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"Water resources availability, exploitation and management as an environmental security factor and a cause of tension and potential conflict in Southeast Mediterranean Politics"

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ΥΠΕΥΘΥΝΗ ΔΗΛΩΣΗ

1. Δηλώνω ρητά και ανεπιφύλακτα ότι η διπλωματική εργασία που σας καταθέτω αποτελεί προϊόν δικής μου πνευματικής προσπάθειας, δεν παραβιάζει τα δικαιώματα τρίτων μερών και ακολουθεί τα διεθνώς αναγνωρισμένα πρότυπα επιστημονικής συγγραφής, τηρώντας πιστά την ακαδημαϊκή δεοντολογία.

2. Οι απόψεις που εκφράζονται αποτελούν αποκλειστικά ευθύνη της συγγραφέως και ο επιβλέπων, οι εξεταστές, το Τμήμα και το Πανεπιστήμιο Πελοποννήσου δεν υιοθετούν κατ' ανάγκη τις εκφραζόμενες απόψεις ούτε φέρουν οποιαδήποτε ευθύνη για τυχόν λάθη και παραλήψεις.

Table of Contents

List of Maps

Images

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"Water resources availability, exploitation and management as an environmental security factor and a cause of tension and potential conflict in Southeast Mediterranean Politics"

Keywords: Mediterranean, MENA, Water scarcity, Transboundary water resources, Shared water bodies, Upstream countries, Downstream countries, Water conflict

Abstract

The purpose of this dissertation is to analyze the effects of the water stress in certain areas of the Mediterranean and the interstate political tensions arising from the presence of extended transboundary water reserves in the region, which are being exploited by two or more neighboring countries, many times sharing a past of political, religious or ethnic conflicts. In the first chapter, we are referring to the concept of water security and the recurrent incidents of the use of water as a war weapon. In the second chapter, we describe the effects of climate change in MENA's water scarce region, accentuated by the exploding population growth and the local food production. In the following chapters, we examine water related tensions in the Balkans' area and Cyprus, while further on, we analyze the balances in the hydro-political complexes formed by the countries sharing the Tigris and Euphrates waters, the ones sharing the Jordan river basin and its surrounding water bodies and the countries sharing the waters of the Nile river in Africa. Finally, we pinpoint strategies for overcoming the region's water scarcity and we conclude by suggesting ways of avoiding conflict and enhancing cooperation between countries sharing transboundary water resources.

1. Introduction

Water is a resource of paramount importance for the people's survival and well-being. The value of this substance for humanity was recognized since the times of the ancient civilizations in Mesopotamia, also known as "hydraulic" (Al-Ansari, 2016, p.142), due to the large-scale irrigation constructions they had built, in order to better exploit the water resources of the area. In fact, in the code of the Sumerian king Hammurabi, many of the laws dating back to 1790 BC, regulate matters of management, negligence or theft of water (Holst-Warhaft, 2014, p.10). For the Muslims, water is considered to be a gift from God and it was traditionally a resource free for everyone in the Mediterranean and the MENA region. In addition to its self-evident value, this resource has become even more important in a state level during the last five decades, due to the water stress that several countries are experiencing, especially in arid or semi-arid areas of the world. In this thesis we are going to focus our research in the South Eastern parts of the Mediterranean and especially the countries located in the Middle East and North Africa, a semi-arid region in its majority, experiencing water shortages, significantly exacerbated during the last decades by factors such as climate change, demographic pressures and overexploitation of water resources for agricultural purposes. It is estimated that food production is the biggest water consumer worldwide, amounting between 80 to 90% of global water consumption (Hezri, 2013, p. 4). The persistence of many Middle-Eastern countries to invest heavily in their agricultural production, despite its toll on the local water resources, instead of developing other sectors of their economies, can be explained by their food security perceptions and their obsession of achieving self-sufficiency in food supplies and independence from international markets.

The increasing water stress in the area, combined with the transboundary nature of most water resources, has created and continues to create interstate tensions among the countries that share them. Almost 90% of the Balkans' water resources are transboundary and over 70% of the water resources in MENA are located in transboundary basins (Scoullos, 2014, p. 6). There are two kinds of shared river bodies, the "successive" ones, shared by upstream and downstream countries and the "contiguous" ones, whose opposite banks belong to different states and form their borders (Dinar, 2011, p. 172). While in the latter case, the incentive for cooperation is evident, due to the reciprocity of benefits or

ills for both neighbors by the way they both exploit the shared water body, in the case of "successive" rivers, upstream countries have the upper hand, since they control the headwaters and can exploit the flows of the river in a way contrary to the interests of the downstream country, by diverting the river's course or by building dams and canals for the production of hydropower or for agricultural use. In this case, the flow of the river in the downstream country can be significantly reduced in quantity, but also deteriorate in quality, since the incoming water may be severely polluted, due to the use of pesticides and fertilizers by the upstream country. A significant decrease of the water flows could also result in soil erosion and increasing salinity of the available water. Despite the geographic advantage of upstream countries compared to the midstream or downstream ones, if the downstream state holds a hegemonic status in the hydro-political security complex formed by the countries sharing the water body, due to its political and military might, it can use its leverage on the upstream riparian, forcing it to accept an agreement that regulates the flows of the shared river in a favorable manner for the downstream riparian. Furthermore, if the downstream country is heavily dependent on the shared river for its overall water supply, it could perceive as a hostile act against it, any decision of the upstream country to exploit the shared river body, for instance for the production of hydropower, even if the upstream riparian's intention is just to boost its economic development and not to harm its downstream neighbor.

1.1. Water security and weaponization of water

It is undisputable that water security, defined as the safe access of a population in adequate quantity and acceptable quality of freshwater, in order to maintain their livelihoods, be protected from waterborne infections and water caused disasters, boost their socio-economic development and preserve their ecosystem (Delev, 2015, p. 7), is essential for a country and its citizens. Furthermore, according to the Resolution on the Human Right to Water and Sanitation adopted by the UN General Assembly in July, 2010, drinking water which is safe and clean, and adequate sanitation are recognized as essential human rights (Hefny, 2011, p. 24). The way states react when transboundary water bodies' management issues arise, depends on their perception of the water. If the water is regarded essentially as a commodity, then it acquires a utilitarian value and it is considered just a possession, but if it is seen in a symbolic frame, its limited value increases (Vuković, 2008, p. 82). Especially under scarcity conditions, it can become part

of the political rhetoric and be linked to national identity and national security narratives. According to water war thesis theorists, as water becomes more and more scarce and the world population increases, the 21st century will be plagued by water wars. Nevertheless, the only water war recorded in the history of the region, that was caused by a dispute over access to irrigation, took place in 2500 BC, when Urlama, king of the city state of Lagash, located in ancient Mesopotamia, diverted border canals to cut off water from the neighboring kingdom of Ummah (Gleick, 2014, p. 332). Many other disputes recorded from antiquity till now, were not fought over water itself, but water was repeatedly used as a weapon of war through the poisoning or the filling with sand of the enemies' wells and through targeting, diverting or destroying the enemies' irrigation systems, in order to flood the enemies' areas or deprive them of water. According to the International Committee of the Red Cross, the infrastructure related with water supply and sanitation has become a direct target of recent or longstanding conflicts in the MENA area and during negotiations the conflicting sides occasionally use the issue of safe access to water as a leverage over the adversary (World Bank, 2017, p. 115). For example, in 2012, in the midst of fighting around Aleppo, its main water pipeline was targeted and damaged, resulting to water shortages in the supply of three million people. Another recent, striking example of water weaponization in the area, is the closing of the Fallujah Dam gates on the Euphrates by ISIS in April 2014, resulting to the flooding of 200 square miles, the subsequent destruction of crops and whole villages in Iraq and the deprivation of downstream Shiite regions of water (Wasinger, 2015, p. 98). In order to recruit more Sunni rebels from the local population, ISIS also spread the narrative that water scarcity was the result of a conspiracy of the Shia dominated Iraqi government, in order to deprive Sunni farmer populations of water in favor of Shias and displace them from their lands. Apart from the use of water as a war weapon, water scarcity turns water itself into a source of contention among neighboring countries sharing common water resources. Water stress in the region is exacerbated by various factors examined in the following chapters.

