Palestinian Water Management – Policies and Pitfalls

Julie Trottier

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Introduction

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Contents:

The Oslo Accords emerged hardly two years after the International Conference on Water and the Environment took place in Dublin in 1992. The Oslo Accords created the Palestinian Authority and brought international support for the construction of a Palestinian state. The Dublin conference defined the manner UN agencies and donors were going to conceive sound and efficient water management over the next 25 years. The two events were completely unrelated at the time but their consequences on Palestinian water management have been closely intertwined.

The Dublin conference did not consider the great variety of forms of local water management that had been developed around the world. Palestinians, like many native people around the world, had long managed water as a flow, crafting rules to regulate the interactions of the users located along that flow. An upheaval occurred in 1994 when donors and the Palestinian Authority started developing water as a commodity, perceiving it as urban domestic consumers would and, more recently, as export oriented agribusinesses would. This bulletin explores these transformations. It provides a short historical review of Palestinian water management, details the importance of considering water as a flow instead of only as a stock, and uses the notion of *paracommons* to show the blind spots that water development policies have suffered from. It

* Julie Trottier is Director of Research at the Centre National de la Recherche Scientifique (CNRS), France.

PASSIA
Palestinian Academic Society for the Study of International Affairs, Jerusalem
Tel: +972-2-6264426, Fax: +972-2-6282819, E-mail: passia@passia.org, Website: www.passia.org, PO Box 19545, Jerusalem

interrogates the notion of "efficient water use" in terms of environmental justice and shows the unintended consequences of the water development efforts over the past 25 years: Policies based on the notion of virtual water are not decreasing the consumption of water in agriculture. Present projects of wastewater reuse in irrigation are not decreasing the pressure on the aquifers. More crucially, the present water driven Palestinian agricultural frontiers are deeply transforming Palestinian society. This bulletin ends by considering possible ways forward to improve the Palestinian water situation.

A Brief History of Palestinian Water Management

Before 1967

Historians have long documented examples of ancient water infrastructure, such as the aqueduct linking Hebron area springs to Jerusalem. However, focusing on long distance, urban-oriented infrastructure is misleading, from a water point of view, for two reasons. Firstly, Palestinian water has been managed locally, on a village-scale, for thousands of years. Secondly, the level of water consumption is much higher within agriculture than domestic use. Therefore, understanding Palestinian water management requires us to pay attention to the many ways it was developed in several hundred villages. It also requires us to pay greater attention to irrigation rather than just domestic water.

Up to the early 1960s, Palestinians relied on three sources of water: springs, wells and the Jordan River.

Springs with a flow large enough to be used in irrigation, such as Ein Sultan spring in Jericho or Ein Miske spring in El-Far'a Valley, had long been developed by farmers. Anyone could collect as much water as they wished for domestic use from a spring. However, irrigating a plot of land required so much water that a farmer had to construct a channel leading from the spring to his plot. Gravity alone conducted water to the field. Irrigation was thus developed on land lying at a slightly lower altitude than the spring. As more and more farmers constructed secondary channels bifurcating from existing ones, intricate networks of open-air channels emerged.

Traditional open air channel leading spring water to a field

Farmers devised grassroots rules on sharing the flow from the spring: each would channel the full flow of the spring to his land for a set amount of time called a 'water turn'. Depending on the spring, this water turn occurred every fifth, sixth, seventh or eighth day. No one paid for water, but the irrigation channels needed maintenance and such work was carried out collectively by the users. The water turn was systematically linked to the land it irrigated: when a plot was inherited or sold, the new owner acquired the water turn. Mediterranean springs show a great variability in their flow throughout the year. Such local rules allowed farmers to distribute the abundance of water at times of great flow and the scarcity at times of low flow in a manner that was considered legitimate. Every spring had water turns that varied greatly. Some farmers were only entitled 15 minutes of the flow every eight days. Others would benefit from 20 hours every eight days. This unequal distribution was considered legitimate by the villagers because of the manner in which it had been constructed. Where springs have not completely disappeared, this system persists to this day.

Wells were developed early in the Gaza Strip whose sandy soil is easily dug out. Irrigation wells only appeared on the north-west edge of the West Bank from the mid-1950s as the rocky soil in this area requires expensive technology for drilling that did not become available and affordable until this time. Farmers in villages around Qalqilya and Tulkarem pooled their savings to create "well companies" (*sharikat al-bir*) in order to drill wells. In contrast to the organization around springs, which remained informal, West Bank wells benefited from formal management institutions with written statuses. Here, farmers pumped water from the aquifer and directed it through pipes to their fields. A well operator activated the pump and recorded the number of hours of water directed to each farmer's field on a daily basis.

