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Stability

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ABSTRACT

The US can help restore stability in Iraq by supporting local Iraqi efforts to obtain water security and to help lay the groundwork for a sustainable riparian agreement between countries in the Mesopotamian Basin. Stability in Iraq requires a multi-faceted strategy. Good governance is one facet of that strategy that cannot be ignored and water security is fundamental to good governance. Water security is vital for the people to be able to survive on a day-to-day basis. Before the Iran/Iraq War, the Gulf War and subsequent sanctions and conflict, the people of Iraq had water security; however, years of war and poor governance have destroyed it to the point that 6.6 million (Couch 2017) people do not have access to clean water. There are solutions to this problem of water security and they rally around a multi-faceted strategic approach to governance. First, the Government of Iraq must reengage with Turkey and Syria regarding riparian agreements and help ensure the water that Iraq needs continues to flow downstream. Second, and far more practical, the local governments should imitate what the City of Basrah is attempting to do with constructed wetlands which recycle waste-water, and bring it up to a degree of potability that will help restore water security in the here and now.

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CHAPTER 1: Introduction

When I began this thesis, I wanted to find the silver bullet for Iraq that would help it overcome its current state of affairs and emerge as a sustainable, vibrant democracy. My journey began with the assumption that a partitioned Iraq along ethno-sectarian lines might be the best course of action. Fortunately, I followed the path that my research led me and soon realized that 1- there is not a silver bullet that can solve Iraq's problems; that it has to be approached with a multi-faceted strategy, and, 2- The concept of partitioning, though it has been done in the past in other states,ⁱ is not a long-term solution. Several people in the Washington D.C. circuit have argued for it,ⁱⁱ but Williams & Simpson argue that it is an ineffectual imposition on the State and further argue for a "federal structure with 18 governates" (Williams and Simpson 2008). After reading their arguments, I could not see what more I could add to the discussion. I had to find a more malleable issue that the US could actually embrace and one that would bring about positive change in Iraq.

The timeline in which I had to write this thesis and the depth of knowledge and wisdom required to illuminate the intricacy of a grand strategy to resolve Iraq proved impossible from the beginning. Therefore I came to the rapid conclusion that I had to seek out a smaller solution that could resolve one of many requirements for a sustainable government. Iraq has faced significant hurdles since the discovery of oil in 1899 by Calouste Gulbenkian (Coughlan 1950),ⁱⁱⁱ the fall of the Ottoman Empire, the rise of the British Mandate, and the subsequent governments that ruled in Iraq through Saddam Hussein, to the difficulties they face with the Islamic State of Iraq and the Levant (ISIL) in the northwest and western portions of the country. As I researched, I came to realize that one of the chief causes for Iraq's ills was that the government was failing to

provide adequate governance to the people, regardless of sect or ethnicity, and it was essentially the lack of proper or good governance that has given rise to ISIL and will continue to be the central issue until Iraq can resolve some of the problems related to proper governance (Ferdinando 2015). Therefore, the idea of a forced partitioning Iraq along ethno-sectarian lines, by this point, seemed ludicrous because it fails to address the root of the problem and only seeks to cure several bleeding arteries by removing them from the body politic, resulting in the death of the subject.

As I began to look at the Iraqi conflicts through a good governance lens, I saw a wealth of opportunities and missteps that have been taken along the way. It was impossible to address them all, but I found one in particular that merited my attention. I was reading about a rise in dust storms throughout the Mesopotamian region which were spreading toxins and causing illness especially in Iraq and Iran; the precipitous reduction in water flowing in the Euphrates and Tigris from Turkey and into Iraq; the destruction of Iraq's marshes by Saddam Hussein after the US liberation of Kuwait, and the migrations that result from the salinized farmlands and marshes (Al-Ali 2014). Further research led me to study the aspects of crisis and environmental migrations and how migrants without jobs or the ability to positively contribute to society can lead to a boost in insurgent recruitment (NATO 2016; Graham 2015; Freeman 2016; Schmid 2016), and can cause significant stress to the infrastructure of the areas they migrate to (Couldrey and Morris 2007; Berry 2006).

Additionally, my research helped me to understand how the dust storms were directly impacted by the reduction in water (UNEP 2016; Thompson 2008) along the Tigris, Euphrates and their tributaries, and how this reduction was leading directly to the loss of lands used by farmers (further metastasizing the environmental migrations), fishermen, and water buffalo

herdsmen (Schwartzstein 2015). My research further helped me realize that the remaining water was becoming increasingly salinated and infused with toxic substances from sources as variant as agricultural chemical runoff, to human waste from upstream sources (Pournelle 2016).^{iv} The research pointed out that in areas where migrants were flocking to (IOM 2016), areas already facing infrastructure stress, the availability of potable water is doubly stressed (Al-Allaq 2010). This led me to discussions with scientists in South Carolina, Georgia, Wisconsin, and Oregon and high-lighted for me several initiatives that were underway to help address some of these issues.

At the conclusion of my research, I found that there were two areas in which the United States could help Iraq restore good governance; 1- In order to help restore good governance at the local level, the Iraqi people must have access to consistently renewable potable water that is maintainable and monitored by a professional cadre in the local government; 2- In order to help the Government of Iraq restore its ability to govern from Baghdad, an enforceable riparian agreement between Turkey, Syria, and Iran must be completed. The ability for the US to see immediate gains in the former are completely realistic and achievable in a matter of months (Pournelle 2017). The probability of the latter, an enforceable riparian agreement, is something that should be initiated but with the understanding that achieving any measureable success in the foreseeable future is not guaranteed. The aim of this thesis is to address both issues, primarily focusing on the more accessible and immediate issue of enabling Iraq to ensure the local governments can obtain water security for the local populace. If the issue of water security is resolved, good governance can follow, and if good governance follows, then stability can become a reality.

Roadmap

In Chapter 2, I focus on the topics and terms necessary for a common understanding and I will review the literature that I have been able to assimilate as relates to good governance, the lack of it, and topics surrounding water management and riparian agreements. At this time there is such a wide variety of literature available pertaining to these topics and that to distill it all would be an impossible task. In addition, I will be treading into highly debatable areas such as dams causing environmental damage downstream and environmental change such as climate change. I will address but not resolve these debates, nor is it my intent to endorse one over the other. I am using the data made available to me that was acquired through the scientific method and applying it as necessary to my thesis in order to convince my reader that the water situation in Iraq merits attention and if properly resolved, has the potential to increase governance for the people.

In Chapter 3, I discuss problems that Iraq is facing because of a lack of water security. The discussion begins with the concept of good governance and how water security is one of the requirements for it. It will then go into how Iraq has become water insecure over the decades and how this has contributed directly and indirectly to the conflicts Iraq is facing.

In chapter 4, I will introduce solutions that have been attempted, are in progress, or should be explored. I will explain how some of the solutions in the past have failed and the lessons learned. I will introduce case studies from both the Southeastern United States and the Nile River Basin. I am using the United States to demonstrate how a country that provides good governance for its people, still struggles over riparian issues. I am using the Nile River as an example of an area of the world that maintains a similar climate and culture to the Mesopotamian

yet it is able to maintain a riparian agreement, albeit, key differences will be noted such as Egypt is downstream of the Nile and Turkey is upstream.

I will then introduce the concept of a Constructed Wetland (CW) and will give examples of how CWs are actually cleaning polluted water sources through natural and sustainable practices in Georgia. These methods are able to take grey water and return 69% of it, naturally, back into the centralized drinking water supply. I will then explain how this same practice is being attempted in Basrah and if successful, can be implemented up and down the Tigris and Euphrates Rivers. Finally, in Chapter 5, I will close with the conclusion, offer suggestions for the US and a possible way forward.

CHAPTER 2: Terms

To begin, we must first lay out defining terms that I will be using throughout this thesis:

Environmental Change vs. Climate Change, Good governance, Iran, ISIL, Mesopotamian Basin, Transboundary Waters vs. International Waters, Turkey, Unification vs. Partition, US Support, and Water Security or Stress.

Environmental Change vs. Climate Change: For the purpose of this thesis, I am going to use the term Environmental Change rather than Climate Change. The term Climate Change maintains a polarizing charge that I believe would turn off some of my readers. When I am referring to Environmental Change, I am referring to the consequences of drought, and the steadily decreasing amount of water flowing from Turkey, through Iraq, through the marshes and conflating as the Shatt al-Arab (river). This decrease is causing the environment along the Tigris, Euphrates, their tributaries, the marshes, and the Shatt al-Arab to change dramatically. The causes for these water reductions are many, but the primary culprits in this thesis are unregulated irrigation canals, Saddam Hussein, an increase in demand, and evaporation from dam reservoirs.

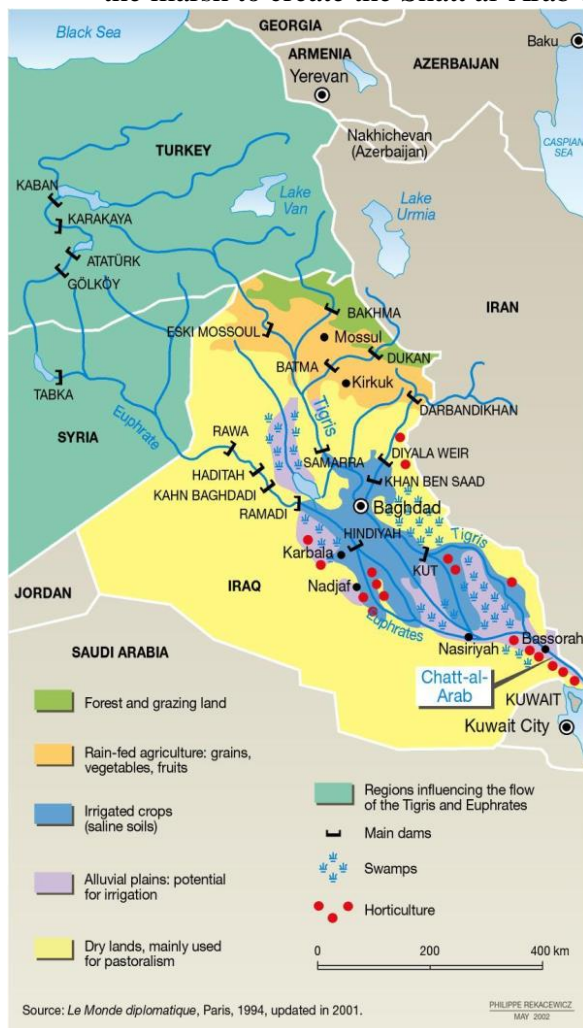
Good Governance: The provision of essential services such as clean water, reliable and consistent electricity, and physical security defined by the UN as decision making that is “participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive, and follows the rule of law” (Shang 2007).

Iran: Iraq has adopted a democratic model of governance, which according to Bernard Lewis, is a threat to autocratic regimes such as Assad’s Syria and Iran because if it works in Iraq, it can work elsewhere (Lewis 2008). More recently, speculation has risen that the Islamic Republican Guard Corps (IRGC), with the death of the former President Rafsanjani, a leading balance to the radicalism of the IRGC, and with the likelihood of a need for a new Ayatollah, have placed themselves in a position to leverage enough power to dictate the future of Iran and “shift the country to more hardline, isolationist policies” (Dehghanpisheh 2017). This is significant with the nuclear deal which was recently struck under more moderate leadership and with Iran’s ongoing efforts to engage in Iraqi politics. Iran’s influence on Baghdad is also having a negative impact on Sunni/Shia relations (Muir 2016).

ISIL: The Islamic State of Iraq and the Levant. There are a few definitions for the 21st Century *Islamic State* that has caused terror to the indigenous people of northwestern and western Iraq (Syria, et al.), however, I chose “ISIL” due to its close proximity to the goals of the new country. The term Islamic State is how the country refers to itself. But the

emphasis of this thesis is on Iraq, which is integral to the Islamic State and to its desire to control most if not all of the eastern Mediterranean which is historically considered, the Levant. The term *ISIS* limits the country to Iraq and Syria but in order for this paper to reach its full impact, I must use verbal imagery that incorporates the vision of the Islamic State into its terminology, thus, *ISIL*. I do refer to *ISIL* as a country, even though we in the west do not wish to give them credit, however, they are providing basic services and according to a 2015 ORB Poll, many of the people in Raqqa [were] “happier” since IS came to power (Marcus 2015).

Mesopotamian Basin: The “basin”, as those well versed in the subject like to call it, includes the Euphrates and Tigris Rivers and their tributaries as they flow south from Turkey down to the Arabian Gulf. Typically, the Mesopotamian Basin refers to Turkey, Syria, and Iraq; however, some literature may include Iran due to its close proximity. Some of the rivers that flow into the Tigris and marshes in Iraq are from Iran. The Tigris and Euphrates merge in the marsh area north of Basrah and come to a head at the base of the marsh to create the Shatt al-Arab (River) which then flows into the Arabian Gulf.