2. Water scarcity in MENA and the effect of climate change

Climate change is already a looming reality, acutely felt in the world's most arid or semi-arid territories, including parts of the South East of the Mediterranean. Around 85% of the MENA region is a desert due to its arid climate (Droogers et al., 2012, p. 3102). Various

studies project shifting weather patterns for the future, including higher temperatures, a decrease in rainfall, intense precipitations and a rise of the sea level. Increased temperatures imply a rise in the water demand for domestic and agricultural purposes. They also imply a reduction in the quality of the available water, since high temperatures favor the appearance of bacteria, algae and fungi in the water, rendering it dangerous for human consumption. Increased water demand implies further over-pumping of the groundwater through the local wells, something which advanced technologies have further facilitated, rendering the natural recharge of the groundwater aquifers, the so-called "blue water" extremely difficult. A decline in rainfall will result to the further desertification of the area, a lower yield in crops, since most of the agriculture in the area is rain-fed, and increased needs for water in irrigated agriculture. Lesser rainfalls could result to the decrease of the moisture on the ground that the soil can retain and the plants can absorb, the so-called "green water" (Hamdy, 2008, p. 16). A rise in very intense precipitations and storms for short time periods could result to the loss of great part of this rain water and to further soil erosion and degradation, since the soil will not be able to retain all the rain water falling with such intensity. Floods will become more frequent and they may cause dams to overflow or cause their storage space to lower, as a result of high levels of sedimentation (Brown and Crawford, 2009, p. 9). Floods could also have devastating effects on crops and livelihoods. Another climate change effect, namely the rise in sea levels, is already resulting to the erosion of the soil in the coastal areas and the intrusion of saltwater in coastal groundwater aquifers, thus degrading their water quality. Furthermore, a rise of the sea level is impacting on the marine habitat and fisheries and could pose a challenge for the operation of the area's desalination plants, upon which the Gulf countries heavily rely in order to cover their needs in water.

2.1. The effect of population growth on water resources

Another factor that adds on the region's water stress, is its overwhelming population growth. More than 300 million people live in the MENA area, from whom around 45 million have no access to safe water. This is an indicator of severe water scarcity, that is defined as the extent to which demand exceeds the resources available for consumption. In 2005, according to the World Bank's projections, the population in the MENA area was expected to grow from 311 million people to 430 million in 2025. In addition, a 3 to 4% growth rate in the area is increasing the potential of conflict over water (Tropp and

Jägerskog, 2006, p. 3). A distinct characteristic of the population growth in the region is the overwhelming percentage of very young people in comparison to other age groups. Almost 50% of the population in Palestine and over a third of it in Syria were reported to be younger than 15 years old in 2009 and it was estimated that the population in the occupied Palestinian territories would double over the following four decades (Brown and Crawford, 2009, p. 10). Iraq's fast-growing population is estimated to double by 2050, while the country is going to experience a 3% decrease in rainfall and a 10% decline of the Tigris-Euphrates rivers' discharge during the same period (Chenoweth et al., 2011, p. 15). The per capita renewable water resources in MENA have declined, due to this fast population growth, from an average 1.179,6 m^3 annually in 1992 to 743,5 m^3 annually in 2011, falling below the water poverty line of 1.000 m^3 annually (Oweis, 2014, p. 115). The aforementioned demographic trends exacerbate demands for food, water and shelter, increase poverty and social tensions and deepen the food security dilemma that makes many of the countries in the area favor the agricultural sector over their diminished water reserves, in order to feed their growing population.

2.2. Water reserves and agricultural production

As stated before, food production is the biggest water consumer in the world, using about 80% of water resources in the MENA region. In fact, irrigation accounts for the greatest water losses, since the methods used are inefficient and old, with the exception of Israel, that has invested heavily in updating traditional irrigation methods and in water saving technologies, using recycled wastewater, desalinated sea or brackish water and drip or sprinkler irrigation systems to lower the evapotranspiration and regulate the soil moisture, thus consuming far less water amounts. Increased use of water for irrigation in the MENA is conflicting with the growing need of water for domestic use, induced by the rise in temperatures and the growing population. While many countries of the region are promoting their agricultural sector in order to achieve food sufficiency to the detriment of their water resources, other ones, like Syria, which followed the same policies over the last decades, are now facing a decrease of the sector, due to the depletion of their water reserves and the advancing desertification, that has forced many farmers to abandon their lands and livestock and immigrate to urban areas without any possessions, surviving day by day, by doing various unskilled jobs. A similar situation was observed in Jordan during the last decades, where poor farmers had to leave their lands and livestock due to

scarce water availability (Tropp and Jägerskog, 2006, p. 6). The low input of the agricultural sector in most of those countries' revenues and the strain put on their already diminished water resources by irrigation, drives many experts to suggest a shift of local economies from agriculture to other sectors, for instance industry and services. When it comes to food availability, they suggest the import of food from water rich countries as a form of "virtual water", which is calculated by the following equation: 1.000 liters of water are needed for the production of 1 kg of bread (Hamza and Mason, 2005, p. 250).

3. Tensions over transboundary water bodies in the Balkans

The Balkans is a water rich region in comparison to the MENA countries, with many freshwater bodies and a regular rainfall rate. Nevertheless, the Balkans is an area marked by historical ethnic rivalries and violent conflicts, the most recent being the wars that led to the dismantling of the former Yugoslav Republic and the declaration of independence by Kosovo.

Map 3.1 The Drin river and its basin's transboundary lakes illustrated in the map of the Republic of North Macedonia

Source: Geology.com – Adapted from map accessed at website: https://geology.com/world/macedonia-satellite-image.shtml

Therefore, ethnic prejudices, previous conflicts and chronic mistrust between the countries of the area could be exacerbated by the issue of the shared water bodies' management, since the overwhelming majority of the water resources of the area are of transboundary nature.

Among those transboundary water bodies is the Drin river, one part of which originates in the Republic of North Macedonia and the other one in Kosovo. Both parts are united in Albania, where hydropower plants that produce 85% of the country's hydropower are exploiting this particular river. One of the sub-basins that form the Drin river basin, is the one of the Prespa Lakes, which includes the Micro Prespa located between Greece and Albania and the Macro Prespa located between Greece, Albania and the Republic of North Macedonia. Underground water is flowing from the Prespa lakes' sub-basin towards lake Orchid, shared by Albania and the Republic of North Macedonia. Despite the establishment of agreements, that regulate issues of ecosystem and water resources management, signed by riparians of all three transboundary lakes of the Drin basin, there was no coordinated cooperation (Scoullos et al., 2014, p. 64) until the signing of a Memorandum of Understanding in 2011 and the subsequent Drin Coordinated Action, aiming to prevent any conflicting management practice of the shared water bodies by the riparians and to survey the proper application of the international water low.

Map 3.2 The Danube river

Source:http:www.lahistoriaconmapas.com– Adapted from map accessed at website: https://www.lahistoriaconmapas.com/atlas/river-map/the-danube-river-map.htm and http://media.web.britannica.com/eb-media/44/99444-004-315309C8.gif

Two of the major points of tension in regard with shared water bodies in the Balkans, include the issue of flood control and the issue of pollution, that is acute in many of the Balkans' rivers. Unfortunately, poor water management, inadequate sewage treatment and industry-induced or fertilizers-related pollution caused by some countries, affect their fellow riparian countries. Serbia is a striking example, since all of the rivers entering the country are polluted and can be used for drinking only after advanced treatment and some of them are so polluted, that their waters can't even be used for irrigation (World Bank, 2003, p. 68). Such interstate pollution issues often create great tensions. For example, after the 2000 Baia Mare accident, which caused a cyanide spill, polluting part of the Danube river, Serbia and Hungary, that were severely affected, demanded compensation from Romania (Vuković, 2008, p. 88). Danube, the second longest river in Europe, flows inside or between many Balkan, as well as Central European countries and its drainage basin is shared by even more.

Map 3.3 The Evros/Maritsa river

Source: WIKIPEDIA File:Maritsa.png – Adapted from of map accessed at website: https://en.wikipedia.org/wiki/File:Maritsa.png

In regard with tensions deriving from flood control issues, we can refer to the case of the river Evros, which is shared by Greece, Bulgaria and Turkey. There are no recent interstate agreements regarding the river's water management and the past ones are not adequately observed. Lately, three major floods of the river took place, one in 2005, one in 2014 and one in 2015 respectively. Greece and Turkey blamed Bulgaria for the flooding of their territories surrounding the river, due to Bulgaria's poor water management. Bulgaria suffered both human and material casualties by the 2005 flood, after which all three countries signed an agreement to cooperate on the issue of flood control and protection and build the required infrastructure, namely dams on the Tundja and Evros/Maritsa basins to mitigate the effect of the floods (Delev, 2015, p. 33). Apparently, due to economic reasons, the infrastructure was not built and the agreement was not observed. The result was that during the 2014 flood, the dam's and the river's flow management on behalf of Bulgaria failed and in addition to Bulgaria, parts of Greece

and Turkey were also flooded, as it happened again in 2015. As expected, Greece and Turkey have repeatedly blamed Bulgaria for all of these events and interstate tensions have temporarily risen. Apart from the aforementioned rivers and lakes, other transboundary water bodies in the Balkans, shared between Greece and other countries, are the river Nestos/Mesta shared by Bulgaria and Greece, the river Axios/Vardar shared by Greece and the Republic of North Macedonia, the Strimonas/Struma river whose drainage area extends between Bulgaria, Greece and the Republic of North Macedonia and lake Doirani located at the borders of Greece with the Republic of North Macedonia.

