

Post- conflict peace building and  
natural resources: A comparative  
study on water management:  
Euphrates and Tigris River Basin in  
Northern and Western Iraq

Galawesh Sofi

Examensarbete i Hållbar Utveckling 202  
Master thesis in Sustainable Development

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## **Abstract:**

Iraq has since post conflict of 2003 administrated the Euphrates and Tigris River in accordance to the countries plan management. It is researched in this study how the Iraqi Government and the Kurdistan Regional Government have managed and prioritized its water resource comparing the Euphrates and Tigris River flowing through Western and Northern Iraq. The focus is also on approaches and the alternative consequences derived from different management perspectives. It is concluded in this study that there are different priorities and management approaches in Iraqi Government and Kurdistan Regional Government. Iraqi Government has not managed Euphrates River as needed post conflict of 2003 where the approach is not satisfactory to resolve the problem facing the Euphrates River. It can become an underlying problem to an additional distress among the population which can heighten the risk for disputes and uprising of further conflicts in the region if the problems are not solved in Western Iraq. Tigris River that is also managed by the Iraqi Government has not been the top priority and there are unsolved problems around the river. The distress amongst the population can outburst in a bad manner if problems not solved surrounding the Tigris River. However the tributaries that flow through Kurdistan Regional Government to the Tigris River are of better condition more attention is directed to water management and there are aspirations for meeting the challenges and well as changing management approach. Kurdistan Regional Government has managed to prioritize and manage water from the tributaries better than Iraqi Government.

**Keywords:** water management, Euphrates and Tigris River basin, Post Conflict peace building and natural resources,

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## **Summary:**

This study focuses on water management of the Euphrates River in Western Iraq and Tigris River in Northern Iraq. It aims to compare the two regions in management approaches and priorities and as well as consequences of the Iraqi Government and the Kurdistan Regional Government. The aim is to find how the rivers have been managed and as prioritized post conflict of 2003, the methods used and the consequences of different management system. The result in this study shows that there are different priorities and management views in between Iraqi Government and Kurdistan Regional Government. The Iraqi Government has not managed Euphrates River as it is required post conflict 2003. The focus is on hard path approach for water management which is not solving the problems facing Euphrates River. Since the issues are not met properly there is a risk for societal tension in Western Iraq according to post conflict peace building and natural resources. The risk of disputes and uprising of a conflict is of concern in Western Iraq if the aggravation amongst the population increases. This can occur if the problems faced Euphrates is not managed as it is required. The Iraqi Government controls also the Tigris River and is head of management but is not top priority in that region where management has been focused on hard path approach and technological solutions are aspired to be solving the problems in Tigris River. In accordance with post conflict peace building and natural resources theory it is highly risk able that dissatisfaction amongst the population arises. However the three major tributaries to the Tigris River is managed by the Kurdistan Regional Government and is highly prioritized as well the managed better. There is a traditional community based water management system that has been deep-rooted. Therefore the importance of water is visible and a desire for changing approaches. PCPB-NR theory sees the region stabilizes and to some extent strengthen the calmness situation by taking the environmental part seriously.

**Keywords:** water management, Euphrates and Tigris River basin, Post Conflict peace building and natural resources,

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## **Lists of acronyms**

IG	Iraqi Government
KRG	Kurdistan Regional Government
PCPB-NR	Post Conflict Peace Building and Natural Resources
WI	Western Iraq
NI	Northern Iraq
SI	Southern Iraq
ER	Euphrates River
TR	Tigris River
MWR	Ministry of Water Resources

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# 1. Introduction

## 1.1 Post conflict, Development and Natural resources

Armed conflicts in form of war whether it is between states or other type have devastating impact not only on the human life but also on the environment (Mrema & Bruch 2009, p 8, 10). It is also not a misconception that conflicts have deeper effect on its surroundings as a whole the longer it is pursued. Depending on what kind of conflict and where it is occurring, the more diverse are the casualties, environmental damages and the structures that are upholding it (Wright & Piergiuseppe 2011, p 5, Nye 2009, p14, Wallersteen 2011, p 15) Additionally when a conflict comes to an end or decreases in quantity development successively takes place. (Junne & Verkoren 2005, p 8, 9)

Development per se has different meanings and depending on its meanings one can conclude whether it is sufficient for the circumstances at hand or not. It should be stated that development in general is seen through economical terms and growth rather than other forms of development (MacGinty & Williams 2009, p. 5, 9-10, Leys 1996, p 111-112).

The environmental aspect on the other hand is neglected and therefore endures in return huge losses. Natural resources are not seen in the development phase and are not taken into account (Barakat 2005, p 106, Paris 2004, p 6).

Natural resources have been on the topic more than a half a century and a subject that has been significantly discussed and debated even more over the last decade on how it has been managed (Goodbody & Thomas-Hope 2002, p 1-3). The discussion has further on been related to the destruction and the overuse of these natural resources caused by human behavior. Given that nature provides us the available resources on which it can be benefited from there has been controversy on how the effects of human patterns have been on the environment ( Hackett 2011, p 103-105, Jain & Singh 2003, p 11).

Natural resources such as water are of various importance since it is vital for every living species on the planet. The ecosystem and all its form of life is highly depended on it (Goodbody & Thomas-Hope 2002, p 94). Water resources needs to be managed without changing or damaging the environmental habitat. Water resources such as rivers, which both humans and the ecosystem highly depend on, are not first priority for recovery after a conflict sizes to exists (Anisfeld 2010, p 2-3).

Rivers have no strict definition that divides them from streams. In most cases the water flow from streams leads to rivers although the size of the water flow, length channel and the catchment area defines and divides rivers from streams. The depth, width and the different structural functions of the water flow distinguishes further rivers from streams (Buckavekas 2009, p 721-723). Due to the size of rivers it has become a place for diverse species and a habitat for different organisms to interact (Buckavekas 2009, p 726-727).

River management is often related to human activity and utilized as according to its needs. Management of rivers means to make them as practical as possible and controllable to make them more useful, effective and attainable to the human activity. Rivers are often managed in different ways and therefore different methods are applied.



Dams which are one of the more traditional forms of managing rivers are built to control the water flow of the river, storage water and at the same time produce hydro electrical energy (Buckavekas 2009, p 725). Canals are another method used mostly to connect rivers in order to transfer or reroute the water. Diversion of rivers is also used as a technique to increase, improve or smooth down the flow rate (Buckavekas 2009, p 725). The usages of any of these techniques are highly dependent on what outcome is desired from the river and what the means and goals are.

## 1.2 Outline

In his study the research is purposely divided in different sections. This is to make a better understanding and simplify an already difficult subject.

In the first section short historical background on the rivers is given following an overview over general transboundary problem.

In part two the measures and methods used for managing Euphrates and Tigris River will be studied in separate sections. The effects of the measures and methods on the rivers will also be highlighted as well as if other alternative approach has been taken.

In the last part information and the conclusion of the research will be put forward.

## **2. Method and research process**

### **2.1 Aim and Research question**

After armed conflict devastation and damage awaits in the post conflicted regions. The question then arises how these areas are to acquire progress post conflict period. Since other parts of development has been advocated and prioritized in post conflict state building the environmental part is therefore neglected. Hence it is intended in this study to compare two regions in a post conflict country.