Each farmer receiving such water, whether a member of the well company or not, received a monthly bill requesting him to pay a fee according to the number of hours of water he had used. A well company did not aim to generate profit from selling the water and fees simply covered the costs of operating the diesel pump and maintaining the well. This system still operates today.

On the eve of the 1967 occupation, Palestinian farmers also pumped water from the Jordan River to irrigate land along its shore. Little existed in terms of water utilities at that time, with the notable exception of the Jerusalem Water Undertaking, created under Jordanian rule. Based in Ramallah, its mission was to supply tap water to Ramallah, East Jerusalem and Bethlehem. Its infrastructure had reached Beit Hanina by the time the occupation stopped its progression further south.

Al-Auja Spring

Pipes leading to fields from an agricultural well

Licensed agricultural well in Habla

From 1967 until 1994

When Israel occupied the West Bank and Gaza Strip in 1967, it did not extend its water law to apply there because it did not annex this land. Israel prevented Palestinians using water from the Jordan River when it declared a military exclusion zone along its shore. No Palestinian has since been allowed to penetrate this zone even if they have a title deed showing property of land lying there. In 1967 and 1968, Israel issued military orders concerning water in the occupied Palestinian territories. In theory, these orders granted Israel complete control over water. However, the occupation authorities did not extend complete control. Instead, Israel allowed every spring institution and every agricultural well institution, whether formal or informal, to continue managing water among Palestinians for irrigation. As early as 1967, Israel installed meters on irrigation wells and proceeded to meter the yearly abstraction from every single Palestinian agricultural well. It then imposed a yearly quota of water abstraction upon such wells that corresponded to the quantity pumped during the first year it had been metered. An employee from the West Bank Water Department visited each well several times a year to note the amount of water pumped since the beginning of the year.

Israel also started extending some of the services it was responsible for as an occupying power, for instance supplying drinking water to villages such as Battir or Al-Auja. It integrated East Jerusalem into the municipal domestic network of West Jerusalem. As opposed to the rest of the West Bank, East Jerusalem was annexed by Israel which extended its water law there. Many Palestinians in the West Bank started paying a domestic water bill to an Israeli authority while continuing to manage their irrigation water, either from a spring or from an agricultural well, in the same way they had done before the occupation.

Oslo

The Oslo Accords induced an upheaval within water management. Palestinians had always managed water communally at the local level but the Oslo Accords created the Palestinian Water Authority (PWA) and put it in charge of managing all of the water attributed to the Palestinians. In the case of the West Bank, the Oslo II Accord of 1995 allocated prescribed quantities of water to Israelis, on one hand, and to Palestinians on the other, from each of the three main aquifers, as illustrated in the table below. This agreement treated water as an immobile stock. It based its allocations on the amount each of the two parties had used in 1992. It maintained the confusion between water use and water consumption as it did not distinguish water that was used once before being consumed, from water that was used twice, or more.

The PWA was given responsibility only for domestic water management. Yet, the quantities allocated to the Palestinians included all the water used in irrigation, i.e. over half of the water consumed by Palestinians. The Oslo II Accord also created the Joint Water Committee, half composed of Israelis and half of Palestinians. The Joint Water Committee functioned on the basis of consensus. Its agreement was necessary to carry out any project dealing with water, whether this meant drilling or refurbishing a well, constructing or repairing a domestic water network, building a wastewater treatment plant, or simply building a rainwater harvesting system.

Allocation of Water According to the 1995 Oslo Agreement

(Annex 10, Paragraph 20, Article 40 of the Protocol Concerning Civil Affairs)

	Million Cubic Meters for Israel	Million Cubic Meters for PA
Western Aquifer	340	22
Eastern Aquifer	40	54 +78 to be developed
Northeastern Aquifer	103	42