Unlike the MENA area, tensions among riparian countries over transboundary water bodies in the Balkans arise from pollution or flood control issues, rather than issues of water sharing for human consumption or irrigation, since the level of water stress on the Balkan countries is far less acute. Nevertheless, according to scientific predictions, due to climate change effects and because of a predicted temperature rise of just 1.5^{o} C, the Mediterranean climate zones are expected to be moved 300-500 km northwards (Brown and Crawford, 2009, p. 9). As a result, the area will become more arid and the available water resources may be diminished. Greece is already using water from desalination plants as an additional public water supply source in water poor islands and tourist resorts. Therefore, good water management and water saving techniques and practices are also required in this part of the world.

4. The case of Cyprus

Cyprus is geographically located in the broader area of the Middle East. Therefore, it has a climate typical of the region, characterized by mild winters and hot dry summers. It is the third biggest island in the Mediterranean after Sicily and Sardinia. The population of the Republic of Cyprus was estimated in 2017 to be around 864.000 people. The yearly rainfall is about 500 mm, but it varies per region or time periods, as even three-year-long droughts have hit the island (Mediterranean Water Scarcity and Drought working Group, 2010, p. 23). The evapotranspiration amounts to 80% of the precipitations annually, due to the country's climate. The groundwater resources of the island are overexploited. As in other parts of the Middle East, this leads to the gradually increasing intrusion of saline water in the coastal aquifers, thus diminishing the quality of the water. Furthermore, pollution induced by agriculture, affects the surface water bodies. Nevertheless, the water coming from wells is still of good quality and without any chemical residues. The

population increase in the cities and tourism, especially during the summer, put an additional burden on the country's stressed water resources, and the island has come to be increasingly dependent on desalination for achieving sufficiency for the domestic water use. Domestic use and irrigation are the biggest water consuming sectors in the island. Due to its location, Cyprus is vulnerable to the climate change trends that affect the rest of the Middle East during the last years. Climate change models predict that things will become worse in the future, due to a rise in temperatures, limited rainfall and more frequent periods of drought. The year 2008 was the fourth year of an ongoing drought in the island with a water inflow of just 19 Mm^3 in the island's reservoirs (Sofroniou and Bishop, 2014, p. 2902), something that led to the reduction of water levels in the underground aquifers. The situation became so urgent, that in April of the same year, Cyprus agreed to import 8 Mm^3 of water from Greece at a very high cost in order to supply Limassol. Water scarcity is an issue that severely affects both the Greek-Cypriot and the Turkish-Cypriot communities of the island, since the two communities exploit the same groundwater aquifer in some areas of Cyprus. US intelligence agencies during the 1980's, have come up with a list of the ten most likely regions for the outbreak of water wars which included Cyprus (Sofroniou and Bishop, 2014, p. 2899), perhaps due to Turkey's occupation of part of the Island's north. In contrast to the aforementioned predictions, both communities proceeded to the development of a common sewage system in the divided city of Nicosia, a UNHCR project, financed by the UNDP and the World Bank, that was accepted as a bi-communal peace building project (Kloos et al., 2013, p. 66). Therefore, due to the lack of previous water conflicts in the island, water resources management could be a good low-level politics issue to be jointly tackled by the two communities.

5. Tensions over transboundary water resources in the MENA region

The exploitation of important transboundary rivers and lakes in the Middle East has led to serious interstate crises in the past and continues to provoke tensions presently. There are three important hydro-political complexes in the region formed by countries sharing vital water bodies, such as a) Euphrates and Tigris, b) the Jordan river and c) the Nile. The "tween rivers" namely Euphrates, shared by Turkey (about 1.178 km), Syria (about 604 km) and Iraq (about 1.160 km) and Tigris, whose drainage area expands over Turkey (17%), Syria (2%), Iran (29%) and Iraq (52%) (Al-Ansari, 2016: pp. 142-145) are a

source of contention between Turkey and its downstream neighbors. Turkey is the hydro-hegemon of the complex, since it can control the flows of the rivers out of the country, due to its upstream geographic position and its military might. Therefore, there have been serious tensions between Turkey and its downstream neighbors, but also between midstream Syria and downstream Iraq since the mid 1970's. In 1975, when Turkey and Syria had almost completed the construction of the Keban dam and the Tabqa dam respectively on the Euphrates river, the impoundment of part of the river's waters for the filling of both of the dams' reservoirs combined with a two year long drought, spectacularly diminished the flows to downstream Iraq, which accused Syria of withholding surplus amounts of water in lake Assad, thus provoking an extended loss of Iraq's crops and the suffering of over three million of farmers in Iraq (Wasinger, 2015, p. 46). Iraq threatened to blow up the Tabqa dam and the two countries came very close to military confrontation, as they concentrated troops on their common borders. Tensions were mitigated after the diplomatic intervention of the Soviet Union and Saudi Arabia, and Syria decided that it would release to Iraq more or less 60% of the water of the Euphrates river flowing from Turkey and withhold the rest for its own use. Turkey provoked a similar crisis in 1990, when it decided to fill the Atatürk dam's reservoir, thus reducing the Euphrates flows for a thirty days period during the course of a drought in the area. Iraq threatened to bomb Turkey's dams on the Euphrates. Tensions died out when the Euphrates flows returned to normal after the filling of the Atatürk dam's reservoir and forgotten with the outbreak of the Gulf war.

Another source of tension in the area is caused over the exploitation of the Jordan's waters, a river shared by Jordan, Lebanon, Palestine, Israel and Syria. The frictions among Jordan's five riparians are continuous (Wessels, 2009, p. 136). Many analysts relate the Six Day War in 1967 with the competition over the Jordan river's headwaters and perceive the 1980 Israel's invasion of Lebanon and its following 15-year-old imposition of a security zone, as an attempt of Israel to gain control over Lebanon's Litani river.

The third hydro-political complex examined, is formed by the eleven countries sharing the waters of the Nile river basin, namely Egypt, Ethiopia, Eritrea, Sudan, South Sudan, Uganda, Burundi, Rwanda, Tanzania, Congo and Kenya. The most important players are Egypt, despite its downstream position, due to its size, population number, political

importance and military might and Ethiopia and Sudan due to their respective upstream and midstream positions.

Finally, tensions in the MENA are also created by the water related migration, as well as the strain on host communities' water resources, exacerbated by foreign refugees and immigrants. Examples of water scarcity induced migration, is the internal migration of large rural communities to urban centers in Syria, due to severe droughts and crops' failures a few years before the outbreak of the civil war, as well as in Iraq due to similar reasons. One of the most famous recent conflicts, largely due to water scarcity, is the violence in Darfur, when drought and desertification in the northern parts of Sudan induced pastoralists of Arab origin to migrate to the southern part of the country, where they had to compete with local black African farmers for the land and the limited water reserves, igniting an animosity, that at first glance seemed to be based on ethnic differences. Water management is referred to as a vital element for peace in this region by the Doha Document for Peace in Darfur (Saleh M.K., 2014, p. 101). Besides water scarcity induced migration, the burden that migrants and refugees impose on the host communities' water resources, also create animosity, especially visible in the case of Syrian refugees in Jordan, where water stressed locals accuse the refugees of waste water behaviors, but also in the case of Lebanon, where the per capita water availability was drastically reduced due to the massive influx of Syrian refugees.

5.1. Turkey's water policy regarding the Euphrates and Tigris rivers

Turkey's decision to exploit the Euphrates and Tigris rivers led to the planning of the Southeastern Anatolia Project or GAP (Güneydoğu Anadolu Projesi), envisaging the construction of 19 plants for the production of hydroelectric power, of which 15 are already completed and 22 dams, of which 12 are already completed (Von Lossow, 2018, p. 3), scattered over nine provinces in Turkey.

Map 5.1 The Tigris and Euphrates rivers

Source: Le Monde diplomatique, Paris, 1994, updated in 2001.

