: *‘desk research, especially literature research, is often used in projects that aim to contribute to theory. A lot of theoretical work is achieved by a combination of logical thinking, critical reflection and study of existing literature’*. In this research, systems thinking and a focus on interdependence are the lenses through which the existing literature will be re-examined.

The Mekong river basin is used as a case in this research. The basin is exceptional in the sense that it is known for its successful river cooperation, despite the many challenges and conflicts in the region. Although I have not done typical case study research, that would involve visiting my case for observations, conversations with inhabitants and interviews with experts, I have used the Mekong river basin as a case in the sense that I have used its daily practice and reality to confront general theory.

3.2 System dynamics (as a methodology)

System dynamics as a theoretical point of view has already been discussed in the theoretical chapter. System dynamics has theoretical implications as it means thinking in terms of systems of related factors. The practical side of using system dynamics as a methodology will briefly be discussed here.

The basic objective of system dynamics is to ‘understand the structural causes of a systems behaviour’ (Garcia, 2006, p. 21). What should be included in the system is always a difficult question,

because you must try to keep the system simple, containing as few elements as possible but at the same time have to add everything that influences the systems behavior. Garcia (2006, p. 24) therefore advises to 'include all elements with a reasonable influence on the behavior of the system'.

Building a model involves two steps. Firstly, a causal diagram is created in which important elements are identified, relations are defined and feedback is identified. The second step is the creation of a flow diagram, which involves equations and assigning values. Only the first step is necessary for my research because my aim in using system dynamics is visualizing the complex interdependencies, not calculating amounts or simulating the development of stocks.

Conceptual models are built up of named variables connected by curved arrows. For every arrow it is indicated if it represents a positive or a negative relationship by adding a plus or a minus. Some of the relationships form loops (for example, A-B-D and A-B-E-C in figure 4). When the number of negative relations is even, the loop is 'positive', when the number of negative relations is odd, the loop is 'negative' (in figure 4, A-B-D is an example of a positive loop and A-B-E-C is a negative loop). Negative loops stabilise the model, while positive loops tend to destabilise it, indicating an 'exploding' system. When several negative loops are connected they support each other and create a 'hyperstable' system (Garcia, 2006, p. 32).

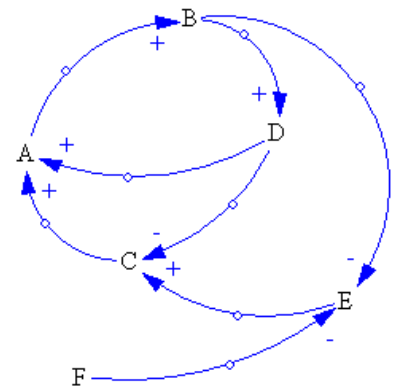


Figure 4: A system dynamics model.

4. The Mekong river basin

This chapter serves as an introduction to the Mekong river basin (map shown in figure 1 on page 8). First we will have a look at the river basins physical, ecological and social characteristics and we will discuss the issue of hydropower. Next is a sketch of the riparians and their interests. The chapter ends with a brief history of cooperation in the river basin, and its successes and shortcomings.

4.1 A first look at the river basin

In this paragraph the physical, ecological and social characteristics of the basin are discussed. Attention will also be paid to the disputed issue of hydropower.

Physical characteristics

With an estimated length of 4,800 km, the Mekong in southeast Asia is the world's twelfth longest river. Its river basin (an area of 795,000 km²) comprises six riparians: China, Myanmar, Lao, Thailand, Cambodia and Vietnam. The area of each riparian in the basin and their contributions to the flow are stated in table X. The Mekong originates in Tibet. It then flows through China for about 2000 kilometers (which is about half the rivers length, passing through Tibet and Yunnan province. After leaving China the Mekong forms a border, first between Myanmar and China, then between Myanmar and Lao, and Lao and Thailand, until it enters Lao territory. After running in Lao for a while, the Mekong forms a border again, separating Lao from Thailand. It then enters Cambodia and ends in the Mekong Delta in Vietnam where it empties into the South China Sea. Some 475 km³ of water are discharged every year (MRC, 2005, p. 1; Keskinen et al., 2008, p. 80).

Table 1: territory of the six Mekong river basin countries within the catchment (from: MRC, 2005, p. 1)

	China	Myanmar	Lao	Thailand	Cambodia	Vietnam
Area (km²) within catchment	165,000	24,000	202,000	184,000	155,000	65,000
Catchment as % of basin	21	3	25	23	20	8
% contribution to flow	16	2	35	18	18	11

The river basin consists of two parts, the upper basin: China and Myanmar, and the lower basin: Lao, Thailand, Cambodia and Vietnam. The upper basin contributes around 18% of the rivers flow. This part of the river basin is characterized by steep terrain, and related to this is a high degree of soil erosion (about 50% of all sediment in the river comes from the upper basin) (MRC, 2005, p. 1). The river flows through deep gorges and drops about 4500 meters before it enters the lower basin (MRC, 2005, p. 5). In the lower basin the terrain is not so steep anymore, the river becomes wider and flows more slowly. Many tributary rivers contribute to the flow. In Cambodia, the seasonal change in water level causes a unique phenomenon; the rivers flow reverses. During the dry season water flows from the Tonle Sap lake into the Mekong, and during the wet season, the water from the Mekong flows into the lake. The lake becomes six times as large as during the dry season and serves as a flood prevention mechanism for downstream areas. After the Cambodian capital Phnom Penh the river breaks up in a number of branches, the start of the river delta. Most of the delta is situated in Vietnam, and is an area characterized by intensive farming and population pressure (MRC, 2005, p. 2).

Due to the monsoon, the quantity of water the river carries is highly dependent on the season. Floods are common in the wet season, and are necessary for the growth of crops and for sustaining the aquatic life in the basin (Elhance, 1999, p. 194; Keskinen et al., 2008, p. 82; Fox & Sneddon, 2007, p. 254)..

Ecological characteristics

The Mekong river basin is rich in terms of biodiversity, and in the last decade over a thousand new species were discovered (WWF, 2008; Gajaseneni et al., 2006, p. 43). Especially unique are the many types of large fish that remain in the basin, of which most are rare and many are endangered. The river offers spawning and nursing habitats for many fish (MRC, 2010, p. 23). The construction of dams however proves to be a serious obstruction to the fish, as many types are migratory. Also, the dams limit the inflow of water into the Tonle Sap lake, an important impediment to fish reproduction (Gajaseneni et al., 2006, p. 51). The main threat however is environmental degradation in general (Coates et al., in MRC, 2010, p. 24)

The basin also has high ecosystem diversity, it includes different types of terrestrial, wetland and aquatic ecosystems (Gajaseneni et al., 2006, p.43). One of the main reasons for the presence of this large number of different habitats is the monsoon climate, that causes natural fluctuation in the river flow. The hydrological cycles are of great importance for biodiversity (MRC, 2010, p. 23).

The water quality in the basin is considered to be good (Isaak & Sax Kaijser, 2007, p. 11; MRC, 2010, p. 23). In areas where agriculture is intensive, and the population density is high the water contains high levels of nutrients, indicating eutrophication (MRC, 2010, p. 23). A notable problem in

the basin is deforestation. Poverty leaves few options but using fuel wood, and both commercial use and slash-and burn agriculture are taking their toll on the forests as well (Jacobs, 1995, p. 43).

Social characteristics

The Mekong River basin is home to some sixty six million people (Gajaseni et al., 2006, p. 43). In general however the basin is not very densely populated, and there are only a few major cities situated at the river (Elhance, 1999, p. 199; MRC, 2010, p. 31). About three quarters of the basins population live in rural areas (MRC, 2010, p.31). Many of these people live traditional livelihoods, and have a close relationship with the Mekong and the plants and animals in habitats supported by the River (Keskinen et al., 2008, p. 82; Gajaseni et al., 2006, p. 43; Drujiven, 2008, p. 34; Phillips et al., p. 92; MRC, 2010, p. 24). Many make a living of water related occupations, for example farming, fishing, net and boat making and repairing, collecting edible plants, fish processing etcetera. A survey conducted among the 25 million people who live within 15 km of the Mekong mainstream showed that of the economically active population 63% had an occupation related to water resources (MRC, 2010, p. 48). The results can be read in table 2 below.

Table 2: Water related and non-water related occupations in a 15 km zone along the Mekong mainstream (from: MRC, 2010, p. 48)

	Economically active population		Economically non-active population
	Water related occupations (%)	Non-water related occupations (%)	
Main occupation	62.6	12.7	24.7
Secondary occupation	38.3	7.5	54.2

Source: MRC 2010

Of course the percentage of water related occupations will be lower among those living further away from water, but we can conclude water is of great importance for the inhabitants of the basin, in terms of livelihoods and food. The sector that demands most water from the river is agriculture, which provides employment for between 65 and 85% of the workforce in Cambodia, Lao and Vietnam (MRC, 2010, p. 48). Another water related sector that is a major employer is fishing. In Cambodia 40% of the population depends on the fish production of the Tonle Sap for their livelihoods, and in Lao, around 70% of the rural households engage in fishing for their livelihoods and additional income (MRC, 2010, p. 48). Fishing is very important for food security, especially in rural parts of the basin fish is more than half the average animal intake as it is a ready available and cheap protein source (Öjendal, 1995, p. 154; Elhance, 1999, p. 202; MRC, 2010, p. 49).

This high percentage of employment in (water)resources related employment is related to an important characteristic of the basin: many people live in poverty (Chomchai, 2005, p. 139; Gajaseni et al, 2006; Öjendal, 1995, p. 149; Fox & Sneddon, 2007, p. 244). Thailand and Vietnam are doing well compared to Lao and Cambodia, that both have very low life expectancy, high infant mortality, low literacy levels and limited access to clean drinking water and sanitation (MRC, 2010, p. 31). A table of the socio-economic indicators of the lower basin riparians can be found in the appendix. The socio-economic disparities between the richest/most developed and the poorest/least developed nations are striking. Not visible in the table are the disparities within nations, that are large as well (Duijven, 2008, p. 34; Keskinen et al., 2008, p. 82; Rijlaarsdam, 2008).

Unemployment, extreme poverty, high population growth, uncontrolled urbanisation and migration are the current state of the basin, and these factors cause tension and increase the chance of conflict (Elhance, 1999, p. 197). The Mekong is one of the least developed great rivers in the world (Dinar et al., 2007, p. 168; Öjendal, 1995, p. 149). The rivers original course has hardly been altered and only a small part of the rivers potential for irrigation and waterpower has been utilized (Gajaseni et al., 2006). Chomchai (2005, p. 139) describes the situation in the basin as ‘poverty amidst plenty’.

Recently, the basin has experienced rapid economic growth and development (Keskinen et al., 2008, p. 82). The demand for energy keeps increasing. Between 1993 and 2005, the demand for energy and the economic growth increased at a yearly average of about 8% in the lower basin, which is one of the highest growth rates in the world over a longer period of time (MRC, 2010, p. 25). But while the energy demand of the region as a whole is growing, average electricity consumption per capita in the basin is still below the average of developing countries. About 20% of the basins inhabitants do not receive electricity at all (MRC, 2010, p. 25).

The countries of the lower basin all started their transition to market-driven economies in the 1990's (MRC, 2010, p. 28). Both the lower basin countries and China have focused on export, which has helped to alleviate poverty and provide employment opportunities in the region (Asian Development Bank, 2007; Duijven, 2008, p. 35). Cooperation through treaties and for example the GMS (Greater Mekong Subregion) program, the riparians cooperated to remove obstructions to trade and increase their trade openness (Asian Development Bank, 2007). The Mekong serves as a route of transportation for both people and goods, but it is not navigable in its full length due to the differences in height.

Hydropower

Hydropower development is a major topic of discussion for the basin. Currently the basin is reliant on fossil fuels (approximately 80% of the electricity generation), of which about a quarter has to be

imported (MRC, 2010, p. 25-27). The basin has a high potential for hydropower, which is favoured by governments and development institutions as it is considered a clean source of power and an excellent method for economic development (Dinar et al., 2007 p. 236). But dam construction has many (and often unpredictable) consequences. Dams alter the rivers course and even out the flooding regime which affects agricultural and fish production, in turn affecting the many people who depend on these sectors for their livelihood. Dam construction has therefore provoked protest and worry among many of the basins inhabitants (Fuller, 2010)(see figure 5).



Figure 5: protest against dam construction in Cambodia (from: Osborne, 2012)

The total hydropower potential of the basin is about 53,000 MW, of which 23,000 MW could be realized in the upper basin, and 30,000 MW in the lower basin (Mekong Flows, 2010). Figure 6 shows a map of present and planned hydropower projects. Note that the lion's share of the projects is located on the Mekong's tributaries, not on the main stream. About 60% of the main streams potential has been realized, of the potential of the tributaries about 10% has been realized (Mekong Flows, 2010). Thailand and Vietnam have developed most of their potential. Lao still has a lot of options for development, and Cambodia has not constructed a single dam yet (MRC, 2010, p. 27). Recently a lot of proposals have been made for hydropower development on the main stream. China has already completed 4 hydropower facilities on the main stream, which are blamed for causing changes in the flow regime, deteriorating water quality and blocking sediment (Mekong Flows, 2010).

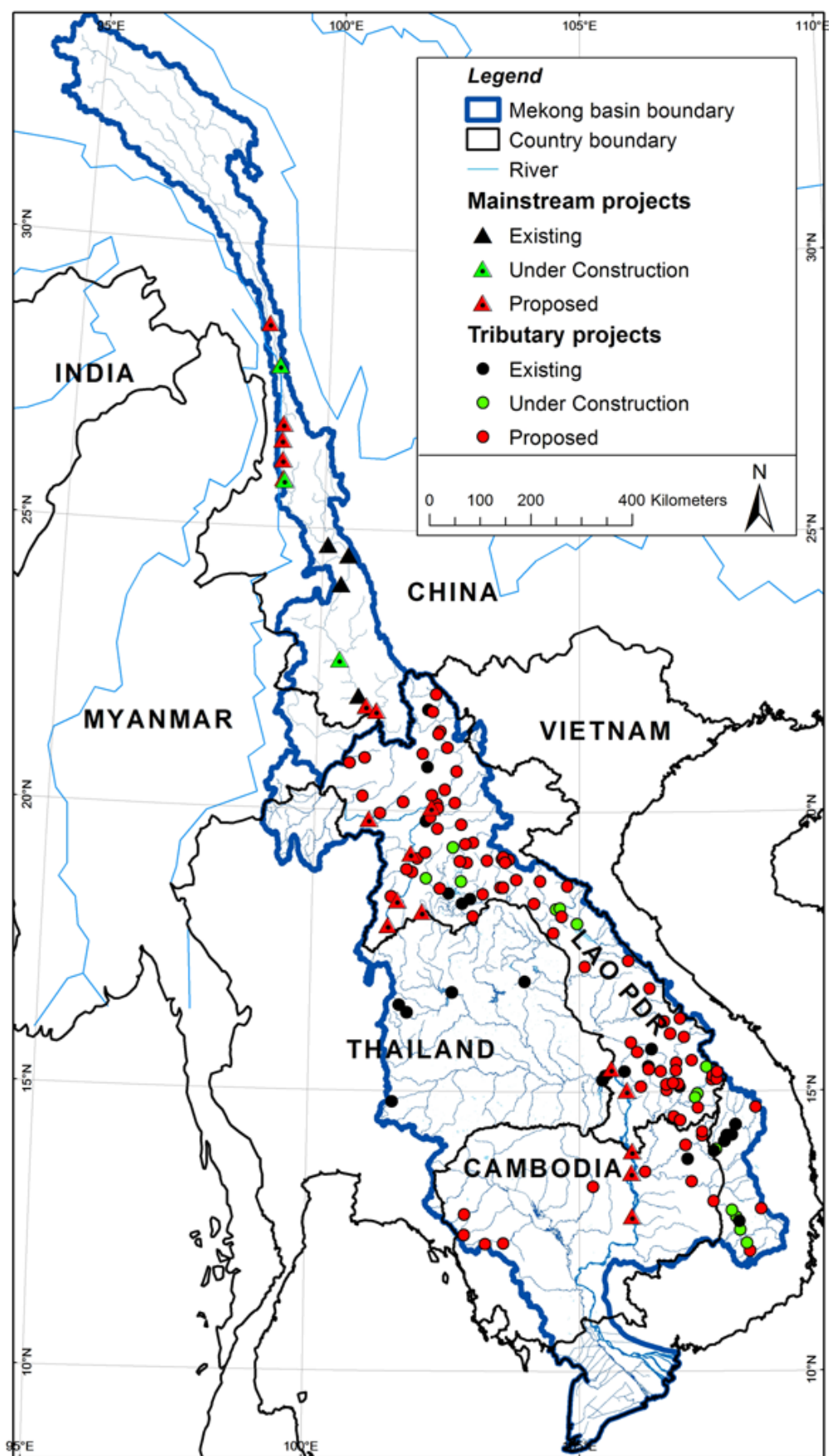


Figure 6: Map of hydropower projects on the Mekong and its tributaries (from: *Mekong Flows*, 2010)

4.2 The riparians and their interests

This research is focused on basin wide problems and interests, and argues the riparians share important challenges and goals. I do however not want to generalize and act as if no differences between the riparians are present and as if there are no conflicts of interest. Therefore I will briefly discuss these here.