1- Mesopotamian Basin (Le Monde diplomatique 2001)

Transboundary vs. International Waters: The difference between these two terms is significant enough to prevent any sort of lasting and effective riparian agreement between Turkey, Iraq, and Syria. Turkey sees the Euphrates and Tigris Rivers as *Transboundary Waters* and that the water should be “allocated according to the identified needs” (Kibaroglu and Scheumann 2011), “defined by irrigable land, population, or the requirements of a specific project” (Wolf and Medzini 2001). Iraq and Syria, on the other hand, insist the rivers are *International Waters*, subject to international law, and that they should be “shared based on each country’s stated water needs [an annual release of X gallons per second] (Kibaroglu and Scheumann 2011)”. After seeing the evidence laid out by Aaron Wolf, I am convinced, and will attempt to convince the reader, that the best course of action will be to integrate the *Transboundary* definition into my recommendations as opposed to *International Waters*, as will be explained in Chapter 4.

Turkey: Turkey is the location of the headwaters for both the Euphrates and Tigris Rivers. 33% of the Euphrates lies in Turkey and it contributes 90% of the overall flow of the river throughout the basin. The Tigris on the other hand, flows through Turkey for only 15% of its length but Turkey contributes 40% of the overall flow (Kibaroglu and Scheumann 2011). Both rivers pass through Syria (the Tigris borders Syria), through Iraq and into the Iraqi marshes just north of Basrah. Turkey controls the vast majority of the water that flows into Iraq from these rivers. Turkey has been in separate riparian negotiations with Iraq and Syria since 1946 (Wolf and Newton 2007). The politics of Turkey are fluid at this time.

Unification vs. Partition: There is a debate regarding whether the US should support Iraq’s unification or partitioning. For the sake of this thesis, unification refers to the people of Iraq coming together as one political entity and setting aside their ethno-sectarian differences.^v The term partition, on the other hand, will refer to a federalized system of semi-autonomous states, where the states are responsible for the majority of their internal affairs, but answer to a central, i.e., federal government.^{vi}

US Support: When I say “US Support”, I am saying that we should identify the people in the Iraqi government that align with what we think is best for their country and ally ourselves with that movement, supporting through pecuniary measures and other peaceful means, not necessarily through force of US military. According to both Bernard Lewis and Raymond Hinnebusch, any overt US involvement will (and has) provoke anti-US sentiments, regardless of what is preached as our good intentions (Lewis 1990) (Hinnebusch 2008). We should also consider, with the US, a more academic approach to the problem as espoused by Fred Halliday in his interview with Danny Postel in 2005, in which he said we need people who are engaged intellectually, have the language skills, who know the region’s history and know the people. In a sense, he described the protagonist of “The Ugly American”, by Homer Atkins (Lederer 1958) (Halliday and Postel 2005).

Water security/stress: This condition occurs, according to the UNDP, “when annual renewable freshwater resources drop below 1,700 cubic meters (m³) per person (Islam

and Susskind 2015). Water consumption, according to this metric, includes daily human intake, sanitation, food preparation, agricultural requirements to grow/raise food, etc... Water security occurs when the threshold of 1,700 m³ per person is met or exceeded. Water security, according to the UN, is “the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and stability” (UN-Water 2013).

Literature Review

As we transition from some of the terms you will see throughout the body of this thesis, I want to focus on the literature I researched on governance and how it applies to Iraq and the several topics that tie-in to the lack of good governance and proper water management. I want to walk you through my research process and how I came to my conclusions. We will consider how migrations are affected by poor governance and how the concepts of unification vs. partition became part of the geopolitical vocabulary regarding Iraq. We will consider older (and some controversial) authors and the theories, that helped to drive the policies of the 20th century. Finally, we will consider how important water is to the Middle Eastern states, something that our western-centric mindsets are not accustomed to, as well as the environmental impacts that can come into place when poor governance negatively impacts water management.

Governance and Iraq

Good governance provides a stable environment for the people to function in a legitimate state. When considering the role of governance in maintaining essential services such as water and electricity and providing security, I settled on the role of water security, or the lack of it, in Iraq. I believe that if water security can be restored in areas where the government of Iraq

maintains a sustainable level of security, then stability will follow. Therefore, I sought literature that discussed water security and governance in Iraq as well as in other areas such as political theory and successful riparian policies that have been exercised in other parts of the world.

The starting focus of this research, before delving into aspects of governance and water management, was to consider aspects of governance more broadly to include literature on governance and unification. Toby Dodge believes that unification requires action on the part of Iraqi PM Haider al-Abadi. Abadi must dismantle Maliki's sectarian driven actions and the politburo that Maliki established [the "insurgents" or Maliki loyalists within the ranks of government] and rebuild the government to reflect the diversity of the Iraqi people (Dodge 2014). At the same time, Dodge asserts that unless this can be adequately addressed, as well as the issues of the provision of basic services and the corruption that plague every level of Iraqi governance, there are not many options for a unified Iraq to exist going forward. Dodge asserts that the unification process has a long history of problems that can be traced to the British Mandate in the post-Ottoman era of Iraq. He believes that Iraq never had a unified structure during the Mandate and when the British left, they left behind a government too immature to handle true unification of the three original Ottoman provinces (Basrah, Mosul, and Baghdad) and control was left in the hands of a small Sunni elite (Wien 2008). On this note, Hinnebusch argues that unity among the Iraqi people was really only brought about by Saddam after he consolidated power, but even then, that unity was temporary due to his authoritarian methodologies (Hinnebusch 2013).

Dodge compared the British Mandate with the US invasion in 2003 and subsequent occupation and surge, saying that there are typically three stages of intervention from an exogenous power and that if followed these stages will end in a security vacuum, primed for the

takeover by an unintended power. They are the decision to engage, and that equates to calling on the military to first establish stability and then governance, the decision to have ‘staying power’, and finally the decision to disengage, typically when things are not going well and this is, so far, done by the new incoming administration of the invading country. The consequences, as mentioned, are a security vacuum that has not been filled by a legitimate power that can incorporate all of the parties and ultimately results in disunity (Dodge 2006).

Throughout his writings, Dodge calls upon the cultural history of Iraq, one of multiple ethnicities and religious affiliations, to describe a problem of disunity that has been in place for almost 100 years, and one that will not be easily resolved. Dodge further calls upon the corruption within any state system as a cause for disunity in a country, such as we saw in the metastasizing ethno-sectarian conflict under PM al-Maliki (Totten 2015). This corruption, as Dodge cited from a 2011 Inspector General report to Congress on the status of reconstruction (Special Inspector General for Iraq Reconstruction 2011), resulted in the lack of support from the central Iraqi government of basic services such as clean water, dependable electricity, sewer and logistics. Such a lack of support for the people, according to Dodge, is one of four^{vii} “contemporary causes of profound state weakness” spread through corrupt state institutions (Dodge 2012). This in itself has helped to prime the call for another entity to rise up and provide these things. ISIL, according to the formerly mentioned survey in Tikrit, did provide basic services.^{viii}

Dodge’s 2014 paper, written shortly after Abadi took power from Maliki, and ISIL seized Mosul (Dodge and Wasser 2014), emphasizes the same points he has been emphasizing all along. They are the decentralization of power from the Central Government down to the provinces, the full integration of Sunni into all parts of the government, the dismantling of the

Maliki politburo, and the movement of Iraqi National Guard forces back to their home provinces. Though he adds, all of this has to be done with caution and careful planning in order to avoid tipping the balance from unification to sectarianism. Finally, he argues, Abadi must change the national narrative to one of unity, and with Iran more powerful in Iraq in 2017 than ever before, his job to preach unity to the Sunni who are fearful of Iranian influence, has become that much harder.

The partitioning of Iraq is something the US should avoid, according to Williams and Simpson who argue against any form of partitioning (Williams and Simpson 2008), whether it is *hard* as in the drawing of distinct lines between the ethno-sectarian groups and population transfers to their respective state, or *soft* as proposed by then Senator Joe Biden and Gelb (Biden and Gelb 2006). According to Biden and Gelb, the soft-partitioning would not necessarily be hard lines and lead to fully independent states, but would be more like a federal government, overseeing the three various regions of Kurdistan, Sunnistan, and Shiastan. Williams and Simpson suggest that we should look at a very simple third option, which is consistent with Art 110 of the Iraqi Constitution, and create a federal system that recognizes the 18 provinces and helps them to create semi-autonomous states. These states would be democratically run and not governed by any one ethnicity or sect, but by the freely elected citizens from the provinces. Their arguments are convincing, however, when they began to suggest that the dangers of partitioning would openly invite Iran into Iraq, a problem that would cause regional disturbances; I quickly realized that their study should be amended because Iran holds influence within the Iraqi governance even though partitioning has not taken place (Sattar 2016; Muir 2016; Trofimov 2016; AP 2012).

Toby Dodge, though he does not call for partition, acknowledges the bold statements from both Sunni and Shia MPs to partition Iraq into separate enclaves (Dodge 2014). Nicholas Sambanis, in his empirical analysis of partitioning in the case of an ethnic war, goes into great detail with his statistical analysis and compares a variety of partitioning cases. He concludes that it is unwise to use partition as a knee-jerk reaction to an ethnic conflict. He says in some cases it may be the best course of action; however, it must be judged by the merits and thoroughly tested through a variety of hypotheses before coming to partition as a solution. He views partition as a worst-case scenario. Partition, he says based on his analysis, can breed other problems depending on how it is conducted (Sambanis 2000).^{ix} The best scenario would be, in his opinion, to have the opposing parties come together and form a consensus on how best to live with each other.

Governance – Justice, Physical Security, and Essential Services; Without Them Conflict Ensues

Dodge addresses governance in the negative, by calling on the corruption of Iraqi officials as the cause for the “abysmal government services, despite the fact that Iraq is an oil-rich country” (Dodge 2014, 14). Furthermore, he also says that legitimacy is closely tied to a country’s ability to deliver services and that this capacity is part of the formula in creating a “unitary nationalism within its own borders, one that ties the population together and to the ruling elite” (Dodge 2014, 14). As an example, and one tied directly to this thesis, Dodge cites an Iraqi survey that says 83% of the wastewater in Iraq was left untreated, as of 2012, and roughly 25% of the 66% relying on public drinking water, were able to receive potable water for [only] two hours a day (Dodge 2014). He also says Iraq is a rentier economy, which detaches the state

from society and results in more corruption (Dodge 2013). An interesting twist in the governance literature, by Matthew Machowski, a Middle East security research fellow at Queen Mary University of London, is that when essential services in Mosul were returned to normalcy after ISIL took over, many residents returned voluntarily (Machowski 2010; Shapiro 2014) which is important when assessing the value people place on good governance.

The Brookings Institution discusses four requirements for effective governance in the Middle East: “Inclusion, transparency, *effectiveness*, and accountability” (Wittes 2016). For our purposes, we will focus primarily on Iraq’s effectiveness in delivering the essential service of clean and potable water. There are a plethora of areas that must be covered simultaneously by an effective governance scheme of maneuver or strategy but this thesis focuses on the governance of water security. Another concept of governance that I thought pertinent to this discussion was that of “New Governance”. Dowdeswell and Hania describe new governance as a new model, defined as “an administrative arrangement in which decision-making is shared among a range of actors, both public and private” (Dowdeswell and Hania 2014). This form of governance is relied on heavily by the US military in Iraq and Afghanistan, and has a tendency to “cut out the middle-man” and go straight to somebody who is willing to work with the US Government.

The problem with this approach to governance, and why it is applicable to this thesis, is that the US Government has a tendency to sometimes skip the local government, albeit, fearing Dodge’s *corruption*, and instead turn to the lowest bidder or someone who will simply get the job done. This, according to Dowdeswell and Hania, opens the door for further corruption and mismanagement of funds and projects. Furthermore, this literature specifically calls for the new governance model not to get involved with the rebuilding of the water infrastructure (Dowdeswell and Hania 2014). This is an important aspect of their research due to the fact, as we

will see shortly that any sort of water infrastructure repair must be in conjunction with an overall riparian strategy from the federal to the local level because what affects one group upstream affects all the riparian recipients downstream.

The literature on water security is extremely broad, but for the purpose of this thesis, I attempted to isolate it to the relevant topic of the Middle East and in particular, Iraq. The literature focused on several themes such as the impact of environmental change on water insecurity, and the requirement for future planning for states and international organizations. One important topic covers the increasing demand in the coming decades and the limited supply. It is true that water is a renewable resource (Bhaduri 2016); however, the definition of *renewable* varies from one researcher to another. On one hand, you can say water is renewable due to our modern capabilities to recycle, as we will discuss in Chapter 4. On the other, we see how renewable can refer to the desalination of sea-water such as the plant that is being built in Basrah. Regardless, water security, even in the United States, will continue to decline as demands increase. This study acknowledges these water inequalities and calls on the US and other states to attempt to not only help Iraq increase their water security capabilities in the here and now, but also lay the foundation for future demands with a sustainable riparian agreement.