Source: World Maps, 30+ FREE TIGRIS AND EUPHRATES RIVER ON WORLD MAP, available at: https://pasarelapr.com/map/tigris-and-euphrates-river-on-world-map.html, Turning the Tides Regulation of the Tigris and Euphrates Rivers – Adapted from map accessed at website: https://wiki--travel.com/detail/tigris-and-euphrates-river-on-world-map-20.html

The main drivers for the planning of the GAP were Turkey's lack of oil reserves, the oil crisis in the 1970's and the rising oil prices, the wish that the country would stop being dependent on expensive imported oil in order to meet its growing energy needs, exacerbated by its expanding industry and the need to spread the supply of electricity over more than the half part of the country, combined with the staggering growth of its population. The project would also secure the availability of water for irrigation, thus

helping the country to boost its agricultural production, leading not just to food sufficiency, but also to a surplus of food products, that could be exported to other Middle Eastern countries. Even though the World Bank refused to finance the project, Turkey went ahead with its construction. During the inauguration of the Atatürk dam in 1992, the Turkish President said that these were Turkey's water resources and as the Turks wouldn't tell their Arab neighbors what to do with their oil, they shouldn't tell the Turks what to do with their water. This highlights Turkey's position of absolute territorial sovereignty over the waters of the rivers that lie in its territory (Dolatyar and Gray, 2000, p. 147). Nevertheless, Iraq claims that it has historical rights over Euphrates and Tigris, as the first one to have exploited them and Syria also points out its riparian rights. The two latter countries believe that they have rights over these rivers' water flows, whose quantity or quality shouldn't be diminished by another riparian without their previous consent. Despite the absence of an integral trilateral agreement for the management of the Tigris and Euphrates rivers' waters, Turkey has singed bilateral agreements with Iraq in 1984 and Syria in 1987, stipulating an at least 500 m^3 per second water flow of the Euphrates river flowing into Syria. Besides the initial internal issues leading to the construction of the GAP, Turkey went on to take advantage of its hegemonic upstream position and linked external policy issues with the Euphrates and Tigris water management, in order to gain concessions from its neighbors. One of those issues, that will be analyzed later on, concerns the Kurdish local populations' political status in Iraq and Syria and those countries' periodic support for the PKK separatists' operations inside Turkey.

Another foreign policy issue, where Turkey exercised its leverage over Syria, was the issue of the Hatay province – or Alexandretta – and the Orontes river that stems from Syria and ends up in Hatay. In 1939, France, acting as a colonial power, ceded the Syrian territory of Hatay to Turkey. After gaining its independence, Syria refused to recognize this concession, considered the region as its own and went on to build dams up on the Orontes river, thus creating shortages to downstream farmers in Hatay. Turkey repeatedly tried to link negotiations with Syria over the Euphrates with the issue of the Orontes river and Syria always refused, since it regarded the Hatay area as part of its sovereign territory. The resolution of that longstanding conflict came through an agreement in 2010 between the two countries to build a Friendship Dam as a "joint project" on the Orontes river, along the borders of Syria and the Hatay area (Wasinger, 2015, p. 82).

Map 5.2 The Orontes river

Source: File:Map of the Orontes river.png – Wikimedia Commons – Adapted from map accessed at website: https://commons.wikimedia.org/wiki/File:Map_of_the_Orontes_river.png

In this manner, Syria indirectly recognized Turkey's sovereignty over this specific area, thus achieving a serious improvement in its water management relations with Turkey.

5.1.1. Consequences of the GAP project and of other factors on the water stress in Syria and Iraq

The construction of the GAP project, had indeed very negative consequences on Syria and Iraq. Syria has claimed that water shortages caused by Turkey led to contamination and increased salinity in the rivers, thus reducing its fisheries (Jongerden, 2017). Since

Syria largely depends on hydropower to produce electricity, Turkey has now the possibility to threaten Syria's electricity production by reducing the Euphrates flows with the use of the GAP project. But Syria's water problems have more causes than GAP. With an annual precipitation rate of almost 250 mm, Syria is considered by researchers to be a water scarce country. The country's population was launched from 3 million in 1950 to more than 22 million in 2012, plummeting the available per capita water resources from 5.500 m^3 to 760 m^3 per person annually in 2012 (Gleick, 2014, p. 331), below the water scarcity limit of 1.000 m^3 per person annually. The ruling Baath's party goal since 1975 for food self-sufficiency and the subsequent policies favoring the irrigated agriculture, which became unsustainable after 1990, have led to a gradual depletion of many of the country's water reserves and a degradation of the water quality of others, due to soil erosion, pollution and salinization. In 2008 and 2009 the government tried to modify previous policies by cutting off subsidies in fuel and fertilizers, thus affecting the agricultural sector that was additionally hit by a four-year-long drought between 2007 and 2010. The drought reappeared in 2011. Almost three million people were affected in addition to the 800.000 people that had already lost their livelihoods during the previous four-year-long draught. Farmers could no longer cultivate their lands and more than 1,5 million people had to immigrate without possessions on the outskirts of urban centers like Damascus, Aleppo, but also in Homs, Hama, Deir ez-Zour and Dara'a in order to make a living (Gleick, 2014, p. 334). Many of them couldn't even prove ownership of the lands they had abandoned, due to the lack of official ownership documents. Farmers' migration led to further unemployment in the cities and social unrest. It is no coincidence that the early protests against the Assad regime in March 2011 originated in Dara'a and spread to other areas where people from rural regions had migrated.

Regarding Iraq, diminished river flows due to Turkey's GAP project, have caused water shortages that have put serious strain on its agriculture, turning many arable lands in arid areas, driving many farmers to abandon their villages and migrate to the cities. In the south of the country, an environmental disaster takes place, because of the desertification of the wetlands and marshes. As a result, the southcentral region of Iraq has almost lost half of its food production capacity. In 2018, the Turkish government completed the construction of the Ilisu Dam, creating the danger that during the impoundment of its reservoir, the water flows of the Tigris river in Iraq could be diminished by 50% (Von Lossow, 2018, p. 3). Adding to Iraq's water stress, is the construction by Iran of various

dams on tributaries of the Tigris river, which originate in Iran, thus diminishing Tigris's waterflow in Iraq. Other factors contributing to Iraq's water stress is the rise of temperatures and the frequent droughts, its rapidly growing population, its serious urbanization trends and the water losses, due to its water network and irrigation infrastructure which is outdated, neglected and damaged by years of military conflicts. As a result, water scarcity increases sectarian rivalry between Iraqi Shias and Sunnis, as the first suspect that the latter, whose areas are located in an upstream position along the Euphrates river, are far better off in terms of water availability. Apart from sectarian tensions, water scarcity also provokes tribal tensions in parts of Iraq between tribes situated along the rivers in an upstream or downstream position. Tribal affiliation is still important in Iraq and several tribal leaders are capitalizing on tensions over water resources, in order to secure water availability, as well as in order to gain legitimacy among their people by politicizing the water issue (Dockx, 2019, p. 9). This often leads to deadly conflicts, since tribes have a propensity for violence and the use of arms. Serious tensions over local water resources, also rise between provincial councils, which are usually settled through the mediation of the federal government or escalate in violence of lower intensity. Nevertheless, many people usually tend to follow their tribal leaders, and distrust local politicians, whom they suspect to be corrupted.

Perhaps the only positive effect of the GAP project on Syria and Iraq, is the regulation of the Tigris and Euphrates waters' flow, since the Turkish dams prevent the occurrence of potential floods that used to plague the three countries prior to the GAP's construction.

6. The Kurdish factor in Middle Eastern water politics

The card of the Kurdish population, which is spread between the borders of Turkey, Iraq, Syria and Iran, couldn't have remained outside the region's countries' water strategy planning. Especially for Turkey, that for years after the establishment of the modern Turkish state, didn't recognize a separate Kurdish national identity and perceived the Kurds of the southeast provinces as traditional, mountainous, tribal affiliated Turks, that the only factor distinguishing them from the rest of the modern Turks was their traditional, backward and tribal properties, the GAP project was an instrument in order to develop and modernize those poor regions, aiming to erase any Kurdish national conscience within the local population and eliminate the PKK separatists' influence. Nevertheless, it was mainly the great landlords who were able to benefit from the