China is the most powerful of the riparians, in economic and military terms, but also as the entire upper basin is located within its territory. Economic growth has made China hungry for energy, and therefore it would like to develop the rivers water power potential (Dinar et al., 2007, p. 229). Also, China is a supporter of improving the navigability of the river which is important for Chinese export (Keskinen et al., 2008, p. 83).

Myanmar makes up only a very small percentage of the basin, and only makes a minor contribution to the flow. The government has shown no particular interest in the Mekong. The area closest to the river, the infamous Golden Triangle, is controlled by armed drug gangs which makes it impossible to set up any kind of (international) river development project (Dinar et al., 2007, p. 229).

Thailand is economically the most developed of the riparians. The part of Thailand that lies within the Mekong river basin however is one of the poorest parts of the country. Thailand hopes to improve the situation by setting up large agriculture projects, and therefore needs the Mekong for large scale irrigation (Keskinen et al., 2008, p. 83). Thailand's other main need is energy, and having developed most of its own hydropower possibilities it buys hydropower from other riparians (Dinar et al., 2007, p. 229).

Lao has a lot of undeveloped hydropower potential, but for now its population depends on fishing and farming for their livelihood. Lao therefore fears any major disruption of the river that would affect the aquatic life or farming (Keskinen et al., 2008, p. 83). Also, because Lao is landlocked, navigation improvements are in its interest.

Cambodia has similar interests to Lao, as most of the population here to is highly dependent on fishing and farming. Cambodia fears any change to the flooding regime as it would disrupt the ecological balance of the Tonle Sap lake, on which 40% of the Cambodian population depends for its livelihood (MRC, 2010, p. 49; Dinar et al., 2007, p. 229).

Vietnam's main interest is a clean and steady flow of water for irrigation. The delta is characterized by intensive agriculture and population pressure. As the most downstream riparian, Vietnam does not have much bargaining power (Dinar et al., 2007, p. 229).

An overview of the uses, impacts feared and caused per riparian are presented in table 3 below.

Table 3: Uses of water and impacts caused and feared per riparian (After: Keskinen et al., 2008, p. 83. Small adjustments made by author)

Country	Main use/function	Major feared impacts caused by the country	Major threats to the country
China	Hydropower, transportation route	Leveling out of the floods, trapping of sediments and nutrients	Lack of energy and transportation routes
Thailand	Water diversion for irrigation, hydropower	Environmental degradation, flow changes	Lack of water for irrigation
Lao	Hydropower, navigation, aquatic resources	Leveling out the floods, trapping sediments and nutrients	Impacts on agriculture and fishing, river bank erosion
Cambodia	Aquatic resources, irrigation, possibly hydropower	Potential negative impacts owing to unsustainable fisheries management	Changes in floodplains, particularly for the Tonle Sap: impact on fishing and agriculture
Vietnam	Irrigation (delta) hydropower (central highlands)	Increasing environmental degradation and water quality problems in the delta due to intensive agriculture and dense population	Decreased dry season water flows; increasing salt water intrusion with negative impacts on irrigation

Besides conflicts of interest between nations, there are also conflicts of interest within nations. River policy is often top-down, so the local people who depend on the river for their livelihood are not involved in determining it (Chomchai, 2005). Both national governments and regional organizations are sometimes far removed from local realities (Keskinen et al., 2008, p. 79). An example is the Lao government cooperating with the MRC to construct dams on major tributaries, which result in a loss of fish and therefore a loss of food and income for local people.

4.3 River cooperation in the Mekong river basin

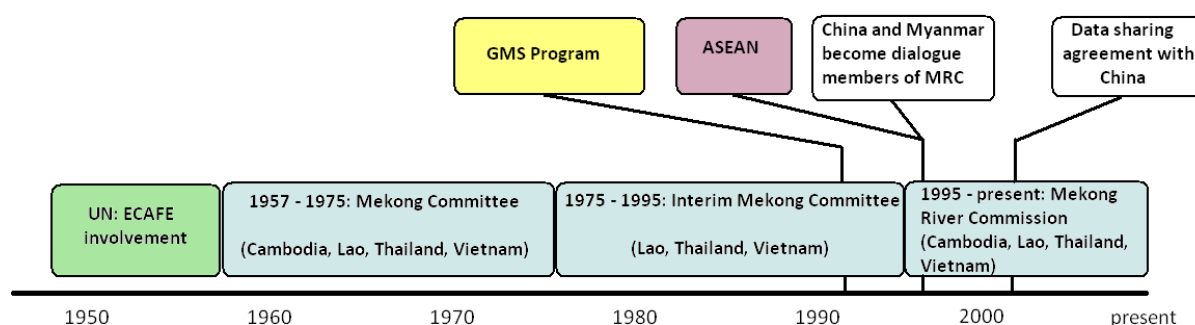
This paragraph provides a brief history of river cooperation in the Mekong river basin. It also discusses the successes and shortcomings of the Mekong River Commission.

A history of Mekong cooperation

In 1949 the UN body ECAFE (Economic commission for Asia and the Far East) set up a program mostly aimed at research and flood control (Öjendal, 1995, p. 155). As China was not a member of the UN and Myanmar was not interested in participation, only the lower basin countries were involved. The United States were a major supporter of cooperation, as they saw river cooperation as a good alternative to armed conflict and the spread of communism (Elhance, 1999, p. 217; Öjendal, 1995, p. 155; Phillips et al., in Keskinen et al., 2008, p. 87). In 1957 the Mekong committee was set up. The focus was on technical and coordinating activities, and the MC was criticized for doing 'too much engineering and not enough ecology and socioeconomic studies' (Öjendal, 1995, p. 156-157). The Khmer Rouge regime in Cambodia caused a crisis in the Committee, and the Interim Mekong Committee was set up in 1975, leaving Lao, Thailand and Vietnam as the remaining members. Only after free and fair elections in Cambodia in 1993, Cambodia was reinstated as a member of the Mekong River Commission in 1995. In 1996, China and Myanmar became dialogue members of the MRC, and in 2002 an important agreement on hydrological data sharing was signed with China. Figure 7 visualizes the different institutions involved in river cooperation over time.

Besides the MRC and its predecessors two other organizations have to be mentioned here. In 1992 the Greater Mekong Subregion (GMS) program was set up. All riparians participate in the program, which focuses on economic development, infrastructure and energy (Keskinen et al., 2008, p. 85). In 1996 the Association of Southeast Asian Nations (ASEAN) was founded. ASEAN has a total of ten members, and among them are all Mekong riparians except China (China is not a full member but a dialogue member). ASEAN is focused on regional integration and trade. Both the GMS program and ASEAN are not directly related to the Mekong, but are important institutions of international cooperation.

Figure 7: a timeline of Mekong (river) cooperation institutions



The Mekong as a showcase of good cooperation

The Mekong is often mentioned as an example of successful river cooperation (Beach et al., 2000; Gajaseneni et al., 2006; Phillips et al. & Jacobs in Keskinen et al., 2008, p. 79). Wolf et al. (2005, p. 85) cite Mekong cooperation as a good example for their conclusion that: *'international water disputes do get resolved, even among enemies, and even as conflicts erupt over other issues. Some of the world's most vociferous enemies have negotiated water agreements or are in the process of doing so, and the institutions they have created often prove to be resilient, even when relations are strained.'*

There are multiple reasons for considering the Mekong as a 'best practice' of river cooperation:

- River cooperation started before any major problems or conflicts occurred (Wolf et al., 2007, p. 218; Wolf, 1998, p. 9)
- Continued cooperation in times of conflict and political mistrust. The 'Mekong spirit' prevailed (Dinar et al., 2007, p. 168; Beach et al., 2000, p. 109; Wolf, 1998, p. 9)
- The members share data and information (Beach et al., 2000, p. 44; Wolf et al., 2007, p. 222; Wolf, 1998, p. 9). Affeltranger (2009, p. 593) argues the availability of data is crucial for institutional effectiveness and sound water-related decisions, but also for political legitimacy and technical credibility.
- The MRC's approach is based on the principle of 'reasonable and equitable' water use (Beach et al., 2000, p. 45)
- River cooperation formed a starting point for cooperation in other fields, ranging from economic cooperation to a collective endeavour against disease, corruption, smuggling and (child) prostitution (Elhance, 1999, p. 211-212).

Although Mekong cooperation is praised by many, the institutions through which the cooperation is taking place are criticized by many. The main problem with the Mekong River Commission is the fact that China and Myanmar are not full members. Also it is argued that the MRC sees the Mekong as a natural resource only, and in their efforts to exploit it they are unable to make sure everybody benefits (Gajaseneni et al., 2006, p. 58-66; Keskinen et al., 2008, p. 91). Other sources of criticism are the dependence on external funding from donors and investment banks (Dinar et al., 2007, p. 168) and the fact that riparians are hesitant to empower the Commission as they try to protect their sovereignty (Affeltranger, p. 593).

5. Complex interdependencies in international river basins

This chapter aims to determine which complex interdependencies play a role in causing a situation of cooperation or conflict in an international river basin. First, we will look at the different kinds of interdependencies common in liberalist research. How do these interdependencies stimulate cooperation according to liberalists? After that, we turn to the specific literature on river basins. Many factors have been identified that are said to cause conflict or cooperation, these will be listed, the causal relations assumed behind these factors will be specified, and we will see if these factors can be grouped into different fields of interdependence. The outcome of this chapter is a list of relevant interdependencies, that will be elaborated for the Mekong river basin in the next chapter.

5.1 Interdependence in liberalism

Interdependencies have long been associated with peace. John Stuart Mill, the influential 19th century liberal already remarked on the role of trade interdependence and called it the ‘the guarantee of the peace of the world’ (Mill in De Vries, 1990, p. 429). But trade is not the only thing that makes nations interdependent. In the theoretical chapter of this thesis, different strands of liberalism were introduced. Every strand focuses on a particular type of interdependence, summed up in the table 4, below.

Table 4: Interdependency focus per strand of liberalism

Strand of liberalism	Interdependency focus
Economic/commercial strand	Trade and economic interdependencies
Social strand	Interconnectedness of people (through any kind of interdependency)
Political strand	
- institutional strand	Political interdependency through international organizations, treaties and international law
- democratic strand	No role for interdependencies but for political characteristics
Pluralist liberalism	No specific interdependency focus, but reminds us to take into account differences in culture, moral and values
Interdependence liberalism	Any kind of interdependencies

Three types of interdependency originate from table 4: economic (trade) interdependence, social interdependence and interdependence through institutions/political interdependence. How do these interdependencies contribute to cooperation? There are some fundamental liberalist assumptions about this.

Firstly liberals have some basic assumptions about trade. For the ‘trade-peace’ proposition (visualized in figure 8) assumptions are borrowed from classical trade theory (Barbieri, 2002, p. 23). Fundamental in classical trade theory is the assumption that states are better off if they trade. Trade enables each state to produce what they are best at, and exchange it for goods that are more difficult or costly to produce. This specialization gives a relative advantage, so a state can produce goods more efficiently. If states produce the goods they are best at at the lowest cost and sell them at a profit, trade will increase their income (Barbieri, 2002, p. 22-23). States will prosper and become part of an interdependent system. Conflict is unlikely to occur because it will have negative effects for the states income, it would seriously obstruct trade, and specialization is problematic as a state at war has to take care of its own. So due to their interdependent economic well-being, nations with good trade relations are unlikely to start a war (De Vries, 1990, p. 429; Keohane & Nye in Tir & Ackerman, 2009, p. 628-629).

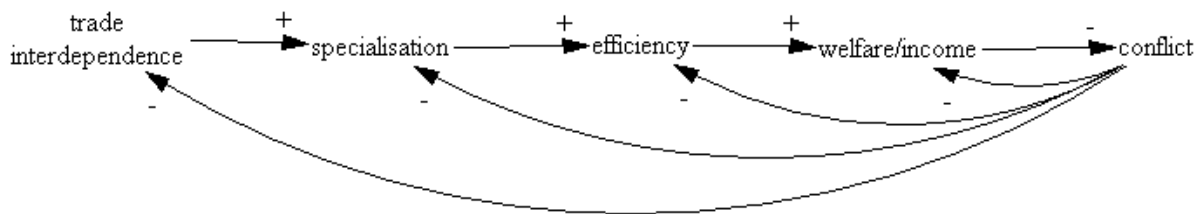


Figure 8: trade interdependence reduces conflict through specialization

Trade is also supposed to promote cooperation through human contact (visualized in figure 9). Trade leads to human interaction, and this interaction generates mutual trust and understanding (Barbieri, 2002, p. 27). Conflict then becomes unlikely to occur, because people know and understand each other. It is more likely they will cooperate, also on other issues than trade, now they trust each other. Cooperation will generate even more trust, more interaction and might induce more trade interdependence. Conflict would be very negative for trust and understanding, would turn the nature of contact from positive to negative and would seriously obstruct trade.

This logic is also used in the social strand of liberalism. Simply replace ‘trade interdependence’ with for instance ‘school exchanges’ or ‘international communication networks’, or anything else that allows people to interact and become interdependent.

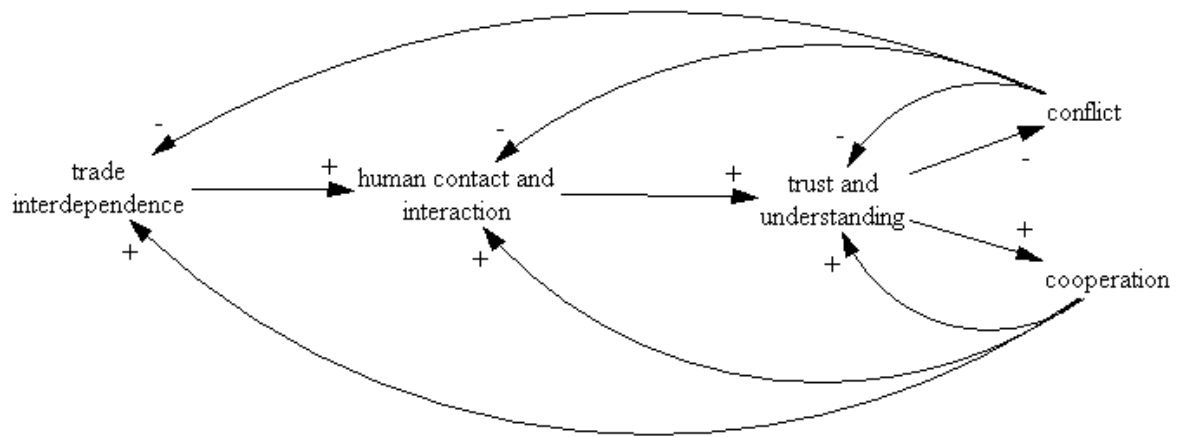


Figure 9: trade interdependence encourages cooperation through trust and understanding

The political strand has some fundamental assumptions about interdependence through institutions (visualized in figure 10). Institutions provide stable and regulated platforms for cooperation, making cooperation attractive and reliable. The more attractive cooperation is, the less likely is the occurrence of conflict. Nye and Welch (2011, p. 60) distinguish 4 ways in which institutions provide stable and regulated frameworks for cooperation: they provide a sense of continuity, they provide an opportunity for reciprocity, they provide flows of information and they provide ways to resolve conflicts.

And this process reinforces itself, as through institutions cooperation is build up, which will increase interdependence which causes regional integration, which in the end makes it in every nations interest to improve and intensify the present institutions and set up new ones (De Vries, 1990, p. 429).

