Engineering Cooperation?

The Contribution of Water Experts in Promoting Water Cooperation in the Mountain Aquifer (Israel – Palestine) and in the Rhine River Basin

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Challenge the future

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Artist: Wikke Novalia

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Preface

This study was carried out as the final requirement for completion of the MSc study in Water Management at the Delft University of Technology. The study was carried out from April 2013 until November 2013. The study case of the Mountain Aquifer has been a part of the CoCoon project Groundwater in the Political Domain.. The result of this study is to be defended on Thursday the 28th of November 2013 in Delft.

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Delft, November 2013
David Martianus Ginting

Summary

Different water resources are shared among neighbouring nations worldwide, as water does not recognize any (political) boundaries. This fact has led to conflict and cooperation between neighbouring states over the management of such water resources, widely-known as transboundary water resources. To manage these resources in a way that it prevents conflict and promotes cooperation, a wide range of expertise is required. It is the objective of this study to investigate the possible contributions that water experts can bring to the promotion of water cooperation.

It was identified that the causes of conflict and cooperation over a shared water resource can be grouped into two dimension, *drivers* and *indicators*. *Drivers* are events over shared water resources (i.e. water pollution, flooding, water abstraction, drought and water development plans) that generate potential conflict. While *indicators* (i.e. power balance, ideological imbalance and inter-riparians relations) are factors that strongly-influence whether the potential conflict will become an actual conflict, or even become an actual cooperation.

Water experts can contribute to the promotion of water cooperation by influencing both *drivers* and *indicators*. These contributions can diminish, or even, counteract the potential conflicts generated by the *drivers*. Also they can create a more cooperative *indicators*. These contributions include:

1. To open and maintain communication lines;
2. To raise public awareness;
3. To build confidence;
4. To exchange and jointly collect data;
5. To develop and propose potential solution;
6. Act as an independent party;
7. Capacity building;
8. To inform decision makers.

In the case of the Rhine water pollution, where riparians have a relatively good and balanced relations, the contributions of (internal and external) water experts are focused on overcoming the *drivers* by developing potential solutions, and on sustaining the cooperative *indicators*. While in the case of the Mountain Aquifer, where riparians have an imbalanced relations and a long history of conflict, the contributions of water experts are focused on building a more cooperative *indicators*. In this case, most of the contributions are provided by the external water experts as the internal water experts are restrained by the political stance and procedure adopted by their governments.

In order for the contributions to impact the *drivers* and *indicators*, the water experts need to overcome obstacles that may dampen the positive impacts of their contributions, or may even cause counterproductive impacts. Such obstacles range from the ones that are inevitable, attached to the complex nature of the water conflict and thus are beyond water experts' grasp, to those that are avoidable. Some of such barriers are as follows:

1. Insensitivity to political and social context;
2. Inter-disciplinary and inter-level communication;
3. Different analysis method;
4. Credibility of water experts.

To overcome those barriers water experts are recommended to stay modest, closely collaborate with experts from other fields and to give extra effort on understanding the local public, the decision makers and the non-technical aspect of the issue. By doing so the (technical) solution that water experts will become more acceptable by those parties. Also, this will enable water experts to see whether their involvement will lead to an *equal* (and desirable) cooperation for all riparians, and lead to ethical and efficient promotion of water cooperation.

Finally, it recommended for universities, as the preparer of the future water experts, to try to make their students realize that in order to be effectively and ethically involved in a transboundary water management, and to promote water cooperation, having the technical knowledge is not enough. Here universities are expected to let the future water experts understand that sensitivity to non-technical aspects of the issue is vital and to provide related training upon the request of these future water experts.

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List of abbreviations

BWC	: Bilateral Water Commission
CA	: Israeli Civil Administration
CC	: Coordinating Committee of the ICPR
CHR	: International Commission for the Hydrology of the Rhine Basin
ICPR	: International Commission for the Protection of the Rhine
EG	: Expert Group of the ICPR
EXACT	: Executive Action Team
FoEME	: Friends of Earth Middle East
JTC	: Joint Technical Commission
JWC	: Joint Water Commission
JSETs	: Joint Supervision and Enforcement Teams
MCM/year	: Million cubic meter per year
NGO	: Non-Governmental Organization
OSA	: Office of Science Advisors
SG	: Strategy Group of the ICPR
RHDHV	: Royal HaskoningDHV
WG	: Working Group of the ICPR
WMB	: Water Mediation Body

Chapter 1: Introduction

1.1 Background

As water does not recognize any (political) boundaries, different water resources (lakes, rivers, groundwater aquifers) are shared among neighboring countries around the world. Such resources are known as transboundary water resources. Today a total of 263 transboundary rivers, and an untold numbers of groundwater aquifers, are shared among 145 nations worldwide; with their basin areas covering almost half of the earth's land surface (A. T. Wolf, 2007).

Conflicts and cooperation over transboundary water resources between its riparian states have occurred, and will continue to occur, for thousands of years; mainly in deciding its management or exploitation strategy. One of the oldest causes of this is water scarcity. Due to over-exploitation of different water resources, in 1997 United Nations estimated around 460 million people were living in water-stressed areas; measured by water scarcity. By continuing the current water consumption pattern, it was estimated that two-thirds of the world's population will live in areas with moderate to high water stress (UN, 1997). Moreover, the ever-increasing fresh water demand (due to population growth, industrialization and urbanization), is also expected to further elevate the level of water scarcity. For countries with shared water resources, such increase will make them more vulnerable to water conflict. Therefore, creating a smart strategy to manage transboundary water resources, that prevents conflict and promote cooperation, is increasingly becoming more important globally.

As water is integrated to almost every aspects of human lives, managing transboundary water resources will require a wide range of expertise. At least six different expertise are needed: international relation, international law, economics, negotiation theory, geography and hydrology (water resources management). As the four-first mentioned expertise have been indicated as the most instrumental expertise in the development of transboundary water management (especially in regard with cooperation and conflict) (A. Dinar, Dinar, & McCaffrey, 2007), relatively less attention are paid to the last two expertise. Despite that, it has been indicated that the experts of hydrology and water resources management can actually play an important role in building a basin-wide cooperation, especially through inter-riparian technical cooperation (Savenije & Van der Zaag, 2000).

1.2 Research Questions

This brings us to the central question of this research:

How can water experts contribute to the promotion of transboundary water cooperation and the prevention of transboundary water conflict?

In this report, the term 'water experts' refers to experts in the field of hydrology or water resources management (with the background of natural or technical sciences).

By answering the main research question, a better insight on the relation between water cooperation and conflict – and the involvement of water experts can be gained. The author hopes that it could be useful for future water experts (who are considering to work in the field of

transboundary water management, especially in the issue of water cooperation and conflict) to make their decision regarding their involvement in this field.

The answer of the main research question was approached by answering the following sub-research questions:

SQ 1. What are transboundary water cooperation and conflict?
SQ 2. What are the causes of transboundary water cooperation and conflict?
SQ 3. Who are the water experts?
SQ 4. What are the contributions of the water experts in the management of transboundary water resources?
SQ 5. How can water experts promote cooperative transboundary water management?
SQ 6. What are the barriers for water experts in promoting water cooperation or preventing water conflict?

1.3 Research Methodology

In general, the research conducted in three major phases: the introductory study phase, case study phase and analysis phase.

Phase I: Introductory study

Phase I was dedicated to lay down author's understanding on water cooperation and conflict worldwide, their causes and their relations to water experts. This introductory study was carried out through a combination of literature study and interviews. Through both means, the author tried to answer sub-research questions 1 – 6 without focusing on one particular case.

The method of literature study was chosen as there are substantial amounts of information, especially on water conflict and cooperation, available at different scientific publications. The initial materials for the literature study were selected with the help of Dr. E. Mostert, as one of the author's MSc thesis supervisor, and with the use of Google Scholar (http://scholar.google.nl/). Dr. E. Mostert, based on his experience on the field of water cooperation and conflict, recommended a list of relevant literatures on the subject. Additional materials was obtained via Google Scholar, using keywords such as: 'transboundary water', 'river', 'aquifer', 'conflict', 'cooperation', 'causes', 'drivers', 'promotion' and 'prevention' (for sub-questions 1 – 2); and keywords like 'contribution', 'role', 'hydrologist', 'water', 'conflict', 'cooperation', 'technical', 'engineer' and 'researcher' (for sub-questions 3 – 6); used in different combinations. From both sources, an *initial set* of relevant literatures was obtained and studied. Along the process of answering the sub-questions, the *initial set* was expanded by adding relevant publications cited in the *initial set*.

Aside from the literature study, interviews were performed to obtain a complete overview of the (generally brief and summarized) information found in the literatures. Therefore several (accessible) authors of the *initial set* literatures were interviewed. These authors are experienced in the management of different shared water resources globally, and thus served the objectives of the introductory study, which is to establish understanding on water conflict and cooperation worldwide. The interviewees include:

1. Naho Mirumachi, Lecturer at the Department of Geography, King's College London, conducted studies on the management of different transboundary rivers, including Orange-Senqu River, Ganges River and Mekong River;
2. Huub Savenije, Professor of Hydrology at the TU Delft, experienced in the management of different transboundary rivers, including Zambezi River;
3. Aaron Wolf, Professor of geography at Oregon State University, developed a database for transboundary freshwater dispute worldwide;
4. Pieter van der Zaag, Professor of Integrated Water Resources Management at the Unesco-IHE, involved in capacity building program for the Mekong River Commission and in Blue Nile Hydro-solidarity project.

Sub-questions 1-6 were used as the main guide in directing the course of the interviews. However, other relevant issues that popped-up during the interview were allowed to be discussed as well. Such semi-structured interview, whereby the interview does not strictly follow the prescribed questions, allowed exploration of new and relevant issues raised during the course of the interview yet not foreseen by the author in his preparation. All interviews were recorded, after getting approval from the interviewees, since it: 1) enabled the author to store more information for a longer period of time, than to store it in author's memory, and to recall it whenever necessary (e.g. when writing the report); 2) enabled the author to be more focused during the interview i.e. not having to take notes constantly which can become a distraction.

After every interview, the interview recording was re-listened and interview scripts were made; scripts that contains the whole conversation. These documents were sent to the interviewees to be checked. By doing this, respondents can check whether there was misinterpretation made by the author. The confirmed, and sometimes adjusted, interview scripts were then used for report writing in the last phase of this study; the analysis phase. This send-and-check method is adopted to all interviews conducted during this study; including the interviews during the case studies.

Phase II: Case study

In essence, phase II was a repetition of part I but focused on two case studies; Rhine River Basin and Mountain Aquifer. The case study method was chosen as it offers the possibility to view and understand the multidimensional issue of transboundary water cooperation and conflicts from different angles and using numerous variables; something that would be difficult to do in other methods, e.g. statistical analysis (Yin, 2009). By looking closer into case studies, author was able to make concrete the rather broad and conceptual information gained from the first phase through specific examples of conflict and cooperation found in the case studies. Although it was realized that more case studies would provide a better overview on the contributions of water experts, the study was limited into two cases due to time and resources constraints. There were three main reasons to select the Rhine River Basin and Mountain Aquifer as the study cases:

1. Shared water resources in these cases exist in different forms, surface water and groundwater. Also, the cooperation and conflict are focused on different aspects; the Rhine River Basin deals with water quality while the Mountain Aquifer deals with water quantity;

2. Information required to study both cases is easily accessible. There have been vast amount of papers and books published on the water cooperation and conflict in both cases. And since this study was performed within the area of Rhine River Basin, it was expected that main actors in the management of this river would be easier to access;
3. The inter-riparians relations in these cases have different natures, which might influence the dynamics of the water cooperation and conflict. The relation between riparians of the Mountain Aquifer can be characterized as hostile since disputes among riparians are *wider* than just about water. While for the Rhine River Basin, riparians have a better relation with each other and cooperate further than the water sector; e.g. industry, trade, transport, etc.

And although a joint management body exists in both river basins, involving water experts, the contributions that water experts in offer in both cases were expected to be different as it can be influenced by the discrepancies in political, economic and international relation among riparians of both cases.

Case studies were done by a combination of literature study, interviews and observations during the 2013 World Water Week in Stockholm; by focusing on the occurrence of transboundary water conflict and cooperation and the involvement of water experts.

Interviews were again conducted as it was aimed to gain information beyond what scientific and official documents may offer. In a sensitive issue such as water conflict, and especially in basins with a poor inter-state relation, official documents may only contain uncontroversial information in order to prevent inter-state tension to further rise. Literature studies were primarily done as preparation for the interviews to gain basic knowledge on the political, economic, geographical and hydrological situation of the riparian states. The materials for this were not only from published scientific literatures, obtained by applying comparable method used in phase I, but also from other sources published by local or international NGO active in these cases. And even documents issued by the conflicting governments were studied; to see whether there is conflicting view. Similar to the interviews done in phase I, the sub-questions 1 – 6 were used as a guide in the interviews while still permitting other relevant issues that popped-up during the interview and was not included in the sub-questions to be discussed.

Case study: Rhine River Basin

The method of snowball sampling (Tansey, 2007) was used in selecting the interviewees. This method was chosen as the (potentially) most relevant interviewees were not foreseeable in the start of the study. The process was started by interviewing a well-known and well-accessible actors in the management of the Rhine, the Secretary-General of the ICPR and the then-Dutch Head of Delegation in the ICPR. After these interview sessions, both respondents were asked to give recommendations about other professionals who can offer different perspective or deeper analysis on the issue. Another reason of choosing the snowball sampling was because water experts that were involved in the management of the Rhine, as potential respondents, were known to have a good relation with each other; or at least a constant contact with each other. Therefore the risk of having the interviewees recommending only their *friends*, those who do not contradict their views, can be considered as minimum. The snowball procedure was repeated until the author gained enough information to answer the sub-research questions; and when the interviews add no significant extra

information and when the respondents began to repeat names in their suggestions. Interviewees for this case study:

1. Gerard Broseliske, Dutch delegation at the Strategy Group of the International Commission for the Protection of the Rhine (ICPR).
2. Bob Dekker, former Head of Dutch delegation at the ICPR.
3. Carel Dieperink, Assistant Professor at the Department of Innovation and Environmental Sciences of the University of Utrecht, did his PhD (an continuously conduct studies) on water pollution and water cooperation in the Rhine.
4. Pieter Huisman, retired Associate Professor of integrated water management at the Delft University of Technology and former Secretary General of the ICPR.
5. Klaas Groen, Coordinator of Dutch representatives at the International Commission for the Hydrology of the Rhine Basin (CHR).
6. Jan Leentvaar, Professor of water and environmental policy making at the Unesco-IHE, former Chairman of the Water Quality and Emission Working Group of the ICPR and former Coordinator of Dutch representatives at the CHR.
7. Michael Schärer, Quality of Surface Waters Section of the Swiss Ministry of Environment, leading Swiss representatives at the Water Quality and Emission Working Group of the ICPR.
8. Heinz Schlapkohl, representative of the Landesverband Rheinland-Pfalz (German NGO) at the Water Quality and emission working group of the ICPR.
9. Eric Sprokkereef, Secretary (and Project Leader Geographical Information System) at the CHR.
10. Ben van de Wetering, Secretary General of the ICPR.

All of the interviews were recorded, written down and sent to the respondents for confirmation.

Case study: Mountain Aquifer

As the author did not have any experience or contact with any Israeli or Palestinian experts, the list of respondents were made with the help of Drs. E. Smidt, one of the author's MSc thesis supervisors. By presenting the profile of water experts that the author considered to be relevant, Drs. E. Smidt with his extensive experience as a mediator for Israel-Palestine water issues, came with suggestion of names and put forward the interview request to them. The method of snowballing was not used here as it was feared that the tension (on political level) of the two countries might have infiltrated to the scientific level. This can prompt the water experts, as the interviewees, to be subjective in recommending the next interviewee i.e. they may tend to recommend only those who do not have contradicting views. Further, the adoption of snowball sampling is also considered unsuitable since the interviewees from both countries might did not know or did not have contacts with each other. Some of the interviews were done via telephone and some of them were done personally, face-to-face, during the 2013 World Water Week event in Stockholm (details to be found in the references list). During the 2013 World Water Week, the author came across another relevant water issue in the area of Palestine and Israel where water experts are also actively involved; the pollution issue of the Lower Jordan River. As the Lower Jordan and the Mountain Aquifer are closely related (through their polluters, through water experts that active in both cases, and through the hydrology cycle), it was decided also to observe the involvement of water experts in this case. The interviewees in these cases include:

1. Nassar Abu Jabal, Palestinian Project Manager of Friends of the Earth Middle East (FoEME)
2. Saul Arlosoroff, (Retired) Director and Chairman of the Finance/Economic Committee of the Israeli National Water Corporation (Mekorot), Former Deputy of Israeli Water Commissioner and was involved in formulating the Oslo II Accords.
3. Gidon Bromberg, Israeli Director of FoEME.
4. Israel Gev, Chairman of the Israel Association of Water Resource and involved in the technical committee of the Israel-Palestine Joint Water Committee.
5. Annette Huber-Lee, Assistant Professor at the Department of Civil and Environmental Engineering of Tufts University, did her PhD (and continuously conduct research) on water allocation between Israel and Palestine.
6. Jeroen Kool, Business Development Director of Royal HaskoningDHV and Project Manager of Royal HaskoningDHV for the Master Plan for Lower Jordan Rehabilitation Project.
7. Sharon Megdal, Professor at the Department of Soil, Water, and Environmental Science at The University of Arizona with research interest in (Israel – Palestine) shared water challenges.
8. Abdullah Sharawi, Business Development Manager at PADICO Holding (Palestinian shareholding company).
9. Joop de Schutter, Programme Manager at the Unesco-IHE, involved in the Regional Water Databanks Project for the riparians of the Jordan River.
10. Abdelrahman Tamimi, General Director of the Palestinian Hydrology Group
11. Omar Zayed, Director of Hydrological Studies and Monitoring of Palestinian Water Authority

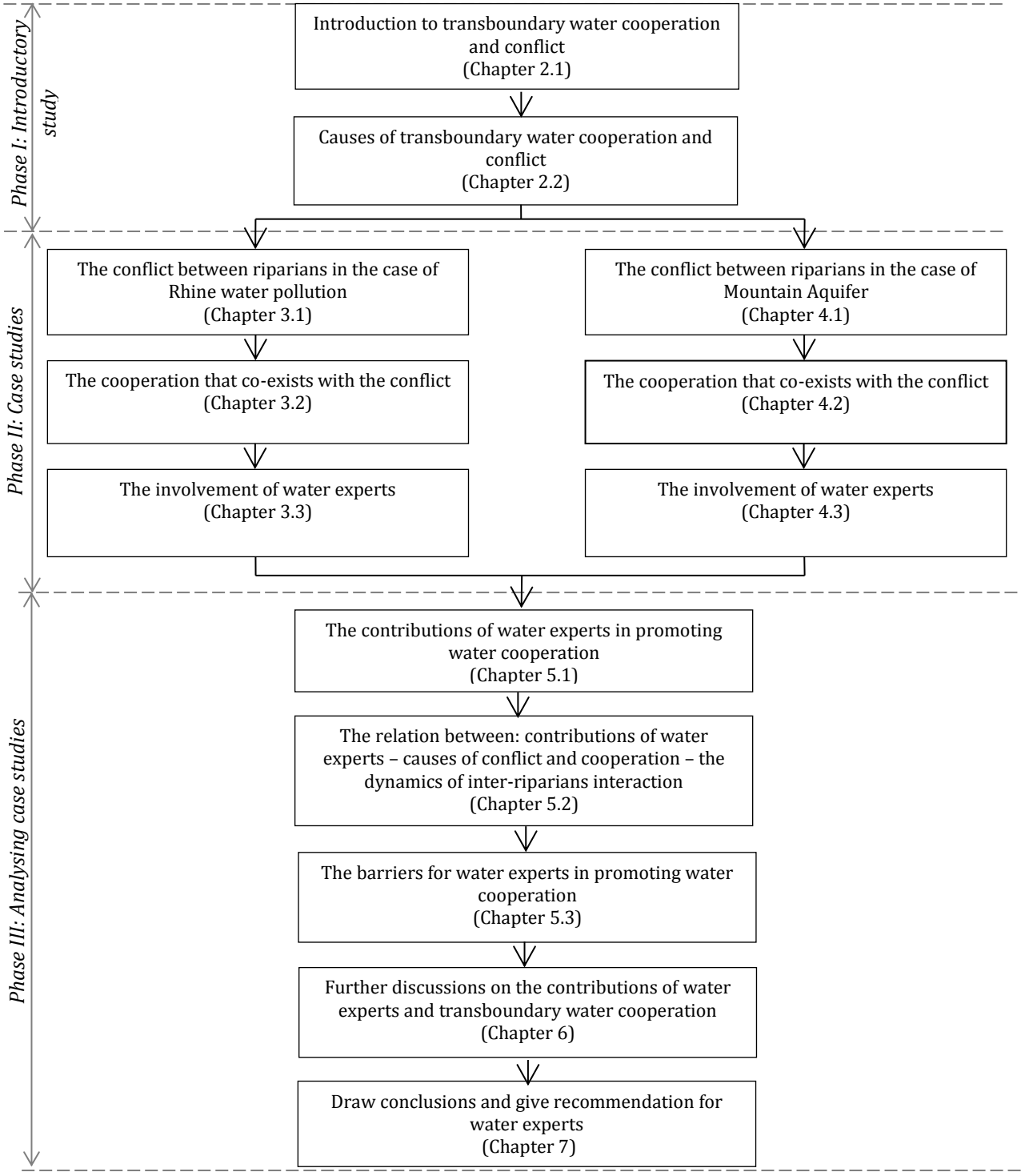
In this case, most of the interviews were unrecorded; except the ones with academics respondents. This was done to enable interviewees to talk more openly about the sensitive issue of conflict. In fact, the first two interviews showed that the respondents tend to restate the official and uncontroversial information when voice recorder was on, yet voluntarily stated their personal views after all interview questions were answered and the voice recorder was turned-off. Although knowing that an interview script will be made and sent to them for correction, respondents still tend to talk *safely*.