The aim of the study is to compare how Iraqi Government (IG) and Kurdistan Regional Government (KRG) has in Western Iraq (WI) and Northern Iraq (NI) post conflict 2003 managed water resources in regard to the two main important river basins Euphrates and Tigris. The comparison is interesting since no other studies as such has been researched and if there are similar studies it is often concentrated on the transboundary countries that is Turkey, Iraq and Syria. However no research between WI and NI has been completed so far. Another reason for this study is linked to the economic development which Iraq as a whole has experienced. It is of great interest to see the management of the river in both regions where economy has expanded.

The research questions are:

How have the governing rule managed and prioritized Euphrates and Tigris River post conflict of 2003?

What are the possible reasons for different management system of water resources between the two establishments? What approach have they chosen to manage them and are there any desire for system change in regards of management?

What are the consequences if management approaches and priorities are not satisfactory?

### **2.2 Research methodology**

All the information and data are collected via second hand information. Due to the situation of the country no interviews were able to be prepared or a minor field study to be arranged. In this study, scientific articles, literatures and papers have been used as material. They hold the scientific standard which is required for research.

This study has a qualitative methodological approach. In this methodological approach the researchers understanding and interpretation of information is at first hand (Holme & Solvang 2008, p 76).

With this approach the researcher looks at the phenomenon, which is aimed to study, from within. The researcher, via this point of view, attempts to have a deeper and a more comprehensive understanding about the subject we attend to study (Holme & Solvang 2008, p 92).

In this study the research has components of descriptive analysis where the question of *how, when, who, where* are at search to be answered. More so this study has also an element of explanatory analysis where more profound and deeper *why* question is to be resolved (Esaiasson et al. 2007, p 37).

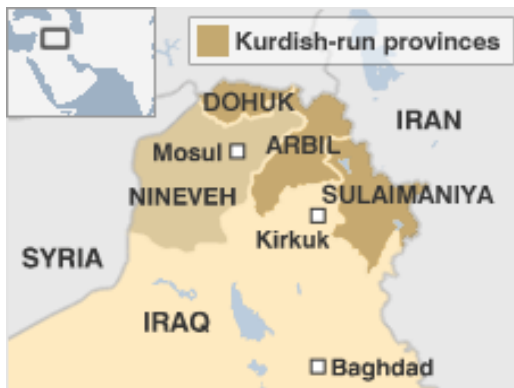
During research the *reliability* and *validity* of the information that has been collected for studies to be inquired. Even though they are closely connected they have different function in a research. These are two important criteria's in order to categorize the quality of the qualitative study. A research of high reliability requires that the information, which has been collected, has rightfully and correctly been prepared and that the information is representative for the study. Nevertheless during a qualitative research such as this study emphasize is on the validity of the information. That is how legitimate the collected information is for this current study and that the information is relevant to the specific context. High reliability does not guarantee high validity although high validity presumes high reliability (Holme & Solvang 2008, p 94-95; Esaiasson et al. p 69-71).

This research is conducted as a *theory consuming* study where one or several already existing theories are trying to explain or give an explanation to the problem. In this research, to some extent, a hint of theory testing study can be seen but since in theory testing the focus is on testing a theory the importance in this case is on the events and not the theory itself (Esaiasson et al. p 42-43). The difference between them in my case study is clear enough that more indications are on theory consuming than theory testing.

## 2.3 Case study selection

The case study in this research is regarding to the management of the two main river basins Euphrates and Tigris in Iraq post conflict 2003. I have selected for this study the river Tigris flowing through NI (Figure 1) and its tributaries flowing through KRG and Euphrates streaming through WI (Figure 2). I have done this selection because I find it interesting to see the development stage regarding environment in post conflict era especially at the present time when IG and KRG are forward driven for development.

The NI and WI are perfect for this study as they are to be compared on the management of the two rivers. Iraq is not only a post conflict region it is also a country where it has as a whole experienced economic growth and at least one part has got the public attention. Since KRG is to some degree semi-autonomous and have own government, military and working institutions within a country which is Iraq it is of great opportunity to study how NI where KRG is included and the WI in control of IG has managed water resources in comparison to each other.



**Figure 1.** NI and KRG ( NBBC 2009)



**Figure2.** WI (RNIC 2014)

## 2.4 Scope and limitations

The study has been limited in various forms. It is due to the specific area of research and the aims of the study. In this research the focus is on management of two main important river basins in Iraq which are the Euphrates and Tigris. Since the rivers are flowing through two other countries this study will be concentrating on the management of the rivers in Iraq. Nevertheless there will be some minor highlights on the subject regarding the transboundary dilemma and difficulties of river management.

The study area is limited to WI where Euphrates flows and NI where Tigris is flowing and its tributaries in KRG. Southern Iraq (SI) is not studied since the area is still a conflict zone and the two rivers flow out through that region. No explicit attention will be given to a specific environmental damage in this study regarding the rivers per se. A specific area of research regarding environment is not possible because of two main factors. One is that not enough information is available in order to get deeper in a single or specific area of study. The second

reason is the difficulty and lack of possibility to attend personally and gather information in the area due to safety reasons in the region.

However the problems will be addressed in general that have been occurring post conflict 2003. In this study the general view of management of the rivers are taken into consideration. Hence if political, social, economical or conflict related issue are a factor for a situated environmental problem in the two rivers they will be addressed as such. The period of time that is of interest is after the occupation of Iraq 2003 until 2013.

### **3. Theoretical perspective**

#### **3.1 Post conflict peace building and natural resources- (PCPB-NR)**

During post conflict peace building it is often seen that peace is sustained via mediation amongst the involved on how to reconcile. The main strategy for rebuilding in a post conflict state since 1990 has been via adaptation of liberal state building. With this approach the environmental problems is not put forward and focus is on how to rebuild and reconstruct the institution in the state for economic and physical security (Kostic, Krampe & Swain 2012, p 42). PCPB-NR highlights on the other hand the importance of natural resources in the peace process and the transition of peace (Bruch et al. 2008, p 59-60).

It is not always the case that the causes of war is direct linked to environmental problems but environmental problems does however have impact on the societies. As a result it has been studied that environmental problems has been creating societal insecurity. The implication of this thought is that environmental deficiency will lead successively to scarce resources. This will in return have unwanted consequences and leading further more to causing insecurity in people's lives (Kostic, Krampe & Swain 2012, p 42-47).

PCPB-NR implies also that the failure to manage natural resources can destabilize already fragile peace but strengthen if it is taken into consideration under the peace process. This is the case since majority of the population that are inhabitants are dependent of the natural resources, including agriculture, water resources such as rivers etc. which is the main source of their livelihood (Bruch et al. 2008, p 59-60). Management of the natural resources can reduce the societal tension that exists and at the same time decrease the potential risk of an uprising conflict (Bruch et al. 2008, p 35).