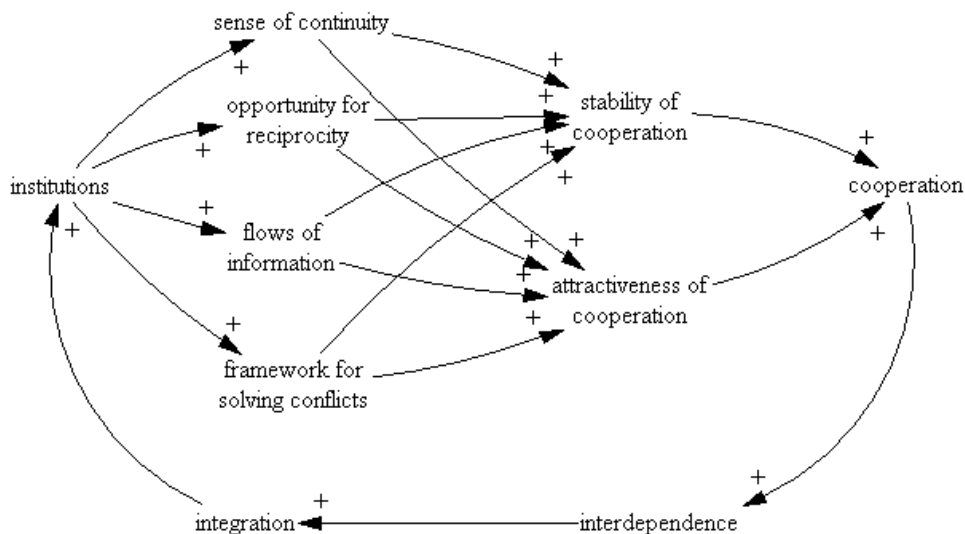


Figure 10: institutions offer stable and attractive cooperation

Also, the simple fact that states are aware of the fact that they are interdependent can reduce the likelihood of conflict (visualized in figure 11). The basic assumption here is that states that are interdependent are likely to take each others interests into consideration, reducing the potentially harmful risk of having conflicting interests (De Vries, 1990, p. 429).

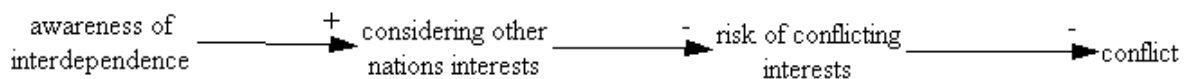


Figure 11: awareness of interdependence reduces likelihood of conflict

A final remark about these liberalist assumptions. I am aware of the fact that many of these assumptions are disputed, and real life situations exist where they do not apply. However, if situations exist where a hypothesis does not apply, it can still be used to generate insights and create understanding for a different situation. We are not dealing with absolute laws of causation but highly likely connections, and after having been influential hypotheses in science for many years, and after having proved their value and applicability in many empirical studies, I will uphold them and find out what their value is in explaining cooperation in the Mekong river basin.

5.2 Interdependence in international river basin research

In the literature on conflict and cooperation in international river basins, many factors are mentioned that can contribute to either conflict, cooperation or both. To which field of interdependence do these factors belong? Which causal effects or influences do authors assume? Table 5 below provides an overview. The first row states the variables, the second row states the source, and in the third row the variable is assigned to a field of interdependence. Below each variable hypotheses on the exact effect of this variable are offered.

Table 5: factors contributing to conflict or cooperation, hypothesis and interdependence fields

Factor/variable	Mentioned by	Interdependence field
Scarcity	<ul style="list-style-type: none"> - Gleick in Dinar, McCaffrey, Dinar & McKinney, 2007, p. 35 - Wallensteen & Swain, 1997, p. 9 – 10 - Anisfeld, p. 268-269 - Beach et al., p. 39 	Economic interdependence
Due to climate change	<ul style="list-style-type: none"> - Hagen, Chapman & Tvedt 2011, p. 4 	Environmental interdependence

Due to population growth	<ul style="list-style-type: none"> - Hagen et al., 2011, p. 5 - Dinar et al., 2007, p. 9 - Wallenstein & Swain, 1997, p. 2 	Economic & social interdependence
Perception of scarcity	<ul style="list-style-type: none"> - Dinar et al., 2007, p. 142 	Political & social interdependence
Presence of alternative sources	<ul style="list-style-type: none"> - Gleick in Dinar et al., 2007, p. 35 	
<i>(climate change/population growth) → Scarcity → conflict</i> <i>(climate change/population growth) → Scarcity → cooperation</i> <i>Perception of scarcity → conflict/cooperation</i> <i>Alternative sources → conflict less likely</i>		
Domestic politics	<ul style="list-style-type: none"> - Dinar et al., 2007, p. 35 - Anisfeld, 2008, p. 269 	Economic & political interdependence
<i>Open and in favour of cooperation → cooperation</i> <i>Closed and hostile → conflict</i>		
The overall relationship between countries	<ul style="list-style-type: none"> - Dinar et al., 2007, p. 35 	Political interdependence
<i>Good relations → cooperation</i> <i>bad relations → conflict</i>		
Relative power and geographic location	<ul style="list-style-type: none"> - Anand, 2007, p. 91 - Dinar et al., 2007 p. 35, 144-145 - Kehl, 2011, p. 229 - Zeitoun & Warner, 2006 	Political interdependence
<i>Powerful riparian in weak downstream position → conflict</i> <i>'upstreamers use water to get more power, downstreamers use power to get more water' (Warner in Zeitoun & Warner, 2006, p. 436'.</i>		
Presence of institutions	<ul style="list-style-type: none"> - Giordano & Wolf in Dinar et al., 2007 p. 38 - Wolf in Anisfeld, 2010, p. 270 - Beach et al., 2000, p. 42-43 - Kehl, 2011, p. 230 	Political interdependence
<i>Institutions → cooperation</i>		
Protracted conflict	<ul style="list-style-type: none"> - Dinar et al., 2007, p. 145 - Anisfeld, 2010, p. 269 - Gleick in Dinar et al., 2007, p. 35 	Political interdependence

<i>Protracted conflict → enemy images → make cooperation unlikely</i>		
<i>History of good relations and stability → makes cooperation likely</i>		
Pollution	- Wallensteen & Swain, 1997, p. 13	Environmental interdependence
<i>Pollution → cooperation (to find a solution)</i>		
Level of development	- Yoffe et al. en Gleditsch et al. in Anisfeld, 2010, p. 269 - Beach et al., 2000, p. 42	Economic and social interdependence
<i>Low level of development → higher risk of conflict</i>		
Context of rapid change	- Wolf in Anisfeld, 2010, p. 269	Environmental, social, economic and political interdependence
<i>Context of rapid change → conflict</i>		
<i>Stability → cooperation</i>		
Different needs and uses	- Beach et al., 2000, p. 41	Economic and political interdependence
Upstream usage influences quality and quantity for downstream use	- Anand, 2007, p. 91 - Beach et al., 2000, p. 40-41 - Wallensteen & Swain, 1997, p. 5-7	
Is the water consumed or used and returned to the stream later?	- Dinar et al., 2007, p. 3-5	
<i>Different/conflicting needs → conflict</i>		
<i>Same needs → cooperation</i>		
<i>Upstream use → lowering quantity/quality → increasing likelihood of conflict</i>		
National water ethos	- Beach et al., 2007, p. 43	Social interdependence
<i>Water has important meaning → conflict</i>		
Political structure of a nation	- Anisfeld, 2010, p. 269	Political interdependence
<i>Closed structure → cooperation less likely</i>		
<i>Democratic nature → cooperation more likely</i>		

The variables/factors mentioned in table 5 fit into the key fields of interdependence from liberalist research (economic/trade, social and institutional/political interdependence). The specific river basin literature does however add a new type of interdependence: environmental interdependence, that has been largely ignored in liberalist research whilst it is highly relevant for international river basins.

Environmental interdependence often results in cooperation when countries join their efforts to halt environmental degradation (Deudney in Dinar et al., 2007 p. 142). We now have 4 main types or fields of interdependencies, and are aware of several factors that possibly play a role in each field. But how does interdependence lead to cooperation in the specific literature on peace and cooperation in river basins?

In their article 'Navigating peace', Wolf et al. (2006, p. 1) explain how water is a catalyst for cooperation: 'Water is so important, nations cannot afford to fight over it. Instead, water fuels greater interdependence. By coming together to jointly manage their shared water resources, countries can build trust and prevent conflict'. In the article, they refer to research and historical evidence to prove that interdependence in international river basins promote cooperation, even in times of conflict. Water cooperation also connects people and experts, builds bridges between nations, can create a shared regional identity and can forge cooperation on different matters than water (Wolf et al., 2006, p. 3). Their argument is visualized in figure 12. This logic is similar to the second trade-peace hypothesis presented above in figure 6. Note how social interdependence (through personal contact) and political/institutional interdependence are integrated in the argumentation.

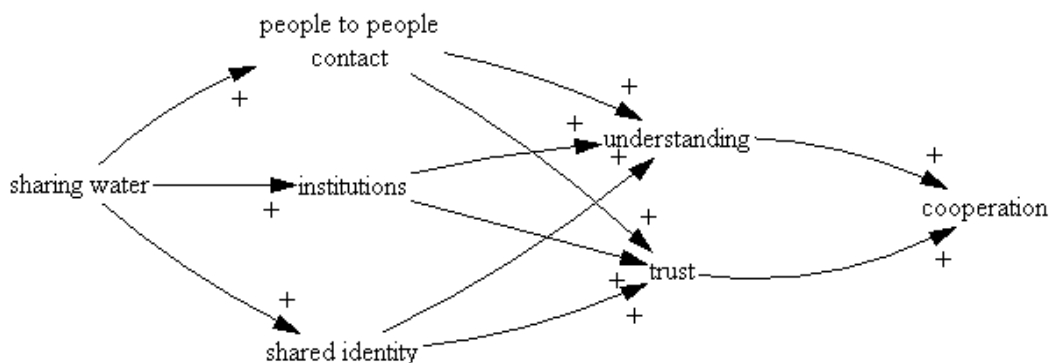


Figure 12: sharing water leads to cooperation

Elhance (1999, p. 244) argues states are interdependent through both common problems and common opportunities, and any obstructions that still remain to cooperation will be overruled by interdependencies (visualized in figure 13). Elhance refers to global warming, interdependence in the global economy, increasing flows of information and ideas across borders and concludes cooperation is necessary (eg. To fight global warming jointly) but also attractive (eg. In the case of trade cooperation). Remarkable about this point of view is that interdependencies are not something states can choose to participate in, interdependencies are an inevitable fact, and states will have to act on them. Elhance identifies 4 fields of interdependence: environmental, economic, political and

security interdependencies. But he does not offer assumptions or hypotheses on how these interdependencies lead to conflict or cooperation. I feel a need to explain why I did not simply look at the same fields of interdependence as Elhance has done. This had to do with 'security interdependence'. The notion of security is a notion that has been subject to inflation and as a result the notion has become so wide it incorporates nearly everything (Cottey, 2007). It involves not only military security, but also things like food security, energy security, climate security, cyber security, and many, many other things. Such a comprehensive notion results in overlap with the other fields of interdependence he identifies.

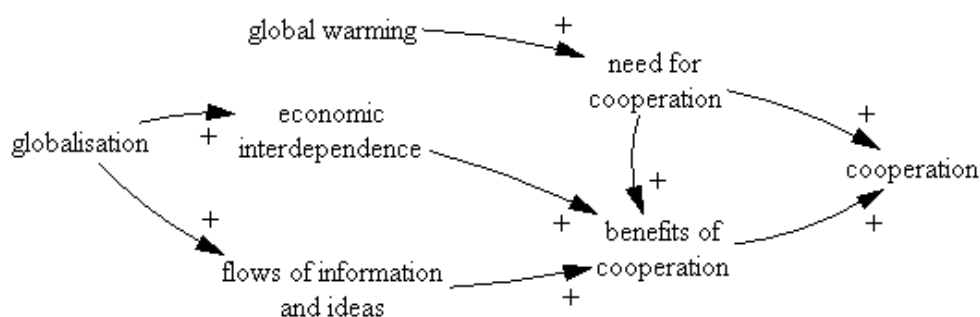


Figure 13: interdependencies are a fact and states need to cooperate

So, this overview of liberalist and river basin research has provided us with a list of 4 main fields of interdependence:

- **Economic or trade interdependence:** leads to cooperation because this is beneficial in a direct way, and in an indirect way it creates trust and understanding that encourage cooperation.
- **Social interdependence:** leads to cooperation in the form of people to people contacts that create understanding and trust, but it also leads to cooperation because nations need to tackle social problems together.
- **Political or institutional interdependence:** takes shape in institutions that promote cooperation and raises interdependence awareness, but enemy images and closed political structures limit cooperation.
- **Environmental interdependence:** often comes down to a need to tackle environmental problems together.

In the next chapter, these fields of interdependence will be elaborated for the real life situation of the Mekong river basin. The relations and variables that were introduced in this chapter will be the backbone of the models of the Mekong's interdependence relations presented in the next chapter.

6. Complex interdependencies in the Mekong river basin

In the previous chapter interdependencies common in liberalist theory and water conflict in general were discussed. This resulted in a selection of 4 main interdependencies. The specific characteristics of the Mekong forced me to make a slight change to the original 4 main interdependencies. The environmental and social interdependence models were so similar that I decided to combine them to a single model. This similarity is understandable, as many of the basins inhabitants live subsistence livelihoods as farmers or fishers, and their lives are closely linked to the environment. Also, I added another model: hydropower interdependence. The issue of hydropower is a critical point of discussion for the Mekong river basin, and all kinds of claims are made about the effects dam construction could have on the environment, the economy and the livelihoods of people. Hydropower is a single issue that seems to be connecting all fields of interdependence. For each field of interdependence, a model will be presented. The models are on pages 52-55. This chapter forms an accompanying text that clarifies included variables, linkages and feedbacks. Words in bold print correspond to variables in the models. On page 56 a general interdependence model is presented that combines all four separate models into a complete model (slightly simplified to ensure legibility and relevance).

6.1 Economic interdependence

The Mekong riparians are experiencing rapid **economic growth** and are developing into market economies (Keskinen et al., 2008, p. 82). Still, they are characterized by the presence of a generally **poor** population, and an **agricultural sector** that provides more than half the **employment** in the region (Gajaseni et al., 2006, p. 52-53). The **manufacturing industry** and the **tourism** sector are still in their infancy, so for now **economic growth** is fuelled with agricultural products and the export of **natural resources** (Elhance, 1999, p. 199-200).

Trade and export

The governments of all Mekong riparians uphold **economic development** as a major goal (Than, 2002, p. 40; Gajaseni et al., 2006, p. 64). There is a sense of **urgency to develop** the region, as the post war boom generation is eager for work and income (Druijven, 2008, p. 34). The riparian countries policies strive for high economic growth, mainly through **export** (Asian Development Bank, 2007; Druijven, 2008, p. 35). Exports from the Mekong riparians rise by 11.6% every year, and trade has expanded both within the region and with the outside world. Trade inside the Mekong region

risers by 19% every year (Asian Development bank, 2007). Through **export**, the riparians hope to fuel **economic development**, by improving incomes and reducing **poverty**.

The Mekong riparians are eager to cooperate to improve trade (Than, 2002, p. 40). Special **economic corridors** have been developed to stimulate **trade** and **employment** (Rijlaarsdam, 2008; Asian Development Bank, 2011). A lot has been done to tackle **obstructions to trade** like inadequate **infrastructure**, lower trade tariffs and improve the inefficient customs procedures (Asian Development Bank, 2007). Still, about 20-30% of the trade in the region is informal (Asian Development Bank, 2007, p. 4). **Trade obstructions** like high import duties, restrictions and **corruption** at border checks dissuade small traders from using formal channels of trade (Asian Development Bank, 2007). Also, the region has a substantial **trade in 'bads'**, like drugs, weapons and human trafficking (Than, 2002, p. 51). Armed drug traffickers in the Golden Triangle area are a serious threat to **navigation** and thereby hamper both **formal** and **informal trade** (Than, 2002, p. 54).

Cooperation boosts the economy

Cooperation has had some positive economic effects for the Mekong riparians. The Asian Development Bank (2007, p. 15-18) describes how **cooperation** enables the riparian states to utilize their **comparative advantages**. Nations can produce what they are best at, and trade these goods for others that are more difficult to produce themselves. Due to this **specialization**, **cooperation** is of great importance. **Cooperation** has led to the establishment of **institutions**, which encouraged the improvement of **infrastructure**, the sharing of **technology** and the attuning of **trade policies**. All these factors, in combination with the **level of education** contribute to the utilization of comparative advantages. And the more comparative advantages are utilized, the more **sustainable** the **economic development** is. Also, **technological** advancements help to improve the quality of products, making them suitable for **export**. Cooperation has also provided a number of agreements on **navigation**, **agriculture** and **forestry**, to make these activities more efficient and less harmful to the environment.

Navigation and infrastructure

The mountainous terrain in the basin has always been a barrier to the movement of goods and people (Elhance, 1999, p. 195). International organizations, donors and investors have invested in large **infrastructure** projects, which have been an impulse to **trade** and have also improved **market access**, **access to services** and **personal mobility** (Asian Development Bank, 2007). **Infrastructure** development is considered a route to **poverty** alleviation, and an impulse to **tourism** which provides **employment** (Asian Development Bank, 2012b).