Phase III: Analysis phase

In the last phase of the study, a report was written. The main material for this is the (adjusted interview) scripts and the literatures gathered during phase I & II. The analysis started by explaining the definition of water conflict and cooperation, the co-existence of water conflict and cooperation (illustrated by the TWINS matrix), their causes of conflict and cooperation worldwide (called as *drivers* and *indicators*), and how these causes related to each other (chapter II). Afterwards, the relevant information gained from the case studies were compiled and summarized; focusing on the conflict and cooperation between riparians, their causes, the dynamic of inter-riparians interaction (presented in TWINS matrix) and the involvement of water experts in that process (chapter III and IV). Different contributions of water experts in promoting water cooperation, obtained from the case studies and the introductory study, were then analyzed (chapter V). The analysis began by discussing the relation between the water experts with the key-actors in the process towards transboundary water cooperation. Then, different types of influences/contributions that water experts can bring to this process were listed, its real-life examples were presented and its affectivity were assessed. Further, the relation between these contributions with the causes of conflict and cooperation

(*drivers* and *indicators*) and the inter-riparians interaction (TWINS matrix) is discussed. Lastly, factors that may dampen the contributions of water experts, or that may even lead to counterproductive impact, were discussed. In the end, conclusions were drawn and recommendations were made, mainly on how water experts can improve their impact on promoting water cooperation (chapter VII).

In general, the study was carried out according to the following steps.



Chapter 2: Water Cooperation and Conflict

2.1 Introduction to Water Cooperation and Conflict

Water conflict and cooperation

In this report (transboundary) water conflict is simply defined as an inter-riparians conflict over the utilization of shared water resources. The term *conflict* does not only refer to war or violence but also to any disagreements between countries on how to manage their shared water resources.

Transboundary water cooperation, in this report, is referred as different forms of inter-riparians working together, either toward a common goal or different goals that are *positively related* with each other (Deutsch, 1949; Tjosvold, 1984), regardless of whether or not they resolve a problem. Different goals are said to have a positive-relation when they are not conflicting with each other; or if one goal can only be achieved if the other goal(s) is achieved as well.

From the definitions above it may seem like water conflict is bad and cooperation is good, yet in reality this is not always the case (Kistin, 2007). Some conflicts are recognized as necessary for creating a cooperation (Jägerskog, 2007); also inter-riparian tension may lead to conflict resolution (and thus reduction of conflict) (Zeitoun & Mirumachi, 2008). On the other hand, inter-state collaboration does not always satisfy the water cooperation definition set in this report. For example, the Israeli-Palestinian collaboration in the Joint Water Committee (JWC) still did not change the highly asymmetric water distribution of 90 – 10 % between Israel and Palestine respectively (Zeitoun & Mirumachi, 2008). Such relation cannot be categorized as a cooperation as it is in fact a domination *dressed-up* as a cooperation (Selby, 2003). This can happen as some countries may be willing to collaborate for some practical reasons, such as to achieve short-term benefits or to make an unjust situation more bearable (Daoudy & Kistin, 2008). Labeling any form of *collaboration* as a water cooperation may be dangerous as it contains the risk that the real conflict remained covered and unresolved.

Expressing water conflict and cooperation

Conflict and cooperation take different forms that resemble the *intensity* of the conflict or cooperation. Different forms, or stages, of water conflict and cooperation are presented in Figure 2.1 using international relations terms; ordered from the most conflictive to the most cooperative.

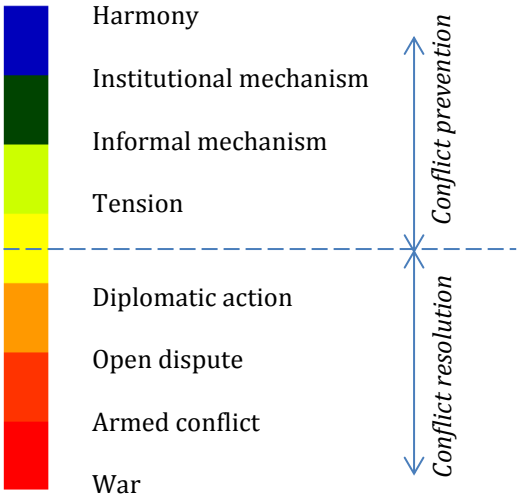


Figure 2.1 Conflict intensity for transboundary (fresh) water resources (Samson & Charrier, 1997)

A comparable, yet more detailed, approach on expressing water conflict and cooperation was offered by Wolf et al. (2003).

	BAR event description
7	Formal declaration of war; extensive war acts causing deaths, dislocation or high strategic costs
6	Extensive military acts
5	Small scale military acts
4	Political–military hostile actions
3	Diplomatic–economic hostile actions
2	Strong verbal expressions displaying hostility in interaction
1	Mild verbal expressions displaying discord in interaction
0	Neutral or non-significant acts for the inter-nation situation
-1	Minor official exchanges, talks or policy expressions—mild verbal support
-2	Official verbal support of goals, values or regime
-3	Cultural or scientific agreement or support (non-strategic)
-4	Non-military economic, technological or industrial agreement
-5	Military economic or strategic support
-6	International freshwater treaty; major strategic alliance (regional or international)
-7	Voluntary unification into one nation

Figure 2.2 Water event intensity scale (A. T. Wolf, Yoffe, & Giordano, 2003)

Both measurements place water cooperation and conflict to two opposing edges; and thus do not allow them to occur simultaneously; which in reality may happen (Zeitoun & Mirumachi, 2008). For example, if we focus our observation on the existence of data-sharing program between Indian and Bangladeshi institutions and ignore the active political nuance on the management of the Ganges River, we may misinterpret the current relation as purely a cooperative relation (Daoudy & Kistin, 2008); while in reality tensions between these countries do exist. Further, from the earlier discussion on the *dressed-up* cooperation, we know that riparians collaboration, in a joint management body, may not change the fact that conflict still exists. TWINS (Transboundary Water Interaction NexuS) offers a different way to express inter-riparians water relation; where conflict and cooperation can co-exist.

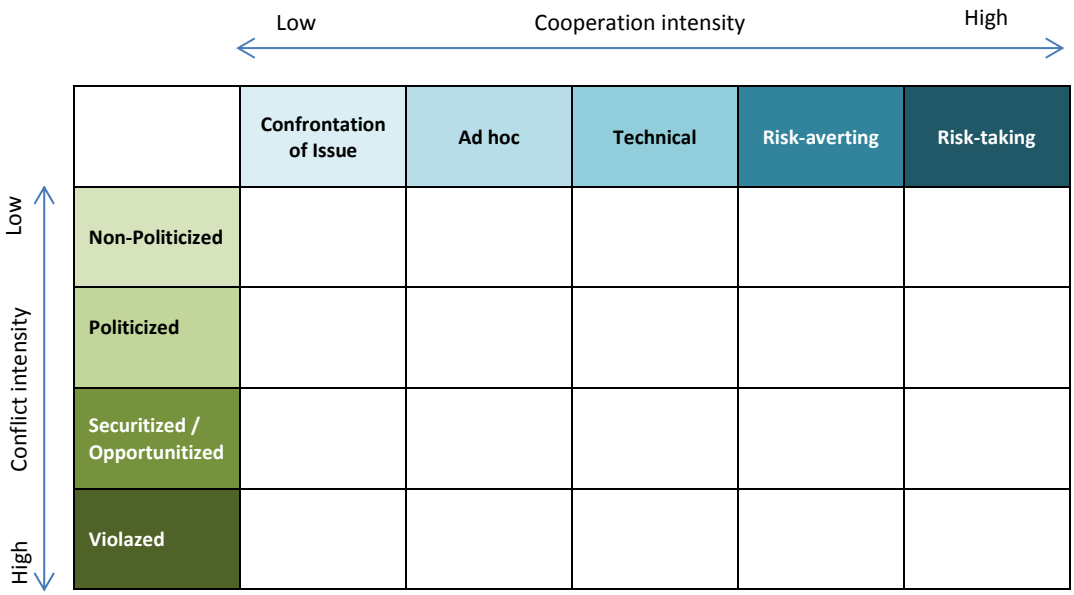


Figure 2.3 The political economy dimension in the TWINS approach (Mirumachi & Allan, 2007)

Conflicts are said to be 'non-politicized' when they exist in the field yet do not concern the state (government) interest. They become 'politicized' as soon as they enter the political agenda and require government attention and decision. When the issue is considered as a threat that requires emergency measures outside the normal political procedure, they have become 'securitized'. However, this situation can also be seen from other perspective. 'Securitized' issues can also be seen as 'opportunitized' as it open the chance to improve the situations and justify action outside the bonds of normal political procedure. The 'violazed' conflict is the phase where riparians are engaged in violent action to sort out the dispute (Buzan, Wæver, & De Wilde, 1998; Mirumachi & Allan, 2007).

On the other hand, cooperation exist at five levels. The lowest level of cooperation, 'confrontation of Issue', occurred when riparians acknowledge the issue yet no joint actions or shared goals exists among them. It develops into an 'ad hoc' cooperation when riparians start to take joint action without having a concrete shared goals. 'Technical' cooperation is when riparians manage to create a shared goal, yet there is no (political) willingness to reach such goal. According to Mirumachi and Allan (2007), the main difference between 'ad hoc' and 'technical' cooperation lays on how the parties shape their goals. In 'ad hoc' cooperation, parties might just happen to be acting together but with different (and uncoordinated) goals. Once there are shared goals, joint actions, and trust that the riparians will execute the joint action, the cooperation can be considered as 'risk-averting'. A 'risk-taking cooperation' happens when riparians agree to take action without even considering the risk and cost generated by the joint action (Mirumachi & Allan, 2007). These concepts of conflict and cooperation, adopted by the TWINS matrix, will be used to describe and analyze the inter-riparians interactions in chapter 3 and 4.

2.2 Causes of Water Cooperation and Conflict

Here causes of water conflict and cooperation are divided into two dimensions; the drivers and the indicators. *Drivers* are events over a shared water resource that generate a *potential* conflict or cooperation among riparians; such events can be man-made or natural events. Whether the *potential* conflict will become an *actual* conflict or cooperation will be strongly influenced by the *indicators*. Further, *indicators* will also determine the intensity of the actual conflict or cooperation.

For example, a drought event over countries that shares their water resources may lead to either conflict or cooperation. Whether this event will make riparians to fiercely compete over the remaining water or to take a collaborative measure in dealing with the issue will depend on many factors, such as the current water availability, the inter-riparians relation, etc. In this example, water drought is the *driver*, while inter-riparians relation is the *indicators*.

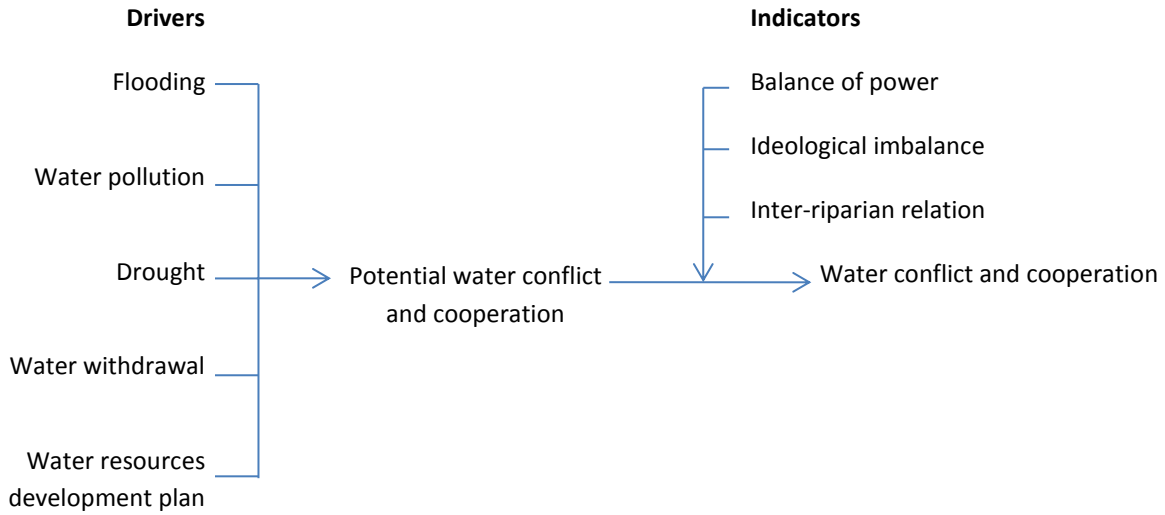


Figure 2.4 Causes of conflict and cooperation in transboundary water management. Source: (Liebscher, 2004) with modifications.

Drivers

Drivers are events over a shared water resource that lead, or expected to lead, to a drastic and undesirable change in the water availability; in terms of quality, quantity and timing. Such change can put riparians into crises; where they become unable to fulfil their water needs or suffer from damages caused by an unwanted water availability. Five drivers are shortly presented hereunder.

Flooding in a shared river basin can generate potential conflict not only because it may bring damages to riparians; but also because it stimulates them to blame each other for causing the disaster and demand each other to take action. However, it may also generate potential cooperation. Flooding events can make riparians realize that a basin-wide measures are needed to prevent or mitigate such disaster. For example, the flooding over the Rhine River in 1993 and 1995 made the riparians see the importance of joint measure and gave birth to “Rhine Action Plan on Floods”; a jointly composed and implemented plan to deal with flooding issue.

Water pollution, generally done by upstream riparians, generates potential conflict as it deteriorates the quality of the shared water and makes it unusable for other riparians. An example, which is also one of the case studies in this report, is the water pollution issue in the Rhine River Basin. Here, the *driver* of water pollution worked both gradually, through decades of chemical and chloride pollution by the upstream countries (Switzerland, France and Germany), and instantly, through several chemical spills in 1969 and fire accident in 1986. Both mechanisms negatively affected the water usage downstream, in the Netherlands, for drinking and irrigation purposes.

The events of drought and large water abstraction, either happen instantaneous or separately, lead to single effect; water scarcity. Water scarcity generates potential conflict as it may create a fiercer competition over the shared water between riparians; or even put them in a critical situation where there is not enough water to satisfy their water needs. Drought, which is a natural event, normally has a gradual impact on increasing the scarcity level; as consecutive dry years are needed to create a severe scarcity. While water abstraction, which is a man-made event, can work both instantly (substantial water diversion by a new dam) or gradually (increasing water usage due to population or economic growth). Therefore, even a plan to develop a (shared) water resources, through dam or reservoir construction, can drag riparians into conflict. Such plan might be perceived as a threat for water scarcity. One example to this is the conflict between Egypt and Ethiopia. Ethiopian plan to build dams, as the upstream country, was seen as a danger by the Egyptians to fulfill their water need and made them launch a violent threat against Ethiopia.

As it was mentioned before, these *drivers* will *only* generate *potential* for conflict and cooperation. Whether this *potential* will become an *actual* conflict or cooperation is strongly influenced by the *indicators*.

Indicators

Indicators, by themselves, would not be able to cause water conflict; or cooperation. Instead, these factors translate *drivers* into water conflict and/or cooperation, and determine their intensities.

Balance of power

The term of 'power' here refers to military, geographical and economic power. In general, the bigger the power imbalance is, the easier for riparians to fall into conflict, and the harder for them to cooperate. A brief discussion on these three forms of power is presented hereunder.

First, a riparian's geographical power is determined by its location within a shared water resources; upstream or downstream. Here, an upstream riparian is more superior as the shared water passed via its territory before reaching the downstream country. Therefore giving them the control over the quality and quantity of the shared water. In general, geographically superior riparians are less willing to sign a treaty and surrender its control (Dinar, 2009).

Second, a large military power imbalance may cause (militarily-superior) country to be less hesitant in being involved in a water conflict. This can be seen in the dispute between Egypt and Ethiopia over the Nile River Basin. The dams construction plan by Ethiopia, which was the *driver*, was responded with a violent threat by the militarily-superior riparian, Egypt (Myers, 1989).

Lastly, great imbalance in the economic condition of riparians will become a barrier to establish a cooperation; or at least to form a treaty (Espey & Towfique, 2004; Hirji & Grey, 1998). Contrasting economic situations may lead countries to have a different, or even conflicting, interest over the shared water. Poorer countries are most likely interested in deriving as much as financial benefits as possible from the shared resource. While richer countries may find other issues more important, such as environmental protection or conservation. Financial situation also determines the riparians' *capability* to collaborate via joint actions. For example, in the case of water pollution in the Meuse River, Belgium, as one the riparians, due to financial reasons decided not to take joint action in the past, by not building water treatments in their area (Dekker, 2013). However, economic imbalance does not make cooperation impossible, especially if the richer riparian is willing to give a financial incentive to the poorer riparian to cooperate. As a matter of fact, some countries are willing to do so in exchange for the establishment of a joint environmental protection program (S. Dinar, 2009).

Ideological imbalance

Here, the term of 'ideology' covers the aspects of culture, language, ethnic, religion, politics and legislation. Similar with power imbalance, large ideological imbalance will make riparians to be more prone to conflict; and thus harder for them to cooperate.

Differences in culture, language, ethnic and religion may not only cause misunderstandings and distrusts among riparians (Avruch & Black, 1993; Walker, 1988); but it may also cause a dispute of its own. If exist, such dispute will further feed the tension generated by the water *drivers* and turn it into a conflict. One example is the dispute in the Indus River Basin, where the religious difference issue between Pakistan and India helped fuel the tension over the shared river and drove it into a conflict. Comparable situation can be seen in the Danube River Basin. The ethnic issue between Slovakian and Hungarian has become a barrier for the establishment of a basin-wide cooperation (A. Dinar & Wolf, 1994). While on the other hand, shared cultural heritage can be one of the contributing factors for riparians to cooperate (S. Dinar, 2009; Hayek, 1973); as it was seen in the cooperation among the riparians of the Incomati River (van der Zaag, 2013). Also, similar politics and legislation system can smoothen the implementation of an agreed cooperation.

Inter-riparian relation

A good inter-riparian relation will increase the *cost* of conflict and make riparians more reluctant to engage in a conflictive situation. This is mainly because such relation creates an interdependency, which will be costly for riparians to break. Further, a good relation will also foster communications and trust; two of the most important ingredients in establishing any type of cooperation (Chen, Chen, & Meindl, 1998). Here relations are divided into two sectors, water sector and non-water sectors.

In the water sector, riparian can be related through a joint body designated to manage the shared water resource. Such body provides a platform for riparians to communicate, to discuss their interest, and to collect and exchange water-related data. As riparians normally have different interests, a joint management body can become a discussion venue for them to re-arrange and link their interests and seek for a mutual goal (Dieperink, 1998; Krasner, 1982). To start such discussion, riparians would need to agree first on a set of facts over the shared water resource. For this, the joint

management body would need to gather and assign water experts to jointly collect and share water-related data, to create a database over the shared water. Disagreement over data, not only can halt the discussion towards cooperation but may also raise tension among riparians (Brehmer, 1989; Warfield, 1993). Furthermore, a joint management body can also nurture a group identity among riparians (Elhance, 1999). The positive effect of a joint management body in fostering cooperation, and preventing conflict, has been demonstrated by the Indo-Bangladeshi Joint River Commission in the Ganges – Brahmaputra – Meghna River Basin (Nishat & Faisal, 2000) and by the Turkish-Iraqi-Syrian Joint Technical Committee in the Euphrates and Tigris River Basin (Kibaroglu & Ünver, 2000). However, it has to be noted that the existence of a joint management body does not guarantee a real cooperation, the one that equally benefits all riparians. In some cases, this form of cooperation can exclude one, or more riparians, in its body; as it is seen in the Nile River Basin (Falkenmark, 1992). Or does not change the (abusive use of) large power discrepancies between riparians; as it is seen in the Israeli-Palestinian Joint Water Committee (Selby, 2013).

Non-water relations refer to all inter-riparians relations that are not related to the management of the shared water resources. It covers a wide range of sectors such as industry, trade, agriculture, education, etc. As it has been briefly mentioned, good relation in these sectors will create trust, good communication, dependency on each other; which will be too valuable for riparians to jeopardize in exchange for conflict. When riparians have a bad, current and past, relation, not only does it make conflicts easier to occur but it may also turn it to violence (Blank, 2012; Elhance, 1999). For example, the prolonged poor relations and tensions between Israel and its riparians have turned into violence in several cases. In fact, from the 37 water disputes that involve violence globally in the last 50 years, 30 of them were between Israel and one of its neighbours (Schelwald-van der Kley & Reijerkerk, 2009).

In short, inter-riparians relations will determine the price of conflict and the level of communication and trust. However, a good relation does not guarantee that any *drivers* would not become a conflict. Riparians might have different perceptions on the conflict, and thus have different ways to assess the price of conflict, and cooperation, and therefore might still choose conflict over cooperation.

The relation between drivers and indicators – TWINS matrix

The dynamics of riparian states' interaction in the TWINS matrix are influenced by the *drivers* and *indicators*. *Drivers* generate potential conflicts and therefore may lead to downward movement in the TWINS matrix, towards a higher level of conflict (see figure 2.3). While *indicators* will strongly influence the likelihood for such downward movement to occur (or the likelihood of an upward or rightward movement due to the contribution of water experts, discussed in chapter 5). Riparians with a cooperative *indicators* will not easily be pushed downward by the *drivers.* Instead, the potential conflict caused by the *drivers* can be used by such riparians as a momentum to move upward or rightward in the TWINS matrix, as it will be presented in the following chapter.