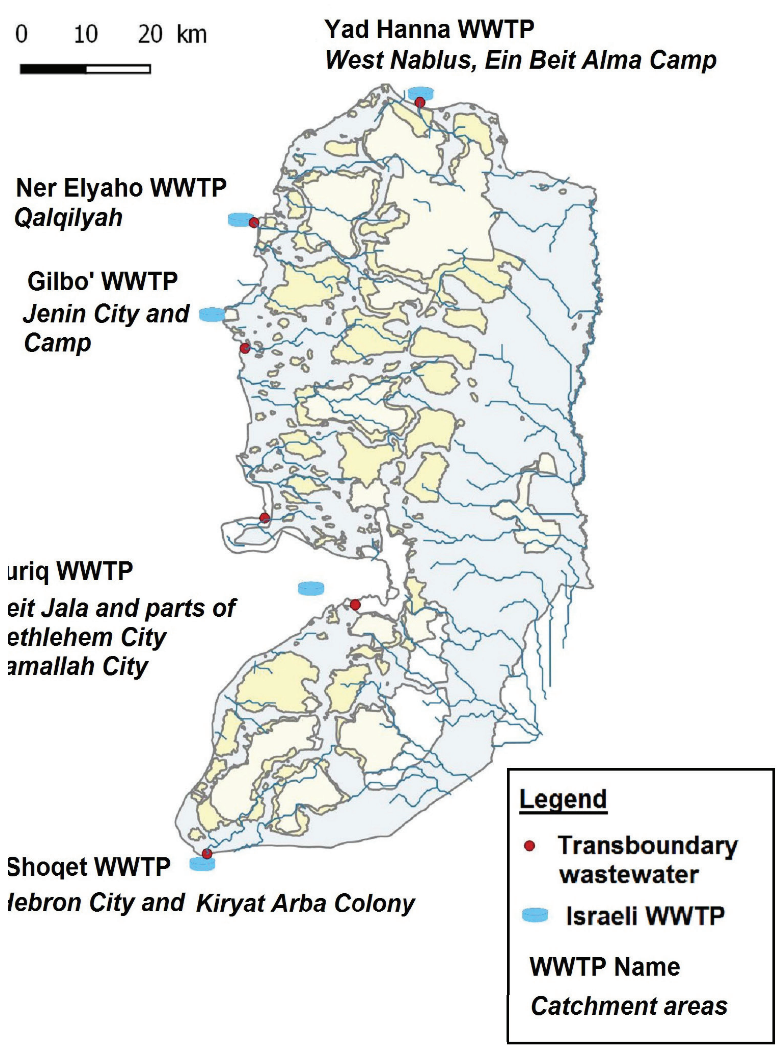
Developments since 1994

The Oslo Accords heralded a new era where international donors took over from Israel the task of developing water infrastructure in the Palestinian territories. Since 1994, in the West Bank alone, over 2,000 projects concerning water have been proposed for donor funding. Almost half of them were actually funded, and 90% of these were implemented or ongoing in 2016. This included the development of the Palestinian Water Law promulgated in 2002. Written in English by foreign consultants on the basis of principles they deemed of universal value, the 2002 Water Law declared that water was a public resource. It did not recognize the many decentralized institutions managing springs and wells collectively as a communal property. It did not integrate their members into policy-making efforts within the PWA.

Israel undertook large-scale desalination starting in the 2000s. Water used to flow from the land to the sea, in other words from the West Bank to Israel, from Israel to Gaza and from Gaza to the sea, mostly as groundwater but also as surface water. Such flow has now largely been reversed. In 2019, water desalinated along the coast in the five big desalination facilities supplied 80% of tap water in Israel (Bar-Zeev, 2019). The growing supply of desalinated water since the Ashkelon plant came into operation in 2005 has had an influence on Palestinian water consumption. In 2011, the PWA purchased 53,000,000 m³ a year from Mekorot, the Israeli national water company (Palestinian Water Authority, 2011). That year, 60% of the water managed by the PWA was purchased from Israel. In 2016, the PWA purchased 69,000,000 m³ from Mekorot, an amount equivalent to 59% of the water it managed over that year (World Bank Group, 2018). Mekorot uses a variety of sources, including wells in Israel as well as in the West Bank, but Israeli large-scale desalination has led to a steady increase in the share of desalinated water within the portion of water it supplies to the PWA.

Israel also undertook the construction of five wastewater treatment plants located inside Israel but close to the Green Line. These plants treat the surface wastewater flowing from the West Bank into Israel. Israel has been charging the Palestinian Authority both for the construction and for the operating costs of these wastewater treatment plants. It supplies the outcoming treated wastewater to Israeli farmers inside Israel (Fischhendler et al., 2011). In 2017, 21,400,000 m³ of wastewater flowed into Israel which billed the PA US$31 million for treating it (World Bank Group, 2018). This bill covers all wastewater originating from the West Bank, whether it is produced by an Israeli settlement or not and whether some of this flow has actually been treated by a wastewater treatment plant or not along its course.

Transboundary Wastewater and Israeli Wastewater Treatment Plants[1]



[1] This map was originally published in Trottier, Julie, Anais Rondier, and Jeanne Perrier (2019), "Donors Playing with Fire: 25 Years of Water Projects in the West Bank," *The International Journal of Water Resources Development*, https://doi.org/10.1080/07900627.2019.1617679.