Especially the upstream riparians are eager to improve navigation (Gajaseni et al., 2006, p.

54). Due to rapids, shoals and the natural fluctuation of the water level, the river is not suitable for **navigation** on a large scale (Gajaseni et al., 2006, p. 54). But for smaller ships it is a very important **trade** route, that is especially important for landlocked Laos and Yunnan (Keskinen et al., 2008, p. 82). Also in large areas the river provides the only feasible way of moving as these areas are mountainous and characterized by dense vegetation (Öjendal, 1995, p. 154). But to improve navigability, rapids and shoals in the upper basin have been removed with dynamite (Gajaseni et al., 2006, p. 54; Onishi, 2008, p. 204; Goh, 2004, p. 7). Both these **adaptations to the river** and **navigation** itself will change the **ecological characteristics** of the river and have negative impacts on **biodiversity** (Gajaseni et al., 2006, p. 54).

Rapid growth and its consequences

Not just the **river adaptations** have serious consequences for the environment and the basins inhabitants. **Populations** are growing, **trade** is increasing, **economic growth** is exploding and the nations experience **urbanization** (Elhance, 1999, p. 197). Connected to these processes is the increasing pressure on **natural resources** and the rise of **social disparities** (Keskinen et al., 2008, p. 82). Economic growth means more water is needed for agriculture and industrial use, and population growth means more water is needed for domestic use. Right now water is not a scarce resource in the Mekong river basin (Beach et al., 2000, p. 108; Priscoli & Wolf, 2009, p. 216), but the demand for water is increasing (Öjendal, 1995, p. 176). Water **scarcity** would constrain **agricultural and economic activity**, and cause **social disparities, migration** and the **disruption of institutions** (Homer-Dixon in Dinar et al., 2007, p. 142). Rapid **economic growth** may also attract **migrants** to the basin, increasing **scarcity** and causing **social unrest** (Elhance, 1999, p. 199).

Donors and investments

Donors and foreign investors encourage the riparians to **cooperate**, as they believe this is the best way to manage the rivers resources but also because international **institutions** and organizations provide a platform from which they can start investing (Elhance, 1999, p. 216-222). Especially Laos and Cambodia were attracted to river **cooperation** because joining meant they would receive **foreign investments** and **technical assistance** (Dinar et al., 2007, p. 236; Priscoli & Wolf, 2009, p. 217). Systems of **aid and foreign investment** make the riparians dependent on the outside world (Priscoli & Wolf, 2009, p. 220; Gajaseni et al., 2006, p. 55-66). Aid, mostly for Laos, Cambodia and Vietnam, is provided by the EU, the World Bank, the IMF, Australia, Scandinavia and UN agencies (Gajaseni et al., 2006 p. 66). Most investments in the region come from other Asian states, for example from Japan, Taiwan, Hong Kong, South Korea and Singapore (Gajaseni et al., 2006, p. 66). Among the riparians,

Thailand is the biggest **investor** (Than, 2002, p. 52). Foreign investors looking for a quick investment opportunity put the riparians under pressure to fuel their **economic development** by very high **natural resource** exploitation and **dam building** (Gajaseni et al., 2006, p. 55-59). **Investment** is mostly aimed at the exploitation of natural resources and the development of **tourism** (Than, 2002, p. 52). This type of development is mostly beneficial to the government and much less beneficial to the **ecology, biodiversity** and local communities (Gajaseni et al., 2006, p. 59). Development based on resource exploitation is also likely to be more advantageous to certain areas, social groups and parts of the population than to others, causing **socio-economic disparities** (Gajaseni et al., 2006, p. 66).

6.2 Socio-environmental interdependence

Human lives and a **healthy ecological system** are closely linked together in the Mekong river basin, as many of the people in the basin rely on the river or the ecosystems sustained by the river, for their **livelihood**. But due to radical social, economic and environmental changes, these traditional farming and fishing **livelihoods** (figure 14) are under increasing pressure as the balance between humans and the environment is being disturbed.



Figure 14: A traditional Lao fisherman collecting fish from the Khong falls on the Mekong in southern Laos. A dam planned upstream is likely to impact the quantity of fish in this area. (From: Fawthrop, 2009).

A vulnerable ecological balance

There is a natural balance between rivers and ecosystems as they sustain each other. The river provides natural regulation of water quality and quantity, and sustains life (Sadoff & Grey, 2002, p. 391). The Mekong is one of the largest ecosystems on earth, and also one of the most **biologically diverse** (Hubbel, 2002; Phillips et al., 2006, p. 120). Staggering amounts of new species are being discovered every year (WWF, 2008). The river basin provides a **habitat** for these animals. Humans too rely on the rivers ecosystem and the resources this system provides, it is a resource utilized by many. It carries **water, fertile silt** and provides plenty of **fish**. The rivers regime includes natural **seasonal flooding**, which is essential for **agriculture, fishing** and the **ecology** in general (Elhance,

1999, p. 194; Jacobs, 1994, p. 45; Fox & Sneddon, 2007, p. 254). The **monsoon** rains cause the **fluctuation of water** flow of the river (Dinar et al., 2007, p. 227; Keskinen et al., 2008, p. 82).

From balance to imbalance

About 80% of the people in the river basin live in rural areas and depend on the river to sustain their **livelihood**, as they survive by subsistence **farming and fishing** (Keskinen et al., 2008, p. 82; Gajaseni et al., 2006, p. 43; Druijven, 2008, p. 34; Phillips et al., p. 92). Their lives are closely linked to the ecosystem. **Fishing** sustains about 40 million people in the basin (Phillips et al., 2006, p. 92) and is a large source of employment (Elhance, 1999, p. 202). Most of the basins inhabitants fish occasionally. Many of the people who do not own land entirely rely on fishing and other types of foraging to survive (Phillips et al., 2006, p. 92). **Fishing** and **agriculture** (mainly the production of rice) provide the food to keep the basins population **healthy**. Fish is the main source of protein throughout the basin (Öjendal, 1995, p. 154; Elhance, 1999, p. 202). People are aware of their interdependence with nature, and have included the river in **spiritual and cultural practices** (Tales of the Mekong, 2007).

Up to recently, the ecological system could deal with the relatively small impact of humans who only participated in small scale **fishing** and **farming**. But now an imbalance between humans and the environment has come into existence. The Mekong region suffers from **environmental degradation** due to manmade calamities like indiscriminate **mining** and **deforestation**, the unintended effects of **dam construction**, and **overuse** of the regions **natural resources** (Elhance, 1999, p. 195-196). Current **overuse** of the ecosystems resources has to do with increased demand, due to a number of causes. **Population growth** means more food is needed, which is linked to an increased need of **water** for both direct consumption and **food** production (Pech & Sunada, 2008, p. 219). Also, more land is needed to produce food, which means **forests** will be cleared, and **habitats** are destroyed which results in the loss of **wildlife** (Gajaseni et al., 2006, p. 52). Besides this increase in demand, **water availability** decreases due to a number of factors. **Pollution** limits **clean water availability per capita**, and **agriculture, dam construction** and **navigation** cause water to be **diverted** for irrigation, estuaries or to improve navigability. Irrigation and estuaries cause a lot of water to evaporate, which means less is available for both consumptive and non consumptive use. **Climate change** is another factor that may influence **water availability** in the future, as it may affect the **monsoon**, responsible for three-fourth of the rivers discharge (Elhance, 1999, p. 194). Changes to the **monsoon** will also influence the **natural fluctuation** of the river.

Socio-economic disparities

Large **socio-economic disparities** are present in the Mekong river basin, both within and between countries (Druijven, 2008, p. 34; Gajaseni et al., 2006, p. 66; Keskinen et al., 2008, p. 82; Rijlaarsdam,

2008). Table 6 shows the GDP per capita of the Mekong riparians. The differences between the riparians are huge, the GDP per capita of Thailand is 8 times as high as that of Myanmar. Duijven (2008, p. 34) points out the regional disparities, indicating that the inhabitants of generally 'rich' Thailand who live the north of the country are much poorer than the generally 'poor' Vietnamese who live in the prosperous Mekong delta.

Table 6: GDP per capita Mekong riparians (2010)

Vietnam	Thailand	Laos	Cambodia	Myanmar	China-Yunnan province
\$3,100	\$8,700	\$2,400	\$2,000	\$1,100	\$1,975

(sources: index mundi; Yunnan, 2012)

Socio-economic disparities are a typical effect of a situation where **rapid economic growth** has set off, but only a part of the society is benefiting so far. In the Mekong river basin, the **disparities** cause **migration** and **urbanization**, as it becomes increasingly difficult for the **growing population** to make a living of **fishing** and **farming** (Isaak & Sax Kaijser, 2007, p. 16; Phillips et al., 2006, p. 119). By 2025, the cities in the lower Mekong basin will be the home of 33 million people (Sally, 2012). Both the **migration** flows themselves and the **socio-economic disparities** that caused them lead to **social unrest**. The riparians all have a population that is highly ethnically diverse (Duijven, 2008, p. 34; Gajasen et al., 2006, p. 50). Due to local wars and colonial times, every Mekong riparian hosts parts of the population of other riparians. Especially the Chinese are omnipresent. They are often part of the wealthier groups of society which causes resentment. Also, China has tried to incite these expatriates against the rulers of their host country (Elhance, 1999, p. 209). Due to these reasons, Chinese diaspora are a source of tension in times of nationalist sentiment (Dinar et al., 2007, p. 230).

The effects of poverty

In general the Mekong river basins inhabitants are **poor**, with the exception of Thailand where the situation is slightly better (Öjendal, 1995, p. 149; Fox & Sneddon, 2007, p. 244). People are surrounded by natural resources and potential to generate more income, but due to a history of **conflict**, resources were never developed. In fact, former **conflict** is still limiting development, as large areas in Cambodia are inaccessible due to landmines and use of chemical weapons in Vietnam has caused severe **soil pollution** (Elhance, 1999, p. 196).

There is a relationship between **poverty** and **pollution** and **environmental degradation** (Jacobs, 1994, p. 43; Dasgupta et al., 2003). **Poverty** is known to cause **overexploitation of natural resources**, and this is also the case in the Mekong river basin (Gajasen et al., 2006, p. 59; Jacobs,

1994, p. 43; Dasgupta et al., 2003). Poor people often have no other option than **overexploitation of natural resources**, sometimes causing acute ecological damage (Jacobs, 1994, p. 43). A destructive situation, as the **poor** are damaging the resource base on which their **livelihoods** and survival depend. News reports show the **social unrest** among people whose **livelihoods** are endangered by **environmental degradation** (see for example Fuller, 2010). In the end, as Jacobs (1994, p. 43) concludes 'raising living standards in the region is important to improving social as well as environmental conditions'.

Deforestation

Deforestation is said to be one of the worst problems of the river basin (Jacobs, 1994, p. 43). Complicated by unclear landownership, **deforestation** continues due to **commercial logging**, **agricultural** land use, **infrastructure** development and domestic **fuel wood** use (Gajaseni et al., 2006, p. 51). The high rate of **deforestation** contributes to **climate change**. **Deforestation** also has dramatic consequences on a local level, as the **forests** contribute to water quality, reduce **soil erosion**, reduce chemical **pollution**, and prevent **floods** (Gajaseni et al., 2006, p. 52; Jacobs, 1994, p. 43) in short, forests contribute to a **healthy ecology**. **Deforestation** has serious consequences, it is known to cause **soil erosion** and **mud slides** and causes **environmental degradation** in general (Jacobs, 1994, p. 43). The forests are the home of many different species of animals and plants, so **deforestation** has negative consequences for **wildlife** and **biodiversity**. It also affects the human population of the riparians, many of them make a living of forestry or forest products, in Vietnam for example this concerns one out of three people (Lam, 1995, p. 26).

Tourism

Tourism, and especially ecotourism has been on the rise in the Mekong river basin, and investors and riparians cooperate to facilitate it (Than, 2002, p. 52; Rijlaarsdam, 2008). Tourists are drawn by the regions rich historical heritage, but also by the regions **biodiversity**, and some local communities depend on the seasonal influx of tourists looking for elephants or river dolphins. Tourism provides employment but has negative effects as well. The river dolphins for example are a rare sight these days, as motorized tourist boats have chased them away from their former **habitats** (Tales of the Mekong, 2007). Tourism in the region has a bad name due to corruption at the border and sextourism (Rijlaarsdam, 2008). The Mekong River Commission is working on **tourism** projects that spread the benefits (in terms of employment and income) across the riparians by stimulating tourists to visit multiple countries, and the commission has also set up education for tour guides to limit the damage to the environment (Asian Development Bank, 2012b).

Damage control by international cooperation

The relation between the environment and the inhabitants of the river basin is under pressure, and there are no easy solutions available. Through international organizations, the riparians try to at least do some damage control. With a joint **flood** forecasting and flood management program, they try to limit the damage caused by **flooding** (Dinar et al., 2007, p. 242). Although **flooding** is a natural process on which **fishing** and **agriculture** depend, the floods can be violent sometimes and destroy lives, homes and crops. A program has also been set up to limit the spread of **disease** in the region (Asian Development Bank, 2010). Diseases like dengue, typhoid, cholera, Japanese encephalitis and HIV/AIDS are present in abundance in the basin, which has negative economic consequences and is also a deterrence to tourists. And finally, the MRC has started a **climate change** initiative that aims to increase awareness and stimulate the sharing of coping strategies (MRC, n.d. a; MRC, n.d. b).

6.3 Political interdependence

The Mekong riparians are a patchwork of political systems and ideologies, and great **power inequality**. The riparians share a turbulent history full of **conflict**, but also a history of **cooperation**. Contrary to the general assumption that nations with bad political relations are less likely to **cooperate** (Dinar et al., 2007, p. 35), the Mekong riparians kept up cooperation even in times of **conflict** (Beach et al., 2000, p. 109; Wolf, 1998, p. 9). The riparians are praised for their river **cooperation**, but recently they seem to be especially interested in economic **cooperation** (Asian Development Bank, 2007; Than, 2002, p. 40).

Power relations and security concerns

China is without doubt the most **powerful** riparian, in terms of 'hard power', 'sticky power' and 'soft power'. Hard power involves military strength, geographical location and hydro hegemony (Zeitoun & Warner, 2006), sticky power refers to economic power (Mead in Kehl, 2011), and soft power refers to political power and the diffusion of ideas (Nye in Kehl, 2011). But the Chinese are unable to fully exploit their position as most **powerful** and upstream nation in the basin. They need good relations with the downstream neighbors because they can provide the needed hydropower, natural resources and access to the South China Sea (Elhance, 1999, p. 213). After China, Thailand is the most **powerful** riparian. Thailand too is unable to bully the other riparians with its **power** as it badly needs their hydropower and resources. Both China and Thailand have **national security concerns** (they need electricity and resources to fuel economic growth for their nations to function) which stops them from exercising their power too much. The **powerful** position of Vietnam is slowly declining,

their only remaining weapon the control over access to the sea (Elhance, 1999, p. p. 215-216). Laos and Cambodia are not very influential in military terms, but have a lot of resources and hydropower potential to bargain with. So, **power relations** are unequal in the basin, but due to **national security concerns**, stronger riparians cannot abuse their **power**, and weaker riparians still have a say. It seems **power relations** and **national security concerns** are balanced in such a way that they induce **cooperation**.

Dinar (2007, p. 243) reminds us that **power** structures are not fixed, and we should consider the influence of political and economic reforms in the riparian states. The relative **power** of Thailand is declining as the other Lower Mekong riparians are developing. Annual growth rates may, in the long run, affect the balance of **power** among the riparians. Also, the current political developments in Myanmar may affect the balance of **power** if the nation opens up, experiences rapid growth and takes its place in **international organizations** and in river **cooperation**.

Protracted conflict

Protracted conflict between riparians leaves behind **enemy images**, that severely limit **trust and understanding** between the riparians, making **cooperation** less likely (Dinar et al., 2007, p. 145; Anisfeld, 2010, p. 269; Gleick in Dinar et al., 2007, p. 35). The Mekong riparians share a history of aggression, as riparians competed for territory, had ideological disputes and civil wars and minority violence occurred (Dinar et al., 2007, p. 230-231; Öjendal, 1995). Although the Mekong riparians are currently famed for their great **cooperation** (Beach et al., 2000; Gajaseni et al., 2006; Phillips et al. & Jacobs in Keskinen et al., 2008, p. 79), old hostilities and rivalries remain (Elhance, 1999, p. 191-192). There are still unresolved boundary disputes and claims over islands in the South China sea (Elhance, 1999, p. 208). But the riparians are eager to build cordial relations and leave their ideological rivalry behind. Especially Vietnam and Thailand were eager to cooperate after the Cold war and water resources were a great starting point to create **trust and understanding** (Dinar et al., 2007, p. 236). Overall, some minor conflicts remain and riparians may be a little reserved due to **protracted conflict**, but the influence has not been strong enough to discourage **cooperation** all together.