Chapter 3: Rhine Water Pollution

3.1 Background

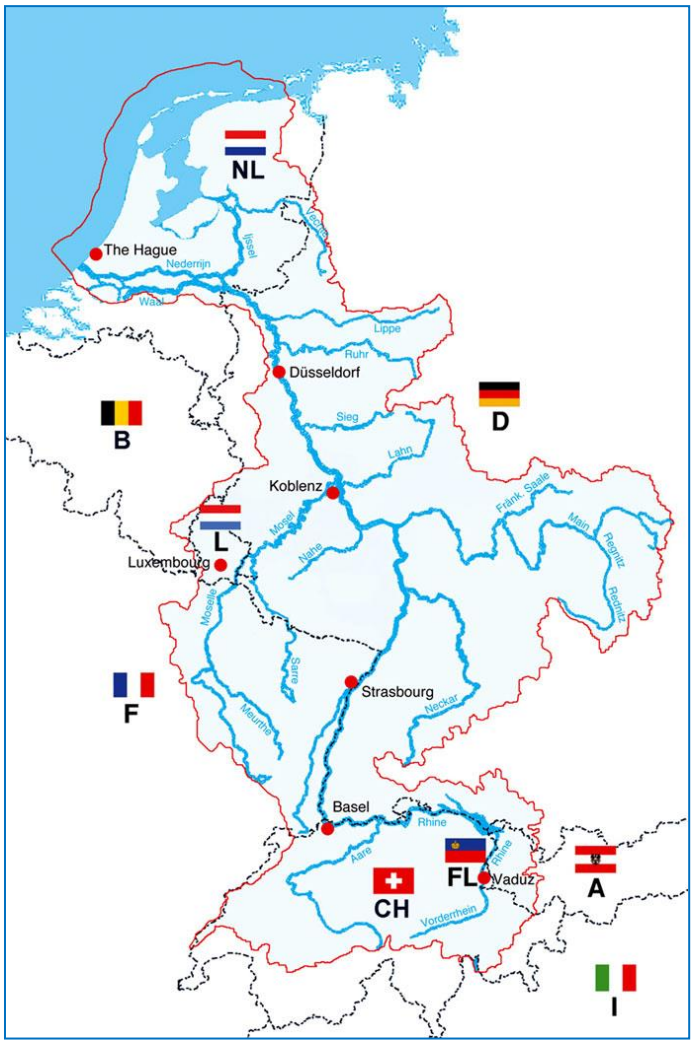


Figure 3.1 Rhine River Basin (ICPR, 2004)

The Rhine River spans over 1.320 km connecting the Alps with the North Sea through the territories of Switzerland, France, Germany and the Netherlands. The river's catchment area also covers parts of Austria, Italy, Lichtenstein, Luxembourg and Belgium and has a total area of about 200.000 km^2.

This area covers some of the biggest industrial areas in Europe (Rijnmond-area in the Netherlands, Ruhr-area in Germany and industrial area near Basle) and is home to about 58 million people (ICPR, 2004). The river is used for different purposes, including power generation (upstream area), navigation, waste disposal, cooling for industries, agriculture, drinking water supply and recreation. In the downstream part (in the Netherlands), the fresh water is also used to push the salt water from the North Sea (Dekker, 2013).

In the following section, the drivers and indicators of water conflict and forms of water cooperation are presented.

3.2 Drivers and Indicators

The main *drivers* of conflict and cooperation in this case is the classical and persisting water pollution issue. The issue first caught the attention of the riparian states in the late 19th century as it was one of the leading causes for the decrease of the salmon population in the river (Dieperink, 1998). At that time the deterioration of the water quality was mainly due to rapid industrialization and population growth, after 1850, which increased the discharge of untreated or poorly treated wastewater to the river (Frijters & Leentvaar, 2003). This issue became very relevant, as fishery was an important economic sector, at least until the 1900, along the Rhine River and its tributaries. The towns along the river would have fish markets with plentiful fish supply, especially salmon (Huisman, De Jong, & Wieriks, 2000). Although the population of the salmon vanished around the 1950's, the water issues remained priority concern as the river still widely used for irrigation and drinking purpose. About 60

million people depend on the River for their drinking water supply, especially in the Netherlands (Mostert, 1999).

There were at least two types of pollution that the river and the riparian countries suffered from: chemical pollution and chloride pollution. Here the chemical pollution refers to water contamination by heavy metals (mainly mercury, zinc and cadmium) from the industrial waste; primarily came from Germany (Bernauer & Moser, 1996; Stigliani, Jaffé, & Anderberg, 1993). While for the chloride pollution, the French potash mines were recognized as the main polluter; aside from the chloride pollution from domestic, agriculture or industrial sources (Dieperink, 2011). The Mines Domaniales de Potasse d'Alsace (MDPA) were 24 potassium mines in the Alsace (close to the France-German border) that mined sylvanite and extracted its potassium chloride content to be sold mainly as fertilizers. The left over materials from this process, consisting of sodium chloride (59%), had no commercial value and had to be disposed (Bernauer, 1995). Between 1910 and 1931, the MDPA dumped these unused materials in 30-m-high piles at several sites around the mines, which had contaminated the groundwater and the local drinking water supply. But since 1931, several small canals were built to discharge these wastes to the Rhine River (Dieperink, 2011).

Although there is not much known yet about the health impact caused by chloride intake in large amounts, except for people with impaired sodium chloride metabolism which may lead to congestive heart failure (WHO, 2003), there are at least two undesirable impacts related to a high concentration of chloride in the drinking water. First, it spoils the taste of the water. The threshold for maintaining un-spoiled taste is in the range of 200-300 mg/l (WHO, 2009). And second, water with high chloride content stimulates corrosion in the drinking water pipes and allowing other harmful agents from the pipe to further contaminate the water (Dieperink, 2011). As around 65% of the Netherlands' water supply originates from the Rhine, it is in the country's interest to suppress the contamination (Dieperink, 2000). Furthermore, as chloride concentration, in irrigation water, higher than 50mg/l is known to have a negative impact on the production of horticulture and greenhouse vegetable; the pollution also affected the agriculture sector along the Rhine. Especially the Dutch greenhouses in the of Westland region which depends on the river for irrigation (Dieperink, 2011).

Chloride pollution

As a downstream country, the Netherlands became deeply concerned with the pollution as it began to negatively affect their drinking water and irrigation supply. The increase of the salt (chloride) content made the Dutch drinking water companies afraid that they would not be able to use the river's fresh water anymore. This concern drove these companies to take the initiative (in 1933) and to start establishing contacts with the upstream riparians; and further tried to put the chloride pollution issue on the international agenda (Dieperink, 2000; Mostert, 2003). After no real improvement of the water quality, as it even got worse, the Dutch government decided to join the campaign and push the issue of water pollution (chloride pollution) onto the agenda of an existing basin-wide commission, the Central Commission for Navigation on the Rhine (CCNR) in 1946. By CCNR, this issue was redirected to another basin-wide commission, the Salmon Commission, in 1948. The Salmon Commission later considered this issue to be beyond its mandate and therefore nothing was being done. Eventually, through several exchanges of diplomatic notes, Switzerland invited the other riparian countries to establish a new commission that would specifically deal with the issue.

Other riparians accepted this invitation and agreed to gather in Basel in 1950 to establish a new joint management body, called the International Commission for the Protection of the Rhine (ICPR). The initial members of this new commission were Switzerland, France, Germany, Luxemburg and the Netherlands; the European Community joined in 1976 (ICPR, 2010; Mostert, 2003).

The first agreement on chloride pollution was reached at the 1972 Rhine Ministerial Conference. That time the water-ministers of Rhine riparians agreed to appoint ICPR to draft a convention on controlling the chloride pollution (ICPR, 2010). At the same occasion, the Netherlands also made an offer to France to (financially) contribute to the reduction of the salt pollution; with Germany also agreeing to contribute. Four years of following negotiations finally led to the signing of the Chloride Convention on December 3rd, 1976 where France agreed to reduce its Chloride disposal by 60% by January 1st, 1980 (Mostert, 2009).

Nevertheless, the implementation of this convention was problematic as the French central government refused to submit the (non-binding) convention to their parliament for ratification and to be adopted as a law. The French government expected that they would not get the parliament's majority support on obtaining the ratification and thus reluctant to do the submission. The action plan on the Chloride Convention included the injection of salt into the ground of Alsace; a solution which was strongly opposed by the local society. Before the introduction of this plan, the French government had just imposed several unpopular projects in the area (from the local's perspective) including motorways and a nuclear reactor. Fed up with the treatment of the central government, the lobbyist of the Alsace region used the controversial plan, of injecting salt into the ground, to raise support in the parliament to reject the convention and the solution it proposed (Dieperink, 2013).

This decision created tension and disappointments within the Dutch government as there was the expectation that they could end the 26-year-long negotiation. Upset with the situation, the Dutch government called its ambassador back to the Netherlands in 1979. In international relations, this action is normally only to be taken when countries are approaching the state of war. The tension also infiltrated into the Dutch media and the civil servants, who viewed the French government's action negatively. (Dieperink, 2011, 2013). The negotiation was not completely stopped; and after two more round of research, in 1982, it was concluded that chloride can be injected to an area near Mulhouse. The year after, the French parliament eventually ratified the Chloride Convention. However, it was later found out that the deep rock layers in the selected injection area were not porous enough to absorb chloride and thus injection was not possible (Mostert, 2009).

After the Sandoz incidents and the signing of the Rhine Action Plan (RAP) in 1987 (more on these two items will be discussed in the next section), the Dutch government turned its attention to the reduction of chemical pollution through the implementation of the RAP. This shift created a side effect on its on-going effort to reduce the chloride pollution. In order to further reduce the chloride discharge, France proposed a new measure, a temporary storage, with a total cost of about € 110 million; where 34% of it (about 38 million) would be burdened to the Netherlands. Dutch government considered this to be too expensive and preferred to invest the money on the RAP. After all, the damage that the chloride pollution caused to the Netherlands had reduced. Many Dutch gardeners decided to change their crop to chloride-sensitive crop which made desalination of irrigation water become *compulsory* either with or without chloride emission reduction action taken

by the government (Mostert, 2009). While other gardeners tried to lessen their dependence on Rhine by also using rainwater and tried to grow less vulnerable crops (Dieperink, 2011).

The final solution to the chloride issue finally emerged when the Association of Waterworks in The Netherlands (VEWIN) drew the Dutch government's attention to a new problem: the drinking water supply from Lake Ijssel. As investing on drinking water plants, the Dutch government expected to have an emission reduction of 60 kg/s. Failure in achieving this reduction level would mean that an extra investment of € 140 million would be required; which is about three times of the contribution asked by the French government. However, the Lake Ijssel's chloride load was not solely originated from the Rhine but also from the brackish seepage water of the Wieringermeer, an adjacent polder. By diverting the discharge of the Wieringermeer, from Lake Ijssel to the Wadden Sea, the desirable chlorides concentrations in the lake could be achieved with much lower cost. Therefore, in 1991, this solution was integrated into the Chlorides Convention and the financial contribution of The Netherlands to France was reduced (Mostert, 2009). Slowly but surely the concentration of the chloride decreased too (see figure 3.2). The decrease even surpass the initial objective of the Chloride Convention, which was halving the pollution.

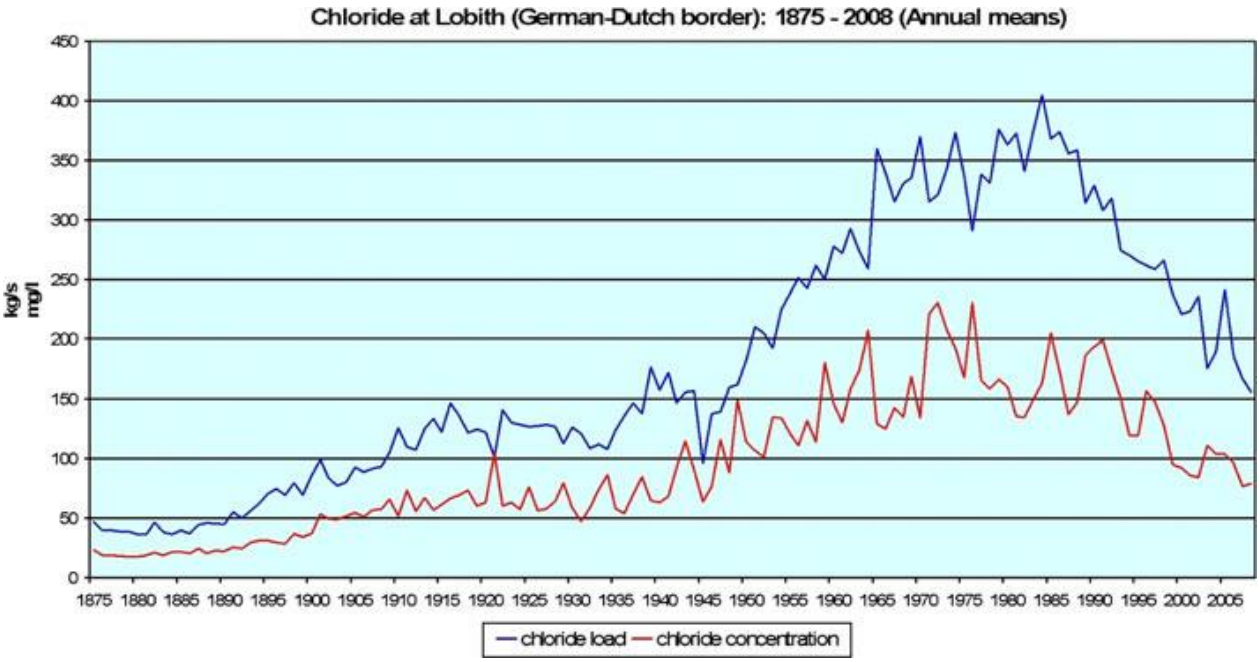


Figure 3.2. Chloride loads and concentrations at the Dutch border. Source (RIWA., 2009)

Chemical Pollution

Unlike the chloride pollution, Rhine riparians started to pay a serious attention on the chemical pollution *only* since 1971. This was mainly led by a combination of several (accidental) spills of pesticides and other chemicals which killed thousands of fish in 1969 and in 1971, and the all-time maximum pollution content during the low river discharge period in the autumn of 1971. This led to severe lack of oxygen in the downstream part of the river and damaged the ecology system (Dieperink, 2000; Frijters & Leentvaar, 2003; ICPR, 2010; Stigliani et al., 1993). This situation shocked both the public and the riparian governments. Both the public and the media lost their trust in the governments' (and industries) willingness and capacity to fix this situation (ICPR, 2010). Reacting on this, the first minister-level conference of the Rhine riparians was held in 1972. In this meeting, the

ministries agreed to focus on the issue and assigned the ICPR to draft three conventions on: the reduction of chemical, chloride and thermal pollution (ICPR, 2010).

In the following negotiations, the Netherlands as the most downstream country was very ambitious in reducing the pollution. This stance was supported by France, which was a minor contributor to the pollution, but opposed by Germany. The German government accused the Netherlands and France of trying to harm the German chemical industry (which was the main polluter) and try to benefit their own industries. This is related to the fact that most of the Dutch chemical industries, which located along the Rhine basin, were also discharging their waste to the river and to the (North) Sea (Mostert, 2009). The German concern was finally resolved by linking the negotiation with the negotiation on the Dangerous Substances Directive (76/464/EEC) within the EU. Several recommendations in this directive coincide with those in the negotiated Chemical Convention of the ICPR, such as putting restriction on cadmium and mercury disposal from industries (Bernauer & Moser, 1996) and therefore required all EU member states to take joint actions, including the Netherlands. Later that year, the negotiation within the ICPR came to an end and the Chemical Convention was also adopted.

In the following years, water quality of the Rhine (especially related to cadmium pollution) was continuously improved. Besides the adoption of the two aforementioned regulations, the German government, by its own initiative, set regulations to limit to the heavy metal disposal from its industries just before the Chemical Convention came into force. Another factor which also considered to cause the decline of the heavy metal pollution was the dynamics of industries along the Rhine; notably the declining coal and steel production factories and the re-usage of cadmium which previously seen as a waste (Bernauer & Moser, 1996).

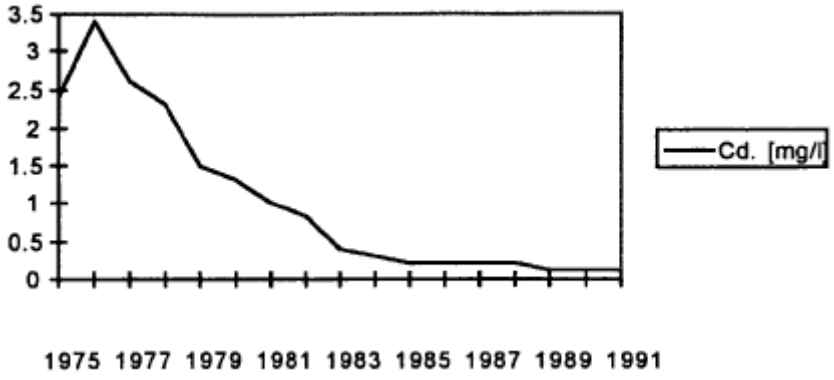


Figure 3.3 The decrease of cadmium concentration in the Rhine. Source: Bundesministerium fur Umwelt Naturschutz und Reaktorsicherheit 1995 as it was cited in Bernauer & Moser (1996).

The year 1987 marked substantial (further) reduction of chemical pollution. On November 1st, 1986 a warehouse at Scheweizerhalle near Basel, owned by a Swiss chemical company (called Sandoz) caught fire. To fight the fire, millions of litters of water were sprayed to the warehouse, mixed with about 30 tons of chemicals stored in it (pesticides, insecticides and fungicides) and flushed down into the Rhine. This spill brought a catastrophic impact on the river's aquatic ecosystem and interrupted the supply of irrigation and drinking water all the way downstream. Images of the burnt warehouse and the river filled with colored water and dead eels filled not only the local but also the international media (Bernauer & Moser, 1996; ICPR, 2010). This raised deep concern within the public and even lead to some protests. The protests not only criticizing the Sandoz company but also the poor river management by the riparian governments. This increasing environmental concern was

also driven by the Chernobyl disaster, one of the biggest environmental disasters that ever happened, that took place just few months prior to the Sandoz fire. Within one week, the responsible ministers of the riparian states met in Zurich to discuss the strategy to deal with the disaster. Just after two more ministerial meetings, the ministers agreed to adopt the "Rhine Action Program (RAP)". The RAP required the member states to reduce the discharged amount of 34 most dangerous chemical substances by 50% within 10 years. This plan was signed on October 1st, 1987 (just 11 months after the Sandoz fire) and became known under the slogan of "Salmon 2000" (as the water quality improvement expected to bring back the salmon population which had disappeared from the River since the 1950's). The chemical pollution load of the river continued to decrease and the objective of bringing back the salmon was achieved in 2006, as salmon, together with sea trout, eel and other migratory fishes, migrated from the North Sea towards Strasbourg (ICPR, 2012).

Having solved the chemical (and the chloride) pollution does not mean that all trans-boundary water challenges in the Rhine have been answered. Instead, these issues evolved and new negotiations are constantly being restarted. After the resolution of the flooding issue in 1995, currently the riparians are trying to collaborate in dealing with the pharmaceutical and thermal pollution (Dekker, 2013).

The influences of indicators on water conflict and cooperation

As discussed in the previous section, the *drivers* of water pollution have led the riparian states with contrasting interests into conflict and cooperation. Hereunder, a brief discussion on how these *drivers* are affected by the (cooperative) *indicators* shared among the Rhine riparians shall be presented.

The *indicators* found in the Rhine River Basin could be considered more cooperative than conflictive. This is mainly due to the fact that the riparian countries have balanced relations (in terms of economic and military) and a long tradition of cooperation. In the water sector, riparian states are connected through the International Commission for the Protection of the Rhine, as the joint management body of the river. In addition, the riparian states also collaborate in a wide array of other sectors such as: trade, navigation, education, etc. The close ties could be confirmed by the fact that all the riparian states, except for Switzerland, are members of the largest economic and political union in the area, the European Union. The only, and inevitable, imbalance found between the Rhine riparian states is related to their geographical locations. This imbalance has caused the riparian countries to have different interests over the river, as shown in the previous section. The upstream riparian states (especially Germany and France) were interested more in using the river for industrial waste disposal; while for the downstream riparian states (the Netherlands) the river was vital for irrigation and drinking purposes. The dynamics of the inter-riparian states relations are presented hereunder using the TWINS matrix.

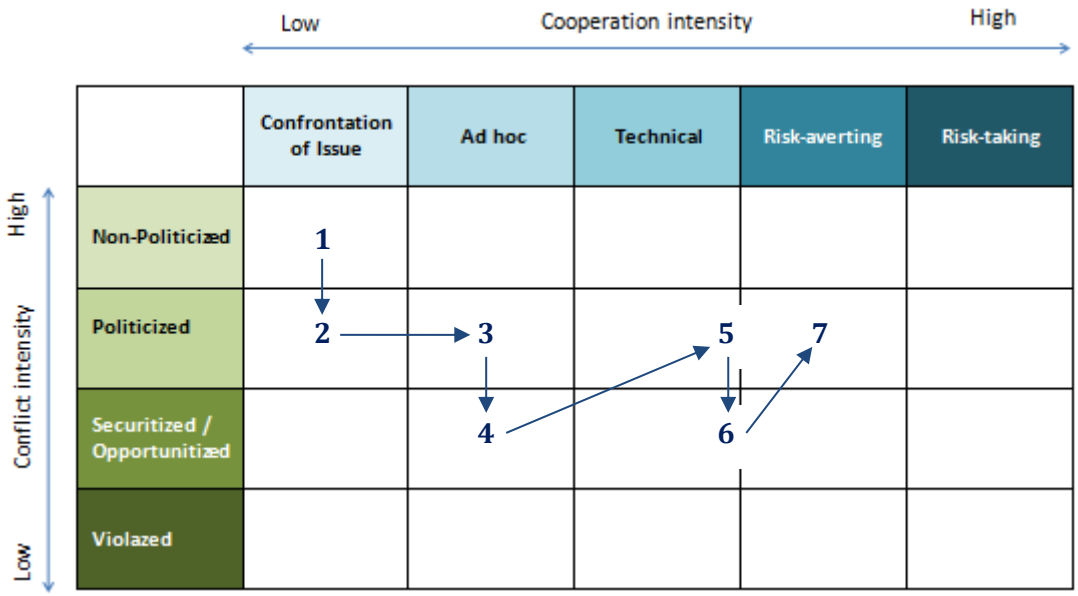


Figure 3.4 The dynamics of water conflict and cooperation caused by Rhine water pollution presented in a TWINS matrix

Note

1 1933 : Dutch drinking water companies initiated contacts with the upstream riparians and try to put chloride issue on the international agenda;

2 1946 : Dutch government pushed the chloride issue to CCNR's agenda;

3 1950 – 1969 : Establishment of the ICPR, joint monitoring system was initiated;

4 1969 – 1971 : Chemical spills led to all-time maximum pollution in the Rhine and damaged the river's environment. Public and media loss their confidence on the governments.