The new water decree promulgated in 2014 by the PWA had the merit of first being written in Arabic. Yet, it did not integrate the numerous farmer organizations that manage water across Palestinian territories. Practices unforeseen or banned by the Water Law, such as the use of prepaid meters for domestic water or the drilling of unlicensed private wells, keep spreading. In some instances, such as prepaid meters in some villages north of Jenin, the population actually requests them. The Palestinian Water Law remains unimplemented.

Since 1994, the development of Palestinian water has been carried out both by donors and the PWA on the basis of assumptions that were deemed to have universal applicability. Yet, field work in Palestinian territories invalidates many of these assumptions. As a result, water policies have been very difficult to implement and have had unintended consequences.

The Importance of Water as a Flow

Water use needs to be distinguished from water consumption. When someone interacts with water flow while letting it follow its course, water use occurs. For example, washing one's hands with tap water constitutes a water use. In this case, water follows its course, draining away from the house. Most domestic water is not consumed when it is used. Water can be consumed in only three ways: through evaporation, through transpiration or through reaching the sea. In this case, it leaves the freshwater system. For example, a farmer abstracting 10 m^3 of water to irrigate a plot of land may cause 3 m^3 to be transpired through the stomata of the plants he cultivates while the remainder of the water he abstracted percolates through the ground. In this case, the farmer has consumed 3 m^3 and has used 10 m^3. Water may be used many times before it is consumed.

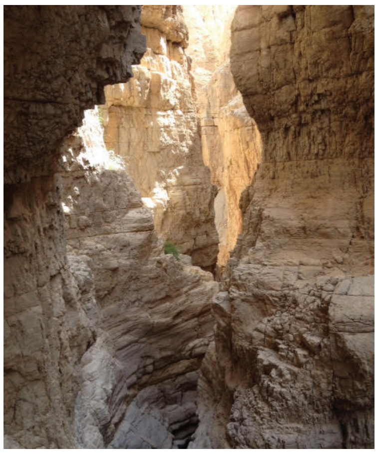
The Oslo Accords treated water as a national stock. In other words, it considered water as if it was an immobile resource, a "pie" that needed to be divided into two pieces, one for Israelis and one for Palestinians. Conceptualizing water as a stock frames the problem in a simplistic fashion as negotiations then only focus on determining the proportions of the pieces of the pie. Considering water as a series of flows rather than national stocks would be far more useful. When water flows, it follows a trajectory and interacting with this flow, such as happens in a water development project, usually alters this trajectory. Previous users benefiting from the initial trajectory may find themselves dispossessed from all or part of the water they used to access. Elsewhere, the degradation of water quality may make former uses impossible.

Water may flow through three types of trajectory (Trottier et al., 2019b):

1. A spatial trajectory because water flows through space.
2. An institutional trajectory because water flows successively through different human institutions between the point it either emerges from the earth or the desalination plant and the point where it evaporates, is transpired by a plant or an animal, or reaches the sea.
3. A sectoral trajectory when water is used successively in different sectors of activity before it is finally consumed.

Spatial trajectories refer to the path water travels through, whether as surface flow or underground. Since 1967, the only surface flows available to Palestinians have been springs. The spatial trajectory of a spring may change naturally, such as when a reflux occurs after a sudden flood. It may also be altered artificially, such as occurs when it is channeled within a gravity fed irrigation network. Underground flows are inextricably linked to surface flows. The West Bank has a karstic soil and spatial trajectories of groundwater through such a soil are notoriously difficult to map or model.

Underground water trajectories can also change naturally. A flood causing a reflux may lead water through new cracks and caves through the rocky soil. Underground water trajectories may be altered artificially as well. For example, the disappearance of Al-Auja, Ein Far'a, Ein Miske and Ein Shibli springs is usually explained by the drilling of wells that diverted the underground water flows that supplied them.



An example of karstic soil:
Wadi Al-Muqallek (Wadi Og)

Currently, spatial trajectories of water in the West Bank are mapped very roughly, on a large scale. Three main aquifers lie under the West Bank. The most plentiful flows towards the west, into Israel. The North-Eastern Aquifer flows northward into Israel, and the Eastern Aquifer flows mostly towards the Jordan River as illustrated in the following map:

West Bank Groundwater Aquifers[2]

2 Courtesy of PASSIA.

As licensed and unlicensed wells have multiplied since 1994, many springs have dried up.