PCPB-NR highlights several parts of the natural resources that humans depend on and needs to be taking into consideration. It is vital that natural resources, such as water, has sufficient infrastructure for the demand. When the sufficiency of water management is not there it is expected that future conflict is more likely to occur. There are several cases on insufficient water management which has further on caused conflict to arise. There are also several cases that have provided the knowledge on how natural resources shared among countries can nevertheless cause stability (Bruch et al. 2008, p 80).

## 3.2 Hard and soft path water management

The hard and soft path approach provides which way is used for water resource management. It is also seen in methods as traditional water resource management versus new alternative water resources management.

The traditional hard path approach for water resource management focuses and is highly relayed on larger dams and the ever more amount of them. Reservoirs, water storages and lakes that are made for gathering water are also linked to the traditional method on water management. Large systems on flood control as well as irrigation and water treatment are included in this approach. According to this approach the response to water management is technology and technical solutions. Often using this approach no detailed analysis is incorporated in the planning of water resources solely completing the project which is planned for. Furthermore little, if any, attention is directed to the facilities for protection of the natural ecosystem where water is been utilized for its indented purpose (Gleick & Wolf f 2002, p 2,6-7, Hamdy & Trisorio-Liuzzi 2005, p 20-21, Wutich et al. 2014, p109-110). There is no doubt that this traditional approach has improved water security over a long time of period and has therefore been the main solution for water management around the world. As a result of meeting the increased demand on water this approach is solely concerned with supply solutions and therefore seeks ever more water supplies (Hamdy & Trisorio-Liuzzi 2005, p 21, Gleick & Wolf f 2002, p 7, Brookes et al. 2009, p 3).

This approach seems to provide adequate water and supply on demand however it does have negative aspects. This approach has been seen as inadequate to find solution for the water management problems that has been taking place. The methods that are being used in this approach have severe negative impacts on the environment as well as on human activity. Humans are being affected in forms of allocation whereas they are force to allocate from one region to another for making place to dams and its reservoirs. The environment gets a setback as their natural habitat gets negatively affected by dams and reservoirs as their natural route is being diverted (Gleick & Wolf f 2002, p 2-3).

It has also been heavily criticized for being economically inefficient and is often related to high costs due to construction and maintenance of the diverse projects such as dam buildings. Via this approach the demand is often not met in long terms and because of e.g. a growing population the demand cannot be met solely by allocating the water resources and the introduction of new technical solutions, they in turn are extremely expensive, will neither solve the underlying problem (Hamdy & Trisorio-Liuzzi 2005, p 21). As it seems this approach has limited power to resolve water problems. Therefore it is not seen as an approach being able to solve the rising water problems that are increasing in contemporary times (Wutich et al. 2014, p 109).

As a result of the inefficient methods of the hard path approach there has been other voices heard. The dissatisfaction of contemporary method has led to water management officials to look for other paths in order to arrange other methodological ways to meet the water demand and get pass the traditional use of water management. Consequently a “softer” path approach has been introduced to lead the newer water management methods for a better maintenance of the already existing water resources. In order to meet the ever increasing demand the aspiration is to allocate from hard path to soft path management in general.

It has therefore been concluded that, in contrast to the hard path approach, the soft path approach is an alternative to the already existing water management. The soft path is trying to meet the demand of water as it already exists rather than increasing supply. The main groundwork is to move away from the already existing large construction works and focus on how to decrease the water demand rather than increasing the water supply (Brookes et al. 2009, p 4-5). It focuses on small scale decentralized facilities and uses economic tools for more efficient use of water resources. There is an institutional response to water management and has two important element that it encourages. One element is water efficiency and the other element is water conservation. These elements concentrate on different methods in reducing water usage and the methods or tolls for completing a certain plan or project (Brookes et al. 2009, p 8, Hamdy & Trisorio-Liuzzi 2005, p 21-22, Gleick & Wolf f 2002, p 3). Improvement of the various technological equipments for more efficient water usage is sought for. According to this approach focus is on the improvement of the institutions which includes regulations, water policies etc. This approach also seeks to meet the need and work on a local scale and in communities where it has noticed the benefits of decentralization of decision makers. It strives also for improvement that is in need for human society but also take the nature and the environment as a whole in consideration (Wutich et al. 2014, p 110, Gleick & Wolf f 2002, p 1-2. 4-7).

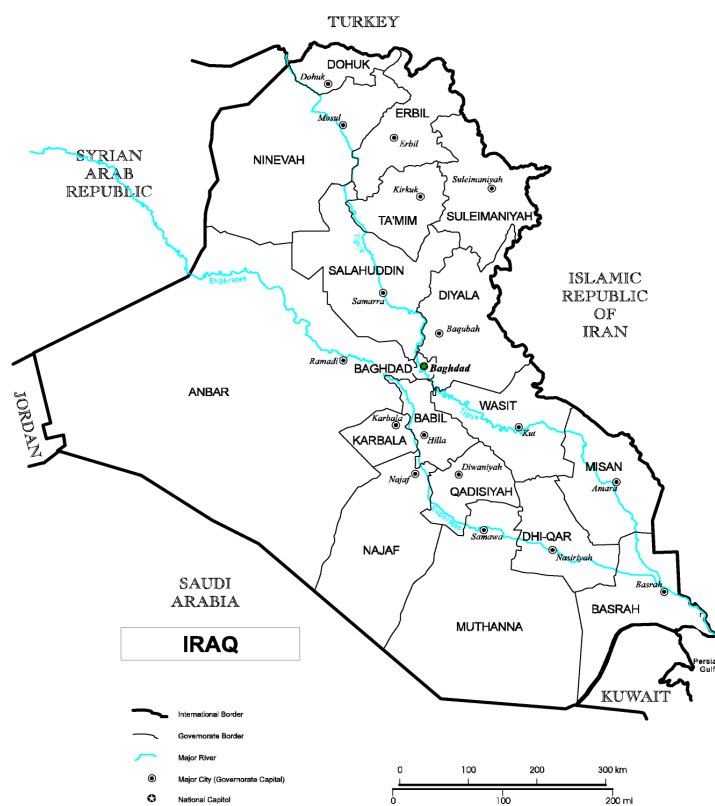
However this approach has not received very much popularity. Not amongst politicians neither amongst its critics since it is economical rational and politically not that desirable. It causes tensions since this method relies on the use of water and is not always wished for (Brookes et al. 2009, p 5-7). The concern regarding this approach is related to unwillingness amongst the politicians and the actors that still see benefits in traditional ways of water management. There are also all to fewer studies arranged on exploring this view and on its planned strategies for water management as well as the public view on this matter. Most of this approach relies on public awareness and public participation although less or little is known on how the public feels and relates to these methods (Wutich et al. 2014, p 110).



## 4. Empirical study

### 4.1 Study background

Historically Euphrates and Tigris has been the main source for development in the region and is the cradle of early Mesopotamian civilizations. Irrigations made it possible for the inhabitants to develop agriculture and as a result ancient Mesopotamian civilizations were established. Euphrates and Tigris flows through the so called Fertile Crescent and is a region where water has a vital role. From early civilizations the land has been a life-giver for millions of people until present time (Mountjoy 2004, p 2, 15, Al-Ansari 2013, p 670).