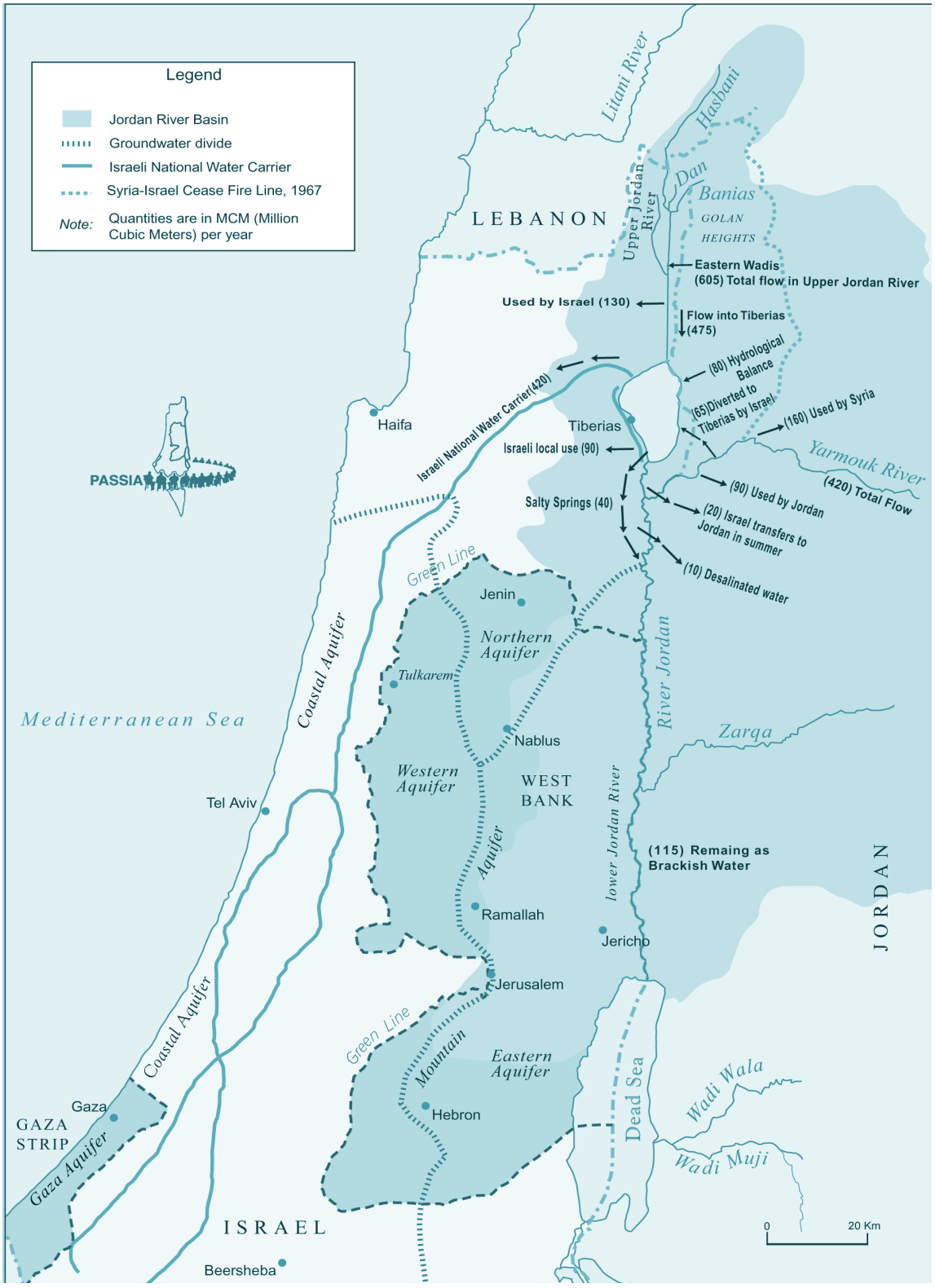
spreading of modern agriculture, something that deepened the social inequalities in the region. Furthermore, the prevailing irrigation practices provoked soil salinization and degradation, that could potentially result to losses of livelihood by local people (Jongerden, 2017). The Ilisu Dam, which entails the displacement of about 78.000 local villagers, most of whom are of Kurdish descent, and the drowning of the ancient city of Hasankeyf, with a history that dates back to 10.000 years, filled with archaeological sites, mosques, tombs and churches inside caves and displaying a cultural richness of various civilizations, is perceived by the Kurds to be a tool of the Turkish state, aiming to erase their cultural heritage (Machowski, 2010). The Kurds of Iraq, situated in the upstream areas of the Tigris river, are in a favorable geographic position in regard with the country's water resources. Their region is blessed with frequent rainfall, groundwater reserves, surface waters and dams used for hydropower production. Their strategic upstream position on the Tigris river allows them to exert some sort of control over the flows of the river towards the downstream Arab provinces. Nevertheless, the Kurdistan Regional Government (KRG) is heavily dependent on the federal government of Iraq, when it comes to its budget and its local economy, so it hasn't openly used so far, its upstream position as leverage. Nevertheless, many Arab farmers, especially the ones living in contested areas between the federal government and the KRG, have accused the upstream living Kurds as being mainly responsible for their water deprivation (Dockx, 2019, p. 15). Therefore, intrastate water disputes along ethnic divides between Kurds and Arabs cannot be ruled out in the future in Iraq, especially if water resources become scarcer. Due to its hostile stance against its local Kurdish population, the former Saddam Hussein regime didn't use the PKK card against Turkey, at least not as much as Syria did. In the 1980's, Syria allowed PKK rebels to conduct subversive actions against Turkey, especially to target the GAP project, from Syrian territory. Syria continued to support the PKK, even after the 1987 water agreement with Turkey. In 1998, Turkey concentrated troops of 10.000 men on the borders with Syria, threatening military action, because of the PKK issue. Syria agreed to negotiate and the two countries' leaders met and signed the Adana Agreement, resulting to the cessation of Syria's support for the PKK and the expulsion of the PKK leader Abdullah Öcalan from Syria, where he was based since 1979. The year following the Adana Agreement, Turkey increased the waterflow of the Euphrates river into Syria.

7. Israel's water policy and the Jordan river basin

Since its foundation as a state, Israel has been very active in acquiring and exerting control over regional water resources. This is because of the importance of water for agriculture, since the development of the agricultural sector was of paramount importance for the Zionist nation building planning. According to the early Zionist thinking, Israelis, who were for centuries displaced, landless, mostly working as craftsmen or merchants in urban centers all over the world, could establish themselves in their newly recovered homeland, mainly by owning and working the land (Selby, 2003, p. 66). Therefore, water acquired a symbolic importance for Israel's nation building effort. Furthermore, most of the Jewish population, likely to immigrate to Palestine, was living in Europe, in water rich countries, and it would be difficult for them to adjust in a water scarce territory. After being established as a state, Israel started in the 1950's to develop unilaterally its transboundary water resources, constructing the National Water Carrier and diverting water from the northern part of Lake Tiberias out of the Jordan basin into the Negev desert and the Mediterranean coastline. Syria protested to the United Nations. The Arab League attempted to divert the Jordan's headwaters in 1964, before it would reach Israeli territory. Clashes broke out between Israeli, Jordanian, Lebanese and Syrian forces, mostly targeting their rivals' water infrastructure. Israel bombed a Syrian – Jordanian common water project that would pump water from Lake Tiberias in 1964 (Kiser, 2000, p. 5). In 1967 Israel also bombed a common Syrian – Jordanian dam construction on the Yarmuk river, which is a tributary of the Jordan river. Nevertheless, Israel extracts water from the Lake Tiberias and the headwaters of the Jordan river and exploits almost half of the water of the Jordan basin. The over-pumping of water caused the water level of Lake Tiberias to fall critically and salt springs underneath the lake started leaking in it, salinizing its water. Israel covered the salt springs, pumping the saline water downstream into the Jordan river in Jordanian territory. Therefore Jordan, not only receives far less water than Israel from the Jordan river, but also the waters of the river's section that are available to it are very salinized, unfit even for irrigation. Israel also relies on groundwater for around 45% of its water supply. Nevertheless, almost half of the pumped groundwater comes from the Mountain Aquifer, which is divided into the Western, Eastern and Northeastern Aquifers. Eighty percent of the Mountain Aquifer replenishes under the West Bank, but naturally flows towards Israel or into the Jordan, making the access to its water from the West Bank mainly possible through the drilling of wells. Nevertheless, Israel doesn't issue permits to Palestinians for the construction of new wells. The groundwater of the Coastal Aquifer, the only natural water source of the

residents of Gaza, is also shared, but its quality is unfit for human consumption, as it is polluted with bacteria, pesticides, untreated sewage and other residues.

Map 7.1 The Jordan River – Israel



Source: Jordan River Israel • Mapsof.net, Available at: http://mapsof.net/jordan/jordan-river-israel - Adapted from map accessed at website: http://mapsof.net/uploads/static-maps/jordan_river_israel.png

Israel's hydro-political relations with its neighbors will be further examined in the following chapters.

7.1. The conflict with Syria and the water value of the Golan Heights

Continuous tensions and minor clashes on the Syrian – Israeli borders after the establishment of the Jewish State, especially around the two countries' shared water bodies, leading to the targeting of each other's water projects, as well as to minor engagements between Israel and its other Arab neighbors, escalated critically in 1964, something that contributed to the outbreak of the Six-Day-War in 1967, when Israel gained territory of great hydrological value, like the West Bank with its Mountain Aquifer, Gaza with its Coastal Aquifer and the Golan Heights, an area with frequent rainfall and natural high quality water springs and brooks, which contribute to the upper flow of the Jordan river, and which currently constitute around 15% of Israel's water resources. Since these freshwater reserves are very valuable to both Israel and Syria, the latter has unsuccessfully tried to recapture the Golan Heights in 1973. The conquest of the Golan Heights deprives Syria from any access to the Jordan river or Lake Tiberias and prevents Syria, Lebanon and Jordan from trying to exploit the headwaters of the Jordan River and its tributaries. Due to the above mentioned reasons, it is very difficult for Israel to return the Golan Heights to Syria, especially after the latter's declared plans to populate the area with half a million of settlers (Skiadas, 2011, p. 233) in the event of its recapture, something that would inflict tremendous strain upon the region's water reserves, leading to their pollution and reduction of their quantity, as well as leading to the quality degradation of the waters of the Israeli Lake Tiberias, which would lose a valuable influx of high quality freshwater that replenishes it and reduces its salinity.