Elsewhere, new surface streams have appeared because cities and villages are generating an increasing amount of wastewater.

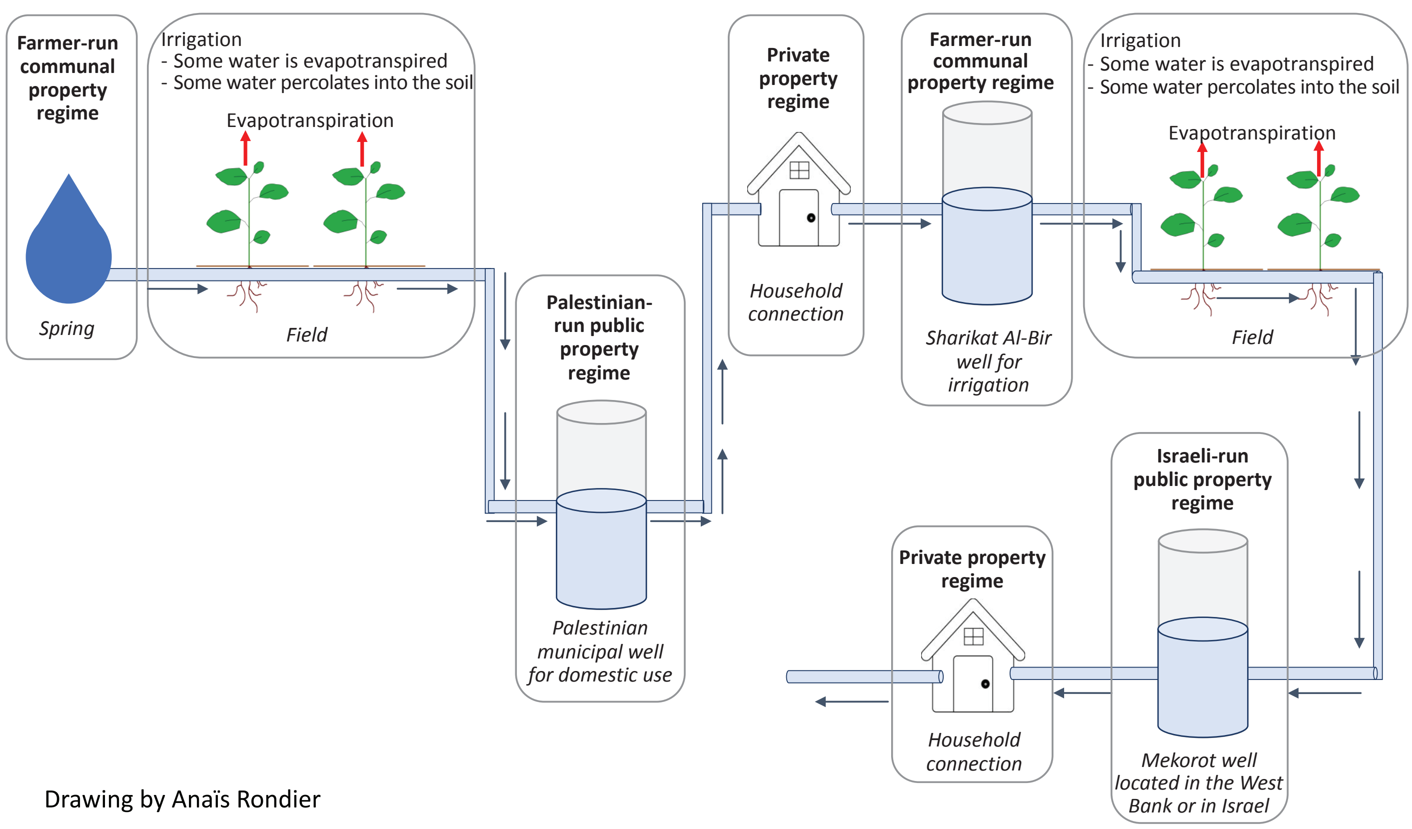
The changes in these trajectories of surface water have had a huge impact on Palestinians' interactions with water. Farmers had constructed elaborate common property regimes to manage springs and their water rights were tied to their plots of land. The disappearance of the springs brought about the disappearance of the grassroots institutions managing them. The only solutions available to farmers dependent on a spring that dries consist of either drilling their own unlicensed well, thereby participating in unregulated resource capture, or buying water from a (likely unlicensed) well that most probably contributed to drying their spring out in the first place. Interactions with water had previously been sustainable and tightly regulated but unregulated water mining has paved the way for increasingly unsustainable use of the upper aquifer.