**Figure 3.** Euphrates and Tigris River basin through Iraq (GS 2013).

Euphrates and Tigris initiates in the mountains of southeastern Turkey. Both rivers are transboundary basins and are distributed between several countries (Figure 3). Euphrates and Tigris has a total area of 879 790 km<sup>2</sup> and flows directly through three countries that Turkey, Syria and Iraq (Lehner, Verdin & Jarvis 2009, p 93-94).

Two-third of the rivers route goes through the highlands of southeastern Turkey and through the valleys of Syria and at last through the Iraqi highlands with final destination the arid plain of Iraq. The two rivers meet and unite close to Qurna, near Basra, in Iraq and they form the Shatt-al-Arab. After this unification and formation the combined river then empties in The Persian Gulf (Lehner, Verdin & Jarvis 2009, p 9-14).

Euphrates, as already stated above, has its origin in southeastern Turkey between Lake Van and the Black Sea. It is 2780 km long and is shared among four countries and it drains of a total 444 000km<sup>2</sup> where Turkey represents 28%, Iraq 41%, Syria 17% and Saudi Arabia 14%. Euphrates is formed by two major tributaries in southeastern Turkey i.e. the rivers Murad Su and Karah Su and enters Syria at Jarablis flowing in 675 km before entering Iraq. In Syria further downstream at Jarablis three tributaries, the Sajor, Balikh and Khabur, joins the Euphrates. Entering Iraq no further tributaries supplies water to the river (Al-Ansari 2013, p 670-671).

Originating from the Taurus mountain chains in southeastern of Turkey the TR flows through the country. 1900 km is the range of the river and drains an area of 471 606 km<sup>2</sup>. The river is shared by Turkey, Iraq and Syria where an amount of 54% is to be found in Iraq. The total percentage of area of the river basin in Iran is 34%, 12% in Turkey and 0.2% in Syria. Before reaching the border of Iraq and Turkey the river is joined by three major tributaries Butman Su, Karzan and Razuk. Entering Iraq the TR is joined along the course to the south by Khabur, Greater and Lesser Zeb, Adheim and Diyala river tributaries (Al-Ansari 2013, p 670, Erdem 2003, p 2).

## 4.2 Basin problem - The Transboundary issue

Contemporary transboundary river basin in the Middle East has its foundation with fall of Ottoman Empire. Early 1920s new political boundaries were established where the region had been divided into separate states i.e. Syria, Iraq and Turkey. As a subsequent, of the establishment of the new states, the river basins got divided in present political boundaries. Disputes in region over water resources especially the two river basins according to some records go back to 6000 years. However the dispute in between the riparian states with the rise of hydro political problem in this region extends to no more than 50 years (Altinbilek 2004, p 15).

The relation among the riparian states from 1920s to 1960s can be illustrated as a stage of harmony. Most importantly during this harmonious-period the countries had no large development projects in progress and therefore no overutilization of the rivers were within reach. Moreover if any project was indeed at work for the management of the rivers it had modest effect, if any negative effect at all, on the rivers water quality (Kibaroglu 2007, p150). Due to the excessive irregular flow of the rivers there could be little rate of utilization. Hence there was also no negative impact on the quantity of the water (Altinbilek 2004, p 15-16).

The harmonious relation amongst the states got interrupted when a protocol takes over the 1946 Treaty of Friendship and Good Neighbourly Relations. The protocol, mainly between Iraq and Turkey, provides management plans on the rivers in order to control floods and storage water. (Kibaroglu 2007, p 150). This simplified the path to instigate major water and land resources development projects.

Syria and Turkey has since 1960s advanced their all so ambitious project plans with the intention of utilizing the water resources mainly for energy and irrigation from Euphrates and Tigris river basin. Turkey with the Southeastern Anatolia Project (GAP), Syria and its Euphrates Valley Project and the Iraqi Thartar Canal Project has during these past 40 years advanced in the water management of the rivers (Kibaroglu 2007, p 153).

Any joint project during the 1960s negotiations failed and as a consequence of these large project plans disputes erupted at 1970s between the three riparians in the Euphrates and Tigris basin. All three countries have their diverse arguments on how and most importantly as it seems why they should have the rights to have overhand in the water distribution problem. Turkey's claim on the rivers are based on the acknowledgement that the rivers initiates in southeast of the country and therefore has the sovereign right to utilize water resources as it desire. The rivers are its natural resources as much as oil, gas, coal or any other natural resource is another country's sovereign right to make use of. Iraq on the other hand is arguing that they have "historical rights" to the usage of the river and the rivers are international rivers with special emphasize on the TR. Therefore Turkey should not obtain nor decide alone on the quantity of water that should flow to Iraq and Syria. Tigris is a river that they strongly oppose and sees the river as the country's sovereign right. As to Syria they proclaim that the rivers are "international watercourses" and are to be shared. The resources should be divided amongst the states where every country is obliged to a certain quota. Besides the dispute in 1970s several diplomatic crises occurred also in 80s and 90s between the three riparian countries. However negotiations amongst the countries did take place where the most significant and long withstanding negotiations were in 1980s at the Joint Economic Commission (JEC) and Joint Technical Committee meetings (JTC). JTC meetings were held continually 1981 to 1992 but

no agreement was achieved (Altınbilek 2004, p 15-17, Çarkoğlu & Mine 2001, p 56-58, Kibaroğlu & Scheumann 2011, p 282-285).

The negotiations in regards of Iraq took a setback during the 1990 Gulf war. Syria and Turkey on the other hand did manage to improve their relations to great extent. This occurred after signing the Adana Security Agreement in 1998 where a better cooperation and management of the two rivers were reached. Additionally even more initiatives have been taken from the time when the two countries agreed on cooperating on the management of the rivers. In 2001-2005 further economic cooperation and further development in the region between the two countries increased (Kibaroğlu 2007, p 160). These agreements did not include Iraq and the last dispute it had with its neighbours was 1996 which was concerning the newly started construction of a dam in Turkey (Kibaroğlu 2007, p 157). Nevertheless in 2003 the disputes over water resources from the two rivers were provisionally at a stop as a result of the occupation of Iraq by the Coalition force (Altınbilek 2004, p 16).

### 4.3 Water resource management - Euphrates River Basin

After establishing a governing government the rebuilding plans for the country in regards of water management has been one of the top priorities. Many of these projects that took place were directly addressed at reconstruction of already existing water system, power plants and treatment plants. One of the major projects for the ER and the management of its water are dams. Several dams have been built and reconstructions of them are in progress (SCECI 2006, p 6-8 &17-18, UN/WB 2003).

One of the biggest dams in Iraq lies in WI on the ER and is called Haditha dam. The Haditha dam has a multi functional purpose. It is to control the water flow for irrigation purpose and accumulate water from the ER into the Haditha reservoir. Its purpose is also to generate hydroelectricity and is also the second largest power supplier in Iraq (Othman 2013, p1-4).

The dam's hydropower function slowed down in 1990s but restarted again after the US invasion 2003 to its full capacity. The problem that has arisen these recent years regarding the Haditha dam is due to the low water level. The water level in Haditha dam has depleted severely from 2009 to 2012. This meant that the dam was almost empty and as a result the hydropower had to be stopped for a period of 4 months. This has caused major concern in the regional political arena as well as in the country (Othman 2013, p 1).