International institutions and organizations, treaties and agreements

Institutions play a key role in facilitating cooperation. They *'spell out the rewards and obligations of the signatories, deal with technical details, and perhaps offer dispute-resolving mechanisms. The treaties can consequently change the states' preference toward cooperation by providing predictability, decreasing uncertainty [...]* These functions can contribute directly to higher levels of **trust** and to expanding state preferences to be more inclusive and long-term; this increases the scope

of **cooperation** immensely' (Tir & Ackerman, 2009, p. 627). So **institutions** facilitate and enable **cooperation**, and through **cooperation** the **trust** can be built to **cooperate** in other areas as well (Barbieri, 2002, p. 27; De Vries, 1990, p. 429). Öjendal (1995, p. 162) argues Mekong river **cooperation** has at some points restrained riparian states from diplomatic and political confrontation, and it has helped to decrease **enemy images**. Browder (in Kehl, 2011, p. 219) confirms international organizations have played an important role to overcome mistrust and facilitate negotiation in the Mekong river basin. International organizations are especially important because they can facilitate negotiation in basins where power relations between riparians are very unequal (Kehl, 2011).

The Mekong riparians are interested in **cooperation**, especially in the field of trade and economics (Keskinen et al., 2008, p. 84; Than, 2002, p. 40). The main **institutions** regarding economic cooperation are the Greater Mekong Subregion (GMS) and the Association of South East Asian Nations (ASEAN). The GMS program is focused on **economic development, infrastructure** and **energy**. It also includes some environmental issues, but only land ecosystems. The controversial issue of the aquatic **biodiversity** of the Mekong is ignored by the GMS (Keskinen et al., 2008, p. 85). ASEAN aims to stimulate sustainable **economic growth** in the Mekong river basin and tries to stimulate countries to work on common projects (ASEAN in Keskinen et al., 2008, p. 86).

The Mekong River Commission (MRC) is the **international organisation** that aims to facilitate sustainable and comprehensive management of the rivers natural resources (Keskinen et al., 2008, p. 89). The MRC has been praised and criticized. The **institution** kept functioning in times of conflict, facilitated data collection and was established before any major conflict occurred (Beach et al., 2000, p. 44; Wolf et al., 2007, p. 222; Wolf, 1998, p. 9). On the other hand, the commission only requires informing other riparians about water projects, not reaching agreements, it is not responsible for the implementation of its projects, and the commission is incomplete, as China and Myanmar are only dialogue members (Keskinen et al., 2008, p. 91; Gajaseni et al, 2006, p. 64). Gajaseni et al. (2006, p. 58-59) are very critical about the commissions projects which are mostly large hydropower and development projects, the type investors are looking for but that are harmful to the environment and threaten local **livelihoods**.

The riparians have also signed **multilateral treaties**, for example on a project to improve **navigation** between China, Thailand, Myanmar and Laos (Keskinen et al., p. 85). And **bilateral treaties**, for example on **hydropower** and **trade**, between China and Thailand, Laos and Thailand, Cambodia and Vietnam and China and Cambodia (Keskinen et al., p. 85).

Domestic politics

Domestic politics influences the likeliness of conflict. **Domestic political sentiments** can be open or hesitant toward cooperation (Dinar et al., 2007, p. 35). Thailand has had an open economy and a pro western regime for some time, the other riparians have also been opening up recently. Besides a favourable or unfavourable **attitude towards cooperation**, **security concerns** can also motivate riparians to **cooperate** (Tir & Ackerman, 2009, p. 626). Nations can have specific problems or interests that force them to look for a solution outside their borders, or ignore the outside world and focus on internal problems first. For example, the government of Myanmar is not in control of the Golden Triangle, and needs to solve the internal **security problem** of rebels and drug cartels before Myanmar can cooperate with other riparians on navigation or hydropower projects. The Chinese on the other hand need to tackle their energy **security problems** and maintain economic growth to sustain domestic stability, and to achieve this China needs to **cooperate**. Laos and Cambodia have taken an open and cooperative stance in order to attract investments and aid to kick start **economic development** and fight **poverty**.

Acknowledging interdependence

If states are aware of their **interdependence** with other states they are likely to take the interests of other nations into account in order to avoid conflicts (De Vries, 1990, p. 429). The downstream riparians seem to be aware of their **interdependence** in terms of water resources and have united in the Mekong River Commission, but Myanmar and China do not seem to acknowledge interdependence in this field, probably because actions downstream do not affect them. China does acknowledge economic **interdependence** and is eager to **cooperate** in this field (Than, 2002). Downstream riparians could try to link economic issues to river management when dealing with China. But the fact that China **acknowledges interdependence** with the riparians at all is a start. It changes the perception of the riparians, from seeing each other as competitors for depleting natural resources to seeing each other as partners that realize their situations are interlinked (Tir & Ackerman, 2009, p. 637).

6.4 Hydropower interdependence

The Mekong river basin is highly **mountainous**, and this relief provides opportunities for **hydropower development** (Dinar et al., 2007, p. 228; Gajasen et al., 2006, p. 45)(see figure 15, and a map of hydropower projects can be seen in figure 6 on page 25). Many argue that development of the Mekong's **hydropower potential** is the best way to improve the economies of the riparians (Dinar et al., 2007 p. 236). The **dams** are symbols of change, materializations of the need for economic

cooperation and wealth creation (Bakker, 1999, p. 229). But **dam construction** has many critics, who argue the dams will have destructive effects on the **environment** and the **livelihoods** of the people dependent on **fishing** and **farming**. Research on the possible effects of **dams** is highly contradictory, some of it concluding there will be little and harmless effects, other concluding the effects will be disruptive and disastrous.



Figure 15: The Dachaoshan dam in China, Yunnan, providing power to the region but also disrupting fish migration, (From: Eichenseher & Than, 2011).

In need of energy

If the Mekong's **hydropower potential** was fully realized, it could supply the predicted needs of all riparians for several decades (Elhance, 1999, p. 194). The regions **energy demands** are fuelled by **economic development, industrialization, population growth** and **urbanization** (Weatherbee, 1997, p. 174). Hydropower is favored by the riparian governments, **donors** and **investors** as it is a clean alternative to coal fired power plants. Many dams have been constructed on the Mekong's tributaries, dams on the mainstream are (still!) relatively rare.

Socio-environmental effects

The dams can have local effects but some effects could also be felt hundreds of kilometers downstream. The construction of dams causes **landslides and earthquakes** (Goh, 2004, p. 4). When the dams have to be filled for the first time after construction a lot of water will have to be retained from the flow for a period of several years. For some of the biggest dams that China has planned, this could amount to filling periods of 10 years in which half of the rivers flow was held back (Goh, 2004, p. 4). Less water in the river means a disruption of the **ecological balance** that will affect downstream **fisheries** (Phillips et al., 2006, p. 111).

When the **dams** are finished they will change the rivers **natural flooding regime**, as they release equal amounts of water throughout the year. **Evening out the flow** would serve as **flood**

protection (Keskinen et al., 2008, p. 93) and would improve the **navigability** of the river, an impulse to **trade** (Druijven, 2008, p. 35). But some subsistence farmers downstream depend on the **seasonal floods** for their crops and they will suffer the consequences of the **dams**. On the other hand, large scale, irrigated **agriculture** in the Mekong delta will benefit from an even flow of water, as it will enable the Vietnamese farmers to grow crops throughout the year and harvest up to 3 crops a year (Elhance, 1999, p. 201). This food is needed to feed the ever **growing population**.

Another major concern is that dams would trap the **fertile sediments** carried by the Mekong (Gajaseni et al., 2006, p. 55; Goh, 2004, p. 6). Less than one fifth of the water in the Mekong originates from the upper basin, but more than half of the **fertile sediment** the river carries comes from the upper basin (Keskinen et al., p. 82; Goh, 2004, p. 6). Trapping sediments would have negative effects for both the dams themselves, as it lowers their efficiency, but also for **agriculture** and **fisheries** (Bakker, 1999, p. 218; Goh, 2004, p. 6). **Fish** would also be affected by the changes in flows and water temperature, and dams also form a physical barrier to fish migration (Bakker, 1999, p. 218).

So, while the dams are supposed to stimulate **development** in the basin in the long run, in the short run many people will suffer setbacks as they lose their **livelihood**.

Politics and hydropower

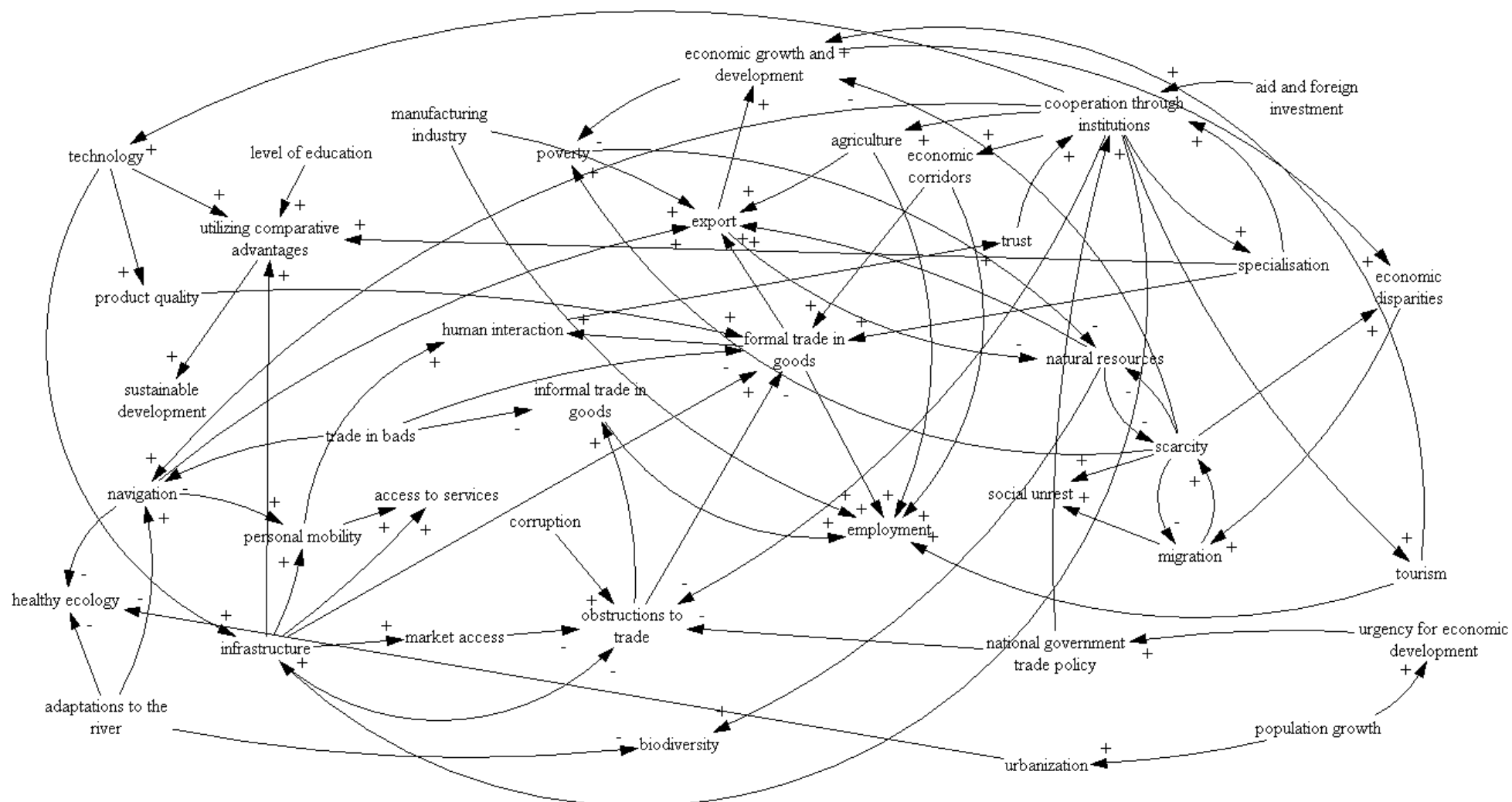
Due to the harmful effects discussed above, planned hydropower projects cause unease for every riparian downstream of the dam. This is not exactly beneficial to the **political relations** between the riparians. The Mekong River Commission provides a platform where the downstream riparians exchange information on their hydropower projects. China is not a member of the MRC and has constructed **dams** before without any consultation with the downstream riparians (Gajaseni et al., 2006, p. 67; Onishi, 2008, p. 202-203). This leads some to accuse the Chinese of exploiting their powerful upstream position, and simply ignoring or not caring about downstream complaints (see for example Gajaseni et al., 2006, p. 50; Druijven, 2008, p. 35; and many responses cited in Onishi, 2008, p. 201). Recently China has agreed to share data and provide more information on its hydropower plans (Dinar et al., 2007, p. 242). This did however not stop worries and criticism from other nations. The complaints and worries about Chinese dams seem not entirely fair, as the downstream riparians have also constructed **dams** which have also had very negative social and environmental effects (eg. dramatic social and environmental consequences of Nam Theun 2 dam in Laos, and Pak Mun dam in Thailand). This makes it seem like the downstream riparians are not so much afraid of the effects of the Chinese dams, but of China as a political great power in general, that has the potential to claim the rivers resources if it would ever feel a need to do so.

6.5 Explanation and justification of the models

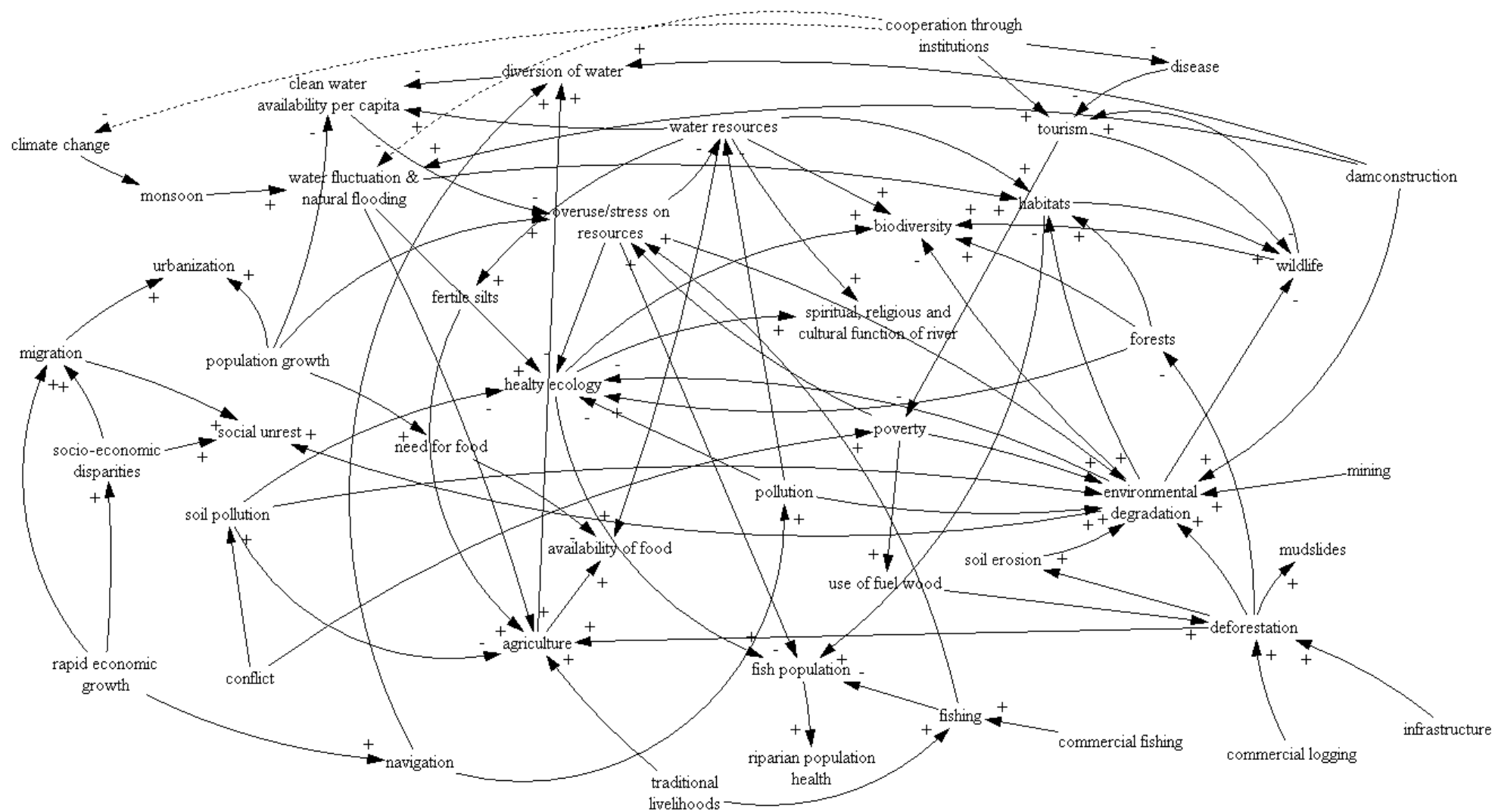
I would like to make some (final) remarks about the models presented here. Often, this research has lead me into fields in which I am no expert. As a human geographer I am not specialized in the technical details of dam construction, or the exact effects of soil pollution on specific crops or animal species. So whilst trying to complete models, I was often completely dependent on the conclusions about causality and connections in the research of others. I have tried to guard the quality of the models by always comparing multiple sources. And when sources contained highly contradictory points of view, as in the case of the effects of dam construction, I have included this ambivalence in the accompanying text and deleted controversial variables from the model.