Another aspect of water security that occurred repeatedly in the literature is the idea of water insecurity causing conflicts. This hypothesis may seem logical, but according to Wolf, within the last 60 years (as of 2010) there has not been any significant conflict over shared water resources and he believes, based on his analysis, that even if countries seem confrontational, cooperation is still a possibility (Wolf et al. 2010). According to McMahon, “there is a decisive, if largely overlooked, consensus that it is cooperation rather than violent conflict that dictates

interstate water relationships” (McMahon, 2017), a consensus that is vital to the conclusion of this research.

Water security amongst transboundary states is impossible without some form of shared riparian agreement (Mirumachi 2013). Amongst riparian states, there are typically stronger and weaker states depending on a wide variety of variables such as where the headwaters are located, economic strength, and good governance. So how does a weaker riparian state leverage power over a stronger riparian state in a hydropolitical complex? According to Kehl, there are many assets a weaker state can leverage such as “trade and aid”, “military mobilization”, and “external power” just to name a few, but for the purposes of this study, “external power” is going to be the most effective (Kehl, 2017). Iraq is in a weakened state due to ethnic conflict, previous wars, and international sanctions. It is not in a position to leverage power against Turkey, therefore, as we will discuss in chapter 4, the United States and other allies are most likely in a better position to assist Iraq in any riparian discussions.

Water security, according to Neda Zawahari cannot be separated from the physical security of Hobbes and Madison. According to Zawahari, unless there is a secure area in which the government can operate more effectively (such as Southern Iraq), it is pointless to institute water policies. Furthermore, she argues that in the more secure areas, or once the physical security environment is asserted, the “first step is to recognize why the al-Maliki and Assad policies led to failed states, ripe for internal violence and external penetration”(Zawahari, 2017). Water security is just one aspect of governance. Any approach to governance must be multi-faceted and include a security approach. Without security, the rest of governance cannot occur (Callaway and Harrelson-Stephens 2006). This is why the majority of the research focus for this paper is on southern Iraq where the country is most secure (al-Khatteeb 2015).

The body of literature on water in the Middle East is immense, thus I focused on literature and data available to answer the question of how water security can bring a semblance of governance to Iraq. I looked at several aspects regarding water, from the history of the hydraulic hypothesis,^x water scarcity, riparian agreements (SELC 2017; Copas 1997; Zawahari 2006; Wolf and Newton 2007; Wolf and Medzini 2001), dams and dikes (al-Khafaji 2013; Fawzi and Mahdi 2014; Chulov 2009; Hamid, Lief, et al. 2010), and water purification solutions from hardscape such as desalination plants (Atab, Smallbone, and Roskilly 2016; Zolnikov 2013), to softscape such as constructed wetlands (Pournelle 2016).

I looked into the history of water and the rise of civilizations in the Middle East and how water played a role (Wittfogel 1957; Harrower 2009; Rayne 2014; White 2003; Ahram 2015). I encountered controversy in the literature regarding dams and whether or not they were responsible for reduction in flow downstream (Shamout and Lahn 2015), in other words, the *Inventory Conclusion*, or if the reduction was caused by other man-made and natural causes (Venturi and Capozzoli 2017). I had to look at water quality, potability, and availability issues and what causes the quality and flow to become reduced.

In reviewing the literature regarding successful (or unsuccessful) riparian agreements between states, I found it helpful to look at the states along the Nile in order to give a more non-western view and I also chose to review past agreements in the Euphrates and Tigris Basin. Furthermore, I chose to consider the riparian agreements between Florida, Georgia, and Alabama, and how difficult it can be for a state to ensure water security for its citizenry whether that state is categorized as a successfully governed state or not.

Connected to this focus on water is necessarily an attention to associated environmental issues such as dust storms.^{xi} There is considerable debate in the literature regarding dust storms

and their origins. Some literature says it is due to climate change weather patterns, while other literature directly blames reduced flow in the rivers (Chulov 2009), and untended agricultural lands, and conflict – which is tied into politics. What is consistent in the literature is rising temperatures on the surface help create wind patterns that turn into dust storms (Al-Jumaily and Ibrahim 2013; Youlin, Squires, and Qu 2001; DiGiovanni 2016).

There is not any research that I have identified that directly ties a reduction in water flow to the rising surface temperatures in the arid areas of the Mesopotamian Basin, though this is a recurring hypothesis. For this thesis resolving this is not tenable, but I will point out that more research is required to determine if the reduction in flow is directly correlated to the rise in surface temperature. Another recurring hypothesis that requires further research is the idea that the reduction in flow leaves former marsh areas dry,^{xii} exposing toxic particulates that are picked up by the dust storms and aerosolized throughout the Middle East. For the purposes of this thesis, I will seek a middle ground. After engaging with the climate scientists primarily responsible for the climate-based analysis, I am confident that my middle ground approach is sound and based on the science presented.

CHAPTER 3: The Significance of Water Security for Good Governance

Good Governance, as defined earlier, is the provision of essential services such as clean water, reliable and consistent electricity, and physical security. As Wittes writes in her report for the Brookings Institution, unless the US can remember what caused the “underlying vulnerabilities that produced the [violent upheavals]” in Iraq in the first place, then we will continue to see the same problems occur repeatedly (Wittes 2016). For the sake of simplicity in this thesis, we are focused on water in Iraq and how the lack of clean water is affecting Iraq’s ability to reassert good governance in the country. Furthermore, the bulk of this study will focus on the south of Iraq due to its relatively secure status compared to the rest of the country.

Much of the literature indicates that Iraq’s governance problems as they relate to water began about the time Turkey started building dams (Gleick 1994; FAO 2014) and using them to influence their downstream neighbors (Machowski 2010). The problems were further exacerbated after the UN sanctions were placed on Iraq after the Gulf War (Zolnikov 2013).^{xiii} In southern Iraq, the problems with water security did not begin or cease after sanctions were imposed or the 2003 US invasion of Iraq. Iraq’s water woes began with Saddam Hussein and his attempt to bring the Marsh Arabs into modernity.^{xiv} However, due to a significant lack of security throughout the country after the 2003 invasion, the water infrastructure remained vulnerable to attack and indeed was attacked by insurgents (CTED 2017; IRIN 2005) metastasizing an already significant problem of water shortage.

If basic security is under control, we can focus on water infrastructure and building good governance. So what are the problems with the water infrastructure in Iraq? The major problems are reduced water flow, abandoned agricultural lands, salination of the rivers and marshes, the

destruction of the southern marshes, an increase in Total Dissolved Solids¹ (TDS) in the water, and reduction in potable water. All of this contributes to an increase in dust storms,^{xv} mass migrations, a loss of food security, and stress on urban infrastructure².

In Baghdad, the daily requirement for water is 3.4 million m³ whereas the actual capacity for providing that water is at 2.1 million m³ as of 2011 (Aenab and Singh 2012). In addition, the Baghdad capacity for treating raw sewage is 50% and about 300,000 t of raw sewage is dumped daily into the Tigris River (Aenab and Singh 2012). Furthermore, it is important to note that according to the study conducted by Aenab and Singh, the “*water treatment* plants in Central Baghdad are satisfying the standard conditions, though the *water supply* network is in poor condition” (Aenab and Singh 2012). However, the smaller cities on Baghdad’s outskirts had higher concentrations of water-borne toxins indicating the water being provided is of poorer quality (Aenab and Singh 2012) and fails to meet the definitions of good governance.

Reduction in water flow

Another problem is reduced water flow as the rivers flow downstream. As defined earlier, the *Mesopotamian Basin* consists of the two primary rivers Euphrates and Tigris and their tributaries, as they originate in Turkey, flow through Syria, through Iraq from the northwest and

¹ **Total Dissolved Solids (TDS)** “refer to any minerals, salts, metals, cations or anions dissolved in water ... TDS comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) and some small amounts of organic matter that are dissolved in water” (Oram 2012).

² **Infrastructure Stress** relates to the hardscape infrastructure in an urban setting. Water treatment facilities, waste-water treatment plants, electrical grids, etc... can face significant stress when damaged by natural or man-made disasters or when the demand is higher than what it was originally designed for. In this scenario, we are seeing infrastructure stress on urban centers where migrants are fleeing to and increasing demand. Additionally the stress is in areas where the government has either not repaired the infrastructure post-conflict, or where the supply lines, i.e., repair parts and expertise, for donated hardscape systems, are no longer available.

empty out into the marshes in the southeast. They then re-emerge as the Shatt al-Arab (river) which flows around Basrah and out into the Arabian Gulf. Along the path, the water volume is reduced.

Between 1974-1975 Syria and Turkey began building dams along the Euphrates River, which caused^{xvi} a decrease in river-irrigable lands along the Euphrates in Iraq from 136,000 ha to 10,000 ha (FAO 2012). In 1990 “irrigation potential was estimated ... at over 5.5 million ha, of which 63 percent [was] in the Tigris basin, 35 percent in the Euphrates basin and two percent in the Shatt al-Arab basin” (FAO 2012). However, by 1997, the actual number of estimated ha was placed at 3.4 million. The Turkish Ilisu Dam,^{xvii} which is scheduled to come online in 2017, is



presumed to reduce the water flow on the Tigris River, into Iraq, by 43-50% more than it already is (FAO 2012). Furthermore, in spite of the lack

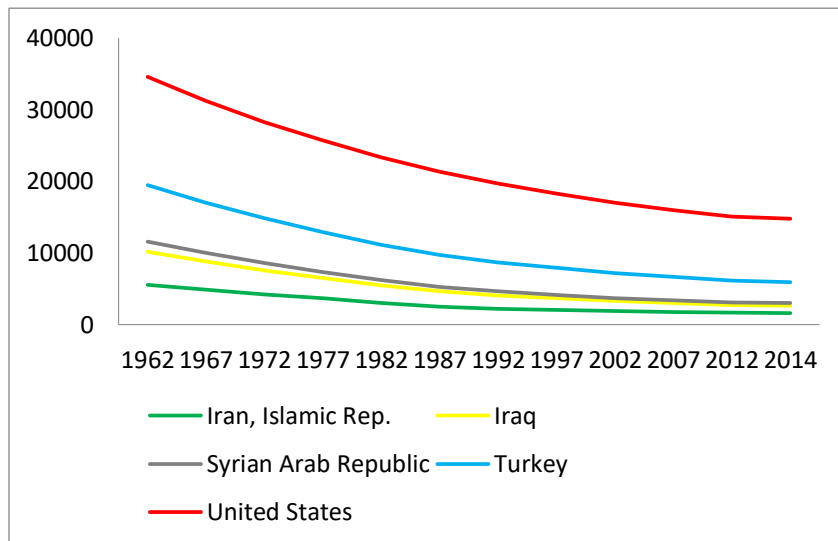
2- Dams in the Mesopotamian Basin (Abdulhadi 2015)

of data available due to the current conflicts and corruption in Iraq, “it is generally acknowledged that the amount of surface run-off has been reduced by upstream impairment to the order of 30%.

This impact is forecasted to increase further in the next 20 years, reducing the water available to Iraq by up to 60%” (Fanack 2016c).

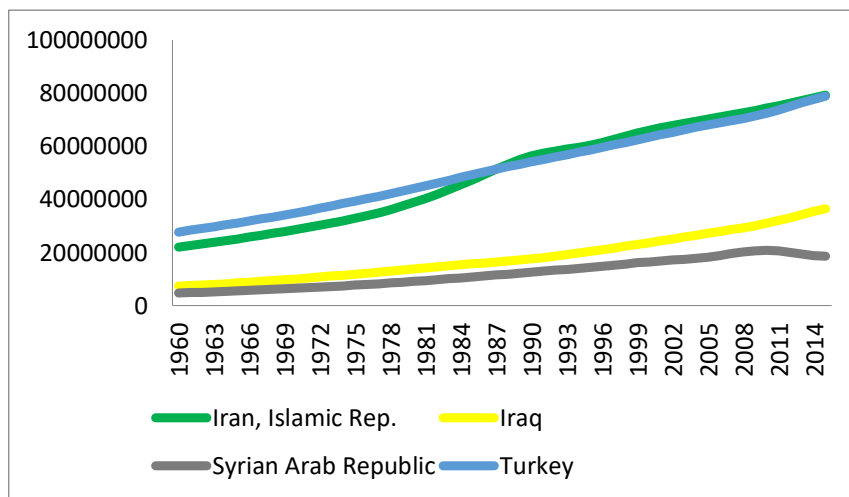
There are several factors working in concert with each other that cause this reduction. Reduction in flow can be caused by a dam operator restricting the amount of water that goes through the dam. You also have to consider the evaporation rate from reservoirs that are holding the water. For example, of Iraq’s total loss of water through reservoir evaporation, the Thartar Lake reservoir in Iraq is reported to be responsible for the loss of 50% (Fanack 2016b).^{xviii} Each

Table 1- Renewable internal freshwater resources per capita (m3)(WB 2017)



reservoir loses water to evaporation at different rates, depending on the local climate and the depth of the reservoir compared to the surface area (Terrascope 2017). Then there is draw from local municipalities or irrigation ditches as the river

Table 2- Population growth in the Mesopotamian Basin (WB 2016)



continues to flow through the basin. As we look at the increase in dams and irrigation canals (of which there are an estimated 8,000 miles (Chulov 2009)) as well as the projected increase in population in the four countries

affected by the Mesopotamian Basin, and who act consistently on a unilateral basis, we are reminded of Hardin's *Tragedy of the Commons*. With each action taken to divert the water, there are consequences downstream, and as we will see in this paper, those consequences can reach back to affect those upstream in the way of migrations and dust storms.