The Technical and Architectural Department in Water Resource Ministry Anbar Province is trying to further maintain and operate on Haditha dam in order to store water and generate electrical energy. The maintenance and technical support is to be operated on the hydroelectric stations, tunnels and on electricity generators. This is the case of the Haditha dam even though it is notable that the water flow of the ER is at verge of depletion where the Haditha dam is no longer of any use and the traditional functions cannot be carried out as usual (Al-Ansari 2013, p 673). The depletion of ER is considered as a problem that is a consequence of large dam constructions in the neighbouring countries namely Turkey and Syria. The large dams in the neighbouring countries are preventing the water flow from ER to reach Iraq in the same quantity as it is suppose to do (Issa et al. 2014, p 429).

It is stated that Haditha dam has a hydro-electrical function it is of great importance that it is to be managed and technically improved. Being the second largest dam in Iraq it is vital for the region, management of the ER as well as for the development in the area that more attention and construction is at the Haditha dam for continued utility (Al-Ansari & Knutsson 2011, p 60, UN-ESCWA & BGR 2013, p 66).

Ramadi barrage is situated further south of WI where the ER flows additionally downstream. Its main functions are to regulate the water flow of the ER to guarantee the irrigation system of crops in the region via diverse coordination of canals. The regulation is done by discharging the surplus of flood water into the lake called Habbaniyeh via Warrar Regulator. The water, after being stored in a short time of period in the lake, gets diverted via the Mujarra Regulature to the Lake Razzaza or it flows back into the ER (UN-ESCWA & BGR 2013, p 63- 66). There has been high salinity detected in the water flow and in the Habaniyeh Lake and Lake Razzaza under a long time period. The high salinity of the water flow downstream and the discharge of the

surplus of flood water are highly related. The discharge has great impact on the water were a balance is needed to regulate the salinity overall (Kamel, Mustafa & Sulaiman 2013, p 1-6). It is also stated that the storage of water in the Habbaniyeh , Razzaza and Lake Tharthar, which will be discussed further down, has had an overall negative effect on water quality in the ER. There are other studies that are indicating other methods on how to storage water that is not decreasing the water quality of the ER (Kamel, Mustafa & Sulaiman, 2013).

In the Anbar Province near city of Fallujah where a barrage is situated and is called the Fallujah barrage. Its main functions for the ER are to raise the level of the river water in purpose of irrigation. Solely for this reason the ER was thus diverted to the barrage. The Falluja barrage has also no hydro- electrical power station (UN-ESCWA & BGR 2013, p 63, Kliot 2005, p 119-120). Fallujah barrage like other barrages has complicated the water management of the ER. The quality of water has deteriorated and as other barrages along the ER salinity has become a major problem. It is detected high amount of salinity in the Fallujah station and since the function of the barrage is to divert the ER it has had bad negative effect on water quality (Kamel, Mustafa & Sulaiman 2013, p 4-8).

Between the Euphrates and Tigris River Lake Tharthar is situated, which works, like Lake Habbaniyeh, as a reservoir. Lake Tharthar is one of the most important projects in Iraq in regards of flood control and excessive flood water storage. The main purpose of the Thathar lake construction project is to control floods and storage water for irrigation. The lake encloses water from both the Euphrates and Tigris River via artificial canals and therefore links both rivers. The diversion of Euphrates water to the lake reservoir is incorporated by a multifaceted canal system (Kamel, Mustafa & Sulaiman 2013, p 7, Sissakian 2011, p 47, 49).

As earlier referred to it has been observed that salinity has increased additionally downstream in the ER. This is linked to the decrease of water flow in the river which is connected partially to the inflow of water from Lake Tharthar. Due to the farming and agricultural activity around the area the topsoil has therefore endured lots of damage by vehicles and has also led to further more salinity in the Lake which in turn flows downstream into the ER ( UN-ESCWA & BGR 2013, p 68).

There is another factor that has contributed to the high salinity being detected in the water quality of the ER. This is related to the natures own system namely evaporation. A huge amount of water in the Lake Tharthar is being evaporated and this contributes to additional gathering of salt. The high quantity of salt being accumulated is not considered as a positive contributor to an already high salty rate in the ER (Kamel, Mustafa & Sulaiman 2013, p 7).

In the Najaf province where Euphrates additionally flows, a barrage called Hindiya is situated. Its functions are to raise the water in order to contribute with water for irrigation purpose for the region. It also concludes production of hydroelectricity to the near region (UN-ESCWA & BGR 2013, p 63). It has been observed that lesser volume of water has passed the Hindiya barrage. The main reason for this event is partially due to the dams but also to the lakes that collect high amount of water and barrages that divert water from ER that has hindered the flow of water to reach the Hindiya barrage

as needed (UN-ESCWA & BGR 2013, p 58 -59). Like other already named barrages it has also been detected the high amount of salinity (Kamel, Mustafa & Sulaiman 2013, p 4).

In general the water quality of Euphrates is in bad condition. Overall the salinity of the Euphrates water has increased downstream and there are several direct links to this occurring. This is linked to the various amounts of dam buildings, drainage that has its main source from upstream and all the irrigations projects and ever increasing farmers. The impact on water quality differs from upstream and downstream. The further up the ER the more irrigation related problem are detected. This means that the return flow from irrigation goes directly to the ER due to the agricultural activity in the area. The further down the ER has a water quality that has reached to a point where it cannot be used for neither agricultural activity nor domestically (UN-ESCWA & BGR 2013, p 68).

The quality of the water from ER has also been highly affected by the discharge of industrial waste, raw sewage and the return flows from agricultural drainage. More damage has been done via these two disposals and therefore the quality of the water has declined furthermore. The high amount of raw sewage directly discharged into the river has been observed and is estimated to be of high ranking. This has raised major concerns since the increase of disposals has been notable and has created diverse challenges (Al-Ansari 2013, p 678, UN-ESCWA & BGR 2013, p 49).

The depletion of water flow in the ER is considered as a national crisis. The ER River is in even worse condition since other that inflow from upstream countries has no other tributaries that can contribute to the water quantity. This problem has drawn the attention of both media and some politicians but as it seems the IG is focusing on other problems situated in the country especially in the western part of Iraq (Al-Ansari & Knutsson 2011, p 63, UN-ESCWA & BGR 2013, p 55).

Politically WI, being overwhelmingly an area with Sunni resident, has been a priority by the government. Not for mere purpose of water management of the ER but for fighting radical groups. Radical groups are constantly and repeatedly causing troubles in the area and armed gunfights are observed. This has caused major issues for the development plans in the region and the governments focus has been on how to constrain the different group's power over the area (Baram 2005, RIMWR 2014).

Other causes for depletion in the ER are connected to the ever increasing demand for water and a combination of population and economic growth. There are also manmade causes and naturally causes for depletion of the ER. The evaporation of water from the river collected in the lake are evaporating and causing severe problems for the region and the operative dams. However WI being already an area with desert it is very likely that desertification of the area continues if depletion of the river is not stagnated (Issa et al. 2014, p 42, 425, 429, Al- Ansari 2013, p 676-678, SCECI 2006, p14).