5 1972 – 1976 : First Rhine Ministerial conference was held, the Chemical Convention was signed and implemented, the Chloride Convention was signed but not (yet) implemented;

6 1979 – 1986 : French government refused to submit the Chloride Convention to their parliament for ratification, Sandoz fire accidents;

7 1987 – 2006 : Rhine Action Program (RAP) was signed, France and the Netherlands jointly fund the diversion of chloride-polluted water from the Lake of Ijssel to the Wadden Sea, the goals of the RAP were achieved and the issue was solved.

Here the influence of cooperative *indicators* on the dynamics of the inter-riparian states interactions can be seen. The cooperative *indicators* have prevented the riparian countries to be *trapped* in a 'securitized' conflict for a long time, and retained it in a 'politicized' level. Although there were several incidents, including the chemical spills in the early 70's, the French government's refusal to submit the Chloride Convention to their parliament for ratification and the Sandoz fire, pulled the conflict downwards. The open communication line and quick coordination among the riparian states enabled them to use these incidents as stepping stones in progressing towards cooperation. The incidents '4' and '6' (see figure 3.4) did not drag the relations deeper into conflict, yet they were the turning points for the riparian countries to move to the right side of the TWINS matrix. Along the way towards a better cooperation, different forms of joint water-related bodies were established. Two of the most important bodies and the involvement of water experts in them are presented in the following section.

3.3 Cooperation and the Involvements of Water Experts

The cooperation on the management of the Rhine River has a long history dating back from the beginning of the 19th century. In 1815 the riparians of the Rhine established the first joint management body focused on navigation under the name of the Central Commission for Navigation on the Rhine or CCNR (CCNR, 2011). This commission is still active today and has become one of the oldest forms of inter-riparian cooperation that exist in the area. Another form of cooperation on the Rhine's management was established in 1885 and was referred as the Salmon Commission. This commission was established by the Netherlands, Switzerland and Germany with the main objective of preventing the decreasing salmon population in the river. This was the first commission that paid attention to the river's water quality, as it was seen as one of the driving factors for the declining salmon population (Dieperink, 2000). Although it still exists today, this commission ceased all of its activities since 1950 due to the disappearance of the salmon from river(Mostert, 2009). As the attention on water quality and river-basin cooperation increased, two additional commissions were established. In this sub-chapter, these two commissions will be introduced and the involvement of the water experts will be discussed.

The International Commission for the Protection of the Rhine (ICPR)

As it was briefly discussed in the previous sub-chapter, the ICPR was established in 1950 by the Rhine riparians with the initial objective of dealing with the increasing water pollution at the time. ICPR is an inter-governmental coordination body formed and operated by (governmental officials of) the Rhine riparians. This commission is a venue for riparians to negotiate, synchronize national interest and reach agreement on the management of the river. This agreement is manifested in a form of (legally unbinding) conventions. Since its establishment the commission has developed, with a more comprehensive structure, and covering wider range of issues including water quantity. The current organization and its decision making process will be briefly explained hereunder.

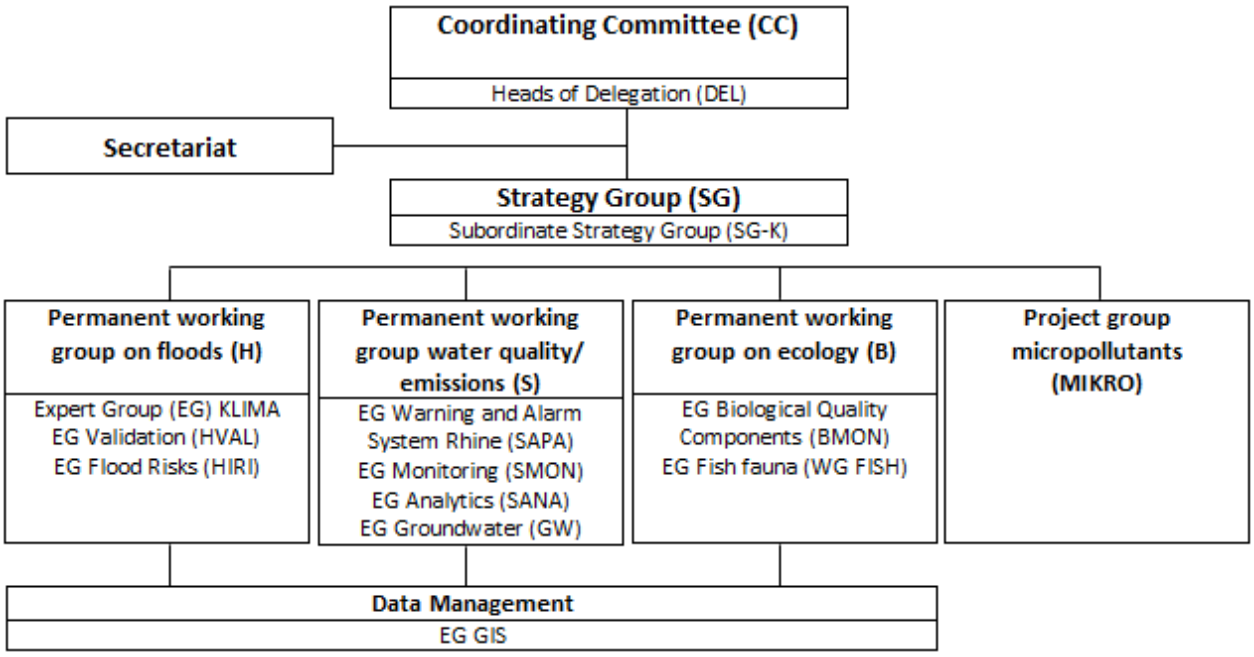


Figure 3.5 Current organization structure of the ICPR. Source: http://www.iksr.org/index.php?id=310&L=3

In general, the ICPR is operating at three levels, the political level (operated by the Coordinating Committee), the expert level (operated by the Working Groups and Data Management Group) and the transitional level (operated by the Strategy Group). On top of these levels, ministers of the riparians would meet, in an event called Conference of Rhine Ministers, to give a political direction on the committee's activity and to sign conventions agreed in the Coordinating Committee. The Coordinating Committee (CC) consists of the Head of Delegations, from every riparian states, who are the high governmental officials that lead and coordinate all the professionals from his/her country that work within this joint body. The main task of the CC is to determine the direction of the ICPR's activity (and thus the activity of the subsidiary bodies). Although in some cases the Head of Delegations, or even the professionals in the Strategy Group (SG), may have technical or natural science expertise in water, their involvements would not be the focus of this research. This is mainly due to the fact that their involvements are more political rather than technical (as it was mentioned in Chapter II).

Water experts are involved in the Working Groups (WG) and in Data Management Group. These experts are mainly governmental experts that come from the different (water-related ministries of) Rhine riparian states. There are three permanent WG that deal with three constant issue in the river and (currently) one time-limited project group (Frijters & Leentvaar, 2003). Within the ICPR they are divided into different Expert Groups (EG) based on their expertise. In several EG, the water experts from non-governmental experts can be involved; mainly from the NGO, universities of engineering consultancy companies. The last-two mentioned experts are not normally involved directly, the instead governmental experts from the different states normally would consult with their local universities' or engineering companies' expert (Dekker, 2013). While for the NGO's expert, they can be involved directly in the process if their organizations are granted with "observer" membership within the ICPR. This would give them the possibility to assign their experts in the EG (and SG), to attend the EG's meeting and to contribute their ideas, without any guarantee that these ideas will be put forward to the CC (Schlapkohl, 2013).

The main role of the EG, and thus water experts, within the ICPR is to support the (political) decision making process in the CC by providing the answer to questions that are posted by this body. The working mechanism within the ICPR generally begins with the Head of Delegations within the CC agreeing on the issues that the riparian states would need to solve. In order to do this, a (practical) knowledge on how to solve the issues would be needed, a knowledge which is not available within the CC. With the help of the Strategy Group (SG), the main question of "how to deal with the issues?" would be broken-down into more specific questions such as: "what are the available alternatives to solve the issues?"; "what will be the economic and environmental impacts of it?"; etc. These questions will be then distributed to the relevant EG and by conducting a joint effort (joint research, joint data collection, etc.), the EG would try to answer them. Along the process of answering these questions, the EG would interact closely with the SG in order to guarantee that EG's effort remains in accordance with the demand of the CC (Broseliske, 2013). Finally with (again) the help of the SG, the answers provided by the EG (the recommendations on dealing with the issues) would be assembled into reports and submitted to the CC for the final negotiation and approval. In this final stage the Heads of Delegations generally would need to agree on the less-technical discussions (such as "how should the cost be distributed among the riparian countries?" or "how much effort should be invested in solving these issues?") before coming to a convention or treaty. However, the contribution of the water expert in the ICPR should not only be seen limited to their activity within

the EG. Along the negotiation process, the Head of Delegations (or the delegation within the SG) would from time to time consult with their experts in the EG, an interaction that may influence the stance of their country in the negotiation table (Leentvaar, 2013).

It might seem that all the negotiations are done in the CC and all the scientific-discussions are done within the EG, however in reality this is not the case as experts also need to negotiate during their operation (Leentvaar, 2013). In general, the Head of Delegations would agree on the issues that the riparian countries need to solve without being precise on it. For example, they might agree to solve the water pollution issue, without being precise on what does water pollution exactly refers to. Therefore it is the task of the EG to discuss (or negotiate) on how to define the concept. They need to agree on the type of the substances that can be labeled as pollutants, and the concentration of that substance in the water before it deserves to be called as a polluted situation (or pollution). And further they would need to agree on the method to approach the solution of this issue. Notably, different methods may lead to different results (or recommendations). However, the result of this negotiation can be considered as less significant to the one from the CC; as any result from this scientific discussion (or negotiation) would first need to pass the negotiation in the CC before being implemented.

Nonetheless, the decision making process (the negotiation) within the ICPR is much easier said than it is done. In reality, the negotiation constantly hit impasse, which remained for years before countries can finally break into an agreement. A clear example would be the 26-year-long negotiation on the chemical and chloride pollution. And it took that "extra push" from the all-time high pollution concentration in 1971 to speed-up the negotiation process and start the drafting process of the conventions in 1972 (until it was finally signed in 1976). Similar mechanism can also be seen in the road towards the "Rhine Action Program" (and the ratification of the Chloride Convention) in 1987. During the time, it was the Sandoz fire that gave the "push". Prior to the signing of this plan, not only did the negotiation hit impasse, but the tension was also raised between France and the Netherlands. In such situation the contribution of the water experts in promoting water cooperation become very limited or even negligible. Only after the incidents (both the Sandoz or the high pollution in 1971) did the gate for the water experts to contribute their ideas suddenly become open.

Another factor that may hinder the decision making process is the fact that the water experts in the EG work for two entities, the ICPR and their home-ministry. These entities may have different, or sometimes opposing, interests on the development of the river; ICPR with basin-wide interest versus home ministry with nation-based interest. As such situation is rather unpreventable, therefore it is vital to create an open and friendly atmosphere within the EG. Such atmosphere will enable all the water expert to be open and even to discuss this opposing interests (Leentvaar, 2013).

The International Commission for the Hydrology of the Rhine Basin (CHR)

The CHR is a cooperation platform for scientific (water) institutes of the Rhine riparian to develop joint hydrological measures for sustainable development of the Rhine basin with no policy making mandate. As the CHR is a scientific-cooperation, the water experts hold a central role and are actively involved in every activity and parts of the organization. The CHR was established in 1970 following the advice of the Unesco in order to promote a closer cooperation in the transboundary river basin. This commission has two main objectives: to develop the hydrological knowledge in the Rhine Basin

and to make the contribution in resolving the cross-border water issue. To achieve these goals, the CHR is active in: conducting joint research, exchanging data and knowledge, developing standardized procedures and disseminating it through the CHR publication series. Until today the member states of the CHR are: Switzerland, Austria, Germany, France, Luxembourg and the Netherlands (CHR, 2013a)

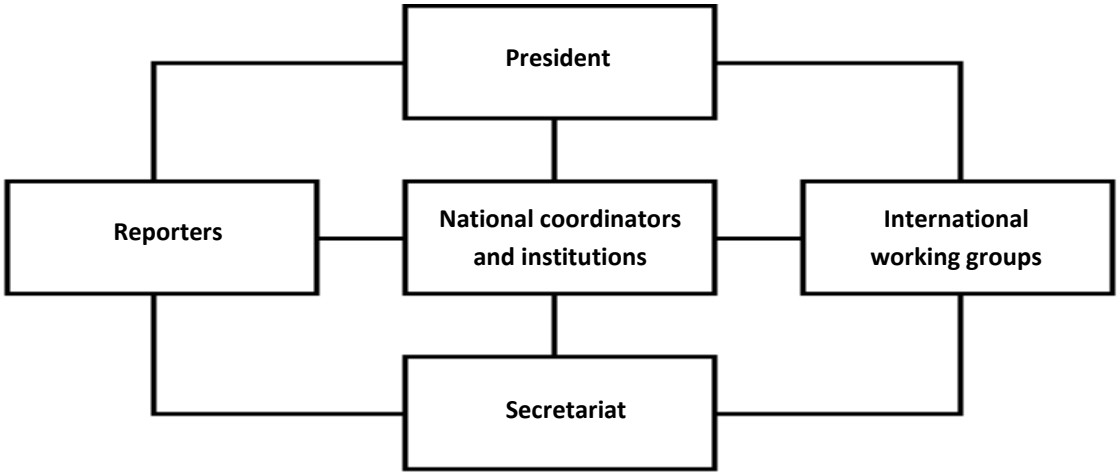


Figure 3.6 Organization structure of the CHR. Source: http://www.chr-khr.org/en/organization

CHR consisted of five working bodies that are operated entirely by the water experts (without policy makers as it is in the ICPR). The roles of each body would be presented here briefly. The "National coordinators and institutions" constitutes of representatives from the water-related ministry of the member states and the selected water institutes. These representatives would meet and decide the study-orientation of the CHR every year. This decision will be based on the (present) needed knowledge within the ICPR (or other international institutes that are active in the area, e.g. World Meteorological Organization and International Hydrological Program) and on the (anticipated) needed knowledge for the Rhine in the future; e.g. climate change (Sprokkereef, 2013). These needed knowledge will be translated into (joint) study projects and handed over to the "International working group" to be carried out. These working groups are also formed by the water experts from the water-related ministries of the member state, and *external* water experts (normally from the universities) when additional knowledge is needed. Before starting the joint study, the CHR normally organizes a symposium. In this event selected water experts from all around the world would be invited, the to-be-carried-out topic would presented, and these invited experts would be expected to come up with suggestions on approaching this topic and questions that need to be addressed before and during the study. The result of the study would be then passed on to the "Reporters" to be assembled into reports and disseminated (to the ICPR, the governments of the riparians) and made available to general public. The Presidency, which rotates among the member states, supports the working of the CHR by setting new incentives, representing the CHR in the public and leading the meetings. While the Secretariat would provide any needed support and support the administration, such as the publication (Frijters & Leentvaar, 2003; Sprokkereef, 2013).

In general the study interest of the CHR is more related to the Rhine's water quantity than its quality. Some studies that related to the river's water quality are: study on sediment and development of the Rhine Alarm Model (RAP). The RAP was developed on the request of the 8th ICPR Ministerial

Meeting in 1990 and was used to predict the pollution propagation in the case of a (sudden) discharge of harmful substances to the river; so that necessary action can be taken (CHR, 2013b).

Although operating independently, the CHR can still influence the management of the Rhine mainly through three mechanisms. First, the CHR holds an "observer" membership within the ICPR; the same type of membership is also held by the ICPR within the CHR. Through this link ICPR can indicate their needed knowledge to the CHR; or CHR can gather this by attending the ICPR meetings. Through this mechanism the studies of the CHR can be kept aligned with the needed knowledge within the ICPR. Second, the result of the CHR's studies would be disseminated to the ICPR and to the (local and national) governments of the Rhine riparians. This provides a *route* for the CHR to influence the policy making process in local, national and inter-national (or basin-wide) level. And third, some of the water experts in the CHR also works in the ICPR (Leentvaar, 2013; Sprokkereef, 2013). However, it is still uncertain whether this relation can really promote science-based policy making in the ICPR.

Not having to make any political decision makes the cooperation among Rhine riparian states in the CHR somewhat easier than in the ICPR. After existing for about 40 years, this intra-water-expert cooperation has not hit major obstacles. The obstacles that the commission has to face until now are merely the language difference and the differences in the (measurement and analysis) methods the scientists use. And although the water experts come from different ministries that might have different interests (subjected to the national interest), the water expert have always been able to separate themselves from their (subjective) ministry interest and operate objectively (Sprokkereef, 2013). This good cooperation can even be maintained in the current difficult situation where almost all riparian ministries are suffering from the budget cuts. The budget cuts only mean that the CHR can only do less study but does not make the discussion on money management (among national coordinators and institution) become more difficult (Sprokkereef, 2013).

Although the riparians can cooperate (almost) without barriers in the CHR, it does not necessarily mean that the CHR can make direct impact in promoting a basin-wide cooperation in the management of the Rhine. This is mainly because the decision related to the management of the river is made on the political stage within the ICPR. Having all the riparian countries (represented by their experts in the CHR) agreeing on a measure does not mean that it will be adopted (or even discussed) by the decision makers of the ICPR. In its early years (1980s) the study of the CHR was not even discussed within the ICPR as the CHR was not studying the issues that were highly prioritized in the ICPR. Although this has changed and the coordination between the commissions is now better, there are still some views within the ICPR that see the work of the CHR as a pure science and will never fit in the policy making process (Leentvaar, 2013).

In general, the CHR can be seen as an effort to isolate the (scientific) discussion on the issue of the Rhine from the political influence. It then comes up with science-based recommendations to deal with the issues. So far the cooperation between the riparian countries within the CHR faces no major barriers, yet in practice the affectivity of this cooperation (on creating cooperative management of the Rhine) is still very much dependent on the political negotiations between riparian countries.

Chapter 4 Mountain Aquifer

4.1. Background

Figure 4.1 Groundwater Aquifers in Israel and Palestine (Aliewi & Assaf, 2007)

The Mountain Aquifer is a shared water resource by Israel and Palestine. It consists of three sub-aquifers or basins; the Western Basin, the Eastern Basin and the Northeastern Basin (or sometimes referred as the Northern Basin).

For Palestine the aquifer plays a vital role as it is the only water source for the Palestinians that live in the West Bank (after their access to the Jordan River was denied due to the Israeli occupation of the West Bank in 1967). For Israel the aquifer supplies more than one third of the nation's annual water consumption (Tagar, Keinan, & Bromberg, 2007), with the remaining being provided by the Jordan River via the Tiberius Lake (50-60%) and by various desalination plants. Both Israel and Palestine abstract the water from the aquifer via wells and water springs that are scattered across both states (Tamimi, 2013b). According to the Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip (Also known as Oslo II Accords), the Mountain Aquifer has an estimated potential of 679 million cubic meter per year (MCM/year).

In the following sections, the drivers and indicators of water conflict and different forms of water cooperation are presented.

4.2 Drivers and Indicators

The drivers in the case of the Mountain Aquifer is related to water quantity as well as to water quality. Water scarcity, especially in the Palestinians' area, can be seen as the main *driver*. This situation worsened due to the persisting disagreements on how the water of the Mountain Aquifer should be allocated and the different claims on water availability and usage in both areas. In terms of the water quality, the untreated sewage, mainly from the Palestinians and Israeli settlements, pollutes the Mountain Aquifer and thus the drinking water supply of both countries. Brief discussions of both drivers are presented hereunder.

Water quantity

One of the biggest disagreements between Palestine and Israel is on how the water from the Mountain Aquifer should be distributed. Each side is not satisfied with the current water allocation and sees themselves as the disadvantaged party (Klawitter, 2006). The dispute over water is a part of the dispute over the land, which is further heated up with the arid climate of the area.

On one hand, Palestine claims that the right over land should go hand-in-hand with the right over water. This claim is based on the fact that the water flowing into the Western and the Northeastern basin originates from the rain over the West Bank, which implies that Palestinians should have the right to this portion of water (Haddad, 2007). Therefore Palestine rejects any expensive schemes to desalinate salty water or to import water from other nations as Israeli recommended. They also fear that if they agree on a desalination project, then it would have to be done under the Israeli management and control. In short they are concerned that such potential solutions will be expensive and further reinforce Israeli control over their vital needs, and thus their life, which would deprive them from their independence (Shuval, 2007).