Abandoned agricultural lands

The reduction in flow affects the agricultural sector of the economy because many of the irrigation pipes that are installed along the rivers are no longer low enough to reach the water (Al-Ali 2014). Consequently, the river water is not able to reach the agricultural lands resulting in devastated crops and causing migrations to the urban areas and a dependence on imported food (FAO 2012; Schwartzstein 2015). In al-Anbar province, farmers complained that even their wells (dug by themselves and the government) were no longer deep enough to reach the water due to the reduction in the water table (Chulov 2009).

The salination of rivers has affected the marshlands, which we will discuss in a moment, and this has directly affected the south's ability to produce water buffalo milk (Walther 2011), which is a staple from the south (Schwartzstein 2015). The results of this, in addition to the conflicts in the rest of the country have caused there to be approximately 3 million IDPs (2.4 million food insecure and 1.5 million severely food insecure^{xix}) resulting in a steady increased dependence on food imports according to data collected at the end of 2016 (FAO 2017). This of course is to Turkey's advantage as they increase their electrical and food productivity through the Güneydoğu Anadolu Projesi (Southeastern Anatolia Project or GAP) system, and especially with their highly anticipated opening of the Ilisu Dam which is part of GAP. Turkey will soon

have the capability of becoming Iraq and Syria's "breadbasket" (al-Ansari 2016). This places Turkey in an extreme advantage over the Mesopotamian Basin since they will then control the water and food security of their southern neighbors (Wolf and Medzini 2001).

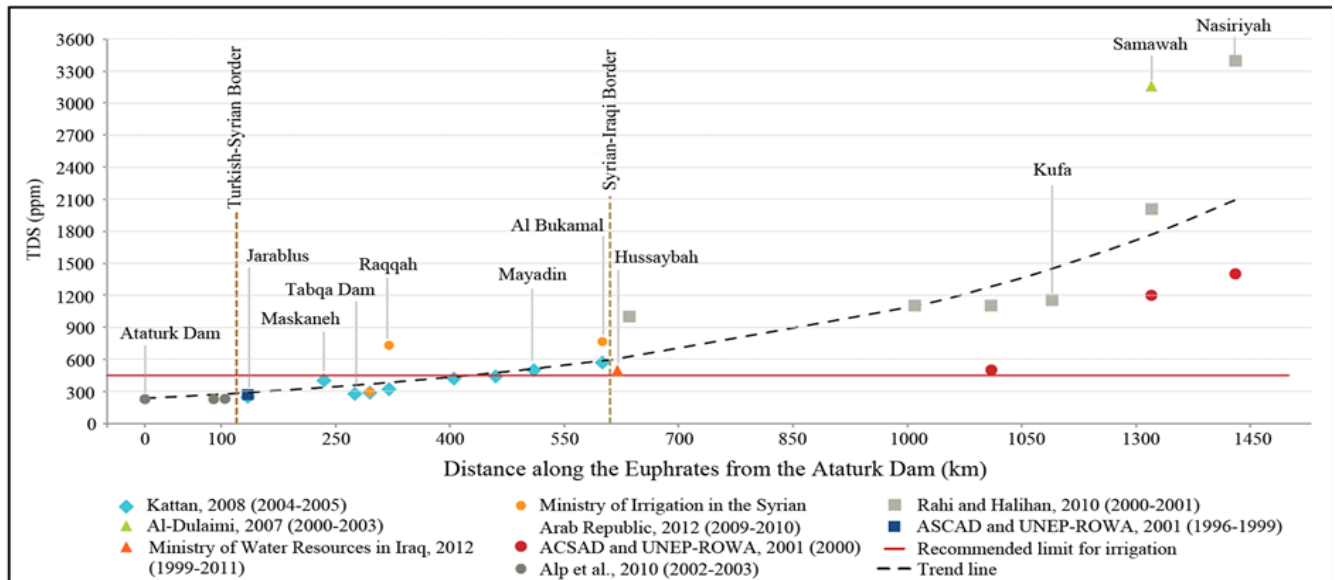
Migrations can sometimes be caused by environmental factors such as reduced water flow which can be caused by dams, irrigation, drought, or other issues.^{xx} The greatest number of Iraqis that migrate are coming from the conflict regions in the northwest and in Baghdad. The next highest number comes from the west in the Anbar province and the last group comes from the south in the marsh region (IOM Iraq 2016). The numbers correlate with the areas of Iraq that are insecure due to security factors and they decrease as the numbers correlate with areas that are suffering more from economic factors (IOM Iraq 2016; IOM 2016).^{xxi} However, in a recent survey of migrants, taken by IOM Iraq in 2016, 10% of respondents cited security as the primary reason for leaving while 80% cited no hope for the future (IOM Iraq 2016).

Water reduction, salination, and contamination

Reduction in potable water

It is important to realize the problem of potable water has not gone unrecognized. There are multiple agencies from the UN, to the Japan International Cooperation Agency (JIAC), USAID, the ICRC, and Iraq working towards solutions. For example, JIAC contracted for a desalination plant to be built in Basrah (Trade Arabia 2016) and the ICRC boasts having trained 83 people to be able to manage water systems in 2016 (ICRC 2017) and to have built desalination plants in IDP camps (ICRC 2017).

Due to the pollution and salination of rivers and marshes, the government, as of 2009, estimated that close to 2 million Iraqis faced “severe drinking water shortages” (Chulov 2009) and one estimate as of 2017, places up to 6.6 million Iraqis as not having access to “safe drinking water” (Couch 2017).^{xxii} Since the 1970s, the salinity in the Tigris and the Euphrates has continued to increase both over time and along the southward flow. Sampling over the years is consistent in that it annotates higher increases in salinity as the water flows from Turkey’s headwaters, through Syria and south towards (Nasiriyah where the Euphrates ends, and Amarah where the Tigris ends) the marshes. However, the increase in salinity over time coincided with the “filling of the upstream reservoirs [of Tabqa and Keban]” (Fawzi and Mahdi 2014). For example, the sampling of salinity in the Euphrates was first measured in the 70s at 500 ppm and as recently as 2009 it increased in Nasiriyah to 4,000 ppm. Further complicating the water’s integrity, the silt that is deposited behind the dams, originally intended by nature to be carried down the river, ends up depriving the agricultural lands of much-needed nutrients which have to be replaced by chemical fertilizers (Boulos 1985). When irrigation occurs, as inefficient and archaic as the irrigation canals permit, the water is returned to the river carrying with it Total Dissolved Solids (TDS) (Chulov 2009). TDS were observed to follow the same pattern in both rivers as the salts, increasing as the water flows south (Fawzi and Mahdi 2014).



3- This image shows how TDS increases along the river as it ventures south (al-Ansari 2016)

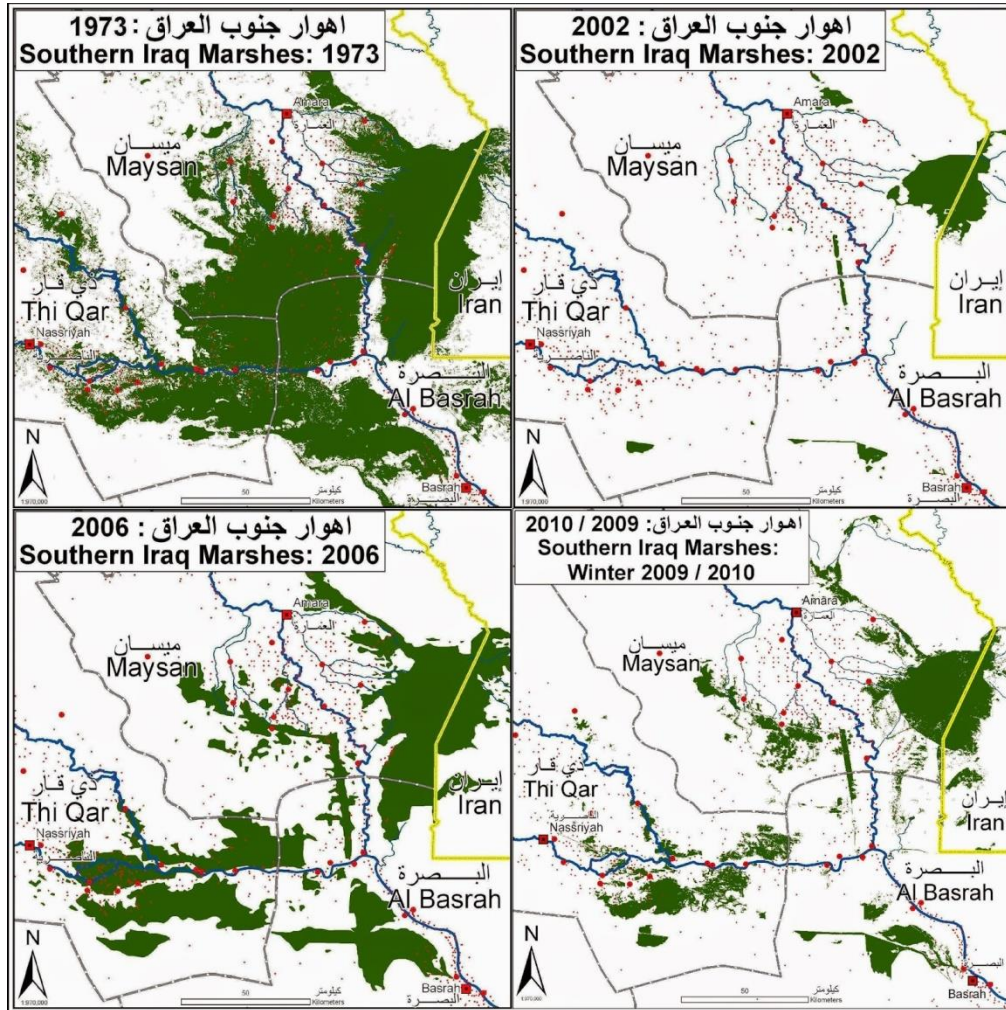
Another problem is Iran^{xxiii} who over the years has been diverting water from the marshes for electrical and irrigation projects. The introduction of the Al Karkheh River dikes in Iran “deteriorates the water quality of the marsh” causing salination to increase to unacceptable levels during the “wet and moderate” years (al-Khafaji 2013). In addition, the Karun River, which flows from Iran into the Tigris and helps to flush freshwater into it, forcing the saltwater back into the Arabian Gulf, had been diverted by Iran to build the Karun Dam in 1978. The consequences are that the tidal push from the Arabian Gulf is able to force its way further upstream and into the marshlands, which then salinate the water (Chulov 2009), dramatically changing the ecology and forcing people who depend on the marsh water for their survival, into the migrant category.

Destruction of the marshes

The large-scale destruction of the Iraqi marshes in southern Iraq began with Saddam Hussein, but even under the Ottomans and the British Mandate, the people of the marsh were often at odds (Ahram 2015). The marshes are the alleged location of the biblical *Garden of Eden* and the birth of civilization according to both western and Middle Eastern traditions and they have provided an ecological paradise to the people that have lived there. It is difficult to say when people first settled in the marshes, but there is enough evidence through the archeological record of the canal and irrigation systems to believe that people have been living in the marshes since at least “the Neo-Babylonian and Seleucid periods (600-300 [B.C.])” (Eger 2011).