It is highly important that further enhancement and construction in the most needed area are sustained. This is the most effective way to manage the river flow and to minimize the depletion of the lakes. Further maintenance for the lakes is ahead and this is mostly directed to the construction and management of cannels that provide the ER with additional water flow. If the lakes are not maintained as planed and construction in various forms not

attained it will have massive impact both in terms of economical and environmental damage that would affect the inhabitants and the region as a whole in most severe way (RIMWR 2014).

The main purpose for the regulators and barrages are to regulate the amount of water flow for irrigation and interacting in this part would have severe impact on the area if not the region as a whole. Nevertheless it is necessary to improve the regulation systems to be more effective. Regarding the lakes that upholds water from the river the most effective way to entertain is via decreased water flow but since salinity is an issue it needs to be addressed more and studied even further how it can be maintained the best way that is both good for the environment and the quality of water. It is however a difficulty in that process since depletion in the lakes a risk if decrease in the water flow an alternative therefore management of water is to be further studied (RIMWR 2014).

It is a widespread problem regarding salinity but if the barrage is not continued to serve as it is intended than no solution for management of the river is at hand.

It is also no surprise that water quantity has decreased in ER. This is directly related to the neighbouring countries and their management of the river. This is the transboundary issue that needs to be solved with direct contact at higher level with the neighbouring countries (RIMWR 2014).



## 4.4 Water resource management- Tigris River basin

The region in which the TR flows through in Iraq is located at NI. The TR doesn't flow through the KRG region however the tributaries link to TR are in KRG region. In post-conflict 2003 the KRG has been experiencing calm and peace in comparison to other region in Iraq such as WI Anbar province. It has also experienced a high economic boom which has contributed to the fast growth in the KRG region (Baban 2005, Anthony et al. 2012).

The TR is, unlike the ER, linked via several tributaries. The rivers water flow to the south of the country is being managed via one major dam along its route in the north. The dam is called Mosul dam and is a station where the river hits high flow rate. The dam has multidimensional purpose which includes irrigation, flood control, water storage, urban water supply and generating hydropower. The dam provides necessity not only to Mosul, the second largest city in the country, but also a major contributor of its diverse functions to the province (Issa et al. 2013, p 780).

It has been observed that the Mosul dam is of bad condition and is on the verge of collapse. This has been related to the fracture of the construction of the dam and the way it has been built (Al-Ansari & Knutsson 2011, p 60). The Mosul dam was at the very first beginning constructed poorly and the situation has deteriorated along the years. If the dam could not hold the pressure that it has been put upon and break the cities that are allocated further south of the rivers path will suffer dourly. Some methods and techniques have been applied to hinder the acute condition but it is not a permanent solution (Al-Saeedy 2007, p 5). Another problem hitting Mosul Dam is the shortage of water flow in the TR. It is observed that water depletion in the river both naturally caused and manmade are having severe consequences on the dam. As it seems the shortage of water have affected the Mosul Dam and expects to worsen as dams in neighbouring country is being constructed. This will not only effect the dam but also all the functions that it is aimed to do such as generating electricity to the area and irrigation ((Al-Ansari & Knutsson 2011, p 63).

What differs Tigris from Euphrates, as noted above, is that there are more tributaries connected to the TR and therefore generating higher amount of water flow than Euphrates. In the NI the Tigris gets connected via three major tributaries that are Greater Zab, Lesser Zab and Diyala River. These rivers and tributaries are in their turn being managed via different dams in order to regulate and control the outflow. No specific water agreement is arranged regarding any of the tributaries to the TR (UN-ESCWA & BGR chap 4. 2013, p 128).

Greater Zab, being the largest tributary amongst them, contributes to almost half of the flow which provides to a great amount of discharge to the TR (Beaumont 1998, p 170). This tributary is unregulated which means that no regulation is at place right now. However two dams are under construction and to be finished in order to regulate and control the water flow. Bekhme Dam has been under construction for several years and has been postponed due to different reasons but is planned to be finished 2015 (Al-Ansari & Knutsson 2011, p 60, UN-ESCWA & BGR chap 4. 2013, p 137). Its main purpose will be to provide the KRG with electricity but also have use for irrigation, flood control and water storage. Mandawa dam is another dam that has been on the construction plans.

It is also to be finished at 2015 and main purpose to regulate water that is being released from Bekhme Dam (UN-ESCWA & BGR chap 4. 2013, p 136-137, 140).

Lesser Zab has two dams operating on the water flow of the tributary. The first dam is Dukan Dam and has storage capability, generating hydropower and controlling the outflow of TR Dibis Dam, being the second dam on Lesser Zab River, has main function of regulating water flow to the Kirkuk Irrigation Project. The water management of this river is concentrated on how to fulfill the KIP which is counted as one of the most important projects in the region in regards of irrigation (UN-ESCWA & BGR chap 4. 2013, p 138, 140, Al-Ansari & Knutsson 2011, p 63).

There is limited information on the Tigris tributaries water quality. However those data that is available points out that the water quality in Greater Zab and Lesser Zab is up to standard. It has also been observed that salinity has not changed in the rivers and therefore is suitable for irrigation and other purposes (UN-ESCWA & BGR chap 4. 2013, p 141).

Diyala River differs from other Tigris tributaries in various forms. Diayala River is being shared by Iran and Iraq. The river is being managed via 5 dams however three of them in Iraq and one in NI in KRG. The Diayala River also includes many more of its own small tributaries that continually provide more discharge to the river. Some of these small rivers are being themselves managed via dam or regulators both in Iraq and in Iran.

The dam that is regulating the discharge of Diyala River is called Derbendikhan Dam.

This dam has several purposes which includes controlling flooding, generating electricity, generates water supply for the area and usage for irrigation (UN-ESCWA & BGR chap 4. 2013, p 139-141).

Since the head of the river starts in Iran and two major dams has been build along the river on the Iranian board has led to conflicts between Iraq and its neighbour. The catchment area lies in Iran with dam in which it manages the water discharge. This has led to less water flow in the river to the Iraqi part and therefore less discharge of water is observed to the river of Tigris (UN-ESCWA & BGR chap 4. 2013, p 141). It has also been noticed a higher amount of salinity in Diayala River and this has been linked to the dam construction on the neighbouring side, which is Iran, on a small tributary that is connected to Diayala River (UN-ESCWA & BGR chap 4. 2013, p 141). Problem that has been noticed in regards of Derbandikhan Dam is related both to the dam itself and the reservoir. Huge masses of rocks have been observed to slide down in to the reservoir and heading towards the dam. This has caused major concerns especially when the dam is being affected (Al-Ansari & Knutsson 2011, p 60). Further south of the Diyala River it has been observed a higher salinity value that contributes to worsens the water quality in the TR (Al-Ansari 2013, p 678).

The TR has in general been experiencing depletion and therefore has been highlighted as one of the main national crises. Attention has been drawn from media, politicians but the government seems keener on tackling other issues that has been confronting the nation such as terrorism, political corruption etc. Due to these crises the IG has put aside the fragile state the TR is facing at the moment (Al-Ansari & Knutsson 2011, p 63.).