Institutional trajectories of water refer to the path whereby water travels through different forms of management from the point it emerges from the ground or from the desalination plant to the point it evaporates or is transpired by a plant or an animal. In the West Bank, when spring water is directed to a field,

Wastewater stream originating from Nablus and flowing through Aqrabanyah, January 2017. The foam does not occur naturally

Stone canal that used to direct the water of Ein Miske spring in Aqrabanyah to the land it irrigated, but has now totally dried up

Example of an Institutional Trajectory



Drawing by Anaïs Rondier

it is usually managed by farmers according to a locally constructed common property regime that determines the water turn every user can have. When a portion of this water seeps into the ground and recharges a well, it becomes managed by another institution. If the well is an agricultural well, the water might now be managed by a well company, or *"sharikat al-bir".* This institution, made up of farmers, also deploys a common property regime over the water and the well. As opposed to the first institution water travelled through, this second institution has written statuses describing this property regime. The well might also be privately owned in which case water is managed according to a private property regime and is sold to the farmer using it. Once abstracted, water from that well is directed to a field or an orchard, where it may seep again into the ground, thereby recharging another well managed either by Israel or by the PWA. In this case, it becomes managed through a public property regime.

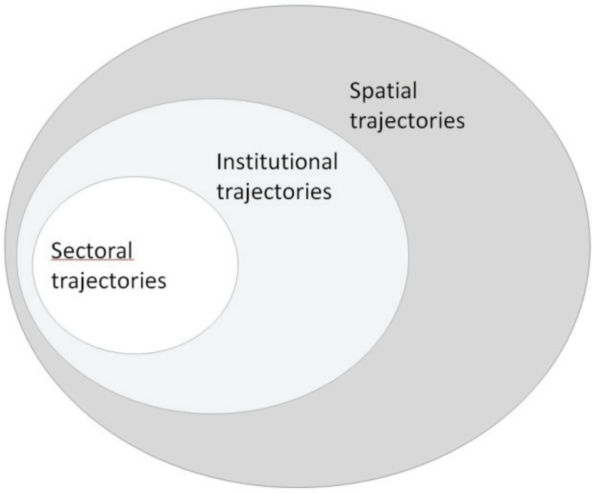
Understanding institutional trajectories is crucial. It allows us to understand the manner in which various forms of water tenure are embedded within each other. It also allows us to understand which forms of social organization destined to manage water are strengthened or undermined whenever the spatial trajectory of water is altered so that it now bypasses an institution that used to manage part of its course.

Sectoral trajectories of water refer to the path it travels through as it is used successively in different sectors. Considering sectoral trajectories of water allows us to understand the overall impact of changes in either spatial or institutional trajectories. For example, a project refurbishing a reticulation network may repair many of the leaks along the network. This changes the spatial trajectory of water because the flow of the leaked water to the neighboring agricultural wells is reduced. It also changes the institutional trajectory as the flow of water through a farmer managed common property regime used for the well is reduced while the flow of water through the wastewater treatment plant managed thanks to a public property regime is increased, providing, of course, the houses are connected to that plant. Finally, the sectoral trajectory of this water is also altered. Water that previously leaked from the reticulation network used to supply the farmer-managed well and was used in irrigation. The wastewater treatment plant, however, may sell its treated wastewater to an industry. In such a case, a change in spatial trajectory occasioned an institutional change from a common property regime to a public property regime and a sectoral change from irrigation to industry.

These three types of trajectories are subsets of each other as illustrated in the following diagram:

The West Bank is a small place: 5,655 km² (OCHA, 2015). The great number of water projects carried out together by donors and the Palestinian Authority since 1994 in such a small area has massively impacted spatial, institutional and sectoral water trajectories. As a result, the overall impact of all donor supported water projects has been greater than the sum of the individual projects. Understanding how these projects have altered the many trajectories of water allows us to understand how they have altered the way Palestinian society structures its interactions with water.

Types of Water Trajectories as Subsets of Each Other



What is a Common?

Until very recently, Palestinians had always treated water as a common. Elinor Ostrom et. al (1992) (2002) defined common property resources as those natural resources that showed two characteristics: they are non-excludable and they are rivalrous. A resource is non-excludable when it is very difficult to exclude users from accessing and using it. A resource is rivalrous when, once it is consumed by one user, it cannot be consumed by another. A spring or a well shared by irrigating farmers constitutes a typical common property resource.

The organization around the exploitation of such a resource is what made it a common. Ostrom identified a series of rules that kept reappearing in institutions managing such resources in a way which is both economically and environmentally sustainable. This work led her to receive the Nobel Prize in 2009.