On the other hand, Israel argues that water should be allocated based on the *prior or historic use* principal, which adopted by the international water law, regardless of the source of the water. Israel government has stated that it will not release any additional water from the Mountain Aquifer (or from any other water resources) to Palestine that is currently being used, or has been used historically, by Israel. In the Oslo II Accords signed in 1995, which planned to be an interim agreement before reaching the final peace agreement within five years, Israel and Palestine agreed that Palestine would need an addition water supply of 70 MCM/year; with 28.6 MCM/year of it is going to be supplied by Israel. Although the peace agreement has not been reached until today, and the Oslo II Accords *expired* in 2000, the Israeli governments stated that it is prepared to offer options for Palestine, such as additional water supply from the desalination plants or to jointly develop a new water project. Israelis are concerned that if the Palestinians achieve independence (over the entire West Bank) and regain control over the aquifer, then they will use the portion of the water that falls in the West Bank exclusively for their own need (or implementing their current claim). The Israeli water managers fear this will seriously reduce the state's ability to manage and control the supply of its water needs and may have detrimental effects. Also, they fear that this will lead to over-exploitation and pollution of the aquifer that was observed in the part of the Coastal Aquifer Gaza. The aquifer became over-utilized as about 1000 new wells were dug immediately after the transfer of administration of the area to the Palestinian Authority (Tagar et al., 2007).

To make matters worse, both countries still cannot agree on the data of the water availability and usage in both countries. Currently there is no data on water usage that are being shared and agreed by both governments. In the case of Israel, the governments do not want to share any water-related data as such data are seen as being related to the national security. The only agreed data dated back from 1995 from the Oslo II Accords.

Table 4.1 Water availability according to the Oslo II Accords

Aquifer	Total available water (MCM/year)	Water available for Israel (MCM/year)	Water available for the Palestinian Authority (MCM/year)
The Western Aquifer	362	340	22
The Northeastern Aquifer	145	103	42
The Eastern Aquifer	172	40	54 (with 78 MCM/year yet to be developed)
Total	679	483	196

Years after the Oslo II Accords were implemented, and expired, both governments issued different claims on the water use. Palestinian Water Authority claimed that the water availability and usage from the Mountain Aquifer (in 2004) was as presented hereunder (Tamimi, 2013b)

Table 4.2 Water availability issued by the Palestinian Water Authority

Aquifer	Total available water (MCM/year)	Water abstracted by the Israelis (MCM/year)	Water abstracted by the Palestinians (MCM/year)
The Western Aquifer	350 - 380	370	22
The Northeastern Aquifer	80 - 100	103	25
The Eastern Aquifer	70 - 80	40	63
Total	623	513	110

On the other hand, the Israeli Water Authority published different figures; although in their report the authority admitted that the data might not be accurate anymore as it was determined over a decade ago and there have been six consecutive years of drought since then (Tal-Spiro, 2011).

Table 4.3 Water availability issued by the Israeli Water Authority

Aquifer	Total available water (MCM/year)	Water available for Israel (MCM/year)	Water available for the Palestinian Authority (MCM/year)
The Western Aquifer	362	340	22
The Northeastern Aquifer	145	103	42
The Eastern Aquifer	172	40	132
Total	679	483	196

Regarding with the undeveloped quantities in the Eastern Aquifer (of 78 MCM/year) mentioned in the Oslo II Accords, at least three conflicting claims are currently exist. First, Israel claims that the Palestinians deliberately do not pump from this aquifer despite the option to do so (Tal-Spiro, 2011). Second, there are claims saying that this aquifer contains less water than the Israel claims it has (Tal-Spiro, 2011) and the third claim says that this aquifer contains mostly brackish water and therefore unusable (Zayed, 2013).

Regardless of those different claims, the estimations of the water availability and usage by both parties (seemingly) concludes towards one fact, the fact that the Palestinians are living under the minimum water requirement. In order to meet vital human needs and to maintain a reasonable level of social and economic life in the Middle East, it is estimated that a person needs approximately 125 m^3 of water annually (Shuval, 1992). This estimation has also been accepted by different Israeli and Palestinian experts to be valid in Israel, Palestine and other riparian countries of the Jordan River (Assaf, Al Khatib, Kally, & Shuval, 1993; Braverman, 1994). This number also happens to be comparable to the water demand of the Israelis; which lives with a good hygienic standard and sufficient water to assure their livelihood (Braverman, 1994). However, this number has not been accepted by the Israeli or Palestinian governments; at least until 2007 (Shuval, 2007).

Both Shuval (2007) and The World Bank (2005) estimated the average water availability in Palestine is about 70 m^3/person/year (with Israel about 240 m^3/person/year). In the case of drought or in places with inadequate water supply infrastructure, it is estimated that the supply may even go to the level of 35 m^3/person/year (Shuval, 2007). The estimation provided by the Israeli Water Authority (2009) is somewhat different. The authority estimated the water availability in the Palestine to be around 105 m^3/person/year (with in Israel: 150 m^3/person/year) (Israeli Water Authority, 2009). Nevertheless, both estimations on Palestinians water availability are still below the minimum water requirement proposed by Shuval (1992) and other experts mentioned above. The supply of 35 m^3/person/year is even below the minimum level for hygienic standards of the World Health Organization (100 liter/person/day or 37 m^3/person/year). By taking into account the population growth, it is predicted that the water availability will become even more limited in the future (unless the states obtain a significant addition to their water supply). By 2025, the average water availability in Palestine will be only about 35 m^3/person/annum for all uses including for agriculture (Shuval, 2007). Regardless which numbers resembles the exact water usage, the different estimations have not been helpful in pushing the peace process and creating a base for negotiations.

Water quality

The second *drivers* found in the Mountain Aquifer is the water pollution issue. Different with the water quantity issue, this issue has not received the attention that it needed (from both countries) as it is still overshadowed by the water allocation issue (Tagar et al., 2007). Nevertheless, several NGO's and international donors have started to recognize the issue and began to deal with it.

The mostly untreated sewage water from about two millions of Israelis and Palestinians settlers is flowing in the recharge area of the aquifer and percolating into it (Tagar et al., 2007). This sewage is produced not only from the living areas (domestic sewage) but also from the agricultural or industrial area. The sewage received unsatisfactory, or even no treatment, before being disposed directly into

the land. This is even made worse given the karstic geology of most of the Mountain Aquifer's recharge areas which make it more vulnerable to groundwater pollution via infiltration (UNEP, 2003).

In the Palestinians villages (where about 60% of the Palestinians in the West Bank live), sewage is commonly disposed directly into unlined cesspits. The same practice is also adopted in Palestinians cities. Although 70% of the population is connected to sewage network, this system eventually disposes the sewage into (filled or dried) streams with minimal or even no pre-treatment (UNEP, 2003). The situation in the Israelis settlements (within the recharge area of the Mountain Aquifer) is also not much better. It is only since 1999 that the sewage of the settlements (within the recharge area yet outside the West Bank) received adequate treatment. While the sewage from the settlements within the West Bank is still unsatisfactory. A study in 1999 showed that, at that time, only 6% of the sewage from these settlements satisfied the Israeli treatment standards (Environmental Protection Association Samaria and Jordan Valley, 2000). A more recent observation showed that about 48% of the sewage was treated inadequately or not treated at all, while the status of 24 % of the sewage unknown (Tagar et al., 2007)

Table 4.4: Sewage in the Mountain Aquifer's recharge area

	Palestinian villages	Palestinians cities	Israeli settlements
Population	1.381.000	883.000	213.000
Quantity of sewage	28 MCM/year	18 MCM/year	15 MCM/year
Current treatment	Cesspits (unsatisfactory)	Generally none or unsatisfactory sewage treatment plants	Partial treatment only

Source: Palestinian and Israeli Central Bureau of Statistics and Israeli Water Commission as it was presented in (Tagar et al., 2007)

The impact of such direct discharge of the sewage is now can apparent in some places. Examples can be found in the wells in Hebron area where the water has a nitrate concentration of 60-80 mg or in in the wells near Tul Karem and Qalqiliya where the extracted water has a nitrate concentration of 100-145 mg/l (Tagar et al., 2007), while the WHO standard for nitrate in drinking water is 50mg/l. Other traced contaminants in the aquifers are chloride (from industrial and municipal wastewater) and fecal coliforms (Abed Rabbo, Scarpa, Qannam, Abdul Jaber, & Younger, 1999; UNEP, 2003).

This matter is made worse by the fact that the effort on solving the water pollution issue has not been optimal. One of the main causes is the insufficient attention given by both states to the issue. Since 2004, at least eight major water treatments that are planned to be constructed using foreign aid (worth of about USD 230 million). Yet, only one of these projects has been completed. Among different barriers faced during the implementation of these projects, insufficient coordination between Israel (especially Israeli military) and the donor countries was seen as one of the major obstacles. The lack of coordination has hindered the mobility of experts and materials needed for the project and therefore cost more time and money than what was budgeted by the donors (Tagar et al., 2007). On the other hand, the Palestinian authority still puts the issue low on their agenda. This was indicated by the request of their government to the USAID (on September 2003) to reallocate the fund that was designated for sewage treatment project to water supply project in Hebron. And

from the USD 1.2 billion that the state required from international donors (in 2003), only USD 60 million was requested for sewage infrastructure; with the biggest (planned) expenses are for humanitarian assistance and water supply (Tagar et al., 2007). As a consequence, the sewage from both Palestinian and Israel settlements continues to contribute to the pollution of the shared aquifer. The challenge is expected to become even bigger in the future as the bulk of the pollution (for example from the Barkan industrial area) has not reached the aquifer. It is estimated that this bulk would reach the aquifer in 15 years; and within 30 years the pollution is expected to reach Yarkon area which currently providing 37 MCM/year (Isaac & Shuval, 2000).

The influences of indicators on water conflict and cooperation

Contrasting with the *indicators* shared by the Rhine riparians, Israel and Palestine can be considered to have a set of conflictive *indicators*. Not only do they have an imbalance relation (in terms of ideology and power, see chapter 2 for the definition of power and ideology), the riparian states also have a prolonged conflictive relationship. Water conflict is just a small fraction of the multi-dimensional dispute that both countries have been trapped in for decades. The tensions in other sectors, such as: borders, refugees or Jerusalem division, do not only feed the conflict over water, but also halted the riparian states to reach a water cooperation. Although Israel and Palestine jointly operate the Joint Water Committee (discussed in the following section), the existence of this joint body did not change the highly asymmetric water allocation between both countries (Zeitoun & Mirumachi, 2008).

The impact of the previously discussed *drivers* and the influence of the conflictive indicators are presented hereunder using the TWINS matrix.

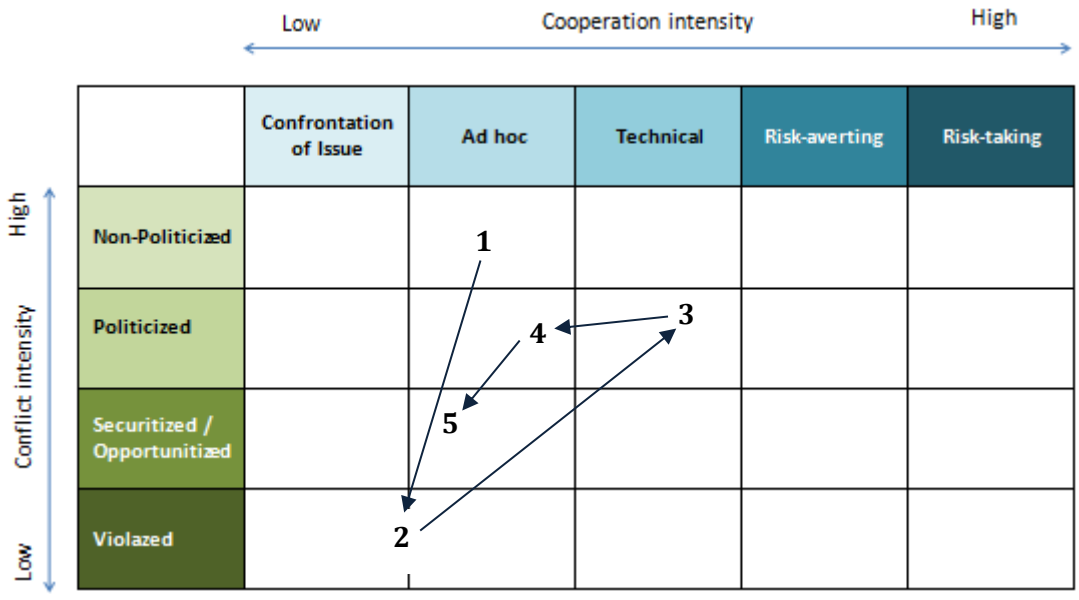


Figure 4.2 The dynamics of water conflict and cooperation between Israel – Palestine presented in a TWINS matrix (E. Smidt, Alemayeh T., Al-Weshali A., Assaf K., Babaqi A., Ghafour D.A., ter Horst R., van Steenbergen F., Woldearegay K. and Zayed O., 2013)

Note

1 1920 – 1948 : The period of British Mandate until 1948;

2 1948 – 1993 : The declaration of Israel state in 1948, the six days war in 1967 and the outbreak of the first intifada in 1989;

3 1993 – 2000 : Oslo Accords in 1993 and 1995, period of hope;

4 2000 – 2009 : Second intifada in 2000, Oslo II Accords expired in 2000, the construction of separation walls;

5 2009 – present : Gaza conflict(s), Palestinian Authority diplomatic effort, UN initiative.

Here it can be seen that conflictive *indicators* made the riparian nations more vulnerable to conflict. They have escalated the conflict into 'violazed' condition and to retain it for a considerable period of time. The conflictive indicators have also made Israel and Palestine unable to independently initiate their water cooperation. In such condition, external intervention became vital. This can be seen in the movement from '2' to '3' (see figure 4.2), where the intervention of external parties (including USA, the United Nations, Russia, etc.) were the main forces to push both countries to the negotiation table and to come up with interim agreements, the Oslo I and II Accords. The relatively unimproved *indicators* from the Oslo Accords have made it easier for the riparians to be dragged back into conflicts. The recent Kerry-initiative, started by USA and its allies pushed the situation back into the more cooperative part of the matrix. However, there is the tendency that it will create a self-repeating loop in the future (E. Smidt, Alemayeh T., Al-Weshali A., Assaf K., Babaqi A., Ghafour D.A., ter Horst R., van Steenbergen F., Woldearegay K. and Zayed O., 2013), especially where there is no significant improvement in balancing and repairing the relation. Several current and past water-related collaborations that aimed to improve the current *indicators*, and the involvement of water experts in it, are presented in the following section.

4.3. The cooperation and the involvement of the water experts

One of the most important milestones made during the Israel – Palestine peace process was the signing of the Israeli-Palestinian Interim Agreement in 1995 (also known as Oslo II Accords). This agreement covers a wide-range of including governance, economy, education, environmental and also water (regulated in Article 40). Related to water quality and quantity issue, which discussed earlier in this chapter, some of the most important agreements made are including: Israel recognizes the Palestinian water rights in the West Bank (Article 40.1); both parties agreed to maintain the existing usage (Article 40.3a) and use it in sustainable way (Article 40.3c). They also agree to reuse sewage water(Article 40.3f), to prevent deterioration of the water quality (Article 40.3b); and to take all necessary measures to avoid any harm on the water resources (Article 40.3e, h).

Water experts were actively involved in shaping up those agreements. In this accords, water experts from both countries also agreed on the data on the current water availability in the Mountain Aquifer (see Table 4.1). The accords also called for both Israeli and Palestinians water experts to remain involved and collaborated under the umbrella of the Joint Water Committee (JWC) and Joint Supervision and Enforcement Mechanism (JSETs). Further discussion on these entities and the involvements of water experts in it, and in other cooperative projects and institutions encountered during this study, are presented hereunder.

Joint Water Committee (JWC)

The establishment of the JWC was one of the arrangements reached in the Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip in 1995 (also known as Oslo II Accords). In general, the JWC established to deal with all water and sewage related issue in the West Bank including monitoring the water resource and give license to for wells construction or other water resources projects within the West Bank and Gaza (World Bank, 2009).

When the most of joint Israel-Palestine bodies (established by the Oslo II Accords) become inactive after the second Intifada, the JWC continued to work conduct meetings although the meeting frequency drops drastically to just few times a year (World Bank, 2009). Since 2001, the meetings are done informally, without minutes to be distributed to public and without providing any room for third-party observation or review (FoEME, 2012).

Annex III, article 40 of the Oslo II Accords formulates the characteristic of this committee

12. The function of the JWC shall be to deal with all water and sewage related issues in the West Bank including, inter alia:
    - Coordinated management of water resources.
    - Coordinated management of water and sewage systems.
    - Protection of water resources and water and sewage systems.
    - Exchange of information relating to water and sewage laws and regulations.
    - Overseeing the operation of the joint supervision and enforcement mechanism.
    - Resolution of water and sewage related disputes.
    - Cooperation in the field of water and sewage, as detailed in this Article.
    - Arrangements for water supply from one side to the other.
    - Monitoring systems. The existing regulations concerning measurement and monitoring shall remain in force until the JWC decides otherwise.
    - Other issues of mutual interest in the sphere of water and sewage.

13. The JWC shall be comprised of an equal number of representatives from each side.

14. All decisions of the JWC shall be reached by consensus, including the agenda, its procedures and other matters.

In this committee, water experts are mainly involved in the Joint Technical Committee (or JTC; which operates under JWC), and in numbers of subcommittees dealing with specific issues (wells, pipelines, sewage and pricing, etc.). A proposal of a new water project would need to go through discussion and decision making in three levels (sub-committee level, JTC level and JWC level). For example, a new water supply pipeline project proposal (initiated by either Israel or Palestine) would be first discussed in the Water Supply Subcommittee, upon approval the proposal would be passed to the JTC and then to the JWC for the final approval and implementation. Nevertheless the decisions made by JTC (and thus the Subcommittees) have advisory nature and not binding to JWC final decision. Therefore there is no guarantee that a project approved by the first two committees would be

approved by the JWC. A turned-down proposal can be given back to the subcommittees or the JTC for further discussions or modification (Selby, 2013). Lastly, water experts also involved in the Joint Supervision and Enforcement Teams (JSETs) that oversee and support the implementation of project approved by the JWC.

Although represented by a balanced number of representatives and required consensus for every decision made, the commission has been a subject of criticism for the last few years. JWC (and the Oslo II Accords) has been criticized as a "domination dressed up as a cooperation" (Selby, 2003); as a "pretense of cooperation" (Amnesty International, 2009); or as an "instrument of containment" (Zeitoun & Warner, 2006) used to restrict and contain Palestinian demands and maintain Israeli hegemony over resources captured in 1967. Even a leading Israeli official (Baruch Nagar – Head of West Bank and Gaza Section at the Israeli Water Authority) admitted that the committee is not "working well" and called for a complete reconstruction of Israeli-Palestinian water relations (Selby, 2013).

One of basis for these claims are the regular inactivity of the JSETs, an institution that supposed to provide platform for Israeli's and Palestinian experts to jointly involved in monitoring and enforcing the project passed by the JWC. In the case when the JSETs was involved, their impact has been limited (Selby, 2013). Another failure of the JSETs has also been shown by the fact that the Israeli and Palestinian experts have parted in their operation and now working separately (Tal-Spiro, 2011).

But the main reason for the non-cooperative claims on JWC are based on the lengthy and complex process (especially for the Palestinians) to gain a license (E. Smidt, van der Molen, Boerboom, & ter Horst, 2013). On average, it would take over eleven months for a Palestinian project to get an approval while for an Israeli project it would take about two months. The delays would even become longer in the case the proposed projects are located in Area C[1]. Here, Palestinians would need an additional approval (called as planning approval) from the Civil Administration (CA). The application process to the CA has been criticized as a long bureaucratic process and therefore has limited the Palestinians to develop their water resources (as 60% of the their territory are located within the area C where almost all productive zones for well-drilling from the Mountain Aquifer are located) and limited their effort to deal with the water pollution (as and best location for wastewater treatment plants are generally located in area C) (Selby, 2013).

The Palestinian water treatment projects (designed to deal with the sewage problem) have suffered the most from the long application process (although almost comparable to water supply projects, with application period took up to 8 years). All of the approved water treatment projects (by the JWC and the CA) have faced delays and obstruction both in their application and implementation process (approved: 3 projects; applied: 8 projects). A plant in Hebron needed to wait for 5 years (1999 – 2004) to get approval from the two entities (Udasin, 2011) while a plant in Nablus West needed to wait for 14 years (1997 – 2011) (Selby, 2013). Lastly, the construction in Salfit (approved in 1997) was stopped by the Israeli Defense Force (IDF) in1998. Although a new construction site has been agreed, the construction has not been resumed as the Israel authority is unwilling to guarantee the

[1] According to the Oslo Accords II, the West Bank area were to be divided into three zones:
Area A: under the Palestinian Authority's full control (about 20% of the West Bank);
Area B: under the Palestinian Authority's civil control and Israel's security control (about 20% of the West Bank);
Area C: under full Israeli control; civil and security (about 60% of the West Bank);.

sustainability of the project due to potential future expansion of the nearby settlements (Amnesty International, 2009).

This long and complex bureaucratic application process has suggested that Israel's primary interests in the JWC was other than protecting the Mountain Aquifer out of pollution (Fischhendler, Dinar, & Katz, 2011), but rather to maintain their control over the Mountain Aquifer. Further, the World Bank also does not believe that the JWC would be able to operate as a joint management body mainly due to the basic asymmetry between both countries in terms of power, capacity, information and interest (World Bank, 2009).