Depletion of the river will lead to water scarcity in the region and is a factor for destabilizing the region in

various forms. It will have effect on the economical development and on the prosperity of the country as a whole.

It is foreseen that shortage of water will continue in the region which is directly linked, amongst other causes, to the depletion of TR (Al-Ansari & Knutsson 2011, p53, Al-Ansari 2013, p 667, IOMIRAQ 2012, p 5). The depletion of the TR is connected to several causes. One of them is construction of dams at the upstream neighbouring country but also the limited inflow via tributaries into the TR that are also being managed via dams. These dams hinder the outflow of water into the TR and causes depletion which is manmade. The second reason for depletion of TR is caused naturally. That is caused via evaporation that can be connected to the change in climate (Al-Ansari 2013, p 673-674, IOMIRAQ 2012, p 1). The third reason for depletion of TR is the continuingly demand for water due to population growth and economic development (Issa et al. 2013, p 14618, 14625, Al-Ansari 2013, p 421,430)

Another problem causing the TR is in regards of raw sewage waste into the river. This is a problem which affects the water quality of the river. The TR experiences good water quality in the north but deteriorates further south in the rivers path. Reaching the city of Basra the river hits higher salinity ratings. Due to irrigation projects and water returns to the river have affected negatively on the water quality (Al- Ansari 2013, p 677-678, DFC 2013, p 7-8). However no exact data is available on how much the TR has been affected due to raw sewage and population growth in the northern part of Iraq. Nevertheless current data provides a lower value of salinity in the TR, at least in the north, compared to its twin river Euphrates (Issa et al. 2014, p 425).

The government of Iraq is concerned about the depletion of the TR. However they point out the massive construction of dams in neighbouring country that has been blocking the original water flow in the TR. The best solution applied in this River is negotiation amongst the countries so further water flow is possible in order to retrieve the TR water quality and quantity. The government also purposes a solution amongst them and the KRG in order to let the water flow from the tributaries further continue in the river without any massive changes (MAWRKR 2014).

As it seems there are step taking further for reconstruction of Mosul dam. There have been negotiations on whether the German company Bauer and Italian company Trev will peruse the operation on Mosul Dam (MAWRKR 2014). These are recommendations however on how it should be managed for best possible outcome. Whether these recommendations will be followed or not are yet to see (Sissakian 2014, p 84, 90, Al-Saeedy 2007, 3-4).

The management of the tributaries to the TR has been under KRG supervision. There are projects on how to manage the rivers both Greater Zab and Lesser Zab. One of the projects includes improvements of management on the dams that already exists. This is for the irrigation purpose but also as water supplier for the region. However technical and financial support is needed to further management (Heshmati 2009, p 69, 109-111).

Darbandikhan has been on the plan for reconstruction so has Dokan dam. This has been the management plan since 2006. A project plan has been put forward in order to manage the water from the river better with implementation of technical improvements (WB 2006).

Furthermore the KRG has put more importance to water management since post conflict of 2003. The focus has been on reconstruction projects and management of water resources as well as other natural resources (Brunch 2010, p 85, 80).

Due to the relative calm situation in the region the government in ruling has been able to put further attention to water management in forms of clean water but also putting forward project that are beneficiary for an alternative water management. This is possible since KRG sees it as a high priority to maintain the demand for water supply and has reached to alternative water management in the region. Technological improvements are requested for both to improve the already existing water supply and enhance the utilities that are proving them. There has also been a strong advocate amongst the politicians and in various regions an applied pay system for overconsumption of water (MAWRKR 2014).

KRG sees the importance of water received from the three major tributaries and recognizes the importance of both qualitative rich and quantitative rich water to its citizens. More focus is also on local governance in addition to the already existing management for water supply (MAWRKR 2014).

There is however long tradition of a community based water management in KRG where water is integrally connected and access to water is viewed in the region as a commodity utilized by all. This traditional community based water management is based on the fact that water is utilized for the benefit of all and is grounded on the local individual level. Using this traditional method the harmony was preserved amongst inhabitants and conflicts between them was avoided and in some cases this method could lead to solution of disputes over water (Weinthal & Troell 2013, p 426).

This knowledge of community based solution for water management is not only traditional by itself but is also linked to the diverse conflicts which the population had endured during armed conflict and there life as refugees. Hence the inhabitants of KRG got aware of the importance of shared water resources and locally based water management (Barwari 2013, p 372-373, Weinthal & Troell 2013, p 416).

## 5. Analysis and discussion

As it appears the IG in WI has been concentrating solely on dam buildings, reservoirs and barrages. It also continues its reconstruction of the dams and building further on for continuing supplying water. The dams and other systems, that have been constructed for water management but needs maintenance and are unstable, will have additional work on them. This system is also sought to meet the high demand that is growing in the region as the population grows and even more of them relies on the water resource from ER. Dam building, reservoirs, canal systems etc. are seen as satisfactory methods to meet the demand both for human and industrial use.

As it seems the IG in regards of western region of the country has been choosing the hard or traditional path for managing water resources and sees it as a solution. There are also high thoughts on the technology as a whole to be the main solution both for water management in the ER and as a solution for most of the problems that are occurring in the river both in present and in future.

However the problems that are faced in the ER such as depletion are to be sought to be resolved on the other hand by negotiations with neighbouring countries. Since it is a transboundary issue the problem is seen to be best solved using this direction. This is thought to be the best method or solution to meet the problem since depletion is caused not only by evaporation but has to most degree been causes via dams build in neighbouring countries and hindering the habitual water flow.

Salinity that has been one of the core problems in the ER and has caused concerns but the solution withstands in linear with technology and as a problem caused not merely by the inhabitants in the country or the different methods used for e.g. irrigation, water management but also caused by neighbouring countries. Meaning a transboundary problem and needing a solution involving the neighbouring countries.

Following only the hard path approach will not solve the underlying issues that are confronted in the ER. Neither will it solve them in long term for as it seems the traditional approach has a short term solution for the problem. Neglecting or lack of willingness to introduce some of the elements of the soft path approach will have its impact on the society. There are several elements in water management that are ignored and neglected. Especially in the case of WI and would benefit greatly from introducing at least some parts of the soft path.

Since the soft path approach includes public participation and more focus on local solution the region would have more to say in the issues that are facing them directly. It would also be beneficial politically since the focus has been on local group conflicts. This would take a huge amount of control from the rebel groups in the region, which they use against the government, back to the government and the local politicians.

It is obvious that the ER is been faced with various problems such as salinity, depletion etc. and requires more attention and focus from the IG. Seeing from PCPB-NR perspective there needs to be more inclusiveness and the problem in ER has not been highlighted. There is a need for negotiations and policies to try and retrieve the former quality of the river.

According to PCPB-NR theory there are incitements for both economic and physical insecurity in the region as the water quality and quantity of the ER continues to deteriorate. Seeing that the political situation in WI is not stable and the government seems to concentrate more on the political part rather than attempting to achieve results in the ER it will have consequences such as an uprising conflict. In addition it is more likely that conflicts occur since most of the region is very much dependent on the water resources provided from the ER for deferent usage such as irrigation for crops.