Gravity fed irrigation network from a spring in Battir

The root of the word *common* is latin: *munus*, which means a co-obligation. A common can also be conceived of as a political principle whereby a group of individuals define obligations to each other while taking part in a common activity or a common task to deal with something that cannot be appropriated (Dardot and Laval, 2015). This concept is useful when examining water. It is a material resource but the techno-science that surrounds it, whether this is a scientific discourse such as a hydrologist's analysis of the recharge of a spring or a technology such as hydroponics, is an immaterial resource. So, when looking at a common managing water, we need to consider more than just the local rules developed to deal with the material resource. We need to simultaneously examine the scientific discourse and the technological choices that are involved. We need to understand how water and its use came to be represented in the manner it is represented now.

A water common is a socially constructed set of co-obligations concerning human use of water that is produced endogenously to manage aspects of water that can never be appropriated. Palestinian water commons have managed flows far more than they have managed stocks (Trottier, 2018). Understanding them requires us to understand the construction of techno science concerning water. The construction of techno science is as political as that of the commons. Yet, most people involved in both constructions are rarely aware of the political aspects of this activity. Understanding the development of water since 1994 requires us to simultaneously examine the interactions that right holders within water commons maintain with other commons and with other actors such as the Palestinian Authority and Israel. This can be achieved by a study of the *paracommons* of Palestinian water.

Locating the Paracommons of Palestinian Water

What is a Paracommon?

Ever since the 19th Century, water engineers have worried about irrigation efficiency. As time went by, they defined it successively in different ways with their primary concern always being a reduction of wastage. But wastage can be defined in various ways as can the goal of irrigation. An agronomist may aim to maximize the vegetal mass while a farmer usually prefers to maximize revenue. Each of these two goals may entail quite different priorities concerning water management and the consideration of what constitutes wastage.

When attempting to increase the efficiency of an irrigation system, engineers usually try to ensure that a greater proportion of the water that is abstracted is actually evaporated through the stomata of the plants under cultivation. In other words, they try to reduce wastage between the point where water is acquired by the farmer and the point where it is transpired by the plant. Since 1994, many donors have funded projects that cemented open-air irrigation channels, thus preventing the percolation of water into the soil which occurs in dirt channels. Donors also funded projects that covered irrigation channels in order to prevent the evaporation of water as it flowed from the spring to the irrigated plot. Additionally, donors have funded drip irrigation systems that deliver water right at the roots of the plant under cultivation. Most irrigation improvement projects aimed at reducing wastage.

Each irrigation improvement project altered the spatial trajectory water had been following. Once the project was completed, a greater proportion of the water that was abstracted reached the cultivated plant and a smaller proportion ended up in the trajectory labeled “wastage”. Where did the “wastage” go? Some of this water percolated through the ground and supplied a neighboring well that could have been used either for drinking water or for irrigation and some, leaking along the way, allowed adventice plants such as *khubbezeh*, an extremely nutritious weed that is a staple for poor families[3], to grow.

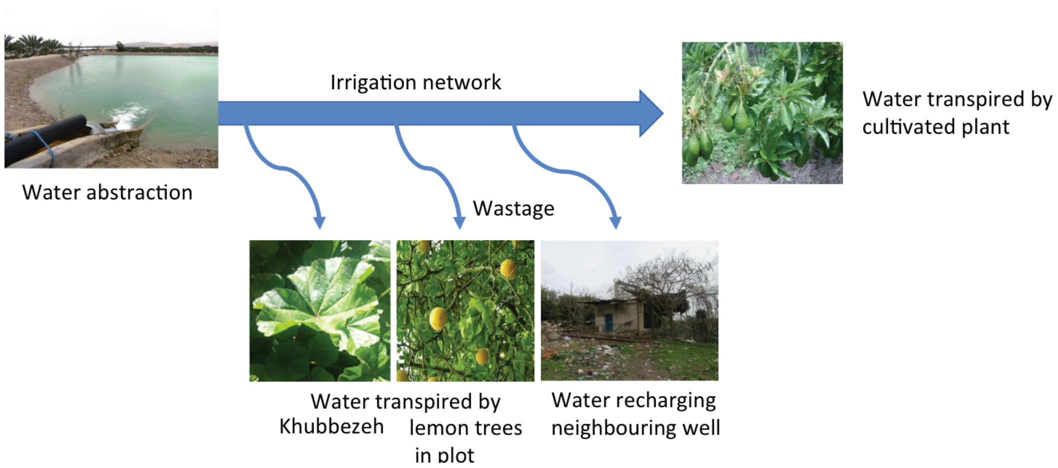
Khubbezeh: once it is cooked and the plant