Alternatives for the JWC

Realizing the importance of reconstructing the existing joint management body, an NGO called The Geneva Initiative integrate the proposal to establish a new joint body as a part their main cause: The Geneva Accord launched in 2003 (The Geneva Initiative, 2009). Although still using the same name in their proposal, Joint Water Committee (JWC), changes are proposed in its practice. Scope of responsibility is also formulated in a more detailed way (Geneva Initiative Annex 10.6) than the existing one (Oslo II Accords, Schedule 8). The new-JWC will be formed by 7 "water professionals" (without indicating whether these professional should be technical or political oriented); with each country send 3 representative and 1 additional neutral representative from abroad. This initiative also proposes the establishment of a new Technical Committee, although it does not treated as compulsory, yet it would be formed only if "deemed needed" by the new-JWC. This would not only puts uncertainty in the involvements of the technical water experts but also to the scientific foundation of the decision making process. This initiative has received a positive reception from the disputing public (Israelis and Palestinians) and the international public (The Geneva Innitiative, n.d.), but it is still to be seen whether this plan will be adopted or not (and whether the proposed body can actually improve the quality of water cooperation).

Reconstruction of the joint management body also being called by an a local NGO called Friends of Earth Middle East (FoEME). This proposal is integrated in their latest campaign to start the peace process by focusing on the water issue first. Different from the Geneva Accords which offer a "bundle" of proposed agreements (and cover all disputed issues), the NGO proposes to start with tackling an "easier" issue first, water issue, (compared to the complex issue of borders, refuges and Jerusalem), then building public and political confidence and then progressing towards permanent peace; a campaign called: Water and the Peace Process (FoEME, 2012). The NGO proposes to replace the JWC with the Bilateral Water Commission (BWC); a joint-body that will manage both quality (deciding the amount of water extraction and delivery) and quantity (managing waste water treatment) of the shared water resource. Decision making in this body will be based on scientific advice from a subsidiary body, the Office of Science Advisors (OSA). BWC would not have the authority to make (draft) decision on its own, they can only approve or reject the suggestion put forward by the OSA, and without any control to alter it. To support the operation of both bodies a Water Mediation Body (WMB) is proposed to find a middle-ground in the case when the OSA's recommendation are acceptable to BWC (or when the public cannot accept the decision made by BWC). To guarantee a balance in this proposed cooperation, BWC and WMB should be composed by an equal number of Israeli and Palestinian representative and one independent member from

outside these countries (FoEME, 2012). This proposal has received some media attention (FoEME, 2013b) but whether this campaign can make its way to the (political) decision making process and whether it can improve the existing water cooperation is yet to be proven.

Water Data Banks Project

The effort in achieving cooperation and peace was done both via the bilateral track (aimed to resolve the past conflict) and the multilateral track (aimed to build confidence and to deal with future issues) (Tal-Spiro, 2011). A multilateral talk held in Moscow in January 1992 gave birth to five multilateral working groups that deal with the key issue in the area, which includes water resources. One of the main projects of the multilateral working group work on is the Water Data Banks Project which was started in 1994.

The development of the databank was expected to promote the adoption of common standard for data collecting and storing and to improve communication among the scientific community in the region (EXACT, 2005b). The project is managed by an Executive Action Team (EXACT), which is formed by Israeli, Jordanian, and Palestinian water experts from the governmental or private institutes. Some of the actors involved in the Water Data Banks Project were: the Palestinian Water Authority, the Jordanian Ministry of Water and the Irrigation and Israeli Water Authority (de Schutter, 2013; EXACT, 2005b).

Besides involving the local experts the project also include the international experts. The water experts of Unesco-IHE contributed actively in this project. When the EXACT tendered the Water Data Banks project, the water allocation model part, the Unesco-IHE collaborated with a Dutch consultancy company called Royal HaskoningDHV (then still called DHV) submitted a proposal and won the project. DHV provided the consultancy work for the project while Unesco-IHE conducted supporting studies and gave training to the local water experts (de Schutter, 2013). One training that Unesco-IHE gave was a training on the groundwater modeling held in Cyprus between January – February 2006 (Unesco-IHE, n.d.). The training was attended by five water experts of the Jordanian Ministry of Water and Irrigation, five of Israeli Mekorot Water Company and four of Palestinian Water Authority. The knowledge acquired in the training was seen as applicable for the three intuitions while the event has shown that the water experts can have a joint activity in a good harmony (Unesco-IHE, n.d.).

Master Plan for Lower Jordan Rehabilitation

To make the master plan for the rehabilitation of the Lower Jordan, FoEME assembled a team of experts consisting both regional and international experts. This team consists of three local engineering companies (CORE Associates Palestine, MASAR Jordan and DHVMED Israel) and one reputable Dutch engineering company (Royal HaskoningDHV). This project started in 2013, as part of the EU-funded project Sustainable Water Integrated Management or SWIM (FoEME, n.d.), and expected to be finished by June 2014 (Royal HaskoningDHV, 2013a).

The main objective this master plan is to offer a potential solution for the governments of Israel, Palestine and Jordan on dealing with the water pollution issue in the river. Via the master plan, they want to show the (economic) potential that the Lower River Jordan has when it is not polluted; to

show that rehabilitation of the river (via cooperation) would bring much more benefit than maintaining the status quo (Bromberg, 2013; Kool, 2013). By restoring the high ecological value of the river and replenishing the river, the experts believe that the river would reveal its eco-tourism potential and further develop its existing religious tourism value (Bromberg, 2013; Kool, 2013). Eventually it is expected to sell this idea, either to the government, private institutes or other potential sponsor in order to implement it (Kool, 2013). This objective serves the NGO's greater goal, which is the environmental peacemaking (building peace through restoring of shared environment).

Another objective of the project is to facilitate the water experts from the three neighboring parties to work together. Not only were they troubled by the different (or conflicting view) on the issue, the cooperation between the experts has become harder to do as some of the tensions between the nations has infiltrated into the experts community. One realization of this is the existence of the boycott of the Jordanian engineering society to any form of collaboration with their Israeli counterparts. Here the involvement of Royal HaskoningDHV (RHDHV) become important as the experts would be reluctant to work together, when they are left by themselves (Kool, 2013).

The project basically consists of three steps. First, the project was started by making a so-called baseline document that would formulate the current water pollution status of the Lower Jordan (which needed to be agreed by all the experts) and then to set a single basin-wide plan in dealing with it. RHDHV, in close cooperation with its three local partners, is currently preparing this document. Next, this single plan would be broken-down into three (more detailed) plans for Jordan, Palestine and Israel taking into account the situation and interests of the three countries. Here the local engineering companies will take the more active role as they are more familiar with the local situation. And finally these three plans will be synchronized and assembled into one final master plan. Here RHDHV is expected to bring-in their unique expertise, expertise that has not been widely available in the area, such as integrated planning process and integrated pollution control (Kool, 2013).

Workshops are done throughout the process. In such events, the water experts from the governmental institutions of the three countries, and general public, are invited to react on the (draft) plan. Also, the governmental experts has been (and are) assisting the process by providing some data.

Academic cooperation

Israelis and Palestinians academics used to cooperate until the outbreaks of the first Intifada (1987 – 1993), ever since Palestinians universities boycott any form of cooperation with any Israeli universities. The only Palestinian university that has cooperation with Israeli university is the Al Quds University in Jerusalem (Huber-Lee, 2013). Nevertheless, *unofficial* cooperation between Israeli and Palestinian researchers still exists. This type of cooperation can be found on individual basis cooperation or on in a form an institution where (expert) members would not use the name of their institutions (Tal-Spiro, 2011; Tamimi, 2013a). One real example of such cooperation is The Israeli Palestinian Science Organization (IPSO).

IPSO tries to promote cooperation between Israel and Palestine through "creating an environment in which Israeli and Palestinian scholars and scientists will meet and establish dialogue" (IPSO, 2013).

IPSO is organized by an executive committee (consisting of 5 experts) where both Palestinian and Israel are represented equally (both represented by 2 experts). Israeli and Palestinian experts are also present in IPSO's scientific committee at equal number. Activities of IPSO covers: finding grants for joint research conducted by Palestine and Israel scholars (and then oversee its management). Although IPSO support any joint research regardless its disciplines, there have been numerous joint research in the field of water including research on water purification and on water history (Tal-Spiro, 2011)

From the examples of different cooperation above it can be seen that the effort on pursuing cooperation between Israel and Palestine are majorly via the *second track diplomacy*; the interaction between non-governmental water experts from both states that aim to develop strategies, to influence public opinion, and to facilitate officials of both states to resolve their conflict. Less effort was done by the governmental experts of both states through the *first track diplomacy* or the official diplomacy. The existing tension between states creates a barriers for the governmental water experts to interact, collaborate and to promote cooperation. Aware of this situation, non-governmental water experts take initiatives and try to bring down those barriers. However, the effectiveness of such second track diplomacy in promoting cooperation in this area is yet to be seen.

Chapter 5: Contributions of water experts

In this report the 'contributions of water experts' is simply referred as the positive impacts that water experts may bring to the promotion of water cooperation. Before presenting these impacts, the relation between the water experts and key actors in transboundary water management is briefly discussed first. Afterwards, different positive impacts that water experts may bring to the promotion of water cooperation will be presented; with examples taken from the study cases. This chapter will be closed with a discussion on factors that may dampen the experts' contribution or even lead to counterproductive impact.

5.1 Water Experts and the Process Towards Water Cooperation

A simple model will be used to illustrate the relation between water experts and the process that leads to water cooperation. There are at least four main actors that are involved in this process; the water experts themselves, decision makers, public and media.

Decision makers

The decision makers refer to the governmental officials that have the final say on whether their country will cooperate or not. In the case of the Rhine water pollution, they are the Head of Delegations that represent different Rhine riparians within the ICPR. Although the Ministers of the Rhine have a higher position in the political *hierarchy*, the whole process of negotiation and the decision making on whether to cooperate or not are in hand of the Head of Delegations. When the Head of Delegations agree to cooperate, a convention will be formulated and the Ministers will *seal* it with signatures. In the case of the Mountain Aquifer, decision makers are the high officials that represent Israel and Palestine in the JWC. Considering the power asymmetry between the two states (as was discussed in Chapter 4), it could also be argued that "the real decision makers" are actually the Israeli representatives in the JWC and the high officials in the Israeli Civil Administration.

Water experts (external and internal water experts)

Based on its relation with the decision makers, the water experts can be classified into two groups: internal and external water experts. The internal water experts are water experts that work directly under the *decision makers*, and thus work in the same body as the decision makers in the joint management body. In the case of the Rhine water pollution, they are (governmental, commercial, NGO or university) experts from the riparians that are active in the EG of the ICPR. While in the case of the Mountain Aquifer, they are the governmental water experts that work in the JTC of the JWC, as it there is no commercial or NGO experts involved in the JTC.

These experts operate to support the decision making process by the Head of Delegations as the decision makers. This can be done by giving a science-based *input* (via consultation or recommendation) on the actions to be taken. To create such input, the internal water experts from different countries collaborate with different type of other experts, such as: legal experts,

environmental experts, financial experts, etc. At least this is the case within the ICPR. Together these experts would need to agree on the *input* as they may have different interests, subjected to their expertise or the country that they represent. However, such interdisciplinary collaboration is not needed every time; for example in the case where the decision makers need input on a purely-technical topic such as "how much water there is?". Another interaction between the internal water experts and decision makers is via personal communication. Along with the negotiation process within the ICPR, the water experts within the EG also interact and give inputs to their Head of Delegations on an individual basis (Leentvaar, 2013).

On the other hand, the *external water experts* are the water experts that do not work (directly) under the decision makers, thus outside the joint management body, yet still deal with the management of the shared water resource. In the case of the Rhine Basin, they are the (governmental, commercial and academic) water experts that work for the CHR. In the case of the Mountain Aquifer they are the experts that work for the FoEME and other institutes that deal with the issue of the aquifer yet operate outside the JWC. Experts from universities of other non-governmental scientific institutes that conduct study on the Mountain Aquifer issue and publish their knowledge can be also considered to fall under this category.

Aside from the internal and external water experts, there is another group of experts that can be considered as *neutral* yet may become *internally or externally involved* when requested or when their interest are in stake. For example, governmental experts that work outside the ministry/department that deals with transboundary water management or other commercial or NGO experts that provide consultancy service in transboundary water management. These experts may become internally or externally involved, except for the governmental expert that most likely to join their colleague as internal expert.

Media

The media refers to all routes of information that can reach and become accessible to the public. Examples of the most widely used media include the internet, television newspaper and radio. The information that the media convey to the public may influence, or even form, the public's opinion on certain issues. This might even lead to public demanding several actions to be taken by the decision makers.

In general, the media are affiliated with the water experts when the information that they have are of interest to, or at least concerning with, the general public as the media's audience. For example, in the case of the Rhine water pollution, the results of the water experts' study on the impact of pesticides spills from the Sandoz fire on the environment and drinking water, which held the public's interest at that time, were widely disseminated by the media. The water experts can also try to affiliate themselves with the media by involving the public in their activities and inviting the media to cover such activities. In the case of the Mountain Aquifer, this strategy is adopted by FoEME that constantly organizes events (education, workshops, etc.) that involve the public. In some cases they even take a more pro-active action to approach the media, such as holding press-conferences. To widely disseminate their idea on the restoration of the lower Jordan River, which caught the local and international attention, FoEME even held a press-conference in international events such as the

World Water Week 2013. The impact of media on the public and decision makers and its relation with the experts will be further discussed in the next section.

Public

In this report the public simply refers to the residents of the riparian countries.

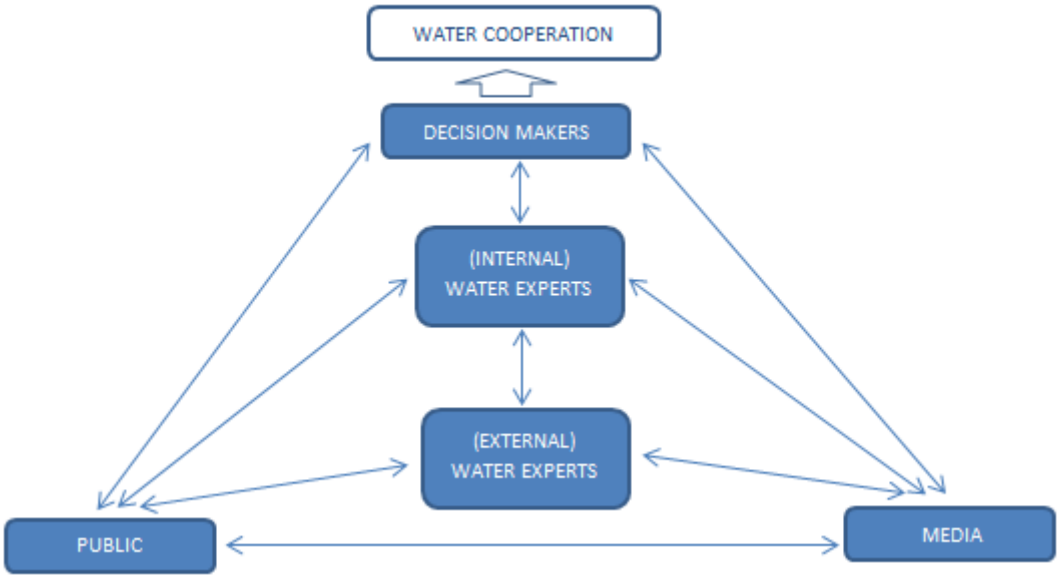


Figure 5.1 Water experts and the process towards water cooperation

5.2 Contributions of Water Experts

From the interviews and observations done throughout this study, there are at least eight contributions that water experts can provide to the promotion of water cooperation. Not only are they able to reduce the potential conflicts generated by the drivers (see chapter 2), these contributions can also create cooperative indicators (see chapter 2) through influencing the different actors in transboundary water management (see figure 5.1). The descriptions and examples of these contributions are given hereunder

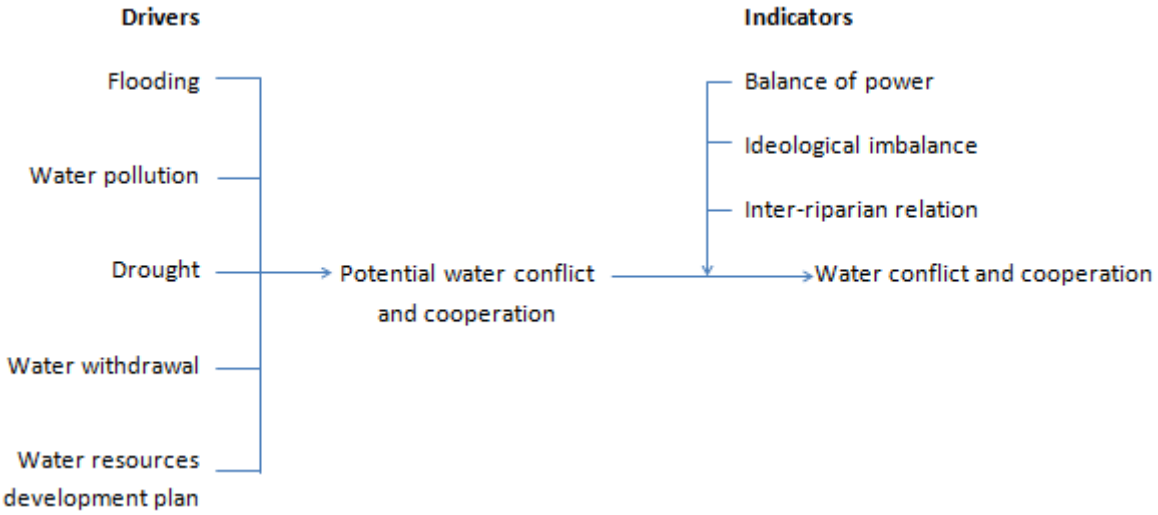


Figure 5.2 Drivers and indicators of conflict and cooperation in transboundary water management.

A: To open and maintain communication lines

This contribution can have a positive effect in improving or at least maintaining the *indicators* of inter-riparian states relation, especially in the water sector. As discussed in the previous chapter, a good inter-riparian states water relations would foster communications and trust; two of the most important ingredients in establishing any type of cooperation. Further, it would increase the *cost* of conflict and make the riparians more reluctant to engage in any conflictive situation

This can be very important especially when the riparian states do not have a good relation. A situation where the decision makers and/or the internal water experts from different countries may not be able to communicate with each other anymore. To be able to provide this contribution, the water experts or the institution that the water experts represent need to have a certain degree of independence from the (conflicting) governments and therefore not to be influenced by the political stance of their national governments. Normally this can only be done by the (external) water experts who work for NGO's or universities and not so much by the internal water experts who work for their countries' ministries.

Cooperation between academics in Israel and Palestine is one example of this. The water experts from Israeli and Palestinian universities were able to communicate and collaborate with each other despite their governments were reluctant to do the same thing. Unfortunately, this form of cooperation is almost extinct due to the outbreak of the first Intifada (or the Palestinian uprising against Israeli occupation) in 1987. The first intifada has led to a boycott by Palestinian universities on any form of cooperation with Israeli universities. Currently, Al Quds University is the only Palestinian university that openly cooperate with Israeli university (Huber-Lee, 2013). Also, some other academicians from both countries still form *underground* cooperation; without representing their home institutions (Kool, 2013; Tamimi, 2013a).

"They (the water experts) cooperate informally or on an individual basis and not openly to the public as (Palestinian) public wouldn't accept this as they consider this as an act of normalization (to the Israeli occupation)"
(Tamimi, 2013)

Opening and maintaining communication line between the riparian countries can also be assisted by foreign (external) water experts. Unesco-IHE is a good example for this. Unesco-IHE (through its water experts) gives a wide range of training programs that are mostly attended by junior or mid-level governmental water experts that work for different water-related ministries worldwide; including from countries that share their water resources. Some of them would even meet again in the negotiation table after their graduation (van der Zaag, 2013). Although this does not guarantee that they would chose cooperation over conflict, but at least it would not add obstacles in the negotiation. It may even lessen the barriers, and accelerate the negotiation process, as the actors are already familiar with one another.

The last example for this would be the Friends of Earth – Middle East (FoEME), an NGO based in Israel, Palestine and Jordan. The main objective of this NGO is to promote cooperation through environmental restoration or what they call as *environmental peacemaking* (Bromberg, 2013). In its operation FoEME involves water experts of Israeli, Palestinian and Jordanian engineering companies and have them collaborating in different projects. Previously such cooperation was almost impossible due to the tension between Israel and Palestine and the boycott of Jordanian engineering society on any collaboration with Israeli engineers (Kool, 2013). Further, in their project to rehabilitate the Lower Jordan River, FoEME also organizes workshop that gathers governmental (internal) experts from the three riparians in a discussion.

In the case of Rhine water pollution, water experts did not have to open and maintain the inter-riparians communication lines. This is mainly due to the fact that the decision makers of the riparians have always been able to talk with each other.

B: To raise public awareness

The contribution of rising public awareness can promote water cooperation by influencing two *indicators*, the inter-riparians relations and the power imbalance. By increasing the public's understanding of the water issue (or danger) that they are in, water experts can hope that a certain pressure is created on the decision makers (as the public's representative) to take cooperative stance and improve their water relations. This pressure may also indirectly make the decision makers to be more lenient in negotiating their interests, and may even be willing to *converge* the diverging interests the riparians have, caused by the (geographical or economic) power imbalance. In general, this role can only be taken by the external water experts for similar reasons as in the previous contribution.

In the case of the Rhine water pollution, this contribution was realized mainly through the wide media coverage on the Sandoz fire incident. The expert's analysis on the incident's impact, on the environment and on human health, managed to reach the general public with the help of the media. This has raised the public's concern and even led to several protests. This pushed the riparians, represented by the decision makers, to take basin-wide measure as soon as possible; and thus to cooperate. As a consequence, the riparian countries had to alter their national-interest, which was strongly defended in the negotiation before the incident, and come up with a common goal; which was to solve the pollution issue holistically. However, the *key driver* for that was the media and not the experts. One of the main reasons for that was related to the limited means that experts had in communicating with the public.