For millennia, these marshes have acted, according to Jennifer Pournelle of U of SC-Columbia, as “kidneys” for the Tigris, Euphrates and their tributaries, cleaning the water of its impurities, so that by the time the rivers conflated towards Basrah as the Shatt al-Arab, they were clean and available for continued agricultural and human need (Pournelle 2017). Unfortunately, the infusion of saltwater into the marshes (Fawzi and Mahdi 2014), the reduction in flow, and the intentional draining of the marshes by Saddam before and during the Iran/Iraq war and post-Gulf War (Ahram 2015), reduced the marshes to 30% (Hopkin 2005). The “Marshlands naturally act as nature’s water filter in that they separate toxins from the water, but without any water moving through the area the marshlands can’t do their jobs” (O'Reilly 2017). Over the years since the fall of Saddam, the water volume in the marshes has fluctuated and they have even been inducted into UNESCO’s World Heritage List (UNAMI 2015). The marshes are vital for the cleanliness and usability of the water not only for the Marsh Arabs, but for the cities south of the marshes that straddle the Shatt al-Arab and border Arabian Gulf (Fawzi and Mahdi 2014). The increase in

salinity in the Shatt al-Arab was first recognized in the 1960s and it continues to increase. For example, the salinity range in 2010 was “1,112-3,645 mg/L and [in 2011] 1,304-9,230 mg/L ... these values far exceed the guidelines for irrigation, limiting agricultural activities to highly salt-tolerant date palms ... [this is in sharp contrast since before the 1970s which had 80% more palms^{xxiv}]” (BGR and UN-ESCWA 2013).^{xxv}



4- Fluctuation of the marshes over the years (Null 2010)^{xxvi}



5- Iraqi Marsh in 2015 (National Geographic 2015)



6- Water Buffalo in Marshes in 2008 (Dransfield 2008)^{xxvii}

So what does all of this mean for our analysis of governance and stability in Iraq? As the water flow rate continues to decrease due to upstream restriction; the salinity in the south increases because of an inability for the freshwater injection to push the sea water back into the gulf. As a result of TDS increase due to deposits upstream, the agricultural sector in the south, where Iraq is most secure, will continue to decline. Consequently, the Marsh Arabs who have depended on these waters for their livelihood will continue to migrate, creating additional stress on the hardscape infrastructure in the cities where they migrate to. In addition, the dust storms increase due to the availability of loose solids, where it is hypothesized, that they are able to pick

up heavy metals that have been accumulating in the (now-dry) marshes, aerosolizing them and causing illnesses. Iraq's neighbors, especially Turkey and Iran, who are not allies, continue to interfere with Iraq, and Turkey, who is well positioned to be able to assist Iraq into a solid transition as a rentier economy – one without food or water security, will be in a position to control the Mesopotamian Basin. Finally, an area that this thesis does not go into, but should be noted, is that a lack of water security can cause people to turn towards extremism due to an “unresponsive government” (Lorenz 2008; NATO 2016; Graham 2015; Freeman 2016).

The lack of water security in southern Iraq has enabled an environment of poor governance. In spite of the enormous efforts by the government of Iraq, NGOs, and other relief agencies to provide potable water to the people, it is not enough and they are not able to sustain themselves adequately. With this dire picture in mind, we now transition to consider some solutions that have been tried in other riparian basins both on the international and the local scale in order to understand which good governance practices could be considered for Iraq.

CHAPTER 4: Solutions

Good governance requires the provision of essential services such as clean water, reliable and consistent electricity, and physical security. In southern Iraq, the security aspect, as discussed earlier, is relatively stable. This environment gives the government an opportunity to enhance governance in this region. There are several areas such as electricity and the economy which certainly require the government's attention, but this thesis asserts that if water security for the people can be restored, then good governance can follow. We have already seen how the lack of water security can lead to migrations, a tattered economy, and possibly even an increase in dust storms; therefore, no thesis worth its weight can finish without attempting to offer some solutions to the problems it has just excised.

I recommend that a multi-faceted approach to water management must be used in any strategy to increase water security and strengthen good governance. There are many ways to increase water security and all should be considered by Iraq as it continues to rebuild, however, I wish to focus on two: 1- Riparian agreements between countries in a water basin is one area and one that will require an enormous amount of effort on the part of international bodies and the Mesopotamian Basin riparian countries; 2- Constructed wetlands, which are designed to clean and filter water that would normally be considered waste water and they return the water to a state of potability that meets US Environmental Protection Agency guidelines.

Riparian Agreements

Flooding in the Mesopotamian Basin has been a recurring event for millennia and there are periods of discharge along the rivers that vary naturally from high, to low, to average depending on the time of year. This proves difficult for agrarians that depend on the river's waters because "the seasonal distribution of the water supply of the system does not coincide with crop needs" (Wolf and Medzini 2001). Records as far back as the Hammurabi Code give instructions on how to control the water through irrigation (Gleick 1994) and in general, people along the basin have learned to live with the results that nature gave. It was not until the last quarter of the 20th century that the countries that rose from the ashes of the Ottoman Empire learned how to control these waters and began to harness them through the use of dams (Wolf and Medzini 2001). It was then that the idea of riparian agreements became a necessity since the dams upstream can restrict the flow-rate when the reservoir is filling up and when the dam is complete. The building of dams to secure one's water security in the arid Mesopotamian Basin took on a unilateral flavor as Turkey, Syria, and Iraq raced to build, according to one report, 32 dams along the Euphrates since the 1970s, which has reduced the flow-rate by 40-45% (Shamout and Lahn 2015). What was once a plentiful substance – water – has now been subjected to the *Tragedy of the Commons* as the population increases and dams are built.

The Güneydoğu Anadolu Projesi (Southeastern Anatolia Project or GAP), Turkey's riparian brain-child from the 1960s, "envisioned the full development of the Euphrates-Tigris basin" (Shamout and Lahn 2015) and with the Turkish Ilisu Dam coming online on the Tigris this year, it is probable that their vision is coming true. Turkey has planned "annual water demand to rise from 50 billion cubic metres [sic] (m³) in 2012 to 112 billion (m³) in 2023"

(Shamout and Lahn 2015). This should hardly be surprising for us, because “In the 1930s, the father of the Turkish Republic, Kemal Ataturk, proposed the construction of a series of dams with the idea of harnessing the mighty Euphrates and Tigris rivers” (Lorenz 2008). Nor should it be surprising that the GAP project has only intensified under Erdogan since he sees himself as a modern-day Ataturk, a man of action (Akyol 2016). This enhanced control of the Mesopotamian rivers places Syria and Iraq at the mercy of Turkey.

Over the years (see Annex A), a variety of riparian agreements have been made between Turkey and Iraq, Turkey and Syria, Syria and Iraq, but never has there been an agreement between all three riparian countries. One of the main sticking points that has prevented a trilateral agreement has been the definition of International River vs. Transboundary Waters. As defined in the definitions, Syria and Iraq want Turkey to release a certain flow rate, i.e., 500 (m³)/sec. annually, however, Turkey insists that any agreement would have to be from a transboundary perspective and Turkey would release water based on the need of its riparian neighbors. Kibaroglu and Scheumann defined the difference best when they say that Turkey’s vision^{xxviii} of transboundary means that the “waters should be *allocated* according to identified needs” as opposed to Syria and Iraq’s International Waters perspective which calls for the immediate *sharing* of the water (Kibaroglu and Scheumann 2011).

The only way that may work for a trilateral riparian agreement, is for the resurgence of the Joint Technical Commission (JTC), a cooperative commission established in 1980 between Turkey and Iraq in order to discuss water resources (Wolf and Newton 2007). During disputes between Turkey and Iraq over Turkey’s filling of the Tabqa and Keban dams and during its construction of the Ataturk Dam, a decision was reached to create the JTC and they began to meet in 1981. Syria joined the discussions in 1983^{xxix} (Kibaroglu and Scheumann 2011; Fanack

2016a). A series of the JTC meetings were held between Turkey, Iraq, and Syria between 1982-1992, 2007, 2008, and 2009. The JTC still exists to this day; however, conflicts in Iraq and Syria have taken a higher priority.^{xxx} Both Wolf^{xxxi} and Kibaroglu would agree that the transboundary, as opposed to the international, waters definition is the most successful approach to this particular riparian scenario based on their studies of successful riparian agreements. Wolf goes a step farther by outlining lessons learned and says “in almost all of the disputes which have been resolved, particularly on arid ... streams, the paradigms used for negotiations have not been rights-based at all ... but rather ‘needs-based’ and he goes further to suggest that the best-case scenario would be a “basin-wide institution” that strives for “coordination over integration” (Wolf and Medzini 2001). The integration word carries a punch and typically means a loss of sovereignty. Wolf argues, in this case, sovereignty is very important and that coordination, if handled correctly, can yield the same results of integration (Wolf and Medzini 2001).

Case Studies

Toynbee theorizes that the ancient societies, built around rivers, did so not because of the provision of water, for how would you explain settlements in deserts and mountaintops. Rather, he believes, these ancient cultures came together in order to overcome the challenges the rivers posed such as annual flooding and sought cooperation in controlling these massive natural systems. He calls it the “stimulus of hard countries” (Toynbee 1934). Wittfogel, on the other hand, theorized that it was the demand for irrigation and large earth-work projects that propelled the Ancient Egyptian Old Kingdom into power, whereby they centralized authority and maintained strict control over water resources. This theory, according to one of his critics,

Verhoeven, claims to establish that in water-restricted societies authoritarianism rises as the governing model of choice, arguing that water could be used to entice opposing factions to surrender their authority to the centralized state. Rayne argues, on the other hand, that the control of water and irrigation came after a kingdom was established in an attempt to exert governance or “control” over the people (Rayne 2014). It would be presumptive to say that this *is* Turkey’s intent; however, they are in the position of having and maintaining this control. This is significant as we consider the future of any riparian agreement in the Mesopotamian Basin and for immediate solutions affecting water potability at the local level in Iraq’s more governed areas.

Iraq vacillates between weak and failed state status, depending on the scholar discussing it. Turkey, on the other hand, with Erdogan’s recent grasp for power, could be placing themselves in a more assertive role regarding security in the Mesopotamian Basin. This thesis does not seek to predict the future regarding Turkey’s role, but it is important to consider that a rising Turkish state will have a direct impact on Iraq, Syria, and Iran, and any efforts meant to resolve Iraq’s governance problems. This makes Turkey the dominant power in the Mesopotamian Basin and the other states, already in a weakened status due to conflict, are geographically the weaker riparian states. In this case, the most effective leverage Iraq would have is an external entity such as the US, EU, UN, and/or possibly even Iran.

As we consider the possibilities going forward with a riparian agreement involving Turkey, we should take a moment to look at two transboundary riparian entities that are currently going through the riparian agreement process, or should be. The case study of the Nile riparian agreement is an example of how a transboundary agreement with a similar climate and culture as Iraq can come together and initiate proceedings that are actually working. The case study of the

southeastern United States is an example of the difficulties that arise with any transboundary riparian agreement, even in a country that practices good governance.

Nile Riparian Agreement

Egypt has a riparian agreement with the 9 other countries in the Nile Basin. There are several similarities with the Nile riparian agreement such as an arid climate and dependency, however, one major difference between Egypt and Turkey is that Turkey is the location of the headwaters and is upstream – Egypt is at the delta and is downstream. The history of a riparian agreement along the Nile River Basin begins in 1929 with a cooperative agreement between the UK and Egypt. As colonialism retreated and Sudan gained its independence, a new agreement was formed between Sudan and Egypt in 1959 that allocated water flow between the two countries (55.5 bm^3 [billion cubic meters] for Egypt and 18.5 bm^3 for Sudan annually).

Another part of the agreement ensured that they would maintain a “united view ... on the claims of upstream riparian states” (Paisley 2005). In 1999, the Nile Basin Initiative was formed which included all of the Nile River riparian states (Burundi, DR Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan and later South Sudan, Tanzania, and Uganda. Eritrea is an observer) (NBI 2017a). The objective was to “provide a forum for consultation and coordination among the Basin States for the sustainable management and development of the shared Nile Basin water and related resources for win-win benefits” (NBI 2017a). The idea of sustainability is something I continue to see in successful riparian resolutions. Typically, when the term *sustainable* is used, it is referring to hardscape or softscape water infrastructure that has both an adequate supply chain and professional expertise that will continue to grow along with the country or community.

It is the idea that there is an overarching body to provide oversight and direction from the local to the federal level, and in the case of the Nile, to the regional level as well.

The leadership and decision-making body of the Nile Basin Initiative (NBI) is “composed of members from all member-states comprised of Ministers in charge of Water Affairs from each NBI State” (NBI 2017b). By 2009, seven of the states agreed to a Cooperative Framework Agreement (CFA) that acted as a transboundary waters agreement, which would allocate water to the riparian states based on their need, described as "promot[ing] integrated management, sustainable development, and harmonious utilization of the water resources of the Basin, as well as their conservation and protection for the benefit of present and future generations" and not, as the preamble to the agreement states, the “quantifiable equitable rights or water use allocations” (NBI 2017a) as Egypt and Sudan currently maintain is their right.