Another matter I need to clarify is the nature of the links in the models. System dynamics models are intended to include causal links only. Of some links in my models, causality has been demonstrated by a number of empirical studies, for example the causes of deforestation have been investigated thoroughly. Other causal links in the models are a matter of logic, for example that an increase in deforestation causes a decrease in the presence of forests. For some links scientific backing is present, for example the link between poverty and environmental degradation. For some links included in my model, causality has not been demonstrated scientifically, or causality has not been demonstrated in the specific context of the Mekong river basin. Even though 'hard' evidence of these causal relations between variables was absent, I still decided to include some of these relations in my model. I only did this when multiple authors considered a variable or link between variables to be influential and this claim seemed highly plausible to me. This choice has consequences for reading the models. An arrow marked with a '+' sign, does not necessarily mean: 'variable A causes variable B' but can be read as: variable A 'causes'/'contributes to'/'has a positive effect on' variable B, because causality has not always been proved.

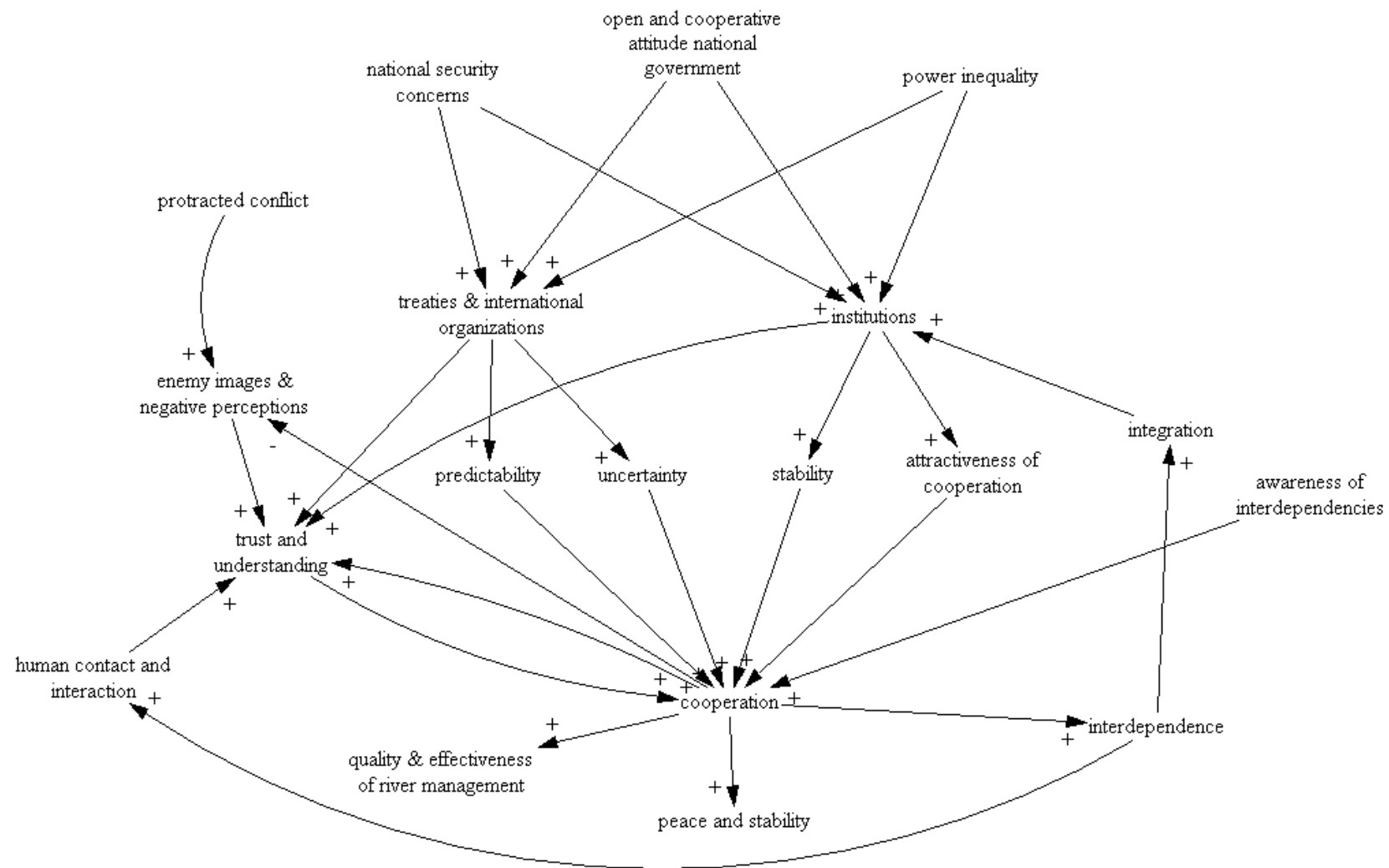
Economic interdependence



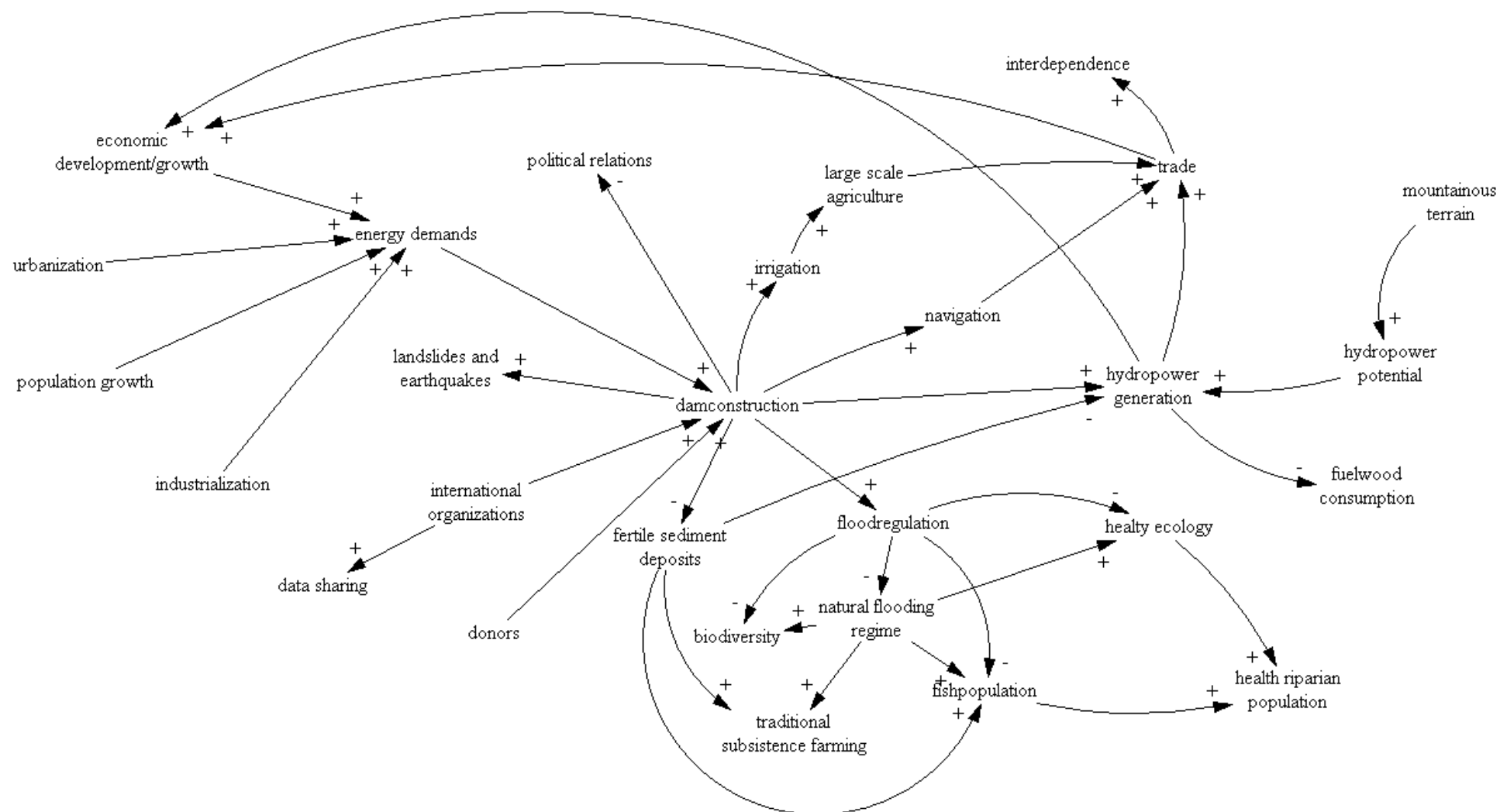
Socio-environmental interdependence



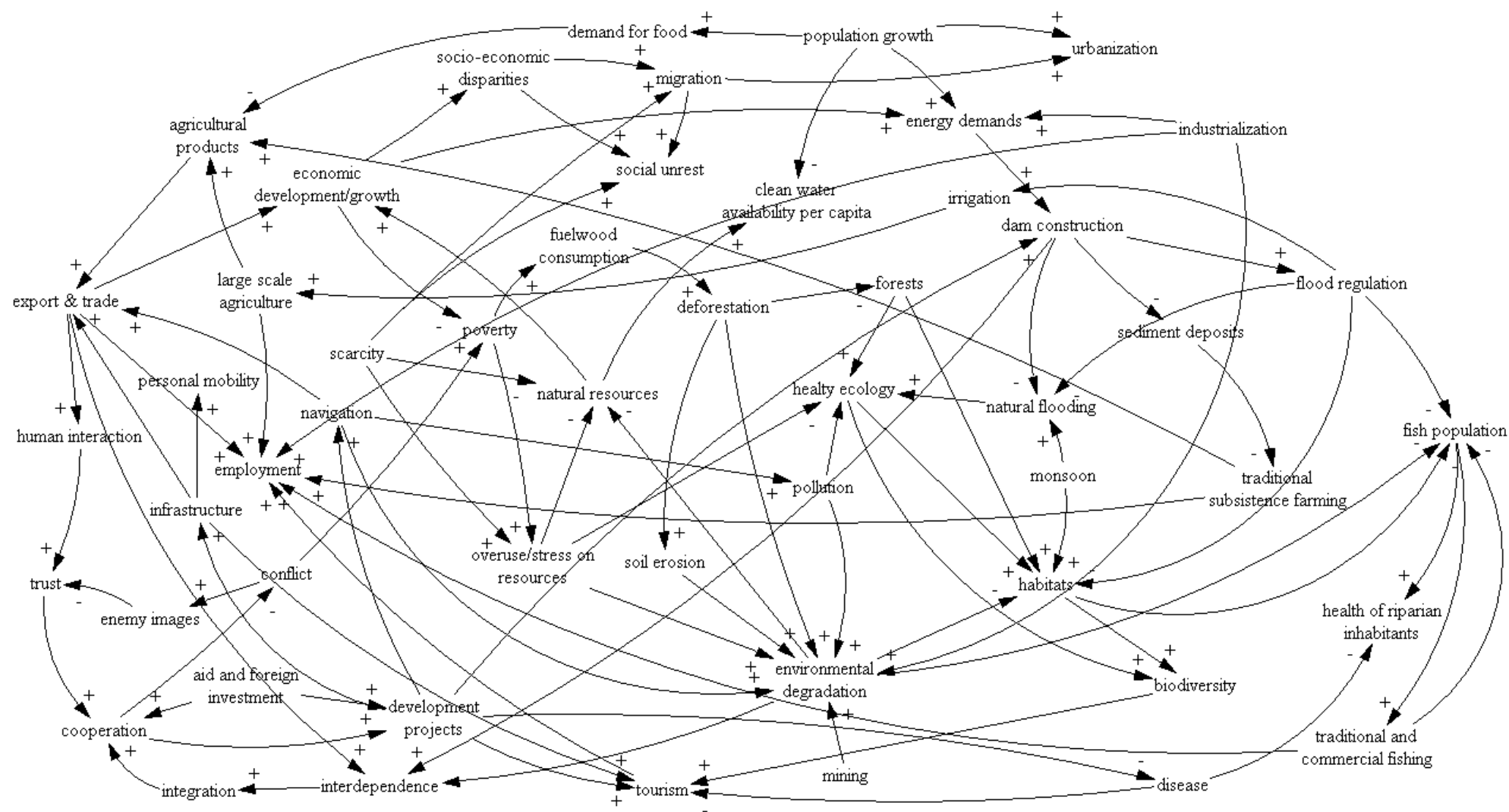
Political interdependence



Hydropower interdependence



General interdependence (combination of key links and variables from the separate interdependence models)



7. From interdependence to river cooperation

In the previous chapter we have seen how complexly interdependent the Mekong riparians are. How do these interdependencies stimulate - or maybe even force - the riparians to cooperate? Why do the Mekong riparians not use threats and violence in relation to the rivers resources, as some states in international river basins do? Cooperation is favorable for three reasons: it allows the riparians to tackle problems, to prepare for the challenges of the future and to sustain the precarious balance of the basins interdependence system.

Tackling problems

Cooperation through institutions, agreements and treaties has enabled the riparians to deal with some problems that they would not have been able to deal with on their own.

River cooperation, through the MRC and its predecessors has resulted in a joint approach to flooding, with measuring stations throughout the basin, where data are collected to forecast floods and a flood management program. Besides flood management, the riparians are dealing with other river management problems through institutions. A navigation program has been set up, and rules for water utilization have been agreed upon (Dinar et al., 2007, p. 242).

River cooperation has led to regional integration. The riparians share problems concerning agriculture and irrigation, and deforestation. To deal with these problems integrated approaches were set up to agriculture irrigation and forestry in the lower basin (Dinar et al., 2007, p. 242). Also of great significance is the lower basin hydropower strategy, that results in coordinated hydropower development, an improvement to situations in the past where riparians were surprised by dams suddenly appearing upstream. All riparians (including China!) now share data on their projects and the expected effects (Dinar et al., 2007, p. 242). Also, the riparians will set up a cross border energy network, that will help to connect even the most remote villages to the power network (Asian Development Bank, 2009).

Through the GMS program, the accessibility of the region was improved by massive investments in infrastructure. New roads are/have been constructed from inner Yunnan all the way to the Mekong delta. Infrastructure is a major improvement to the lives of the people in the basin and is also considered a route to poverty alleviation. Access to markets enables people to trade goods, and many have gained access to services they did not have before (Asian Development Bank, 2007). The roads have also facilitated the intensification of tourism. The riparians of the lower basin try to develop sustainable tourism that will have little impact on the environment, but are a great help to poverty alleviation and a source of employment. By developing multi-country tour packages,

they try to spread the benefits (Asian Development Bank, 2012b).

Cooperation has also provided major impulses to trade in the region. Special 'economic corridors' were set up to stimulate employment and economic development (Asian Development Bank, 2011). The basin now knows five of these economic corridors and every riparian is a part of at least one of them. The riparian governments also cooperated to lower obstructions to trade, like inefficient custom procedures and high import duties (Asian Development Bank, 2007). Intensified trade in the region has allowed the riparians to specialize their production and utilize their comparative advantages (Asian Development Bank, 2007).

A less obvious but certainly not less important area of cooperation is the joint initiative by all riparians to fight transmittable and tropical diseases in the region. The program works on improving local health services and regional health cooperation (Asian Development Bank, 2010). This will not only help save lives, but also lessen the impact of disease on the economy, trade and tourism.

Preparing for the challenges of the future

The Mekong riparians face challenges in the long run. Climate change is starting to show its first impact on the basin (MRC, n.d. a), and the riparians are also facing the difficult challenge of combining economic growth and demographic changes with a healthy environment and social stability.