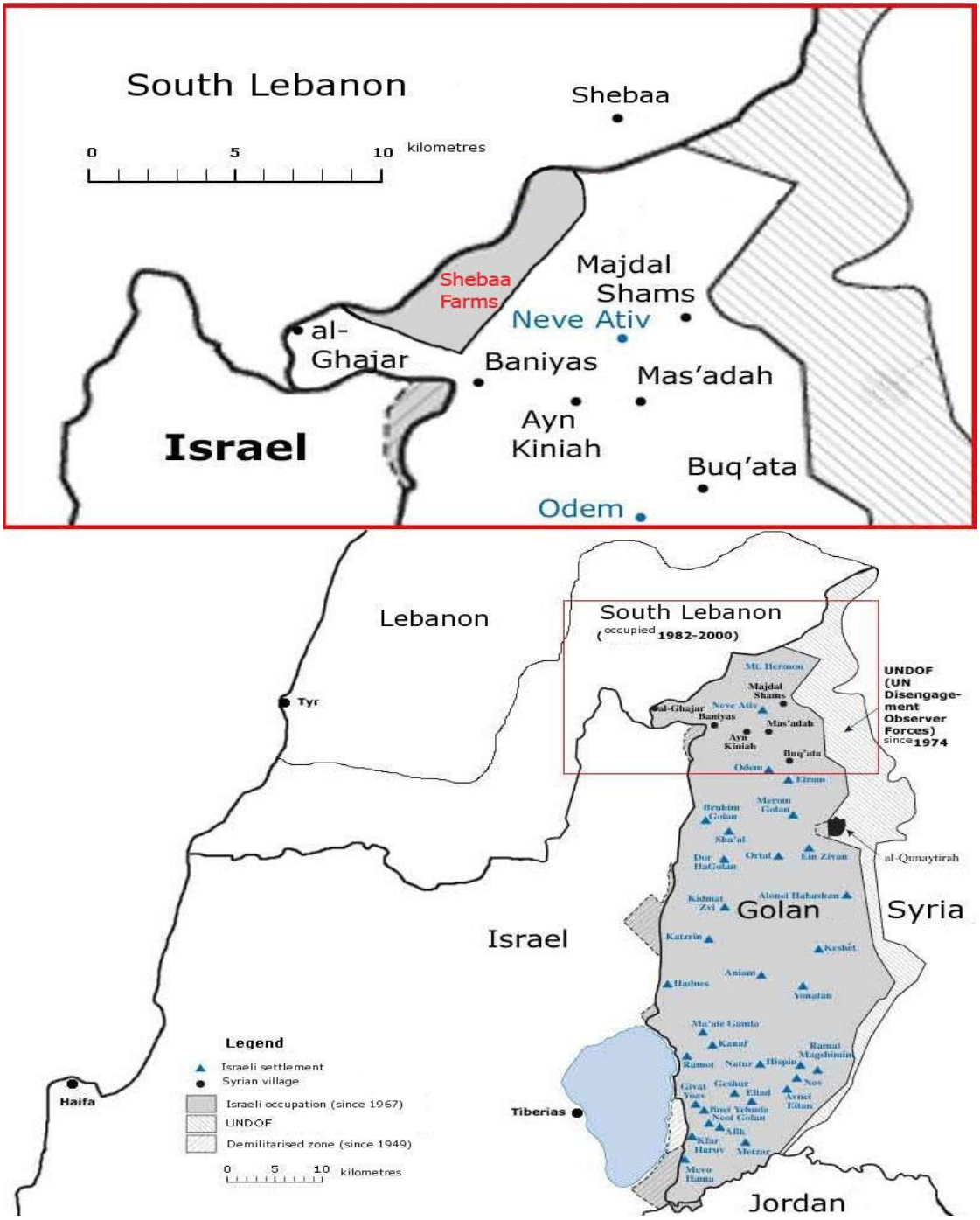
7.2. The Litani river and the Lebanese-Israeli relations

Many Lebanese consider their country as a land blessed with sufficient water resources. Nevertheless, besides the effects caused on the country's water reserves by the climate change and its growing population, exacerbated by the massive influx of Syrian refugees, Lebanon faces grave water mismanagement issues. A great percentage of the supplied water in urban centers is of questionable quality. Even before the arrival of Syrian refugees, water supply from the public water network ranged from 3 to 13 hours per day, depending on the season and the region. Furthermore, according to some UN organization

studies, access to safe water is unavailable to 64% of the country's population. Due to the old infrastructure of the water network, to which many areas are not even linked, there are significant water leakages (Baylouny and Klingseis, 2017). Most of the country's water is used in agriculture and the inefficient irrigation systems account for important water losses. The uncontrolled use of fertilizers and pesticides further diminishes the quality of groundwater, which is also polluted by industrial wastes' leaks and residues' damping (Farajalla et al., 2014, p. 127). There are private wells depleting the country's groundwater and a part of them is not even licensed. Water theft is frequent and many citizens buy water from private suppliers. Despite the aforementioned mismanagement issues, many Lebanese blame Israel for their country's water stress problems. The reason is the hydrological value of the Lebanese regions seized by Israel in 1978 and officially occupied since 1982. After the invasion, the Israeli forces left from Southern Lebanon but created a security zone, guarded by 1.000 – 2.000 Israeli men, who were put under the command of the South Lebanese Army, a force that was equipped and funded by the Israeli government. The security zone, where the drilling of wells was immediately forbidden by order of the Israelis, was an area of 850 km^2 and had a population of 180.000 people (Skiadas, 2011, p. 242). Through its occupation, Israel gained access to the Litani river, which flows exclusively within Lebanese territory, as well as to the Hasbani river near the Litani, that originates and flows in Lebanon but is a tributary of the Jordan river. Finally, the Israeli forces completely retreated from this zone in May 2000, but the Lebanese people are very sensitive on the issue of the Litani river, since there is a wide-spread belief among them, that Israel originally invaded the area and then retained its security zone for so long, not in order to prevent Arab attacks on northern Israel, but in order to access and steal Lebanon's water resources. There are also speculations that during the occupation, Israel built secret underground canals that are pumping the Litani's water into Israeli territory. Contributing to the Lebanese's belief, that Israel is appropriating their water resources, is the ongoing occupation since 1967 of territory claimed by Lebanon, namely of the northern part of the town of Ghajar, a place located across the Wazzani Springs, and of the Shebaa Farms, a territory which gives Israel control over the catchment area of the Litani and the Banias rivers (Zeitun et al., 2013, p.96). Israel has remained in the area, since it regards it as part of the Golan Heights. Tensions with Israel escalated in 2002, when the Lebanese announced plans to exploit the Hasbani river, which flows in Lebanon, and to build a pumping station at the Wazzani Springs, which provide the river with 40 Mm^3 of its yearly flow. The Israeli prime

minister responded that this would constitute a reason for conflict. Since the Hasbani is Jordan's tributary, and the Wazzani Springs in Lebanon are its main water supply source during the summer, there were fears by Israel, that the Hasbani's contribution to the Jordan's river flows, which is heavily exploited by the Jewish State, would be diminished.

Map 7.2 The Shebaa Farms



Source: File:Shebaa Farms.jpg – Wikimedia Commons – Adapted from map accessed at website: https://commons.wikimedia.org/wiki/File:Shebaa_Farms.jpg

During the 2006 Israeli attack on Lebanon, Israel targeted water infrastructure that connected the Litani river to the south of the country (Wessels, 2009, p. 136). The Yarmuk river (an important water supply source of the Kingdom of Jordan), the Hasbani river and the Banias rivers, are all tributaries of the Jordan river, which supplies Israel with water, therefore Israel objects to the construction of any projects on them, that could diminish their flows into the Jordan river.