"[…] for the water quality, when they (general public) don't know what's (the pollution) in the water then they probably wouldn't be upset. But, as soon as you (water experts) can measure it and show the pollution in it, then they'll might become upset (and demand for change)"
(Dieperink, 2013)

Today, water experts have a better access to reach the general public via media such as the internet. However, effort to raise public awareness using this media is not (yet?) widely done by experts. For internal water experts, doing this might not be always possible as they restricted by political stance (and procedure) adopted by their government. While for the *un-restricted* water experts, such as the academic water experts, disseminating water-related information is also not popular; as these experts are more interested in communicating their ideas with their peers through scientific publications.

However, there are still water experts with their own initiative, and not completely rely on media, try to raise public awareness. For example, in their effort to rehabilitate the Lower Jordan, FoEME organizes workshops where public are informed about the issue in their area and asked to give suggestions. Workshop is only one of the means that the NGO has been using, FoEME has been actively organizing, or contributing in, different events that aims to promote their causes to local or international public; e.g. guest lectures, presentation in conferences, press-conferences, etc.(FoEME, 2013a). Another example is a Belgium-based website called riversnetwork.org; which established and managed by two water experts during their spare time. With the slogan of "knowledge and awareness", riversnetwork.org provides a wide range of information on different river basins around the world. To make the information more *fun* and *digestible* for a larger audience, the website includes less scientific reports and more informative , and communicative, flyers, maps and short videos. This website has been accessed by ten-thousands of people and subscribed by around 900 professionals, mostly by water experts (Tilman, 2013). Whether such independent efforts will lead to an increasing public awareness and able to influence the decision makers is yet to be seen.

C: To help build confidence

This contribution can help to promote water cooperation by improving (the *indicators* of) poor inter-riparians relations and to enable the riparians to overcome the obstruction to water cooperation caused by ideological imbalance. For similar reasons as the first contribution, this contribution can only be played by external water experts. Building confidence can be very crucial especially in the case where the general public, and thus the politicians, are not confident that they can reach cooperation.

Such sceptics view currently exists in Israel and Palestine and it is one of FoEME's main goals to alter this view (Abu Jabal, 2013). By facilitating the experts from the conflicting countries to work together in rehabilitating the Lower Jordan, the NGO is aiming to demonstrate to the public, and decision makers, that despite the ideology imbalance and a long history of conflict, the riparians can actually work together. The NGO tries to do this by organizing workshops, seminars, public training and other public events that involves the public as well as water experts. Through such activities, FoEME also hopes to convince the public that the three countries can live side-by-side. Such confidence within

the public, the NGO believes, can push the politicians, as the representative of the general public, to *move* towards cooperation. FoEME believes that as soon as the public's confidence is gained, by fixing the water pollution issue, the three countries can then progress to the bigger issues, the Israel-Palestinian land conflict (Abu Jabal, 2013).

> "FoEME vision is that when people (the experts) from different countries work together and see that they are able to (do it) [….] to improve the environment […] this will make them (the society) see that they can actually work together […] and can sit together and can talk […] about the bigger conflicts"
>
> (Abu Jabal, 2013)

As for the case of Rhine water pollution, water experts did not give effort in building public confidence. Although riparians went through decades of negotiations, the public did not share the same *pessimistic* view that the Israeli and Palestinian public have towards each other. Instead the public of Rhine did once lost their confidence on, the political willingness and ability of, their decision makers in reaching a joint action, shortly after the Sandoz fire (ICPR, 2010). This led to protest and demonstrations in different countries.

D: To exchange data and jointly collect data

Exchanging and jointly collecting data can promote water cooperation as it provides a strong foundation for the (*indicators* of) inter-riparian (water) relations. This contribution can lead to a common view on the water issue shared by the riparians; which will be the basis for taking a joint action. Theoretically, this contribution can be provided by both internal or external water experts. However, due to political constraints, as it was found in the case of the Mountain Aquifer, the internal water experts may not be *allowed* to share their data across the border. Meanwhile, in the case of Rhine, this contribution has been provided ever since the ICPR was established.

> "The water experts were even already very important in the first meeting of the ICPR on July 11th, 1950, the main discussion was on answering: what is our common problem?; so they started to develop a joint monitoring system."
>
> (van de Wetering, 2013)

At the time, the decision makers of the riparians acknowledged the water quality issue of the Rhine; but did not know how big the problem actually was and what measures would be needed to solve it (van de Wetering, 2013). These questions were then addressed to their water experts who established a platform for (joint) data collection and exchange. This joint system still operates actively until today; mainly for designing new agreements and monitoring the implemented ones.

A different situation is found in the case of the Mountain Aquifer. Here, agreeing on a set of facts has been an issue between the Israeli and Palestinian water experts which does not help the negotiation process (Bromberg, 2013; Megdal, 2013). Jointly collecting and exchanging (and thus agreeing on) water-related data is still somewhat problematic in the area. One of the main factors is because the Israeli government sees water-related data as highly relevant to the national security and therefore

become reluctant to share it. The absence of a jointly agreed data has even lead to a situation where both countries throw accusations at one another. For example, the Palestinians claim that Israelis use more water than what was agreed in the Oslo accords, while the Israelis claim that the Palestinians waste water and do not use them efficiently (Tal-Spiro, 2011). Whether these claims are true or not, even the mere existence of such accusations may further increase the existing tension and will definitely not be helpful in creating cooperation.

In order to promote a joint data collection and exchange, the European Union, France, The Netherlands, and the United States initiated the Regional Water Databanks program (EXACT, 2005b). Here, the foreign experts tried to stimulate the internal water experts to jointly collect data and exchange data. More on this contribution will be discussed in point G.

E: To develop and propose potential solutions

Developing and proposing potential solutions can promote water cooperation as it can reduce, or even counteract, the potential conflicts generated by the *drivers*. Further, it may also smoothen the negotiation process and reduce the stress caused by water competition, as it will be shown at the end of this section. This contribution can be provided both by the internal or external water experts. Needless to say, it would be easier for the internal water experts to provide this contribution as they work directly under the decision makers; and in fact this is one of their main tasks.

In the case of the Rhine, the internal water experts can put forward their solution via two routes. First, via individual communications with their Head of Delegations or second, via the "*input*" created in the EG (see section 4.1). The solution that was proposed via the "*input*" would require a longer time before it reaches the decision makers; as it needs to be shaped based on the discussions of the experts from different countries, fields and institutes; governmental and non-governmental. However, this solution will be enriched by such multi-disciplinary and multi-national discussions and more likely to be accepted by the decision makers. The development and proposition of solution in the case of the Mountain Aquifer is almost similar, except for the fact that the JTC, as the science-based advisor for the decision makers in the JWC, consists of only governmental experts (without experts from NGO or universities) and only technical experts.

For the external experts, proposing potential solutions to the decision makers is somewhat more difficult in both cases; especially in the case of the Mountain Aquifer. In the case of the Rhine water pollution, the solution that the external water experts developed, especially from the CHR, may still be able to reach the decision makers. Although CHR and ICPR are independent with each other, both institutes are still related through their water experts, who some of them are working for both entities, and through their operation, as the CHR is an *observer* within the ICPR and vice versa (Leentvaar, 2013; Sprokkereef, 2013).

While for the case of the Mountain Aquifer, the external experts do not have such privilege. However, FoEME, as one of the most active external expert bodies in the area, still active on developing and promoting potential solutions. Knowing that they do not have direct access to the decision makers, FoEME gives more attention on disseminating their solution to the public through different means; website, press conference, public discussions, etc. To create a potential solution for the water pollution in the Lower Jordan, the NGO hires another *external* water experts, a renowned

Dutch engineering firm called RHDHV. By involving water experts with a good reputation, the NGO hopes that the solution that they put forward will become harder for the skeptics to criticize. And by wide dissemination, they hope that it would be more difficult for the decision makers to ignore their solution (Megdal, 2013).

Whether the potential solutions that the water experts develop and propose will be implemented, and solve the dispute, or not, at least these potential solutions may reduce the stress on water competition and negotiation through two mechanisms. First, by providing several alternatives of solutions, the water experts can help smoothen the negotiation process. Negotiations often hit impasse when there are not enough alternatives available on the negotiation table (Mastenbroek, 1999). And having more than two potential solutions will prevent the negotiators to fall into a polarized debate (Fisher & Ury, 2011). Having alternatives of possible solutions will enable the decision makers to explore and fine-tune the different options until a desirable solution is reached.

Second, water experts may still develop technologies that can *indirectly* solve the issue; without necessarily needing the decision makers' approval for its implementation. One example can be found in the case of the Mountain Aquifer. The development of the desalination technology, water reuse technology and drip irrigations, mostly by the Israeli water experts, have freed up some amount of fresh water. This, at least theoretically, may decrease water scarcity and may loosen up the tight competition for the shared water (E. Smidt et al., 2013). Nevertheless, in practice, the negotiation between both countries still hits a dead end.

F: Act as an independent third party

Another contribution that (external) water experts can give to promote water cooperation is by acting as an independent third party. The *indicators* of inter-riparian (water) relations can deteriorate when the riparian countries could not agree on the water-related data and there is a conflicting claim between them; such as different claims on the quantity of the shared water. Here, the external water experts will play the role as a 'detective' as well as a 'judge'; to solve this disagreement. To do this properly, the water experts need to be uninfluenced by any riparian states, therefore this role can only be played by the external water experts. In the case of the Mountain Aquifer, the American water experts played this role. As for the case of the Rhine water pollution, the presence of a joint data collection and exchange program between the governmental water experts made navigated the external water expert away from this role.

> "There were experts from the U.S America, […} when there's a discussion about water balance in the part of Palestine. So then the Americans expert played the role as a judge, […] they made also a report that says how much the exact water is […]."
>
> (Gev, 2013)

G: Capacity building

Riparians may be unable to collaborate when one or more riparian states do not have the needed (technological or infrastructural) *capacity* to take a joint action. For example, one of the reasons for the persisting disagreement between Israel and Palestine (and Jordan) is the inexistence of joint data collection and exchange platform. Therefore the European Union, France, The Netherlands, and the

United States initiated the Regional Water Databanks program. This program, with active contribution from the water experts of Unesco-IHE and RHDHV, developed joint data collection standards and procedure. This program was then disseminated through training to the governmental water experts (de Schutter, 2013; EXACT, 2005a). This project was aimed to equip the governmental water experts with the needed tool to start-up a joint data collection and exchange. However, although this program was initiated over a decade ago, in 2002, the governmental water experts of the three countries still have not decided to share their data. Other capacity building programs that can be found in the area are aiming *balancing* the different capacities between Israel and Palestine in treating their wastewater. For example, foreign water experts, especially from Germany, contributed in the design and construction of several water treatment plants in Palestine (Tagar et al., 2007).

In the case of the Rhine water pollution, the water experts did not play this role as every riparian state had all of the required means to cooperate; yet they failed to cooperate due to political and economic reason.

To conclude, this contribution can be taken by external water experts with the objective of increasing the riparians resistance towards *drivers* and providing the internal water experts with the needed tool and technology to start a collaboration with each other.

H To inform the decision makers

In order to promote water cooperation, water experts need to make their decision makers realize the *urgency*, and the dynamics, of the issue and the *common interest* that the riparian states share. Therefore the decision makers can see that it might be in their best interest to have a better inter-riparians relation. This is important as the decision makers may not be trained in (water) technical or natural science. And even if they have a relevant training background, the decision makers might still be unable to see the shared interest; as their job is to represent their national interest. In order to reveal the urgency of the issue and the common (basin-wide) interest among the riparian states, (internal) the water experts from different riparian nations first need to collaborate in joint study, joint data collection and exchange study (van der Zaag, 2013).

> "The water experts together with the other experts facilitate the politicians or the decision makers […] to be aware of what their (common) interests are, and therefore preparing them to make their decision."
>
> (de Schutter, 2013)

In case of the Rhine water pollution, internal water experts managed to provide this contribution via personal communications or via reports of their joint studies. The common view, however, did not immediately turn into a cooperation as there was lack of political willingness among the decision makers to take action (Dieperink, 2013). But as soon as there was a political willingness, raised by the chemical spills in 1971 and the Sandoz fire 1986, the common view immediately translated into a joint action. In the case of the pollution in Mountain Aquifer, such common view is starting to be present as well. However due to the political constraints there, nothing has been done (Gev, 2013).

To summarize, this contributions can be taken by internal water experts to create understanding within the decision makers on the urgency of the shared water issue and to make them realize that it might be in their interest to deal with this common issue. This may stimulate the decision makers to re-arrange their interests and start to improve the (*indicators* of) inter-riparians relation.

The different contributions of internal and external experts

From the discussions above it can be seen that there are several contributions that only external water experts can provide and vice-versa for internal experts. Some of the contributions that can only be provided by external water experts include: 'to open and maintain communication lines', 'to raise public awareness', 'to build confidence', and 'to act as an independent party'. In these contributions the water experts are required to be independent from any riparian states and do not constrained by any political procedures that the riparian states might adopt. This is a freedom that the internal water experts do not have in general. While on the other hand, the contributions of 'informing the decision makers' can only be provided by the internal water experts as they work directly under the decision makers.

If we look closer at; the contributions of internal water experts in both cases, then we can see they provide almost similar contributions. The only difference is that the internal water experts in the case of Mountain Aquifer still could not be able to exchange and jointly collect data. This is mainly due to the fact that Israel sees water-related data as a security-related affair and they do not want to share it. This situation has restricted the Israeli governmental expert to reach their counterparts in establishing a common view and to collaborate.

While on the other hand, the external water experts in the case of the Mountain Aquifer can offer more contributions than in the case of the Rhine water pollution. This is mainly due to the fact that the Rhine riparian states have more cooperative *indicators*; with more balanced ideology and power and better inter-riparians relations. Therefore, to promote cooperation, the external water experts of the Mountain Aquifer need to influence the conflictive *indicators* that the riparian states have.

Table 5.1 Internal and external water experts' contribution towards the promotion of water cooperation

	Rhine water pollution		**Mountain Aquifer**	
	Internal	*External*	*Internal*	*External*
A: To open and maintain communication lines				✓
B: To raise public awareness				✓
C: To build confidence				✓
D: To exchange and jointly collect data	✓	✓		✓
E: To develop and propose potential solution	✓	✓	✓	✓
F: Act as an independent party				✓
G: Capacity building				✓
H: To inform decision makers	✓		✓	

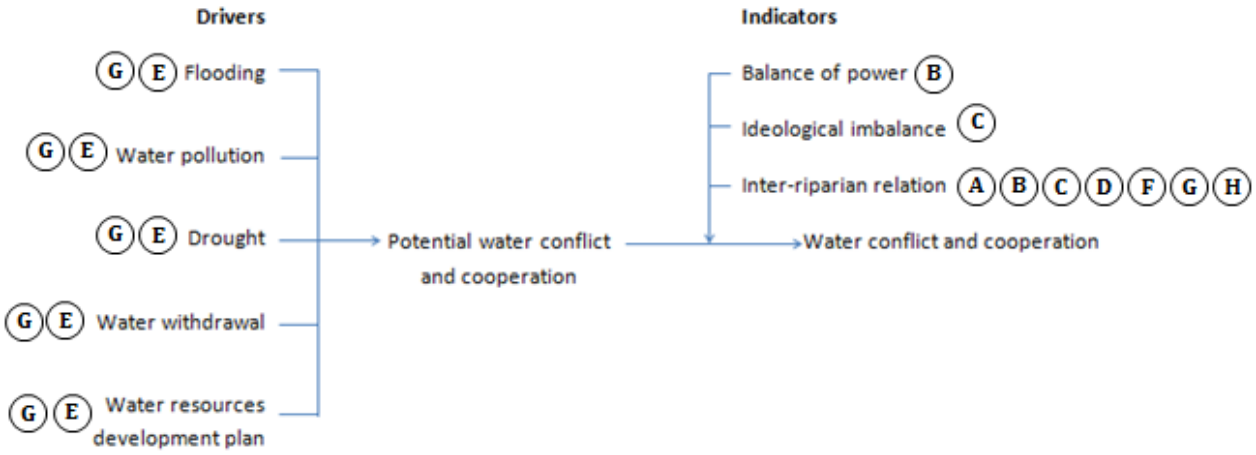
However, offering more contributions does not guarantee that the external or internal experts would have a better impact towards the promotion of cooperation. The affectivity of contributions is still dependent on a wide range of factors; both within and beyond the water experts' reach.

5.3 Contributions of water experts – drivers and indicators – TWINS matrix

Here, the relations between the three main elements of this study, the contributions of water experts, the *drivers* and *indicators* and the riparians interaction in the TWINS matrix, are going to be presented. As the relation between the *drivers* and *indicators* with the TWINS matrix has already been discussed in section 2.1, therefore their relations will only be briefly mentioned here.

Contributions of water experts – the drivers and indicators

From the discussions above (section 5.1) it can be seen that most of water experts' contribution can have a positive impact on creating a more cooperative *indicators*. This is mainly done through influencing public and decision makers, directly or via the media. While the remaining contributions can have a positive impact on the *drivers*; as it can diminish, or even, cancel the *potential* conflicts generated by the *drivers*.



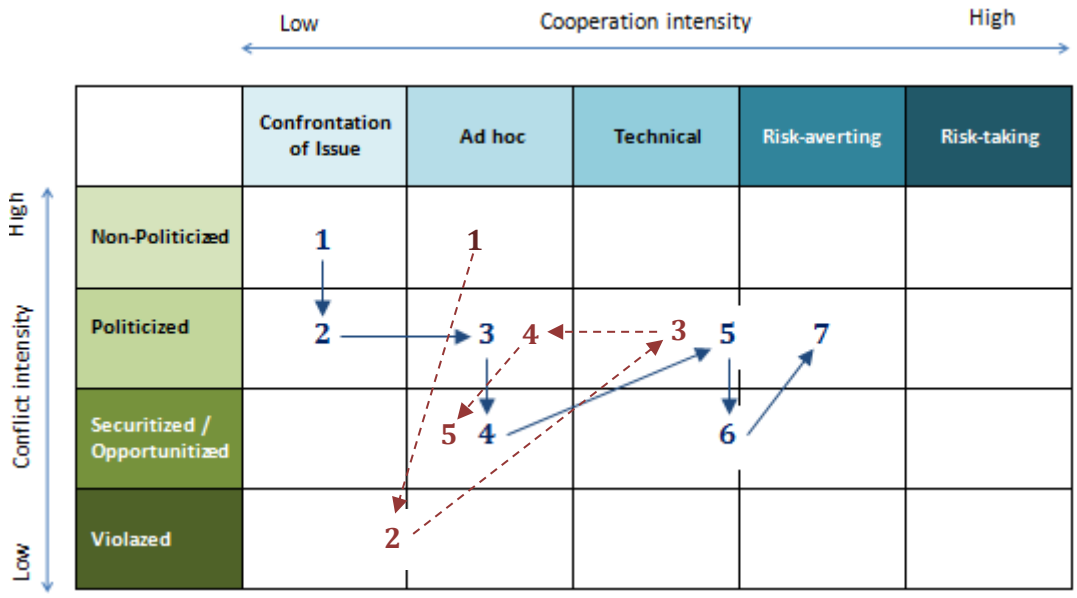
Note

A	: To open and maintain communication lines	**E**	: To develop and propose potential solutions
B	: To raise public awareness	**F**	: Act as an independent party
C	: To build confidence	**G**	: Capacity building
D	: To exchange and jointly collect data	**H**	: To inform decision makers

Figure 5.3 Water experts' influences on drivers and indicators of transboundary water cooperation and conflict.

Contributions of water experts –TWINS matrix

As it has been discussed before, the contributions of the water experts can lead to upward or rightward movement in the TWINS matrix. For example the contributions of 'rising public awareness' and 'creating potential solutions' that the water experts of the Rhine provided after the Sandoz fire managed to push the state from '6' to '7' (see figure 5.4). In the case of the Mountain Aquifer, water experts also contributed in the movement from '2' to '3'(see figure 5.4 hereunder). At that time the Israeli and Palestinian water experts managed 'to develop and propose potential solutions' (in that case agreeing on water allocation in the Oslo negotiations). Although it can be argued that the pressure from external parties (including the US, UN, EU, etc.) was the main *force* that caused the movement, and the water experts were *dragged* by that force.



Note

1 ——→ Rhine water pollution;

1 - - - - → Mountain Aquifer.

Figure 5.4 The dynamics of water conflict and cooperation in the Mountain Aquifer and in the Rhine River Basin presented in a TWINS matrix.

The reverse relations can also be found between the contributions of water experts and the state of conflict and cooperation in the TWINS matrix. From the discussion above it can be seen that the type of contributions that the water experts can offer is influenced by the interacting states in TWINS matrix (represented by different boxes in the matrix). Not all types of contributions are *feasible* and *useful* to be taken in every state of conflict or cooperation and therefore the water experts may choose (or indirectly *be forced)* to take or not to take certain types of contributions. For example, the contribution to 'open and maintain communication' might be completely feasible to do in the Rhine River Basin (state '7' in figure 5.4) yet it was not considered as *useful* as the decision makers can still communicate with each other, therefore this contribution was not provided by the water experts. Vice versa, a contribution might be considered to be very *useful* in certain state of conflict or cooperation yet might not be *feasible* to be taken. For example, the contribution of 'exchanging and jointly collecting data' will get more *useful* as the conflict become more severe, but on the other hand the *feasibility* of such contribution will be lower if the conflict increase. For example, the contributions of 'exchanging and jointly collecting data' could be very *useful* to provide in the case of the Mountain Aquifer, yet became *infeasible* due to the level of the conflict; and thus the political constraints that the riparian countries adopted.