The population is highly depended on farming and agricultural activity as source of income, if not for most of them as the only resource of income, and therefore the water management of the river is of great importance. The depletion of ER and the high salinity of the water quality are worsening the already fragile situation and can lead to water scarcity and in turn have negative effect on different parts of sectors that the society as whole depend on.

In accordance with the PCPB-NR this can cause tension and there are risks for a possible uprising. Since there are no stable agreements on the river and with already tension and problem in the river it is also likely that future conflicts can occur.

Since the ER is shared amongst several countries and flows through two neighbouring countries before entering Iraq according to PCPB-NR agreements and joint communication is of vital importance. This step is in right direction in the case of ER from the IG and it is of even greater significance that an agreement is reached and strived for. This step is highly thought of since a even bigger risk for disputes and conflicts between transboundary countries can be erupted and cause even more damage.

As it appears the focus in the TR has been on dam buildings and its functions. Like the ER the TR is being managed via dam and additional work and construction on it is aspired for. Unlike ER the TR in NI is managed only by one major dam however this dam is constructed to fuel the region with various usages such as electricity, water for irrigation etc. Therefore more attention is on the management of the dam and the government of Iraq stresses the importance of its functions. It is of vital significance that the dam continues as it is suppose to operate. Improvement of the dam and its additional functions are required by the government as the solely solution. It is observable that the IG will continue its hard path on the river. It is also obvious that hard path approach is seen as the foremost solution for the problem that is encountering the TR. However some steps are thought of in order to retrieve the original water flow in the TR by the government through negotiations with the neighbouring country. They see contact with neighbouring countries as a path for solution in or to diminish the depletion problem in the river.

Since no soft approach is detected for improving water management in TR the government and the region would benefit from introducing the methods, or some of the methods, that are included in this approach. There would be direct impact on the population and the region where stress would not be on receiving more amount of water but efficient use of the already existing water supply. Locally the inhabitant would have more independence in water regulations and the government would gain trust amongst the population.

However the government is more enthusiastic on solving political matters in the country rather than pulling the attention of the problems that has been occurring as a result of water shortage. According to PCPB-NR refocus on what actually causes public dissatisfaction to political issues are in itself embedded for continuation or uprising of conflicts. Problems in TR, both in water quality and quantity, if continued and not resolved will cause public insecurity since the river like Euphrates is the main source for securing their income.

As a vast amount of residents is depended on the water received from TR it is important that problems are resolved for otherwise worries and irritation will arise against the government hence an uprising will be at risk. Since water shortage in the TR has been forecasted it is more likely that societal insecurity increases amongst the population and the consequences as a result can be severe. If the situation such as the Mosul dam is deteriorates and not met as it needed, there can be disastrous outcome in the region.

PCPB-NR acknowledges the importance of negotiations amongst the transboundary countries which share same water resources and encourages similar actions. The step taking into negotiations and future agreements will cause stability both in the region, amongst the countries as well as a big step for the fatigued water resources.

The tributaries that are under control of KRG are being managed through dam constructions. The hard path is also viewed in this region and focus is still on different constructions for providing water to the population rapidly. There is however elements of soft approach in the KRG plans. They have embraced some of the methods in the soft path approach where traditional method for water management is being overlooked at. There are advocates for payment-system on overconsumption amongst the politicians and seem to be applied in various districts.

The focus on governance from the government has shifted to local areas where the inhabitants have more to add in decision making process in the area. This has both traditional and historical context which need to be taken into account. There is also need for technological improvements in order to achieve the need on already existing water. Taken as a whole there are incitements for soft path approach in the water management in KRG and as it appears KRG is committed on alternatives rather than traditional means for water management.

In accordance to PCPB-NR the KRG is not solely diverting the troubles in the region in regards of water but also trying to resolve the issues and include improvements. The focus is right and on the right pathway. Historically it has been shown to the region that water management is a necessity to make it possible for the population to coexist and to evolve without getting introduced to conflict. The experiences can also provide how to overcome the obstacle of future water shortage.

As it appears there is less tension in the region and it has experienced calm and stability post conflict of 2003. In consideration to PCPB-NR theory this has played vital role for the environment but also to establish a healthier environment.

Water management has been prioritized and continues to be one of the important areas under discussion for improvement and better management. According to PCPB-NR theory if this procedure is continued this brings not only societal security but provides also a path on future water security.

In consideration to PCPB-NR theory the KRG has been able to stabilize the region and to some extent strengthen the calmness situation by taking the environment as a role in post conflict era. However it is important that natural resources such as water is given more attention and more focus. It has a significant role in the region and therefore is encouraged to be a top priority.



## 6. Conclusion

Taking the different perspectives into considering and scrutinizing the information at hand it has become clear that the IG aim for management the Euphrates and Tigris River is based on traditional path. IG sees the technological prospects as more important and clearly more useful as well as beneficial for the outcome of desired goals for managing the water resources in the two rivers.

More specifically the ER has been Post conflict of 2003 managed via the traditional approach and no greater change has been observed in the methodological way of preserving or managing the water resource. There are neither any concrete step to change the method to a soft path approach to meet the need and not solely the demand. The problems facing the ER such as depletion and salinity cannot be solved only by relying on technology that to some degree being the source of the problem. The focus is not on how to overcome the obstacles but how to supply more water to meet the demand and how to resolve the political situation in WI. The reroute of the real problem facing WI can in the future become an underlying problem to a crisis and this is what PCPB-NR points out as the most important aspect in not taking care of the problems in ER. WI is a region under already bedded with political problems and providing one of the most important resources to the area, which the population highly depend on, is imbedded for conflict. It is essential that action is taken to eradicate the problems faced in the WI if not conflict is a risk.

The TR is not in a political destabilized area as WI is however the management of the river is highly important to the region and the rest of the country. Post conflict 2003 the TR has been managed via one major dam in NI and is under the control of the IG. The traditional approach is also seen in TR and the challenges that are faced is more like ER met by traditional means and methods. Since the only dam, that is managing the river in NI, is appearing to be in bad condition it is crucial for NI and the downstream regions that the dam is in perfect condition and the difficulties resolved. Also like Euphrates if the cautionary actions are not taken there will be public dissatisfaction.

Post conflict of 2003 the KRG has been managing the tributaries to TR via the hard path approach. This is the main approach however there are incitements both from politicians and the government that methods in soft path approach is being introduced to the water management process. There are some methods introduced in the region and further soft techniques are on the arrangement. In accordance to the PCPB-NR theory KRG has taken the important step to include water as a top priority in the plan management. It shows also a case where conflict has been minimized and avoided by taking decisions that has a positive outcome.

It has been apparent that there is more focus from KRG than IG on water management and different ways to supply the demand. The KRG realizes the importance of water management and pays attention to it as well as improving methods. This is not the case for the IG which has neglected the most important area to prioritize and to develop. The focus has instead been on political disparity in regions. There is also a different priority that differs KRG and IG from each other. KRG has a historical and traditional background on water management and sees therefore the importance of good management whereas IG sees to supply where the demand is and focusing on other issues that appears to be more important such political strive in WI.

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