To find out what challenges exactly the Mekong riparians will face, a lot of research has to be done. International organizations play an important role in research coordination. To gain insight into the future state of the river, flow monitoring programs have been set up (Dinar et al., 2007, p. 242), and research is carried out on a constant basis, often with expertise hired abroad. The websites of the Greater Mekong Subregion program and the Mekong river commission host a multitude of research publications that range from studies of the use of bio fuels in the region, to impact analyses of climate change on the basin.

Recently, expert meetings and summits have been held where academics, policy makers and development partners discussed the future challenges of the basin. How to answer the growing needs for food, water and energy, without damaging the basins ecosystem? Experts from other international river basins were brought in (Asian Development Bank, 2012a). Of course, there is no simple answer to these challenges, but the international organizations are successfully functioning as a platform for the riparians to look ahead.

Another major challenge for the basin is climate change. Although climate change is not affecting the basin on a large scale yet, its first effects are noticeable, especially in the Mekong delta in Vietnam. Salt water intrusion ruins crops, and is thereby a threat to farmers livelihoods but also to food security (MRC, n.d. b). Climate change is expected to cause extreme drought and flooding in the

basin, effecting all the inhabitants. Although climate change is a global problem, the Mekong riparians are cooperating in taking their first steps. Through the Mekong River Commission, they have started research projects to investigate the consequences of climate change for the basin, there is an initiative where locals and organizations can share their adaptation strategies and also an awareness campaign has been set up to inform the inhabitants (MRC, n.d. a).

Sustaining the balance

The interdependence models in the previous chapter have shown the great complexity of interrelated dynamics in the basin. Every change to such a complex system has incalculable consequences. This complexity might be a reason for the riparians to be careful and keep up cooperation instead of taking a risk by giving up on cooperation or resorting to conflict. Cooperation gives positive impulses to the basins system, for example boosting employment and development through infrastructure and tourism promotion. Or by boosting trade by the lowering of trade obstructions and improving harvests and fisheries due to integrated management. These positive impulses would be lost if the riparians cancelled their cooperation programs. Jobs would be lost, and the riparians would suffer an economic set back. An end to environmental cooperation may have even more disastrous consequences. Besides the loss of the positive impacts of cooperation, the riparians would miss the opportunity to prepare for the challenges of the future together. And on top of that, they would also lose a means of control if they left international organizations. The organizations are a framework through which they can try to dissuade other riparians from plans that could be harmful, for example large hydropower projects or projects causing great damage to the environment. In this sense, less cooperation means less influence and less control. Resorting to conflict would have direct negative effects on variables in every interdependence field. The severity of the effects would depend on the severity of the conflict. Diplomatic pressure would impact the system in a lighter way than war, that would have tremendous social and economic impacts, and might be the ultimate disaster to the environment. Maintaining the basins precarious balance through cooperation seems a logical option for the riparians, maybe even their only option.

8. The added value of systems thinking

In this thesis I have applied systems thinking to the international river basin of the Mekong. The river turned out to be a core element in many different interdependence relations in different fields. A complex web of interdependencies connected the Mekong and its resources to economic, social, environmental and hydropower variables. What were the lessons and advantages of looking at a river basin with a systems approach?

In the present literature on international river basins, many authors choose a perspective that compares the different positions and interests of the riparians (for example: Dinar et al., 2007, p. 229; Keskinen et al., 2008, p. 83; Gajaseeni et al., 2006, p. 66-70). This results in the image of a river basin filled with conflicting national interests. These interests are presented in a simplified way, eg. 'China basically wants hydropower, Vietnam focuses on agriculture.' This focus on (simplified) national interests does not take into account that the nations are part of complex economic, environmental and social systems. China does not solely want hydropower, China would also benefit from a healthy ecology, and Vietnam does not solely want agriculture, they also have a growing need for energy. A focus on complex interdependencies generates insights in the multiple interests of states, and how these interests relate to each other. Sometimes interests are contradictory, for example the needs of Vietnam, that criticizes upstream dam construction for damage to the Vietnamese agriculture, but at the same time Vietnam is in need of energy and is constructing hydropower projects itself.

The focus on interdependencies has made me wonder if the international level is the right level to look at the Mekong river basin at all. The nations have common needs and common problems, the models I presented are entirely made up of issues that matter on a basin wide level, they are not national issues. Instead of the nation versus nation conflict of interest described above, conflicts of interest seem to be between the local and the (inter)national, between the people in the rural areas, who depend on the river for their livelihood, and the government, that wants to develop the rivers resources in a way that will threaten these livelihoods. And here again systems thinking kicks in, arguing there may be direct causal links between hydropower development and the disturbance of the ecosystem on which these people depend, but in the long run, via indirect links, hydropower contributes to trade and development and abatement of deforestation from which these people will benefit. Systems thinking enables you to see both short and long term consequences.

Many authors incorporate their personal values in their work, sometimes in a more, sometimes in a less explicit way (eg. Hubbel, 2002, who disapproves of any type of water resource development of the Mekong, and Gajasen et al., 2006, who value ecology over everything else). Some argue in favour of dam construction, some in favour of the protection of the traditional livelihoods, some criticize foreign interference, others praise the economic boost it provides. The benefit of system dynamics thinking in this aspect is the objectivity of it. While constructing the models, you identify the links between variables as being negative or positive, but only in the sense that they lead to an increase or a decrease of a certain variable. You are constantly aware of the fact that the nature of a link between variables is something different from your own appreciation of that link.

Systems thinking forces you to identify all effects of a variable, instead of picking a single chain of consequences. I noticed many authors limit their reasoning to a single chain of consequences. This mostly happens in magazines and news coverage by journalists (eg. Fawthrop, 2009; Richardson, 2009; Lam, 1995; Hubbel, 2002), but also in academic work (eg. Isaak & Sax Kaijser, 2007 on urbanization and dam construction). For example, they examine the negative impacts of irrigation on the environment, resulting in the conclusion that irrigation is 'bad' because it is harmful to the environment. This type of reasoning strikes me as being very narrow minded. How can you oppose irrigation if you are aware of the growing population that has to be fed? Or how can you oppose infrastructure projects if they also provide access to hospitals or markets where families can buy the bare basics to survive? Thinking in terms of systems and interdependence constantly makes you aware that everything seems to have both positive and negative consequences. Even if you started out with any personal opinions, like 'dam construction is a bad option for the Mekong!' completing interdependence models forces you to acknowledge that dam construction also has many consequences that you may value as positive, for example that hydropower means less forests have to be cut down for fuel wood.

Being aware that variables have both effects you appreciate and effects you do not appreciate results in a picture of the river basin as a setting for trade-offs, rather than a setting of negative or positive chain reactions. Every choice the riparians make involves a trade-off, for example the intensification of agriculture may be good for food security but pollute the environment through the use of fertilizers. Hydropower development will boost economic development but has negative impacts on biodiversity. The exploitation of natural resources may seem bad on one hand as rapid depletion is leaving less for future generations but it does provide work and food for their parents. Being aware of this complexity, it suddenly becomes a lot harder to judge the choices made by the riparians. If they want to protect traditional livelihoods, it means less power to fuel economic growth, and if they want rapid economic development, the environment will have to suffer. This is the type of choices the riparians face, and it seems impossible to identify trade-offs as 'right' or

‘wrong’. Interdependence models may be helpful for this type of choices however, as I will argue in the next chapter.

I experienced that a focus on interdependencies, and seeing a river basin as a system enabled me to go beyond simple representations of a river basin as solely an arena of competing national interests. It enabled me to look at the chances and challenges of the whole basin, but also within the basin. It made me aware of long and short term consequences. This approach helped me to see through narrow minded reasoning where only a single effect of a factor is taken into account. It made me aware that the river basin is an arena of trade-offs, and each route to development has negative and positive consequences. The sheer number of connections and feedback loops in the models demonstrated that in the Mekong river basin ‘everything seems to be connected to everything’. This complexity seems to be a plausible explanation for successful cooperation in the basin, because non-cooperation would affect the system through multiple links, and the consequences for the economy, the environment and the people living in the basin are unpredictable.

9. Conclusion

This conclusion consists of two parts. First a general conclusion about the Mekong river basin, based on the insights gained by a focus on complex interdependence and a systems perspective. Second, the research will be reflected upon, and suggestions for a policy application of interdependence models and suggestions for further research are offered.

9.1 The Mekong river basin as an arena of trade-offs

This research has looked at the complex dynamic of water conflict/cooperation from a systems perspective. The Mekong river basin, a showcase of good cooperation was approached as a dynamic system interdependent factors, building on previous research that concluded complex interdependence is probably an explanation for successful water cooperation.

In chapter 5, international relations liberalism provided general principles about cooperation, and the literature on water conflict and cooperation added specific factors that influence the likeliness of cooperation. From these principles and factors, 4 fields of interdependence emerged: economic interdependence, environmental interdependence, social interdependence and political interdependence. The specific situation of the Mekong caused an adaptation from the original 4 fields to: economic interdependence, socio-environmental interdependence, political interdependence and hydropower interdependence. In chapter 6, all four proved to be truly complex fields of interdependence when the models were completed.

In the economic field of interdependence cooperation turned out to be a useful tool for development for the poor riparians, who aim to boost their economies by trade. In the field of socio-environmental interdependence the river basin is facing difficult challenges in maintaining a balance between the inhabitants and the environment. Cooperation mainly serves as a means of damage control. In the political field river cooperation has provided stability and diminution of enemy images. In the field of hydropower interdependence the main benefit of cooperation had been in terms of data sharing and the development of a common hydropower strategy. On the basis of these findings, chapter 7 distinguished three main reasons to cooperate: firstly, cooperation helps to deal with problems that are too much for a riparian to deal with on their own, like poverty, disease or flood management. Secondly, cooperation helps the riparians to prepare for the challenges of the future, for example climate change. Thirdly, being part of such a complex system may in itself be a reason to cooperate. Cooperation and its effects are a part of the current dynamic, and (even minor) conflict would be an interruption. Any disturbance can have disastrous effects for the riparians ranging from a loss of jobs to pollution, flooding or even starvation.

This research has been different from previous studies in a number of ways. Studies tend to look at the basin as an arena of conflicting interests, but this study showed the riparians are interdependent and their interests are not very different at all. They all seek development through export and hydropower, and they all need to maintain a healthy ecology because so many inhabitants in every nation depend on it. The systems perspective made it possible to see the dynamic of the river basin, and see both long and short term consequences. It provided an overview of the basin as a complete system, where things that seemed unrelated at first sight turned out to be related and dependent on each other. Many authors trace a single causal chain of a factor and conclude this factor is 'harmful' (eg. hydropower) or 'threatened' (eg. the traditional livelihoods). But the models showed nearly every factor has many consequences, both ones we value as negative and ones we value as positive.

My conclusion is that the river basin is an arena of trade-offs, and through cooperation a precarious balance is maintained. Acknowledging interdependence, and being aware of it whilst making choices may help the riparians to make more informed choices dealing with trade-offs. Being aware of the true complexity of an international river basin may help people to maintain the balance.

9.2 Reflections and suggestions for further research and practical application

This final paragraph reflects on both the possibilities and the shortcomings of my research. From the shortcomings, suggestions for further research are derived.

Reflections on modeling and a basin wide systems perspective

As I already pointed out in paragraph 6.5, 'explanation and justification of the models', the broad character of this research has lead me into fields in which I am no expert. As a result the models I present are bound to have some inaccuracies and some missing parts. A possible practical application of interdependence models may be to help policy makers to determine a course of action. It can be worthwhile for the riparian governments and/or the Mekong river commission to get an interdisciplinary team of experts together to develop more accurate interdependence models. These models could be of great help when making policy decisions. When policymakers aim to influence a variable from the model, they will be more aware of all variables connected to it, and the long and short term effects their policy may have.

This research has a qualitative nature. The aim of the models in this research is to visualize complex relations, they are not suitable for actual predictions or calculations. If quantitative models were developed researchers would be able to make predictions and calculations. This type of model

that combines quantitative properties with a systems perspective on the river basin would be very useful for hydropower development projects. Current studies of the consequences of dams often have a narrow focus, taking into account for example only changes in water level (for example: Li & He, 2008) or the effects on sedimentation transport (for example: Kummu & Varis, 2006). Seeing the basin as a system would mean linking this type of predictions to further social, environmental and economic consequences. For example, what would this change in water level mean for the aquatic life, and what would less aquatic life mean for the basins inhabitants in terms of a loss of income and food? Or what would this change in sedimentation transport mean for farmers downstream? Only if a complete picture of costs and benefits of hydropower is presented, the riparians can make a choice, and a quantitative model would provide an indication of the actual height of the costs and benefits they are dealing with.

The Mekong river basin has been approached as a whole in this research, the view was on a basin wide scale. Working at this level meant no attention could be paid to local problems and realities. I believe however that complex interdependence is just as relevant at the local level. The local level is the level where the effects of complex interdependence manifest themselves. For example, a basin wide decision to invest in infrastructure or encourage tourism may have particular consequences for a certain village or family. So looking at the effects of complex interdependence at a local level would be a valuable addition to the detached, basin wide picture I have presented.

Reflections on the theoretical background of the research

This research has drawn on liberalism, which highlights the positive effects of cooperation, but fails to explain why some conflicts and clashes of interest remain. Yes, cooperation has proved to be a useful tool for overcoming political tension and for attuning national interests, but it does not simply help to overcome anything. The liberalist background of this research makes it overemphasize the successes of cooperation. I would like to stress however that the Mekong river basin is not some 'shining happy valley'. Despite successful cooperation, many problems and conflicts of interest remain.

As I mentioned in chapter 2, the theoretical framework, international relations has other strands besides liberalism. Constructivism deals with the role of culture and identities in shaping discourse and (political) attitudes. The liberalist background of this research has the effect that it tends to focus on organizations and institutions, and neglect the influence of culture and identity. A constructivist approach could be used to examine the 'Mekong spirit', the drive to cooperate shared by the Mekong riparians. Cultural factors and shared identities may explain why they were so eager to cooperate.

My last suggestion for further research is examining more international river basins with an

approach similar to the one applied here. Looking at complex interdependencies and cooperation in more basins may provide generalizable conclusions. For example, from the case of the Mekong one could derive the hypothesis that countries that are interconnected by trade and that have interdependent economies are likely to have successful river cooperation. But such a hypothesis would of course first have to be verified on multiple cases. By examining complex interdependence in different international river basins one might be able to derive more general assumptions about which types of interdependence are related to successful river cooperation.

Sources

Affeltranger, B. (2009). Sustainability of environmental regimes: The Mekong River Commission. In H. G. Brauch, U. O. Spring, J. Grin, C. Mesjas, P. Kameri-Mbote, N. C. Behera, B. Chourou, & H. Krummenacher (Eds.), *Facing global environmental change: Hexagon series on human and environmental security and peace*. (2009). Berlin: Springer Berlin Heidelberg.

Anand, P. B. (2007). *Scarcity, Entitlements and the Economics of Water in Developing Countries*. Cheltenham: Edward Elgar Publishing Limited.

Anisfeld, S. C. (2010). *Water resources*. Washington: Island Press.

Asian Development Bank. (2007). The Mekong region trade: trends, patterns and policies. Date of request 22 march, from <http://www2.adb.org/Documents/Reports/Mekong-Region-Trade/the-mekong-region-trade.pdf> .

Asian Development Bank. (2009). Mekong nations to expand energy cooperation beyond electric power sector. Retrieved on 1 May 2012, from <http://www.adb.org/news/mekong-nations-expand-energy-cooperation-beyond-electric-power-sector?ref=countries/gms/news> .

Asian Development Bank. (2010). ADB to Improve dengue, disease monitoring in three Mekong countries. Retrieved on 1 May 2012, from <http://www.adb.org/news/adb-improve-dengue-disease-monitoring-three-mekong-countries?ref=countries/gms/news>.

Asian Development Bank. (2011). Economic corridors development: measure of success of the GMS program. Retrieved on 1 May 2012, from <http://www.adb.org/news/cambodia/economic-corridors-development-measure-success-gms-program?ref=countries/gms/news>.

Asian Development Bank. (2012a). Green development key to growth in the Mekong region. Retrieved on 1 May, 2012, from <http://www.adb.org/news/green-development-key-growth-mekong-region?ref=countries/gms/news>.

Asian Development Bank. (2012b). Holidays that help the poor. Retrieved on 1 May 2012, from <http://www.adb.org/features/holidays-help-poor?ref=countries/gms/impact-stories>.

Asian Development Bank. (n.d.). *Cumulative impact analysis: final report*. Date of request 6 March 2011, on <http://www.adb.org/Documents/Studies/Cumulative-Impact-Analysis/A1-Urbanisation.pdf>.

Bakker, K. (1999). The politics of hydropower: developing the Mekong. *Political geography* 18, 209-232.

Barbieri, K. (2002). *The liberal illusion: does trade promote peace?* Michigan: The University of Michigan Press.