In figure 5.4 it can be seen that the conflict level in the Mountain Aquifer is similar to the Rhine River Basin in several states (states '3', '4' and '5'). However, the internal water experts in the Mountain Aquifer were not allowed 'to exchange and jointly collect data' as what the experts of the Rhine have been doing. This is mainly due to the fact that the state of conflict in the two cases are not comparable. The TWINS matrix only portrays the conflict and cooperation in the water sectors, while the dispute between the riparians of the Mountain Aquifer is wider than *just* water. The severity of

disputes in other sectors (regarding Jerusalem division, borders, refugees, etc.) has been predicted to have influences in disabling the riparians to jointly share their data.

Contributions of water experts – drivers and indicators – TWINS matrix

From the discussions above, and those in section 2.2, a simple chart can be made to illustrates the relations of these three elements. A summary of their relations are presented hereunder.

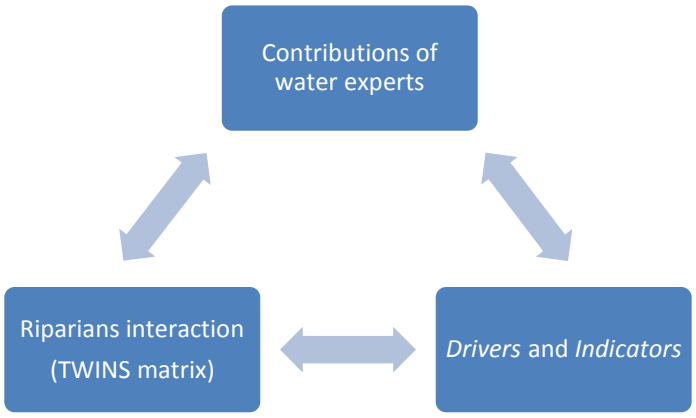


Figure 5.5 The relations between contributions of water experts - *drivers* and *indicators* - riparians interaction (TWINS matrix)

Riparians interaction (TWINS matrix) – *Drivers* and *indicators* (section 2.2)

The *drivers* induce downward movement in the TWINS matrix, towards a more conflictive situation. How likely this movement will be, is strongly-influenced by the *indicators*. Riparians with conflictive *indicators* will tend to move into more conflictive situations upon the occurrence of *drivers*; while vice-versa would occur for riparians with cooperative *indicators*.

***Drivers* and *indicators* – Contributions of water experts**

The contributions of the water experts can influence both the *drivers* and *indicators*. First, experts' contribution can help create a more cooperative *indicators*. This can done through influencing the public and decision makers, directly or via the media. And second, the water experts' contributions can also diminish, or even, cancel the potential conflicts generated by the *drivers*.

Contributions of water experts – Riparians interaction (TWINS matrix)

Contributions of water experts mainly lead to upward or rightward movement in the TWINS matrix (under enabling indicators). While the state of the inter-riparian states interactions also determines the contributions that the water experts are able to provide.

5.4 Barriers to the Contributions of Water Experts

In this subsection, the different factors that may dampen the positive impacts from the water experts' contribution, or may even cause counterproductive impacts, are briefly discussed. Here the discussion will not be focused on inevitable barriers that are attached on the complex nature of the conflict, and that are beyond water experts' grasp, such as the legal system adopted by riparian states or heavy political load the issue has, but on those barriers that are faced and manageable by the experts on a personal basis.

Insensitivity to political and social context

Insensitivity to the political and social context of the issue may reduce the affectivity of the solution offered by the water experts, or may even cause counter-productive impact such as rising the inter-riparian tension.

For example, the involvement of the water experts of RHDHV, in dealing with the water pollution issue in the Mountain Aquifer, by designing a waste water treatment plant in Kidron-East Jerusalem has heated up the bilateral conflict. The involvement of this firm was seen as a support to the Israel's annexation on East Jerusalem which had already crossed over the Palestinian border set in 1967 (The Jerusalem Post, 2013). After being urged by the Dutch government (The Jerusalem Post, 2013) and after "*consultation with various stakeholders*" (as RH-DHV puts it on their website), the company came to understand that the project would violate international law and therefore they decided to terminate their involvement (Royal HaskoningDHV, 2013b).

In the case of promoting treated wastewater for irrigation in Palestine, understanding the culture of the society may hold the key to effective an effective promotion and implementation. Although the water experts have contributed in *providing* extra water for irrigation, by treating the wastewater, most of the Palestinian farmers still reluctant to use it; despite the water scarcity. This is mainly because such practice is still negatively-viewed by the local culture and beliefs. Although one of the biggest school Islamic school, (Palestinians are predominantly muslims), the Al-Azhar, has released a *fatwa* that allows the use of such water, the local farmers, especially those who farm in the rural area, are still reluctant to do it. Therefore, in order to be effective, aside from contributing in constructing a treatment plant, the water experts also need to pay attention in changing the false perception of the farmers. One of the chosen strategies was by involving other farmers, that have been using treated wastewater, in the socialization of the treatment plant as they speak the same language (Tamimi, 2013a).

Being sensitive of the decision makers' political orientation may also help experts to be effective in conveying their message. For example, after the Sandoz fire, the experts' team of the Netherlands advised the then Dutch Minister of Public Works and Water Management to push the other Rhine riparian states to take joint action to rehabilitate the river with the argument of: it is important for the environment. The liberal-oriented Minister was reluctant to accept this idea as she argued that the industry and economy are important. But when the experts team reformulated their advice and argued that the rehabilitation would be crucial for the restoration of fisheries, an industry that used to be vital for the riparian state's economy, the Minister became enthusiastic and brought forward this idea to the other Ministers of the Rhine; which eventually became formulated as the Rhine

Action Program (Leentvaar, 2013). Being aware of the Minister's political-orientation enabled experts to frame their message differently, but still maintaining the same goal, and making it more attractive.

Inter-disciplinary and inter-level communication

Water experts may encounter communication problems when developing a potential solution with experts from the other fields and when promoting the solution to the decision makers. This is mainly related to the various background that these parties have, which make them use different *languages* to convey and receive ideas, and the negative stereotype that exist among experts.

The experts from different fields see a single issue from different perspectives and use different terminologies to convey their ideas. For example in analyzing water scarcity, water engineers prefer to present the hazard in terms of water shortage volume; while the environmentalists will use the possible environmental damage to express the danger; and the economists perhaps want to discuss it in monetary terms. One way to unify such discussion is to use a cross-disciplinary language that can be understood and used by all the experts. The language of 'risk' offers such possibility (Bakker, 2013). As 'risk' can be defined as 'possibility of occurrence x damage', experts from different fields can actively contribute to the discussion without *dispersing* the discussion. By having the natural and technical science experts (hydrologists, environmentalists, mathematicians, etc.) assess the possibility and the damage of different water hazards (flooding, drought, pollution, etc.), and the economists convert the damage to monetary terms, the discussion can be kept focused on the 'risk'.

Another challenge in inter-disciplinary communication is the presence of a negative stereotype among experts. For example, there is a view among water experts that the experts from other fields (e.g. economy, law, social science, etc.) do not really know much about the water issue and often oversimplify it (de Schutter, 2013; van der Zaag, 2013). On the other hand, the experts from other fields see that water experts, engineers, do not know how to communicate their ideas and can only do it to other water experts (Megdal, 2013; A. Wolf, 2013). Whether these claims are true or not, the mere presence of such stereotypes will disturb the creation of a potential solution. This can make water and non-water experts reluctant to involve each other in developing a solution (van der Zaag, 2013). By seeing other parties as incompetent and being over-confident of their own competence, water experts may indirectly limit their view and distance themselves from the holistic solution.

Lastly the inter-level communication can become a problem as decision makers may not be used to read scientific reports, produced by the experts, and therefore may not be able to digest the ideas put forward by the experts. Therefore the usage of other communication media, such role play, visual-aid, etc., might be helpful to send the important message (de Schutter, 2013; Huber-Lee, 2013)

Different analysis method

When shaping a potential solution or a common view towards the shared issue, water experts from different riparian states might be segregated by their different analysis. For example, in creating a common view towards climate change, the different predicting methods that experts from the different countries adopted will result in different visions on the problem; and thus lead to a different potential solution being recommended (de Schutter, 2013). This can be a problem as experts can be stubborn in defending their method (Groen, 2013). Here, involving the experts in

social-related activities may sometimes make the experts more lenient and willing to consider the other experts' method; even a *simple* activity such as drinking coffee or beer together might sometimes help (Groen, 2013; Huisman, 2013). However, there are some things that are less negotiable, for example the different attitude that the experts have in dealing with an issue. For example, the Dutch experts, who are raised in an *insurance culture* with high 'uncertainty avoidance'(Hofstede, Hofstede, & Minkov, 1991), would prefer to develop and propose a solution that can prevent a disaster at almost any cost, a cost that experts from other riparian states might not be willing to pay (de Schutter, 2013). Therefore it would be helpful if the water experts are aware of this different preferences, and how such preferences might be shaped, as it may prevent them from frustration when the negotiation among experts hit impasse.

Credibility of water experts

Having the 'right solution' is not enough for water experts to contribute to water cooperation. When *selling* this solution to the decision makers and public they should have the right profile; they should be considered as credible (Moser, 2010). There are two factors that may influence credibility of water experts as the messenger to their solution; their reputation and their background. Some studies showed that people accept and trust a message more easily if conveyed by people with similar views or background (Arroyo & Preston, 2007; Moser, 2010; Warner, 2007). This can be seen in the promotion of treated wastewater for irrigation in Palestine, the farmer tend to believe other farmers better than the engineers (Tamimi, 2013a). Further, the decision makers and public will not just swallow any potential solutions that are put forward by any expert; especially experts that are hardly known. Therefore it will be helpful to involve a well-reputable engineer to increase the trustworthiness of a solution; as what FoEME did by involving a well-reputable engineering firm, RHDHV (Kool, 2013; Megdal, 2013).

Therefore, experts should always try to assess their credibility in the decision makers' and public's perspectives. When considered not sufficiently-credible, then they should try to involve well-reputable experts, or other parties, that may increase the credibility of their solution and make it more attractive to the decision makers and the public.

Chapter 6 Discussions

This study took two of the most contrasting study cases; this can be seen in the contrasting *indicators* between the cases. The riparian states of the Rhine River are more or less in balance with each other, in terms of ideology and power, and with excellent international relations. While the riparian states of the Mountain Aquifer are completely the opposite. Here, the imbalance of power and ideology appear clear; with riparian states also engaged in a long, and multi-sectors, unresolved conflict. Nevertheless, both cases showed that the water experts can still provide contributions to the promotion of water cooperation. The main difference is that the water experts in the Mountain Aquifer can offer more contributions as there is more (at least perceived) necessity for their involvement.

As these cases can be considered to resemble two opposing edges of a continuum in transboundary water management, from the most cooperative and balanced riparians to the most conflictive and imbalanced one, therefore the result of this study, the contributions of water experts, might not be usable to predict the contributions of experts in other cases; in the middle-range of such continuum where the riparian states are not that cooperative or conflictive and the relation is not that balanced or imbalanced; e.g. Nile River Basin, Mekong River Basin, Danube River Bain, etc. Although it can be predicated (based on the see discussion on section 5.3) that the water experts would have more potential contributions (as more contributions will become both *feasible* and *useful*), it is still recommended to conduct further studies to find out the actual contribution of expert in such middle-range cases.

Not only differ over cases/places, the contributions of the experts also change over time. In the beginning of 1950, when the ICPR was established, the contributions of the (internal) water experts were focused on informing the decision makers and on jointly-collecting and exchanging data. The joint data management was focused on creating a common formulation of the shared water pollution issue. For about 20 years, the contributions of water experts were limited within this extent as there was no political willingness among the (upstream riparians) decision makers to take joint action. As the first political willingness to do something finally came into being in the early 1970s, due to several chemical spills accidents, the (internal) water experts were then asked to contribute more; to develop strategies on how to deal with the common issue. While for the external water experts, represented by CHR, their contributions have remained constant since its first involvement in 1972; in joint data collection and potential solution development.

If the current the power and ideology balance and the relation between riparian states of the Rhine remain unchanged, then the contributions, and the importance of experts are also expected to remain the same in the future; yet with different water-challenges such as: pharmaceuticals pollution, micropollutants, climate change, etc. (Broseliske, 2013; Dekker, 2013; Groen, 2013; Leentvaar, 2013; Schärer, 2013).

In the Mountain Aquifer, the situation is somewhat different, the current contributions of the (internal) water experts is comparable to the contributions of the water experts in the Rhine in the 1950's; except for the fact that the experts in the Mountain Aquifer are not jointly-collecting and exchanging data. Israel still sees water-data highly relevant to the national security, thus they do not

entrust it to Palestine. The internal water experts are expected to *stick* with this contribution as long as there is no improvement in the imbalance and hostile inter-riparian states relations. This is also expected to be valid for the contributions of the external water experts; who are currently more focused on promoting a better and more balanced relation and less on solving the issue technically.

Promoting a balanced relation is an important foundation for creating a *balanced* cooperation. By promoting just any kind of cooperation, without observing the balance of the relations and the impact that their involvement might bring to it, the water experts, consciously or not, may not contribute to the establishment of a *genuine* cooperation, where benefits and costs over shared water are distributed equally among the riparian states. This may even contribute in the establishment of an *agreed domination* by one riparian state over the others. For example, in the case of Israel and Palestine, the existence of a joint management committee does not change the highly asymmetric water allocation between the riparian states, 90% and 10% respectively (Selby, 2003). To do this, the water experts need to be critical to their own contributions as well as be familiar with the dynamics of inter-riparian states' relation. In addition they also need to possess the required technical-knowledge to solve the local water issue.

The last step that the water experts need to take in order to have an *optimum* contribution to the promotion of water cooperation is to learn how to overcome their barriers (see chapter 5.3). To do this, the water experts are expected to develop mainly their inter-personal skills, instead of the technical ones. Such skills can be obtained along with their involvement in transboundary water management but can also be provided by universities; as the preparer of future water experts (Leentvaar, 2013). However this might not always be possible, due to at least two reasons. First, universities cannot and should not *force* future water experts, who might want to focus their education in the technical-aspect of water management, to learn something that they are not interested in. And secondly, some of the interpersonal skills cannot be taught in the universities' classroom. Some skills might only be acquired when the experts are actually involved in the field; while some skills cannot be learned as it may strongly relate to one's personal traits; which is influenced by culture, family, environment, etc. Nevertheless, the least that the universities can do is by (trying) to make their students realize that in order to be effectively and ethically involved in a transboundary water management, and the promotion of water cooperation, it is not enough to only have the technical knowledge. Then it will be the personal decision of the water experts whether they want to learn these skills or collaborate with others that possess such skills.

If the (future) water experts want to conduct study in different study cases, yet with the same focus - on investigating the contributions of water expert, adjustment on the current adopted methodology is advisable. To get a better grasp of the situation and the issue, when possible, it is advisable to conduct site visit and to talk to all types of actors in transboundary water management. This study was done by consulting/interviewing mainly the decision makers and the water experts, therefore its results may heavily resemble the view of these actors and may not capture the whole story. By also consulting the local public and media, researchers may able to reveal other possible contributions that water experts can provide, or other cooperation-promoting mechanisms that might be missed by this research. Also, future researchers of this topic are advised not only to focus their researches on the water-aspect of the issue (as it has been approximately done in this study). This is important as certain phenomenon, for example the *birth* of the water cooperation in the Mountain Aquifer after the Oslo Accords, cannot be explained by only focusing on the water affairs. In this case,

understanding the Palestinian uprising (Intifada) and the world pressure on the riparians are essential to analyze the initiation of the water cooperation. Similar situation is expected to be found in the cases where the riparians have an extensive conflicts (in terms of scope and period), as it was found in the Mountain Aquifer, where the water issue has been tangled with other affairs.

When researchers decided to conduct interviews in such study, researchers should be careful on the selection process of the respondents. A research may end up with different results if different interviewees selection strategy is used; thus leading to different interviewees. If researchers are the new to the study subject/case, they would need to rely on someone (or something, such as the internet) to pinpoint the relevant respondents. It is advisable to consult with a *neutral broker* that can recommend the *right* set of interviewees, the ones that can provide holistic view on the issue. If the riparians of the study case have conflictive *indicators*, the role of *neutral broker* should not be given to the local decision makers or water experts. In such situation, the conflict (and tension) may have *contaminated* these actors and *prohibited* them to be objective in identifying the *right* respondents. Instead, there is a risk that they will only indicate those who have similar view with them, the ones that can confirm their opinion and can frame the issue in the way they desire; which may not represents the reality. In this case it is advised to consult with actors that are independent from any (government of) the riparians yet active in dealing with the issue. Those can be foreign experts (that may be involved as a judge) or mediators that support the negotiation between the riparians. If the riparians of the study case have cooperative *indicators*, the role of neutral broker can be given to any actors that are involved in the issue. Although the risk of biased-recommendation might still exist, as it is inevitable, the risk can be considered much smaller as they have less interest in misleading the research.

Another interview-related challenges that researchers may encounter, especially for researchers with background in engineering study (just like the author of this report), is concerning the communication during the interview. It was observed along the course of this study that actors, especially decision makers, spoke in a different way as engineers are used to communicate. Decision makers, who mainly deal with political issue in their daily work, tend to convey their message rather in an abstract and subtle way and using different terms than what engineering-researchers might be used to. This might not only create complication when the researchers need to retell and rearrange the information in a report, but also contain risk that there could be some information that were missed or *uncaptured* by the mindset of the researcher. Further, engineering-researchers might also face another challenge if the research is to be conducted qualitatively (which is advisable due to the complexity of the subject). This is mainly because the engineering-researchers are not as used to qualitative researches, as most of the studies in this field is done quantitatively. Conducting a (qualitative) study without (concrete and predefined) set of quantifiable parameters might be new for them. Preparing oneself on the methodology of qualitative research and knowing-what-to-expect are keys to a better study, or at least in preventing frustration during the study.

Chapter 7 Conclusions and Recommendations

7.1 Conclusions

- The causes of conflict and cooperation over a shared water resource can be grouped into *drivers* and *indicators*. *Drivers* (water pollution, flooding, water abstraction, drought and water development plans) generate *potential* conflict; while *indicators* (power balance, ideological imbalance and inter-riparians relations) would determine whether this *potential* conflict will become an *actual* conflict, or even become an *actual* cooperation.

- Water experts can contribute to the promotion of water cooperation by influencing both *drivers* and *indicators*. Water experts' contributions may diminish, or even, cancel the potential conflicts generated by the *drivers* and also may create a more cooperative *indicators*. These contributions are:
  1. To open and maintain communication lines;
  2. To raise public awareness;
  3. To build confidence;
  4. To exchange and jointly collect data;
  5. To develop and propose potential solution;
  6. Act as an independent party;
  7. Capacity building;
  8. To inform decision makers.

- In the case of the Rhine River, where riparians have a relatively good and balanced relations, the contributions of (internal and external) water experts are more focused on influencing the *drivers*, by developing potential solutions, and on maintaining the cooperative *indicators*.

- While in the case of the Mountain Aquifer, where riparians have an imbalanced relations and a long history of conflict, the contributions of water experts are more focused on creating a more cooperative *indicators*. This contributions are mainly taken by external water experts as the internal water experts are restrained by the political stance and procedure adopted by their government.

- To have these contributions actually impact *drivers* and *indicators*, water experts need to overcome obstacles that may dampen the positive impacts of the contributions, or may even cause counterproductive impacts. Such obstacles ranging from the ones that are inevitable, attached to the complex nature of water conflict, and are beyond water experts' grasp (e.g. different culture and legal system) to those that are preventable by them. Some of the *preventable* barriers are including:
  1. Insensitivity to political and social context;
  2. Inter-disciplinary and inter-level communication;
  3. Different analysis method;
  4. Credibility of water experts.

7.2 Recommendations

For internal and external water experts: Try to understand the local public and the decision makers. Knowing the local public will give them the insight to the non-technical aspect of the issue and therefore can ensure that their solution to be acceptable or at least worsening the current issue. While knowing their decision makers, will enable the experts to frame their solution in order to make it more attractive to the them (see chapter 5.4).

For internal and external water experts: To be modest and try to involve experts from other fields. It might be easy for experts to fall into the *trap* of thinking that their role is far more important than other experts as they can create (mathematically) complicated solutions which other may not able to do. Being modest will not only help water experts to be more open-minded but may also encourage other experts to share their expertise more optimally which will lead to a better solutions (see chapter 5.4).

For internal and external water experts: Be aware of the public' and decision makers' perception towards their credibility. When they are perceived as not sufficiently credible, might be perceived as biased, water experts should reconsider their involvement; whether it is going to solve argument or lead to more tension. When possible, try to involve parties that have the required (perceived) reliability, as what FoEME did by involving RHDHV (see chapter 5.4).

For internal and external water experts: Be critical and selective in promoting water cooperation. Check whether their involvements leads to an *equal* cooperation or supports an agreed domination; and to be selective on only promoting such equal cooperation (see chapter 2).

For internal and external water experts: As public and decision makers may not be used to read scientific reports. Water experts should try to utilize simpler and more interactive communication means, such as: role play, visual-aid, etc. (see chapter 5.4).

For external water experts: Always explore the possibility of using the media in their effort to build confidence and raise public awareness. The case of cooperation building in the Rhine has shown how effective the media can be in *pushing* the cooperation (see chapter 3).

For universities: As the preparer of the future water experts: try to make their students realize that in order to be effectively and ethically involved in a transboundary water management, and to promote water cooperation, having the technical knowledge is not enough. To let them understand that sensitivity to non-technical aspects of the issue is vital and to provide related training upon the request of these future water experts (see chapter 6).

For future research: to conduct further study on how the water experts contributions change over *indicators*, that changes over cases. This study took two extreme cases, the case with most cooperative and conflictive riparians, therefore the result may not be usable to predict the experts' contribution in the cases where the riparians as not that cooperative or conflictive (see chapter 6).

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