As of 2015, six of the ten member-states had either signed or ratified the agreement, but Egypt, Sudan, S. Sudan, and DR Congo have not (NBI b 2017). Egypt and Sudan, being downstream of the other countries, are in a similar position as Iraq, which is why they insist on maintaining the same bm^3 that were agreed to between Egypt and Sudan in 1959 (Salem 2011). The NBI agreement is not a finished product and there is a long ways to go, but the progress made since 1999 has been significant. The next (5th) Nile Basin Development Forum will be held in Rwanda, 23-24 October 2017.

US Lack of Riparian Agreement

The United States has a history of riparian disagreements yet very few agreements. The reason this is important as a case study is because the United States is not torn with war and a lack of governance like the Mesopotamian Basin. The US is considered to be a developed

democracy and yet we still have problems developing agreements. I would like to focus on Georgia, Florida, and Alabama. In the US, two doctrines for use emerged from the early settlers, and in addition, we have three types of riparian regimes and three types of apportionment options. The two legal doctrines are “natural flow doctrine”, based on the idea that the property owner should have undiminished access to the water that runs adjacent to his property, and the “reasonable use” doctrine which holds that property owners adjacent to water can use whatever they need so long as it does not affect the other riparian users. This follows from *Tyler v. Wilkinson* in 1827 (Copas 1997).

The riparian regimes in the US are: 1- Riparian Doctrine, which tends to lean towards the idea of the *Tragedy of the Commons*, in that water was plentiful a long time ago, but now with higher populations, demand is greater. This model has its history in “European water rights”; 2- Appropriation Model which leans towards the “first in time, first in right” idea, basically meaning the state can determine who gets the access and for what purposes. This model is primarily used in the arid American West and its chief flaw is that “water resources can be traded like fuels and other natural resources”; And 3- The hybrid model, which is becoming more popular, institutes a little of the riparian and appropriation models but in essence, “institute[s] permit schemes for new drains and watercourses” (Copas 1997). Solutions generally sought after amongst scholars and scientists fall somewhere between Congressional Apportionment, Judicial Apportionment, and Interstate Water Compacts, which brings us to the Florida vs. Georgia dispute.

Florida and Georgia are in conflict over the Chattahoochee River Basin, which supplies the bulk of water for Atlanta and then flows into the Flint River, which according to Florida, is vital for the oyster fisheries in Apalachicola Bay. In 1992, the states, to include Alabama, formed

a “compromise agreement” which in essence, froze the conflict and the demand for water in place until more research could be conducted (Copas 1997). Today, the agreement has moved to Judicial Apportionment. In all actuality, Judicial Apportionment has not yet occurred, however, the disagreement between Florida and Georgia made its way to the US Supreme Court (SCOTUS) where the court appointed a “special master” to handle this case. The decision of this individual ended up giving a victory to Georgia and is currently waiting on SCOTUS approval or rejection (Bluestein 2017). If this course of action fails to give remedy to the states on the Chattahoochee River Basin, it could make its way to a higher authority for Congressional Apportionment. It is possible that Congress may impose apportionment to the states, but this is the least desirable due to Congress’ political stance that does not necessarily take into account the individual needs of the states. It is best, according to Copas, that the states come back to the table and form another Interstate Water Compact that they can all live with.

What we have just seen is, 1- even among democratic societies that practice good governance, riparian agreements are difficult and onerous; 2- good governance maintains civility and order even under difficult circumstances. Many of the water issues in Iraq, which we saw earlier in this thesis, are indicative of the lack of a riparian agreement. A sign of good governance would be if in the future we see Iraq and the Mesopotamian Basin states going before a joint body to resolve their differences rather than simply continuing the dispute.

Constructed Wetlands

As we saw earlier, there are a wide variety of water-based solutions being applied at the local level, but one thing that we have to be wary of, is the application of “New Governance”.

Dowdesdale and Hania argue that proper governance, especially in the area of utilities, is having a paradigm shift from a centralized form of top-down governance, much like we see coming out of Baghdad, to a more horizontal approach where decisions can be made at a local level. They further argue that this is not necessarily because the government is divesting itself of power. They believe that when the US came into Iraq and began deploying SWEAT – (Sewer, Water, Electricity, Academics, and Trash) projects and funding them, that a new governance infrastructure developed at the local level (Dowdeswell and Hania 2014).^{xxxii}

Though this is ideal when it comes to the decentralization of power, it was not, they argue, ideal in how it was executed. What has happened, they argue, is a “dark side” of governance has shown itself; a side in which NGOs, Military, Contractors and the like are building infrastructure that is *not* adequate for long term governance and sustainability. They believe that the “new governance mentality of flexibility, adaptation, and private-public partnership” is actually a recipe for mass-corruption in Iraq and precipitates the very lack of governance that the new governance model is supposed to surpass (Dowdeswell and Hania 2014). In addition, it prevents any kind of order, for example, in the riparian realm, resulting in a patchwork of fixes that fail to have, as Jennifer Pournelle describes below, a sustainable supply line of replacement parts and a cadre of professional expertise.

Pournelle of the University of South Carolina, a US Army veteran of the Cold War and renowned scientist in the area of wetland preservation, argues for a decentralized approach. Like Dowdesdale and Hania, she supports the idea of the local government being intricately involved in the decision-making process, regarding their infrastructure, from beginning to end. Pournelle sees the detrimental effect of the top-down approach in Iraq that she says is still very much alive based on her experiences in Basrah. She cites, for example, a local enforcement officer who is

unable to use fines from environmental violations for local support because the money ends up going to Baghdad's central repository (Pournelle 2017). Pournelle further argues that even though the US [and Japan] is assisting with infrastructure projects such as water treatment plants; this has been done before in the 1970s with the Soviets and the 1990s with the Chinese and the Indians. Unfortunately, these infrastructure developments have failed one after another because of the lack of a supply chain, or the "build it and leave it" mentality, defined as sustainable repair parts as well as the academic and professional maintenance of these projects. Unless the US wants these new developments to fail, the US also needs to address a sustainable supply chain (Pournelle 2017).

Between both Dowdesdale and Hania, and Pournelle, the issue of governance could be resolved if 1- the central government would divest enough authority for the local government officials to be able to execute faithfully, their duties and responsibilities and 2- the intermediate players, the ones who build infrastructure without an adequate academic or physical supply chain, i.e., the NGOs, private contractors, OGAs, would be subject to the local authorities and accountable to provincial and federal agencies of the Iraqi government. This, I believe, is what was actually intended with the *by, with, through* concept that was introduced through the US Special Forces when they were encouraged to "operate by, with, through ... [foreign internal defense] agencies" (DA 2008).

With the construction of the new reverse osmosis desalination plant in Basrah, under the Japanese, we have to ask if the supply line will be maintained after the international community loses interest in Iraq and begins to invest in other regions of the world. The *by, with, through* concept cannot be forgotten and I cite, for example, a cooperative agreement between the University of Basrah and the University of South Carolina (U of SC) in which PhD candidates

from Iraq were sent to the United States, specifically to U of SC to study water restoration techniques. Most of the Iraqi students have returned to Iraq and are now working with their respective institutions, but the focus of this one solution is on Basrah and the academic expertise that is being built there at the local level through the University. The ultimate objective for this initiative is for the scientists from the University of Basrah to be able to take “(a) urban sewage and storm water, (b) agricultural waste and irrigation return water, and (c) water produced as a byproduct of petroleum production and refining” (Pournelle 2015) and turn it into water that is potable, according to EPA standards, for the people of Basrah (Pournelle 2017). In the United States, there are several projects like this that take wastewater and through natural means, recycle it and place it back into the water supply for human consumption. Below, we will discuss what this is and give two case studies of this concept in action.

Case Studies

Constructed Wetlands (CW) are artificial pools designed to treat wastewater through natural processes that act as “bio filters to remove sediments and pollutants” (O’Reilly 2017), resulting in water fit for human consumption. Each CW must be designed specifically for the topography of the land in which it is situated and for the treatment of a specific type of wastewater. In other words, no two CWs are exactly alike.

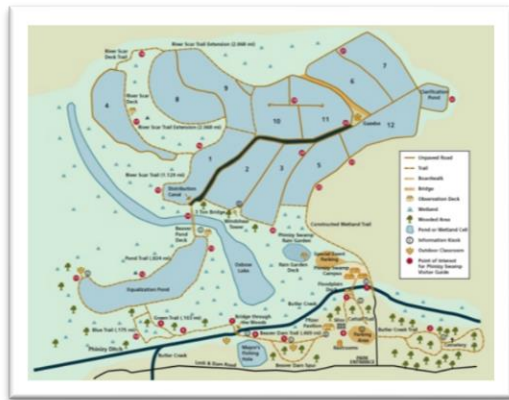
Phinizy Swamp

I had the opportunity to visit the CW located in the Phinizy Swamp of Augusta, GA and saw how it was constructed. The original design of the CW in Augusta, GA, was to act as a secondary treatment site for the wastewater treatment facility and to be able to send the water

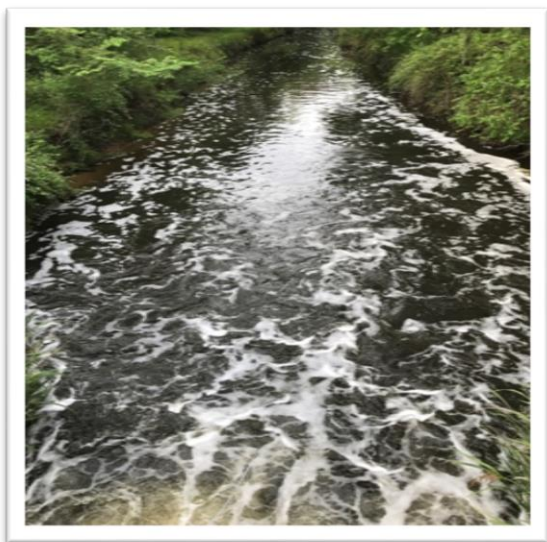
back out into the Savannah River. The system was very successful, but the modernization of the wastewater treatment facility has rendered the CW tertiary though it is still in action and processes over 28 million gallons of treated water daily. In 1997, when it first opened and when it was still secondary treatment, the CW treated water was tested for NH₃-N and BOD₅ and both results came back as “consistently below the NDPES^{xxxiii} permit limits of 1.5ppm and 10ppm respectively, throughout the study period” (Eidson 2005). This means that the water was safe for human consumption after the water completed its 6-7 day journey through the bio-filtering process. Today, the system, in its tertiary status, is a back-up in the event the primary and secondary wastewater treatment plant fails. Now, I would like for us to look at a CW in the United States that is fully functional, secondary and is responsible for recycling a significant amount of wastewater for the local community.



7- Phinizy Constructed Wetland (Outdoors Editor 2004)



8-Phinizy Swamp Map (Phinizy 2016)



9- Clean water leaving the Phinizy CW (Photo Credit – Adam Blocker 2017)



10-Plants removing ammonia and nitrates from the water (Photo Credit – Adam Blocker 2017)

Clayton County, Georgia

Clayton County, GA boasts the world's premier CW site that is secondary to the county wastewater treatment plant. In a state that is in conflict with other states over access to the water in the Apalachicola-Chattahoochee-Flint River basin (ACF), the county's CW plan is able to

recycle 69% of the water used by the county (the CW site can recycle 17.4 mgd, while the county uses 25 mgd). Furthermore, the site boasts of “significant energy savings ... [and instead of using 100 to 150 acres of land to treat 1 mgd through irrigation] now only needs 20-25 acres for wetlands treatment” (CCWA 2017). This is significant and is similar to what Pournelle quoted as an estimate for building CW sites in Basrah. She estimates that the CW site can be constructed in Basrah in as short as six weeks and cost \$250,000 to complete. A sustainable “supply line” is in place along with the expertise and the professionalism of the University of Basrah that maintains cooperation with USC (Pournelle 2017).

If, according to Pournelle, other communities along the Tigris, Euphrates, and Shatt al-Arab also constructed sustainable CWs with a sustainable supply chain, it is entirely feasible to restore water potability to the millions of Iraqis who are still water insecure. This would ensure one aspect of good governance and contribute to both short and long term water security.

CHAPTER 5: Conclusion

Iraq and the other countries in the Mesopotamian Basin are facing considerable upheaval for the foreseeable future. Iraq is facing fissures between ethno-sectarian groups and with countries such as Turkey and Syria. Despite monumental efforts to rid Iraq of ISIL, tensions and potential violence against Sunni populations as repercussions for ISIL violence remain likely outcomes. Kurdish populations have shown indicators seeking a separate state solution, and Iran's involvement with the government in Baghdad may very well increase, creating tension between Iraq and her allies as well as with Turkey. Where does this leave US efforts when it comes to peace and stability for a region that is likely going to see continuing violence for the near future? Where should the US and other actors focus their efforts? Through this thesis I have argued that the US must focus on what we are confident can be accomplished now to help lay the foundation for what could be accomplished tomorrow and how we can support the Iraqis in self-determination.