7.3. Israel's control over the Palestinian water resources

In Israel, there is a great discrepancy in regard with the average daily water consumption between the Israeli and the Palestinian people, with Palestinians in the West Bank consuming about 73 liters per capita daily compared to 300 liters consumed by Israelis and even more by Israeli settlers. There are also Palestinian communities in the West Bank or the Jordan Valley that have to suffice with an average of 28 or 22 liters per capita daily, unconnected to the water network and forced to resort to rainfall storage during the rainy seasons or to buy water by private vendors in the summer, which amounts to a big portion of their annual income (Koek, 2014, pp. 133-134). On the other hand, Israeli settlers in nearby villages, are connected to the public water network and enjoy round the clock high quality water availability. Water discrepancies are even bigger, when it comes to water available for agriculture, that is plentifully provided to Israeli settlers cultivating water thirsty crops and deprived from Palestinian farmers, who have to leave large portions of their fertile land uncultivated and resort to less profitable, low water consuming crops. This is the result of a well-planned, consistent policy of Israel, since the foundation of the Israeli State, designed to create a homogenous, purely Jewish country, as much as this was possible, through the imposition and expansion of Israeli land ownership and the marginalization of the Palestinian presence. After the 1948 war, 700.000 Palestinians had to flee the country and the remaining 150.000 received Israeli citizenship, but not equal rights, since areas of concentrated Arab populations were put under military rule. The Israelis frequently applied colonial tactics through confiscations of properties or demolitions, especially in places aimed to host Jewish settlements, driving the Arab population away. In the West Bank's designated area C, where most of the Israeli settlements are situated, permits to Palestinians in order to build or repair water infrastructure, such as wells or water pipes, even the ones built before the 1967 occupation, are seldom provided and the ones that are built or repaired without permit,

risk the danger of being demolished. Most of the Mountain Aquifer lies underneath the West Bank, but it is allocated to Israel, where the population uses about 75% of its water resources. Many Palestinians are not connected to a water network and have to buy water privately at a price three to six times higher compared to the cost of water for Israeli households (Baumgarten, 2009, p. 11). Many Palestinians have to endure each summer whole months without piped water (Selby, 2005, p. 334). The situation is even more dire in the Gaza Strip, where the Coastal Aquifer is the only natural source of water for the local rapidly increasing population. The Coastal Aquifer is quite shallow, thus facilitating the opening of wells without the need of advanced machinery. Therefore, there are many private wells, but the quality of water is not good for human consumption, since it is salinized due to its over-pumping and polluted by untreated sewage. Due to its ongoing blockade by Israel since 2007, Gaza has minimal access to imported materials necessary for the maintenance of the infrastructure and the operation of its desalination plants or its wastewater treatment facilities and is therefore deprived from the option of using desalinated water for domestic purposes or treated wastewater for irrigation. In addition, the water and sanitation infrastructure of the Gaza Strip was repeatedly targeted during the conflicts of 2008 and 2009. Furthermore, untreated sewage is either drained to the Mediterranean or enters and pollutes the Coastal Aquifer, facilitating the expansion of waterborne diseases among the population, part of whom has to resort to the purchase of water from tankers. In contrast to the Israeli water pricing policy, which is uniform for the overall Jewish population, the pricing of pumped water among Palestinians exhibits scandalous variations. In the West Bank, water is often stolen and then resold to the private market, through the use of illegal connections to the water networks, by private water tanker vendors, who sometimes enjoy backstage political support. Furthermore, local communities with important water resources are taking advantage of their neighboring villages and towns and overcharge them for the distribution of their water (Selby, 2005, p. 343). In this case, Palestinians are doubly victimized, on the one hand through the discriminatory water distribution policies of Israel between them and the Jewish population and on the other hand by their own fellow nationals, who exploit their need for access to water. As a result, there are frequent small-scale clashes between Palestinian communities over the use of water resources.

8. Tensions over transboundary water resources in Northern Africa: The case of the Nile river and its effect on Egypt's relations with its fellow riparian countries

The Nile River is one of the longest rivers in the World and its basin is shared by eleven countries, namely Ethiopia, Eritrea, Uganda, Tanzania, Burundi, D.R. of Congo, Rwanda, Kenya, Sudan, South Soudan and of course Egypt. The Nile Basin is extended to a region of around 3,1 km^2 and is home to about 40% of Africa's population. The river's main tributaries are the Blue Nile originating in Lake Tana of Ethiopia and flowing into Sudan and the White Nile emanating in Burundi. The Nile is historically and culturally linked to Egypt. Nevertheless, upstream riparian Ethiopia contributes an almost 86% of the Nile's waters, compared to Egypt's minimal contribution, with the latter using about 99% of the river's waters (Kiser, 2000, p. 36). Although Egypt is the most downstream country in this hydro-political complex, it is undoubtably the hydro-hegemon of the region, mainly due to its political and military might, compared to the other Nile basin countries.

Besides the aforementioned fact, there are other historical and political factors that helped Egypt to be established as the main usufructuary of the Nile River. In 1929, Britain drafted the Nile Water Agreement, that divided the use of the Nile's waters between the two downstream countries, namely Egypt and Sudan, allocating almost 5% of the rivers flow to the latter and the rest to Egypt. Therefore, Egypt was awarded 95% of the river's water and apart from Sudan, all the remaining Nile Basin countries' rights on the river's waters were completely disregarded (El-Fadel et al., 2003, p. 110). Any effort by the rest of the Nile Basin countries to exploit the waters of the river, its tributaries or its lakes, that would cause a drop on the Nile's flow levels reaching Egypt, was regarded as illegal. During the building of the Aswan Dam in Egypt in the 1950's, areas near Wadi Halfa in Sudan were flooded and as a result a number of Sudanese residents of the region were displaced. The growing tension that followed over reparations and other issues led to the 1959 bilateral Nile Waters Agreement between Egypt and Sudan, awarding Egypt 1,9 trillion cubic feet per year and Sudan 648 million cubic feet (Kiser, 2000, p. 42). The rest of the Nile riparian countries were once again ignored. Egypt's dominant position was never challenged in the past, as the rest of the Nile Basin countries were either too poor and weak or plagued by civil wars. Even though Sudan didn't usually use the amount of the Nile's waters allocated to it and succumbed to Egypt's pressures for more water, this

could change, as growing populations and water shortages led both countries to invest in water projects, in order to exploit the Nile's waters. Sudan's plans to build two dams, the Kajbar Dam and the Merowe Dam on the Nile and Egypt's plans to build other water exploitation projects, including wells and irrigation canals, will probably lead the two countries to exceed their allotted Nile's waters percentages. Since the Nile provides more than 95% of Egypt's water (Hamza and Mason, 2005, p. 249), it is considered a national security issue for Egypt to continue to use the lion's share of the river, while any attempt for its exploitation by upstream riparian countries, that would reduce its flows to Egypt, is viewed as a national threat.

Map 8.1 The Nile River

Source: File:River Nile map.svg - Wikimedia Commons – Adapted from map accessed at website: https://commons.wikimedia.org/wiki/File:River_Nile_map.svg

Nevertheless, other riparian countries, that see the exploitation of the Nile as a potential for energy development and water and food security, question Egypt's and Sudan's monopoly on the use of the river and plan their own water projects. Tanzania, a poor country suffering from drought and deforestation, claims a right on the waters of the Lake Victoria and has launched a project to extract water from the lake (Howe, 2010, p. 33). Furthermore, Kenya demands a renegotiation of the treaty, while Uganda wants to use the

Nile for the production of hydropower. Nevertheless, the most important upstream Nile country is Ethiopia, with nearly the population size of Egypt and an even faster population growth rate per year. As mentioned above, Ethiopia's headwaters contribute most of the Nile's flows, but the country was denied its right to use the Nile's waters, with the argument that it could sustain itself, based on its rainfed agricultural production, something that was proven wrong by the drought induced famines that have plagued the country in the past. The country has vast expanses of arable land, that could be cultivated if more water becomes available. In the 1990's, Ethiopia's attempt to build small dams with an insignificant use of the Nile's annual flow, caused Egypt to react and block any financing from the African Development Bank. In 1999, the Nile Basin Initiative was formed, with the participation of Burundi, Uganda, D.R. Congo, Egypt, Sudan, Eritrea, Kenya, Tanzania and Rwanda, in order to promote cooperation between the Nile Basin countries on the beneficial development of the Nile river. In 2009, nine countries of the Nile River Basin discussed a Cooperative Framework Agreement, which Sudan and Egypt rejected for aiming to achieve water security for the Nile's upstream countries (Howe, 2010, p. 38). Later on, most of the Nile riparian countries signed the 2011 Nile Basin Cooperative Framework Agreement. When new players appeared in the region, things changed. China is trying to use hydro-diplomacy in order to increase its influence in the region and Chinese companies have facilitated the construction of dams in Ethiopia through financing and know-how. The construction of five great dams on the Blue Nile was announced by Ethiopia in 2011 (Okundi Obengo, 2016, p. 5). The greatest project under construction is the Grand Ethiopian Renaissance Dam (GERD), which is expected to produce 5.250 MW of power and hold 67 billion m^3 of water, thus reducing the incidents of flooding in the banks of the Nile river (Tsega, 2017, p. 2). Tensions spiraled between Ethiopia and Egypt's Morsi government, which accused the first of diverting the Nile's waters, while some Egyptian politicians proposed military intervention against the Dam. Nevertheless, Morsi's successor, El-Sisi has initiated tripartite negotiations between Egypt, Sudan and Ethiopia, which led to a preliminary agreement on the GERD in February 2015. Egypt seems to be presently adopting a more cooperative stand. Organizations like the Nile Basin Initiative or even the United Nations, could elaborate a framework, in order to facilitate a compromise towards a more equitable sharing of the Nile's waters between the river's riparian countries, without causing any harm to the development and food or water security of any of them.