Beach, H. L., Hamner, J., Hewitt, J., Kaufman, E., Kurki, A., Oppenheimer, J. A., & Wolf, A. T. (2000). *Transboundary freshwater dispute resolution: theory, practice and annotated references*. Tokio: United Nations University Press.

Chomchai, P. (2005). Public participation in watershed management in theory and practice: A Mekong river basin perspective. In C. Bruch, L. Jansky, M. Nakayama, & K. A. Salewicz (Eds.), *Public participation in the governance of international freshwater resources*. (2005). Tokyo: United Nations University Press.

Cooley, H., Christian-Smith, J., Gleick, P. H., Allen, L., & Cohen, M. (2009). *Understanding and reducing the risks of climate change for transboundary waters*. Oakland: Pacific Institute.

Cooley, J. K. (1984). *The War over Water*. *Foreign Policy*, 54, 3-26.

Cottey, A. (2007). *Security in the new Europe*. United Kingdom: Palgrave Macmillan.

Darwish, A. (2003). Analysis: Middle East water wars. Retrieved on 5 May 2012, from http://news.bbc.co.uk/2/hi/middle_east/2949768.stm.

Dinar, A., McCaffrey, S., Dinar, S., & McKinney, D. (2007). *Bridges over water: understanding transboundary water conflict, negotiation and cooperation*. Singapore: World Scientific.

Duijven, P. (2008). De Mekong: moeder der wateren. *Geografie*, 17(5), 34-37.

Duda, A. & La Roche, D. (1997). Sustainable development of international waters and their basins: implementing the GEF operational strategy. *International Journal of Water Resources Development*, 13(3).

Eichenseher, T. & Than, K. (2011, March 30). Damming the Mekong. *National Geographic*. Retrieved on 22 May 2012, from http://news.nationalgeographic.com/news/2011/03/photogalleries/110331-mekong-river-dam-endangered-megafish/#/mekong-river-giant-fish-threatened-dam_33707_600x450.jpg.

Elhance, A. P. (1999). *Hydropolitics in the third world: conflict and cooperation in international river basins*. Washington: United Nations Institute of Peace.

Fawthrop, T. (2009, March 13). Mekong river hydroelectric dam threatens livelihoods and endangered species in landlocked Laos. *The Guardian*. Retrieved on 22 May 2012, from <http://www.guardian.co.uk/environment/2009/mar/13/laos-hydroelectric-dam>.

Forrester, J. W. (1990). Principles of systems. In B. M. R. Van der Velde (ed.), *Modelling: ontwerp en toepassing*. Nijmegen: Radboud Universiteit.

Fox, C. A., & Sneddon, C. (2007). Transboundary river basin agreements in the Mekong and Zambezi basins: Enhancing environmental security or securitizing the environment? *International*

Environmental Agreements: Politics, Law and Economics, 7(3), 237-261.

Fuller, T. (2010, April 1). Countries Blame China, Not Nature, for Water Shortage. *New York Times*, date of request 4 March 2011, on <http://www.nytimes.com/2010/04/02/world/asia/02drought.html>.

Furlong, K., Gleditsch, N. P., & Hedgre, H. (2006). Geographic opportunity and neomalthusian willingness: boundaries, shared rivers and conflict. *International interactions*, 32(1), 79-108.

Gajasen, N., Heal, O. W., & Edward-Jones, G. (2006). The Mekong River Basin: Comprehensive Water Governance. In M. Finger, L. Tamietti., & J. Allouche (Eds.), *The multi-governance of water: four case studies* (pp. 43-75). New York: State University of New York Press.

Hensel, P. R., McLaughlin Mitchell, S., & Sowers, T. E. (2006). Conflict management of riparian disputes. *Political geography*, 25(4), 383-411.

Garcia, J. M. (2006). Theory and practical exercises of system dynamics. In B. M. R. Van der Velde (ed.), *Modelling: ontwerp en toepassing*. Nijmegen: Radboud Universiteit.

Goh, E. (2004). China in the Mekong River basin: the regional security implications of resource development on the Lancang Jiang. Singapore: Institute of Defence and Strategic Studies. Retrieved on 17 April 2012, from http://dr.ntu.edu.sg/bitstream/handle/10220/4469/RSIS-WORKPAPER_73.pdf?sequence=1.

Hubbel, D. (2002). "Development" in the Mekong region. Retrieved on 17 April 2012 from the Asia-Pacific Human Rights Information Center on <http://www.hurights.or.jp/archives/focus/section2/2002/12/development-in-the-mekong-region.html>.

Index Mundi. (n.d.). Country Facts: Asia. Retrieved on 2 April 2012, from <http://www.indexmundi.com/asia.html>.

Isaak, D., & Sax Kaijser, A. (2007). Mekong: a contested water resource: prospects and challenges for a sustainable development of the Mekong River basin. Retrieved on 2 April 2012, from http://lu.academia.edu/AnnaKaijser/Papers/1092631/Mekong_a_Contested_Water_Resource.

Jackson, R., & Sorensen, G. (2007). *Introduction to international relations: theories and approaches*. Oxford: Oxford University Press.

Jacobs, J. W. (1994). Toward sustainability in the lower Mekong river basin development. *Water international*, 19(1), 43-51.

Kalbhenn, A. (2011). Liberal peace and shared resources –A fair-weather phenomenon? *Journal of Peace Research* 48, 715-735.

Katz, D. L. (2008). *Water, economic growth, and conflict: three studies*. University of Michigan, date

of request 4 March 2011, on
http://deepblue.lib.umich.edu/bitstream/2027.42/60789/1/katzdl_1.pdf.

Kehl, J. R. (2011). Hydropolitical complexes and asymmetrical power: conflict, cooperation, and governance of international river systems. *Journal of World-Systems Research*, 17(1), 218-235.

Keohane, R. O., & Nye, J. S. (1973). Power and interdependence. *Survival: Global politics and strategy*, 15(4), 158-165.

Keskinen, M., Mehtonen, K., & Varis, O. (2008). Transboundary cooperation vs. international ambitions: The role of China and Cambodia in the Mekong region. In N. I. Pachova, M. Nakayama, L. Jansky (Eds.), *International Water Security: domestic threats and opportunities* (pp. 79-105). Hong Kong: United Nations University Press.

Kummu, M. & Varis, O. (2006). Sediment-related impacts due to upstream reservoir trapping, the lower Mekong river. *Geomorphology* 85(3), 275-293.

Lam, A. (1995). A fate worse than war. *Earth Island Journal* 10(3), 26.

Li, S. & He, D. (2008). Water level response to hydropower development in the upper Mekong river. *AMBIO: A journal of the human environment* 37(3), 170 – 176.

Mekong Flows. (2010). Hydropower. Retrieved on 13 June 2012, from
<http://mekongriver.info/hydropower>.

Mekong River Commission. (2005). Overview of the hydrology of the Mekong Basin. Retrieved on 13 June 2012, from <http://www.mekonginfo.org/assets/midocs/0001968-inland-waters-overview-of-the-hydrology-of-the-mekong-basin.pdf>.

Mekong River Commission. (2010). State of the Basin report 2010. Retrieved on 13 June 2012, from <http://www.mrcmekong.org/assets/Publications/basin-reports/MRC-SOB-report-2010full-report.pdf>.

Mekong River Commission. (n.d. a). Climate change and adaptation initiative. Retrieved on 1 May 2012, from <http://www.mrcmekong.org/about-the-mrc/programmes/climate-change-and-adaptation-initiative/>.

Mekong River Commission. (n.d. b). Living on the edge of the rising sea. Retrieved on 1 May 2012, from <http://www.mrcmekong.org/the-mekong-basin/stories-from-the-mekong/living-on-the-edge-of-the-rising-sea/>.

Molle, F., Foran, T., & Kähkönen, M. (2009). *Contested waterscapes in the Mekong Region: hydropower, livelihoods and governance*. Sterling: Earthscan.

Moravcsik. (n.d.). *Liberalism and international relations theory*. Cambridge: Center for European studies.

Mottatarn, M. (2011, April 11). Mekong River special report: the Chinese factor. *South East Asia*

Globe Magazine, date of request 4 March 2011, on <http://www.sea-globe.com/Related-Articles/the-chinese-factor.html>.

Naff, T., & Matson, R. C. (1984). *Water in the Middle East: conflict or cooperation?* Boulder: Westview Press.

Nye, J. S., & Welch, D. A. (2011). *Understanding global conflict and cooperation: an introduction to theory and history*. United States: Pearson education.

Öjendal, J. (1995). Mainland Southeast Asia: co-operation or conflict over water? In L. Ohlsson (Ed.), *Hydropolitics, conflicts over water as a development constraint*. (1995). Londen: Zed Books.

Pech, S., & Sunada, K. (2008). Population growth and natural-resources pressures in the Mekong River basin. *Ambio*, 37(3), 219-224.

Phillips, D., Daoudy, M., McCaffrey, S., Öjendal, J., & Turton, A. (2006). Trans-boundary water co-operation as a tool for conflict prevention and broader benefit sharing. *Global Development Studies* 4.

Priscoli, J. D., & Wolf, A. T. (2009). *Managing and transforming water conflicts*. New York: Cambridge University Press.

Richardson, M. (2009). *Dams in China turn the Mekong into a river of discord*. Yale center for the study of globalization, date of request 4 March 2011, on <http://yaleglobal.yale.edu/content/dams-china-turn-mekong-river-discord>.

Rijlaarsdam, J. (2008). Donorlieveling Cambodja lokt investeerders en toeristen. *Geografie*, 17(5), 30-33.

Sadoff, C. W., & Grey, D. (2002). Beyond the River: the benefits of cooperation on international rivers. *Water policy* 4, 389-403.

Starr, J., & Stoll, D. C. (1988). *The Politics of scarcity: water in the Middle East*. Boulder: Westview Press.

Stein, A. A. (1990). *Why nations cooperate: circumstance and choice in international relations*. New York: Cornell University Press.

Tales of the Mekong. (2007). (documentary)

Than, M. (2002). Economic co-operation in the Greater Mekong Subregion. *Asian-Pacific Economic Literature* 11 (2), 40-57.

Tir, J., & Ackerman, J. T. (2009). Politics of Formalized River Cooperation. *Journal of Peace Research* 46, 623-640.

Toset, H. P. W., Gleditsch, N. P., & Hegre, H. (2000). Shared rivers and interstate conflict. *Political geography*, 19(8), 971-996.

Tvedt, T. (2011). Water: a source of wars or a pathway to peace? An empirical critique of two dominant schools of thought on water and international politics. In: T. Tvedt, G. Chapman, & R. Hagen (Eds.), *A History of Water, series 2, volume 3: Water, Geopolitics and the New World Order* (pp. 79-110). Londen: I. B. Tauris.

Verschuren, P., & Doorewaard, H. (2007). *Het ontwerpen van een onderzoek*. Den Haag: Boom Lemma uitgevers.

Verweij, M. (1999). A watershed on the Rhine: changing approaches to international environmental cooperation. *Geojournal* 47, 453-461.

Vörösmarty, C. J., Green, P., Salisbury, J., & Lammers, R. B. (2000). Global Water resources: vulnerability from climate change and population growth. *Science*, 289, 284-288.

Vries, de M. S. (1990). Interdependence, cooperation and conflict: an empirical analysis. *Journal of Peace Research*, 27(4). 429-444.

Weatherbee, D. E. (1997). Cooperation and conflict in the Mekong River basin. *Studies in Conflict & Terrorism* 20(2), 167-184.

Wolf, A. T. (1998). Conflict and cooperation along international water ways. *Water Policy*, 1(2), 251-265.

World Wildlife Fund. (2008). Greater Mekong a biological treasure trove: more than 1000 new species discovered in a decade. Retrieved on 17 April 2012 from <http://wwf.panda.org/index.cfm?uNewsID=152622>

Osborne, M. (2012). Is Laos building a dam at Xayaburi? Retrieved on 13 June 2012, from <http://www.lowyinterpreter.org/author/Milton%20Osborne.aspx>.

Yoffe, S., Fiske, G., Giordano, M., Giordano, M., Larsson, K., Stahl, K. & Wolf, A. T. (2004). Geography of international water conflict and cooperation: data sets and application. *Water resources research*, 40.

Yunnan. (2012). Retrieved on 2 April 2012, from <http://en.wikipedia.org/wiki/Yunnan>.

Zeitoun, M. & Warner, J. (2006). Hydro-hegemony – a framework for analysis of trans-boundary water conflicts. *Water Policy* 8, 435–460.

Zeitoun, M. & Warner, J. (2008). International relations theory and water do mix: A response to Furlong's troubled waters, hydro-hegemony and international water relations. *Political Geography* 27(7), 802–810.

Appendix

Social indicators of the lower basin riparians (After: MRC, 2010, p. 32)

Indicators	Cambodia	Lao PDR	Thailand	Viet Nam
Total area (km ²)	181,035	236,800	513,120	332,000
Total LMB area (km ²) ¹	156,435	206,620	203,060	34,373 (Mekong Delta) 32,400 (Central Highlands)
Population 2007 (million) ²	14.4	5.9	63.9	87.4
LMB population 2007 (million) ¹	13.0	5.2	23.1	18.7
Number of provinces	25	17	75	58
Number of provinces in LMB	23	17	25	20
Composition of ethnic groups (% of total) ^{3, 4}	Khmer (90) Vietnamese (5) Chinese (1) Mon-Khmer (2) others (2)	Lao (55) Khmu (11) Hmong (8) others (26)	Thai (75), Chinese (14) others (11)	Kinh (Viet) (86.2), Tay (1.9), Tai (1.7), Muong (1.5), Khmer (1.4), Hoa (1.1), Nun (1.1), Hmong (1), others (4.1)
Languages	Khmer	Lao	Thai	Vietnamese
Religions	Buddhism	Buddhism	Buddhism	Buddhism
Average annual population growth rate (% 2007) ⁶	1.9	2.1	0.8	1.2
Population density (people per km ² , 2007) ²	80	25	125	265
Rural population (% of total population, 2007) ⁸	78	69	68* ⁷	72*
Rural population density (people per km ² of arable land, 2005) ^{7, 5}	303	450	323 (1999)	930
Access to clean drinking water (% of population, 2006) ⁹	65	60	98	92
Improved sanitation (% of population with access to, 2006) ²	28	56 ¹⁵	96	65
GDP per capita (US\$, 2006) ¹⁴	648	674	3000	900
Proportion of population below national poverty line (%) ²	35 (2004)	33 (2003)	10 (2006) ¹⁶	16 (2006)
Life expectancy at birth (years, 2007) ²	59	64	71	74
Infant mortality (rate per 1000 live birth, 2006) ²	65	59	7	15
Malnutrition rate (% 2007) ¹⁰	28	36 (2000)	7	20
Global hunger index level (2009) ¹¹	Alarming/high vulnerability	Serious/high vulnerability	-	Serious/high vulnerability
Net primary school enrolment rate (% 2007) ⁹	89	86	94	98
Adult literacy rate (% 2007) ^{2, 13}	76	73	94	90
Freshwater withdrawal for agriculture (% 2002) ²	98	90	95	68.1
World corruption ranking (2007) ^{12, **}	134	140	67	98

* data are for the whole country; ** lower rankings are preferable;

Sources:

1. MRC BDP database
2. UNESCAP 2008. Statistical Year Book for Asia and the Pacific 2008
3. CIA World Fact Book 2008. Central Intelligence Agency, United State of America <https://www.cia.gov/library/publications/the-world-factbook/geos/cb.html>
4. Viet Nam Population Census 1999
5. GMS Atlas of the Environment, GMS Environment Operations Centre, accessible website: www.gms-eoc.org/Country/Country.aspx
6. ADB 2008. Key Indicator for Asia and the Pacific 2008 (39th Edition): Special Chapter Comparing Poverty across Countries: The Role of Purchasing Power Parities
7. International Fund for Agricultural Development (IFAD). Rural Poverty Portal Statistic and World Development Indicators
8. Population and Housing Censuses of Thailand In FAO 2005: Rural population aging and farm structure In Thailand
9. UN MDG Indicators online, <http://mdgs.un.org/mdg/SeriesDetail.aspx?srld=665>
10. The World Bank. An online atlas of the MDG: <http://devdata.worldbank.org/atlas-mdg/>
11. International Food Policy Research Institute (2009): 2009 Global Hunger Index- the Challenge of Hunger: focus on Financial Crisis and Gender Inequality
12. The World Democracy Audit (2007): 2007 Corruption Ranking
13. UNDP 2009 Human Development Report, Viet Nam Country Fact Sheet
14. World Bank database 2009
15. UNICEF and WHO 2008. Progress on drinking water and sanitation.
16. NSO 2006. National Statistical Office, Thailand