In conclusion, I argue that the US needs to do the following:

1. Work through the local government to restore drinking water for people along the rivers. These efforts must be sustainable through local supply systems and ministries to support effective and lasting governance. Focus should first be on water security for areas such as Basrah, due to the pre-existing model, to help develop independent solutions such as constructed wetlands to strengthen local governance. I have demonstrated how CW works in the United States and how there is a "supply chain" of support and technical knowledge that has been developed between U of SC and the University of Basrah. This effort should be supported, championed, and established as an example of how to restore water security at the local level.

2. Riparian agreements between Iraq, Turkey, Syria, and Iran must be created and implemented. Turkey (and Iran to a lesser extent) holds significant control over the water-flow in the Mesopotamian Basin and thus any agreement must be seen as inclusive of Turkish and Iranian interest. The threat of dust storms and mass migrations can be an incentive for Turkey to find it is in their best interest to help Iraq develop water security.

Apart from that, the only other option Iraq has is to leverage external powers such as the US, EU, UN and/or Iran. There are significant risks to any agreement due to ISIL in northwestern Iraq, Al Qaeda in Syria, and the Kurdish situation within Iraq and with Turkey. These bilateral and regional dynamics will come into play in any negotiations. Consequently, this will make any effort very difficult, but not impossible. What is important is that the discussions begin.

With Turkey being the primary shareholder of water resources, the external power that is able to help negotiate any riparian agreement would have to have significant leverage over Turkey. It is possible, with Turkey's recent overtures towards the EU that the EU would have more bargaining power than the US might. However with Turkey having just voted to grant Erdogan significantly more power, the future of any previous Turkish pursuits towards the west are questionable. Regarding the marshes and the Shatt al-Arab, the other key player is Iran. With a rise in Iranian influence and cooperation in Iraq it is easy to assume that riparian agreements between the two countries could be made. However, the geopolitical issues between Iraq and Iran are tenuous and suspect, and as such, are beyond the scope of this research. What is important is that any riparian agreement that will be successful should be led by regional actors.

In order to implement the above recommendations, I suggest the US assemble a team of personnel consisting of hydrologists and agricultural scientists. The team should have experts familiar with Middle Eastern negotiations and extensive knowledge of cooperation theory. Personnel on the team must have an academic and lingual element such as Middle Eastern and Iraqi experts or academics. Finally, the team should incorporate State Department diplomats, military personnel with strategic expertise,^{xxxiv} and a security element^{xxxv} to pursue the following:

1. Determine a strategic end state with regards to a riparian agreement and water security that is synchronized with US interests and develop a realistic course of action that could be quickly approved by Washington.

2. Develop a local plan for Basrah, as a test subject, that is synchronized with Baghdad's vision of water security with the long-term vision of duplicating the Basrah results in other cities.

This last part will only be successful and enduring as long as Baghdad is clearly involved as the overseer, and the local governments have the latitude to meet their water security needs as appropriate to the area. If this can be accomplished, then it is realistic to believe that the US can help Iraq reestablish water security which is a fundamental ingredient to restoring stability in Iraq.

Table 3- Annex A – Major Events in the Mesopotamian Basin

TABLE 3

Chronology of major events in the Euphrates-Tigris River Basin

Year	Plans/projects/treaties/conflicts	Countries involved	Main aspects
1914	Al Hindiya dam on the Euphrates	Iraq	For flood control and irrigation purposes
1920	Treaty regarding utilization of the waters of the Euphrates and the Tigris rivers	France and Great Britain	
1930	Turco-French Protocol	Turkey and France	Coordinates any plans to use the waters of the Euphrates.
1946	Treaty of Friendship and Good Neighbourly Relations	Turkey and Iraq	Extended the principle of mutual cooperation over water development in both rivers. Sharing of related data.
1951	Ramadi Habbaniya dam on the Euphrates	Iraq	For flood control and irrigation purposes.
1960s	Start of the construction of the "Third River"	Iraq	565 km canal between the Euphrates and the Tigris (completed in 1992).
1970s	Construction of several canals	Iraq	Linking Lake Thartar to the Euphrates, and connecting the lake with the Tigris.
1973	The Kevan dam	Turkey	First dam on the Euphrates for Turkey. Construction started in the 1960s. For hydropower purposes.
1973	The Tabqa dam	Syrian Arab Republic (with the help of the USSR)	First dam on the Euphrates for the Syrian Arab Republic, to meet water and energy needs.
1975	Filling of the Tabqa dam conflict	Syrian Arab Republic and Iraq (Saudi Arabia and possibly USSR mediated)	Major sources of conflict between Syrians and Iraqis addressed. Finally the Syrian Arab Republic released more water from the dam to Iraq.
1976	Release of 350 m ³ /s from the Euphrates downstream	Turkey	Prevented tension between the Syrian Arab Republic and Iraq, regarding the filling of the Tabqa Dam.
1977	Southeastern Anatolia Project (GAP)	Turkey	Turkey announced plans for GAP, which included 22 dams and 19 hydropower installations on the Euphrates-Tigris.
1983	Establishment of Joint Technical Committee for Regional Waters	Turkey, Iraq, and the Syrian Arab Republic	Dealing with water issues between the basin riparian countries, to ensure principles of consultation and notification as required by international law. This group disintegrated after 1993 without any progress having been made.
1984	Turkey proposes a "Three-staged plan"	Turkey (indirectly Syrian Arab Republic and Iraq)	For optimal, equitable and reasonable utilization of the transboundary watercourses of the Euphrates-Tigris basin. Conforms to the principle of equitable utilization.
1985	The Haditha dam	Iraq	Dam on the Euphrates river to produce hydropower.
1986	The Bath dam	Syrian Arab Republic	Second dam on the Euphrates for the Syrian Arab Republic. Small-scale electric generation and small amount of water for irrigation.
1987	Informal agreement guaranteed 500 m ³ /s of the Euphrates from Turkey to the Syrian Arab republic	Turkey and the Syrian Arab Republic	The Syrian Arab Republic has accused Turkey of violating this agreement a number of times.
1988	The Karakaya dam	Turkey	Second dam on the Euphrates. First dam built under the GAP. For production of hydropower.
1990	Agreement between the Syrian Arab Republic and Iraq to share the Euphrates water	Syrian Arab Republic and Iraq	The Syrian Arab Republic agrees to share the Euphrates' water with Iraq on a 58 percent (Iraq) and 42 percent (the Syrian Arab Republic) basis. Corresponds to a flow of 9 km ³ /year.
1992	Completion of the Atatürk dam	Turkey	Third dam on the Euphrates for Turkey, the most important one under the GAP project. For irrigation and hydropower. The filling of the dam, shutting off the river flow for a month, causes conflict with Syrians and Iraqis.
2001	Joint Communiqué	GOLD (Syrian Arab Republic), and GAP-RDA (Turkey)	Supporting training, technology exchange, study missions, and joint projects.
2002	Bilateral Agreement concerning the installation of a Syrian pump station on the Tigris river	Syrian Arab Republic and Iraq	For irrigation purposes.
2008	Cooperation on water issues by establishing a water institute	Turkey, the Syrian Arab Republic and Iraq	18 water experts from each country to work toward the resolution of water-related problems.

(Aquastat 2009)^{xxxvi}

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ENDNOTES

ⁱ Partitioning was introduced in Berlin after WWII, Sudan in 2011, after the dissolution of Yugoslavia with the Dayton Accords in 1995, and with the Middle East. There are multiple assumptions that the partitioning of the Middle East was a result of the Sykes-Picot agreement in 1916, however, Toby Dodge argues that Sykes-Picot was merely an informal agreement and that the division of the Middle East actually resulted from "a series of multilateral peace conferences and meetings by a region and an international order that had been transformed after the war (Dodge 2014). To further this argument, Dr. Sara Pursley argues that the Sykes-Picot deal is a myth. She says that the lines that eventually separated the Mesopotamian states were fought over and agreed upon by the states themselves. She says that the idea of a Kurdistan is not far-fetched because it is a long-standing narrative, but the idea of separating the Sunni and Shia in Iraq "is a very bad idea" (Wing 2015).

ⁱⁱ Former Senator Joseph Biden Jr. (Biden and Gelb 2006), Former UN Ambassador John Bolton (Bolton 2015), and the Brookings Institution (Dews 2014) are among the higher profiles that have argued for partitioning on various levels. Williams and Simpson (Williams and Simpson 2008) argue, through an in-depth analysis, that partitioning the State of Iraq along ethno-sectarian lines would be virtually impossible without massive population transfers and the people are so intertwined between religious sects, that it would tear apart Iraq, down to the familial level.

ⁱⁱⁱ "This really began in 1899 under the Sultan Abdul Hamid II upon the discovery of oil by Calouste Gulbenkian (Coughlan 1950). Abdul Hamid II ensured that the lands identified by Gulbenkian as being oil-rich, were placed in his "liste civile" (saniyya) (Jwaideh 1965; FTC 1952). The [saniyya] lands were then seized by the Young Turks (Coughlan 1950) when they overthrew the government and they have remained in the government's hands ever since" (Blocker 2016).

^{iv} There are a large number of sources regarding the salinity and infusion of pollutants into the Tigris, Euphrates, Shatt al-Arab, and their tributaries. These sources will be discussed and annotated throughout the paper as applicable.

^v The majority of Iraqis polled (ORB 2015), believe they can put aside their differences and come back together again as a people. There are a variety of forces that are working against this idea to include Iran, ISIL, and potentially Turkey and the Kurdistan Regional Government (KRG) (Coles 2016; Unal 2017; STRATFOR 2017; al-Jazeera 2017; Berthiaume 2017).

^{vi} Partitioning the country would involve separating the majority of the Kurds,^{vi} Sunni, and Shia in various parts of the country. There are two primary theories of how to do this. The first would be to create semi-autonomous states in a federalized manner much like the United States. The other is to partition the regions into independent states much like the Kurds would like to do in Northern Iraq (Berthiaume 2017). There are numerous issues with either approach, however, the primary hindrance if we are to compare these states to the Kurds is that the Kurds already have an effective government that is providing basic services, not considering lands controlled by ISIL (Marcus 2015), whereas the Government of Iraq is failing in providing these services. The federal government would handle all international issues and any issues, such as oil-revenue sharing that would affect the various semi-autonomous states. This format is consistent with Article 117 of the Iraqi Constitution (Biden and Gelb 2006).

^{vii} The other three are war, sanctions and looting

^{viii} To complicate matters further for Iraq, a large portion of Iraq's electricity comes directly from Iran. As recently as January 4, 2017, Iran stopped supplying electricity to some areas of Iraq until the Iraqi government paid \$1 BIL in arrears, which it did, and Iran turned the electricity back on (ITNA 2017). This is another indicator of Iraq's increasing dependence on its neighbors. Iraq is an energy-rich country and if it were able to practice good governance, it should be an energy exporter.

^{ix} Partitioning would only breed deeper levels of sectarianism. Christopher Phillips, though writing about the sectarian divisions in Syria, alludes to the fact that sectarianism is simply one of many layers of personal identity, and that it can be easily manipulated by power-seeking forces just like any other, i.e., “Workers of the world unite”. The problem lies, not in the appeal to one’s identity with a sect, but whether the opposing parties react to the ethno-sectarian differences. We are observing this as Bashar al-Assad campaigns against the primarily Sunni rebels with the assistance of Iran in the fight against ISIL. Reactions such as Assad’s can indeed harden those identities and make it very difficult to return to a state of normalcy that does not separate sectarian identities for political participation (Phillips 2015). These same ethno-sectarian differences slammed into the Iraqi psyche with the arrival of Zarqawi who in 2003 began his targeting of “Shiite leaders, Shiite mosques and shrines and Shiite holy days for extreme acts of violence ... [in an effort to reap] grim justice on Shiite ‘heretics’” (Riedel 2013).

^x The concept that civilizations were built around the need for people to develop a riparian infrastructure is often thought of as a “Hydraulic Hypothesis” that was popular during the 20th century through authors such as Wittfogel and Arnold Toynbee. More modern studies, conducted with the aids of GIS and CORONA (satellite imagery) have led to conclusions that hydraulic structures were harnessed by the early empires of Mesopotamia in order to project power and “enhance their economic strength” (Rayne 2014; Harrower 2009). This means the need to harness the power of water came *after* the civilization was created, not before as Wittfogel and Toynbee suggested. This is evidenced today where a lack of governance leads to a reduction in water production capacity in Iraq (Aenab and Singh 2012) and Syria (Rayne 2014) resulting in economic loss and hardship.