9. Strategies for overcoming water scarcity in the region

Addressing water scarcity requires the use of both forgotten traditional but sustainable, as well as new and innovative techniques of water storage, production or extraction and management. Firstly, investments should be made in repairing or replacing old or damaged water distribution networks and sanitation infrastructures, in order to prevent the losses of valuable water from the first ones and leakage of untreated sewage into the underground aquifer from the latter, thus resulting to groundwater pollution. Investments should also be made for the construction of wastewater treatment plants, as wastewater reuse in agriculture is largely used in technologically advanced and water stressed countries like Israel. Another source of sustainable water use for irrigation purposes, is the drainage water from agriculture, which is collected, treated and mixed with freshwater in order to be reused. Especially in regard with agriculture, the use of water resistant crops should be encouraged or subsidized, even if these crops are less profitable, since the preservation of water resources is imperative in water scarce areas and the price that farmers will have to pay if their water reserves are depleted will be much higher than their gain from the cultivation of water thirsty crops. In the frame of good water management in agriculture, the use of drip or sprinkler irrigation should replace old surface irrigation techniques, which entail the use of larger water quantities and result to higher evaporative losses. Furthermore, a reasonable water pricing method should be implemented, something that in contrast to the free or largely subsidized water supply, would incentivize farmers to resort to the above necessary measures for the reduction of water waste. Poor farmers specifically, should receive financial help in order to replace old irrigation infrastructures. Saudi Arabia and Kuwait tried a different approach, which consists on buying or leasing, through holding companies, farmlands in other Asian countries and even Egypt tried to gain access to arable lands in Uganda (Sowers et al., 211, p. 617), but the political instability and the possibility of civil wars in those countries, combined with the public outcry or the resistance from local politicians for the subsequent displacement of small local farmers, render the fruition of such endeavors farfetched. Sustainable water saving techniques of traditional origin include the use and maintenance of foggaras or qanats, which consist on a network of wells and tunnels, allowing the underground water collection and exploitation of the natural discharge of the aquifer, a method that has historically sustained water supply for people and crops in the arid surroundings of the Algerian Sahara (Ansari, 2014, p. 109). Other environmentally

sustainable water saving methods are the rainwater harvesting from rooftops or the facilitation of the infiltration of a portion of the local natural streams' winter streamflow into alluvial deposits underground, thus minimizing any evaporative losses that occur in aboveground dams (Stoof and Steenhuis, 2014, p. 162). Underground constructions could include the building of subterranean dams in coastal aquifers, retaining the flow of underground riverbeds' freshwater, that is otherwise lost, as it flows towards the sea. This water could be maintained in the aquifer, pumped up during the dry summer months and be naturally recharged during the winter. Underground reservoirs and dams are cheaper and smaller than the aboveground ones, apart from being more environmentally sustainable. The treatment of brackish water for domestic use or irrigation is another option, since there is plenty of it in groundwater aquifers in the Middle East and its desalination cost is not high. Furthermore, a method that is largely used in the MENA, especially in the Gulf Countries and Israel, for the supply of freshwater, is desalination. A prerequisite is of course, that a country has access to the sea. Although desalination costs were originally high, allowing only wealthy countries to develop desalination plants and units, now the cost has considerably dropped, due to the advancement in desalination membrane technologies, that allow for the use of just a portion of the energy required by older desalination processes. The use of renewable energy resources for the operation of the desalination units, could render the method environmentally friendlier, although desalination has its own environmental impacts, namely the discharge of brine into the sea. This increases the salinity on the receiving water body and therefore, less desalinated water is produced for the same amount of energy used. Unlike open sea environments, shallow seas with fragile aquatic ecosystems, are negatively impacted by increased salinization, caused by the discharge of brine, while the seawater salinity percentage in the Arabian Gulf is estimated to have risen by a 20% (World Bank, 2017, p. 65). Finally, some MENA countries, like Jordan and Libya, have developed plans for the extraction of fossil groundwater from extended fossil water aquifers. Jordan has started a project to pump fossil water out of the Disi aquifer, also exploited by Saudi Arabia. Similarly, Libya, which commonly uses the Nubian Sandstone Aquifer with Egypt, extracts fossil water from it and transports it to its coastal regions by using the Great Man-Made River (GMR) (Sowers et al., 2011, p. 612).

10. Conclusions and reflections on transforming potential conflict to cooperation

Water issues in the Southeastern Mediterranean range from inefficient cooperation regarding pollution emergencies or flood control between the Balkan countries, sharing common water resources, to addressing severe water stress in the MENA region. In contrast with Israel, that finds it hard to concede land of great hydrological value (like the Golan Heights or part of the West Bank) for peace, water may not be a high priority issue for many Middle Eastern elites. Nevertheless, it is very much so for the ordinary people and the communities having to survive with limited access to water resources, which are often of low quality and polluted. Therefore, interstate wars are less probable to happen than intrastate conflicts, between neighboring communities to whom, water supplies are unevenly distributed.

Despite their common Muslim faith (with the exception of Israel), most of the countries in MENA don't seem able to bridge the gap formed by their water rivalries. Any compromise is looked upon with suspicion, as one country's gain is regarded to be another country's loss. For instance, the military and political hegemonic status of Turkey, combined with its favorable geographic upper riparian position, renders it less keen on negotiating and compromising through an integrated agreement with Syria and Iraq on the allocation of the Euphrates and Tigris waters. Similarly, Egypt's economic and military strength compared to its fellow riparians, makes it less prone to negotiate with them a fair allocation of the Nile's waters, and its overdependence on the river makes it suspicious and worrisome of any development projects on the Nile by other countries.

The concept of water security, meaning securing the access of people to sufficient amounts of safe water, is essential for the human well-being and the maintenance of peace and stability in the region. It is not surprising that during conflicts, the opposing sides are trying to weaponize water and are targeting their enemies' water infrastructures, trying to cause pollution, floods or water shortages. Water security in the region is put at risk by ethnic or local rivalries, as well as by climate change, exploding population growth and irrigated agriculture. Climate change causes an increase in temperatures in an already arid region and spreads the desertification process. It also causes the sea levels to rise and induces soil erosion and salinization of the underground costal aquifers. The overwhelming population growth rate in MENA increases the strain on the water resources as well as the needs for food and shelter, resulting to social tensions and unrest.

There are significant water loses due to the badly maintained water networks, as well as pollution of the groundwater due to leakages from the inefficient sanitation infrastructure or because of fertilizers and pesticides used in agriculture and chemical residues from industrial units.

Since agriculture and food production are the main consumers of water in the area, other areas of economic development should be favored in relation to agriculture, such as the industry or services, allowing the local economies to grow and enabling them to import rather than produce food products by depleting their already scarce water reserves. Furthermore, it is important to raise awareness about the impact of water waste. The import of "virtual water" and the decrease of the agricultural sector in water scarce countries are measures that would reduce the strain on those countries' water resources. Equally important is the issue of water pricing that meets harsh resistance in the Middle East, where water was traditionally free, due to fears that if it becomes a market commodity, poor people will not be able to afford it, even for domestic purposes, let alone for watering their crops, and downstream communities fear that the upstream ones may try to make a profit out of their water resources by putting a price on water deliveries originating from their lands. Nevertheless, not charging water consumption related to large-scale agriculture is neither reasonable nor sustainable.

The aforementioned water management methods for addressing the water scarcity issue, could alleviate intrastate and interstate tensions related to it. Nevertheless, there are additional tools for the reduction of conflicts and the increase in cooperation. One of them is the creation of organizations like the Global Water Partnership, as well as the development of a water conflict prevention and arbitration framework within international organizations like the United Nations, that could better impose to its members to comply with the International Low and the decisions signed in International Conventions related to freshwater resources' issues. Another tool for water conflict prevention, is Water Diplomacy, which aims at promoting the dialogue, facilitating negotiations, reconciling disputes, fighting prejudice, mistrust and misconceptions, promoting cooperation and drafting sustainable and lasting agreements among countries that share common transboundary water resources. These agreements should be achieved through a voluntary and fair allocation of water reserves, with a prospect for revision, if the amounts of available water resources diminish, due to climate change. The agreements must also

stipulate that the signing parties do not proceed to unilateral measures, that could harm their fellow riparian states, and that they swiftly convey any information related to flood or pollution emergencies to their neighbors. Trust building joint programs between interstate communities that share common water bodies, can also help foster cooperation. One such program is the Good Water Neighbors (GWN) project, including communities from Palestine, Jordan and Israel, trying to find mutually beneficial solutions on water management (Shinkovskaia, 2014, p. 5). This program has helped to promote dialogue and to build trust among those communities, since they were joining forces in dealing with common environmental problems.

In conclusion, while water scarcity and transboundary water resources lead most of the times to tensions among neighboring countries, the possibility that these tensions either escalate into conflict, or are mitigated and resolved through fair and viable water sharing and management agreements, depends on the will of the people leading the negotiations in all parties involved. It is unquestionable that war has detrimental effects on every side, since it entails human casualties, destruction of property and infrastructures, environmental degradation and other disasters. Therefore, the best viable option of resolving interstate or intercommunal water related disputes, is through dialogue and integrated water management policies.

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