There are two basic theories about the rise of civilizations and their connection to water. Karl Wittfogel, though controversial in many areas, made a sound argument (at the time) in *Oriental Despotism* when he argued that states with limited water resources, or states with annual hydro-disasters, came together in centralized, authoritarian ways in order to take advantage of the power that control over the simultaneous life-giving and destructive power that water has. He argued that states were successful because they were able to centralize that power and administer it accordingly. Harry Verhoeven, however, argues against this logic by citing the breakdown in hydrologically centralized societies because of the centralization. He uses Mohammad Ali of 19th cen. Egypt as a prime example of how the centralization of power over hydrological infrastructure causes a breakdown in utility as the centralized state cannot adequately control the details that require a micro view, whereas the local authorities can. This is important for this study because we will see shortly the value of allowing local authorities latitude to initiate programs to improve water security, under an overall federal plan, since every region is different and has varying topography.^x

^{xi} A dust storm, according to the World Meteorological Organization (WMO) “is the result of surface winds raising large quantities of dust into the air and reducing visibility at eye level (1.8m) to less than 1000 m (McTainsh and Pitblado 1987) (UNEP 2016), and a Severe Dust Storm reduces visibility to less than 200m. Sand storms differ in that the “particles are larger than about 0.06 mm (60 microns)” (UNEP 2016). Essentially, the storms are “dusty aerosols, lofted into the air by the wind-erosion of dry, loosely-packed soil ...” (Miller and Tegen 1997).

^{xii} The marshes have been collecting heavy metals and toxins for an unknown amount of time. Heavy metals can be naturally occurring due to natural decomposition, however, some of the heavy metals detected are from substances such as raw sewage being dumped into the water further upstream (Salman 2011; Abo-Ksour 2016). Dust storms pick up toxins from loose soil and aerosolizing them (Pirasheb, et al. 2014; Kennedy 2014).

^{xiii} It is important to note here that though sanctions and the subsequent invasion of Iraq in 2003 did cause significant damage to the government’s hardscape infrastructure, Saddam deserves a significant amount of the blame as well. One of the Ba’athist themes was modernization of the marshes in Southern Iraq. The indigenous people, were seen as backwards and needed to be brought into the modern age. Saddam began drying up the marshes with infrastructure projects long before he invaded Kuwait in 1990 (Ahram 2015). Additionally, “130,000 tons of munitions were dropped on Iraq in a 43-day span in 1991, devastating infrastructure such as power plants, water facilities ... although there is a programme [sic] for the rehabilitation of dams and hydroelectric plants, **security and governance** issues have slowed its progress” (Shamout and Lahn 2015).

^{xiv} When Iraq withdrew from Kuwait and the Shii rose up against Saddam in Southern Iraq, he reduced the swamps to 30% in his effort to deprive the Shii of the cover and concealment the marshes provided (Ahram 2015).

^{xv} See Endnote VIII

^{xvi} Regarding dams and the loss of water, most of the actual water loss from a dam is from reservoir evaporation and when the reservoir is filling up.

^{xvii} One of the many justifications given by the Turkish government over the Ilisu Dam, is the idea that the resulting electricity will help draw the affected Kurdish population out of poverty and that the “increased levels of prosperity will eliminate Kurdish dissatisfaction” (Erickson and Lorenz 1999).

^{xviii} One solution is to use a monolayer on reservoirs to help prevent evaporation (Ikweiri et al. 2008). This can be applied with a powder that spreads across the water and is reported to decrease the evaporation level in this particular case study, by 16.25%.

^{xix} In addition to Iraq’s food insecurity, neighboring Syria, as of November 2016 is “about 7 million ... food insecure and a further 2 million are at risk of food insecurity (FAO 2017).

^{xx} As of 2016, the Net Migration Rate for Iraq was 1.5 per 1,000 in 2011 (CIA 2016). **Migrants:** The literature regarding *Crisis Migrations*; *Environmental Migrants*; *Climate Refugees* is consistent in that it calls for the recognition by the international ruling bodies to grant people in these categories a protected, legal status (States News Service 2017; Martin 2013; FOE 2017; Bates 2002; Kerwin 2016). As they are, the people who have to leave their homes due to circumstances, such as environmental catastrophes or drought, often are forced to do so due to their circumstances. Typically, according to the literature, these movements are en masse and cause significant stress on the urban hardscape architecture of the cities they migrate to. This in turn causes these cities (or countries) to react in a variety of ways, some of which have given rise to the call to grant these migrants legal status which will help guarantee legal protection of their human rights. “Migrants choose to move not because of a direct threat of persecution or death, but mainly to improve their lives by finding work, or in some cases for education, family reunion, or other reasons” (Edwards 2016).

Environmental, Climate, or Crisis Migrant: These descriptions define individuals who have fled their homes due to environmental, climatic, or crises situations. They typically remain within the borders of their home country; however, they will often cross international borders into other states. In the context of this thesis, these migrants are crossing into Iran, Syria, Turkey, and Europe (IOM 2016). The primary difference between this type of migrant and a refugee is that this migrant does not receive legal protections under any international law (Martin, Weerasinghe, and Taylor 2013; FOE 2017).

Internally Displaced Persons: “An internally displaced person (IDP) is a person who has been forced to flee his or her home for the same reason as a refugee, but remains in his or her own country and has not crossed an international border. Unlike refugees, IDPs are not protected by international law or eligible to receive many types of aid. As the nature of war has changed in the last few decades, with more and more internal conflicts replacing wars among countries, the number of IDPs has increased significantly” (1951 Refugee Convention 1951).

International Migrant: “An international migrant is a person who is living in a country other than his or her country of birth” (UN 2016).

Refugee: “A refugee is someone who has legal status and has been forced to flee his or her country because of persecution, war, or violence. A refugee has a well-founded fear of persecution for reasons of race, religion, nationality, political opinion or membership in a particular social group. Most likely, they cannot return home or are afraid to do so. War and ethnic, tribal and religious violence are leading causes of refugees fleeing their countries” (1951 Refugee Convention 1951).

^{xxi} The economy is in tatters causing economic insecurity. During the rebuilding phase of Iraq after the US invasion of 2003, the US was expecting the Iraqi oil industry to accelerate but by 2017, Iraq has failed to meet its original goals which the former (<2003) Iraqi Oil Minister Fadhil al-Chalabi, had overestimated a daily production of 12 million b/d for Iraq (Bakhtiari 2003). Prior to the 2003 invasion, the Iraqi economy had fits and starts, but between the Iran/Iraq War and US sanctions after Iraq’s 1991 invasion of Kuwait, the infrastructure suffered enormously, especially the oil industry since they were not able to obtain the parts they needed for repairs (Currency Liquidator 2014). For example, in 1980, Iraq was producing 2,526,000 bpd and was #4 in the world for productivity. However, the Iran-Iraq War took a heavy toll as well as the invasion of Kuwait and the sanctions that followed. By 1993, Iraq had fallen to #25 (523,000 bpd) but soon after the US-led invasion, Iraq began to increase oil production so that by 2010 it was #13 (2,398,000 bpd) and by 2015 #6 (4,050,000 bpd) (EIA 2015). Estimates made by WOCAP in 2001 estimated that by 2010, Iraq would be producing 5,560,000 bpd and Wood MacKenzie estimated by 2012 Iraq would reach a maximum output of 6,800,000 bpd (Bakhtiari 2003). All predictions fall far short of reality because back in 2002, the world did not realize ISIL would be in existence and would be 1- stifling production in the north and 2- forcing Iraq to focus the majority of its efforts on eliminating the threat when it could be rebuilding its economy. Iraq is home to the 5th largest oil reserve in the world (EIA 2015). With oil prices reaching a peak in June 2008 (\$155.36 p/b) to the low in March 2017 (\$53.23 p/b) (WTI 2017), the Iraqi economy cannot sustain itself

without international assistance. When considering international assistance, the World Bank issued a report in Spring 2016 that characterized the Iraqi economy as being hit by two crises; the insurgency in the north and the lower price of oil. 2016, according to estimates, had a negative account balance (%GDP) of -15.3 and 2017 is projected to improve slightly to -9.0. However, that does not bring immediate relief to the high unemployment rates that have been caused by the insurgency in the north (41.2% poverty rate in 2014), the drop in oil prices (an aggregate of 22.5% poverty rate in 2014 due not just to oil prices, but to the entire network of employment that is directly and indirectly affected by the industry) (World Bank 2016), and a decrease in agricultural jobs in the north due to conflict and the decrease in agricultural production in the south due to increased salination of irrigated lands and the continued lowering of the water levels in the Shatt al-arab (Ahram 2015). Keep in mind that the majority of the cereal production (rain fed farming region) is in the north where ISIL has seized control, requiring Iraq to increase its import efforts (FAO 2017; FAO 2012) while in the south and central Iraq, which relies primarily on the Tigris, Euphrates and tributaries for irrigation, “mixed farming systems are predominant”, i.e., vegetables, date palms, fruit trees (FAO 2012).

^{xxii} Due to the constant fluid nature of Iraq due to IDPs and conflict, obtaining accurate numbers are difficult at this time. There are a significant number of projects aimed at ensuring water security in Iraq and it would appear, because of this, that the numbers would be shrinking. However, the facts remain that water insecurity is very real and must continue to be evaluated. It is also equally important that the solutions found, are locally tenable and able to be maintained long after international efforts have ceased.

^{xxiii} In February 2017 a series of dust storms affected Ahvaz, Iran, effectively shutting down the power plants and reducing the oil capacity by about 700,000 bpd (Paraskova 2017). The blame was placed on Iraq, but Iraq is hardly to blame. A series of pre-Islamic Revolution dam projects were completed beginning with the Dez Dam in 1963, to the Karun River Dam in 1978. The current Iranian regime has since built several other dams in order to harness power, provide irrigation for agricultural sectors, and to control flooding. The intent was to control annual flooding (which was blamed for land salination), and to help establish controlled irrigation practices, and to provide electricity (BGR and UN-ESCWA 2013). However, as with most dams in the Mesopotamian Basin, the results downstream can be disastrous, especially since the Karun flows into the Shatt al-Arab. Meanwhile, protesters who speak out against the Iranian government’s seemingly lack of response to the drying conditions of the Karun River in vicinity of Ahvaz, are being detained (HRANA 2017).

^{xxiv} In the 1970s, prior to the Iran/Iraq War when Saddam accelerated the draining of the marshes, there were an estimated 18 million date palms in the region (BGR and UN-ESCWA 2013).

^{xxv} The ranges allow for seasonal differences. The winter months see a higher flow introduction of TDS as opposed to the summer months (Al-Saad, Al-Hello, et al. 2015).

^{xxvi} The years 2009-2010 saw a drought which may explain some of the loss to the marshes and is not entirely unnatural.

^{xxvii} Throughout any search you will find advances for the cause of the marsh and you will find loss. The intent of the photographs is not to instill a sense of despair but rather to reinforce my point. Azzam Alwash, an engineer out of California is an advocate for the marshes with the government of Iraq and has made significant progress. It would be wise for any US group that is planning on addressing this situation, to identify the key players who are already working the issues (Aikins 2015).

^{xxviii} The Turkish version of the plan, as of the 1990s, can be seen in this document (Republic of Turkey 1993).

^{xxix} The meetings were suspended in 1992 but reconvened in 2007.

^{xxx} As an indicator of the current priorities, Iraqi AMB to Ankara, Dr. Hisham al-Alawi, spoke with Ankara about removing Turkish troops from the Iraqi town of Bashiqa but did not mention water; at least it was not reported. The Turkish troops are stationed in Bashiqa at the invitation of the KRG – Iraq seems powerless to do anything about it (Unal 2017).

^{xxxi} Dr. Aaron Wolf of Oregon State University, is one of the leading scholars of OSU’s “Transboundary Freshwater Dispute Database, which currently includes a computer database of 150 water-related treaties and 39 US inter-state compacts, catalogues by basin, countries or states involved, date signed, treaty topic, allocation measure, conflict resolution mechanism, and non-water linkages” (Wolf and Medzini 2001).

^{xxxii} An example of how the provision of utilities (SWEAT – Sewer, Water, Electricity, Academics, and Trash) helps to lower insurgency operations comes from the deployment of the 1st Cavalry Division from 2003-2004 under MG Chiarelli. MG Chiarelli’s staff found that “the insurgency was strongest in areas with little or no [services]” and that

by addressing these issues strongly influences the “fence sitters”. Furthermore, “[they] found that where services were restored, insurgent attacks fell sharply” (Mosher 2008).

^{xxxiii} NH₃-N (ammonia), BOD₅ (dissolved oxygen required for organisms to break down organic matter) (EPA 2017).

^{xxxiv} The diplomatic and military personnel do not need to be current employees of the USG, however, they must be able to either make decisions, or be in direct contact with USG officials who can make decisions.

^{xxxv} This team must be prepared to conduct site visits in Iraq in unsecure areas. Security will be important due to the fact that Iraq is not secure from a western-point of view and due to the proximity of Iranian-backed militias operating freely in the area.

^{xxxvi} As of April 2017, there is not any evidence of further agreements between Iraq, Turkey, and Syria regarding water and the JTC.