Some of this water may also have been used intentionally by the farmer to irrigate lemon trees that often serve to demarcate the plots of siblings after they have inherited from their father. All of this ‘wastage’ contributed to local food security. Such water may not have contributed to the cultivated crop but it contributed to several processes that ensured many people, beside the one farmer trying to improve his irrigation system, could access sufficient food both in terms of quality and variety. Such water, considered as wastage, also contributed to the livelihoods of other farmers. In other words, water considered to be “wastage” by an irrigation engineer, is not wasted by other people.

Lankford (2013) re-examined the notion of irrigation efficiency, bearing in mind the idea that wastage for one farmer is useful water for someone, or something, else. He coined the term paracommons to designate all of this “wasted” water which development projects could redirect towards a cultivated plant. This water was already used by several people. It was very difficult to prevent these people from using it

3 The herb *khubbezeh* is known in English as (little) mallow, cheeseweed, or under its scientific name Malva parviflora.

which made it a non-excludable resource. Once that water was consumed by the lemon trees or the *khubbezeh*, for example, it could no longer be used by someone else, which also makes it a rivalrous resource. These characteristics make it a common property resource. In many ways, this "wasted" water had been managed as a common for a long time. For instance, in a great stretch of the Jordan Valley, nothing grows without irrigation so any *khubbezeh* growing in the field has inevitably relied on wasted water from the irrigation system. Yet, anyone who asked the farmer's permission to pick *khubbezeh* in his field would receive it for free. On the one hand, this was free weeding of the field. On the other hand, farmers consider weeds not to be the result of their work; it is the result of God's work so it would be unethical to prevent anyone from picking them and using them. While the "wasted" water clearly constitutes a common property resource, the scientific discourse deployed by water engineers since the 19th Century denies any *munus*, i.e., any co-obligation among the various users sharing this water. Lankford called this "wasted" water *paracommons*. The prefix "para" means that it is yet inexistent but it could be constructed because it is a common property resource.



Reusing Treated Wastewater

Water development carried out in Palestinian territories since 1994 has ignored the many ways water designated as "wasted" was actually part of commons that had developed over time. This is not an idiosyncrasy of the Israeli-Palestinian situation. Globally, water engineers systematically refer to the reuse of treated wastewater as "creating a new resource". This is technically erroneous because wastewater, whether treated or not, initially followed a given trajectory so reusing it in either industry or irrigation does not create a new resource but simply channels it along a new trajectory. Portraying this as the creation of a new resource means that the users of the initial trajectory are not considered. This globally promoted conception of the reuse of treated wastewater as the creation of a new resource coincided with the hefty bill sent yearly by Israel to the Palestinian Authority for treating the wastewater flowing from the West Bank into Israel. The Palestinian Authority wanted to reduce that bill. Donors had a favorable view of wastewater reuse project so, everywhere a wastewater treatment plant was built, a reuse project was elaborated.

Missilya wastewater treatment plant

The Palestinian Authority has now completed building wastewater treatment plants in Al-Bireh (south of Ramallah), Ramallah, West Nablus, Jenin, Tulkarem, Missilya, Gaza and Jericho thanks to foreign donors.

Article 55 of the Palestinian Law on Agriculture No. 2 of 2003 prohibits irrigation of agricultural crops with wastewater unless “it has been treated in accordance with the national standards certified by the competent technical authorities”. These standards are higher than Israeli standards and, in effect, forbid the use of treated wastewater in irrigating anything but fodder or fruit trees.

In 2019, Jenin showed an advanced case of reuse. Jenin’s wastewater treatment plant provided only secondary treatment. Yet, its outflow was channeled to formerly rain fed fields north of the plant. An underground drip irrigation system brought water to grow fodder while an aboveground drip irrigation system brought water to orchards of fruit trees. Here, sheep raising enticed farmers to invest in irrigating fodder. Previously, they could only produce one rain fed crop a year. Now, they can produce 10 crops a year on the same plot. What used to be a surface flow of wastewater into Israel is now being directed to fodder and trees for transpiration for eight months of the year. Farmers pay for the treated wastewater so they do not irrigate with it four months of the year when rainfall spares them that cost. During those months, the outflow of the wastewater plant continues to Israel. A waiting list of farmers exists, willing to purchase any additional treated wastewater once more houses are connected to the plant.

Fruit trees growing rapidly thanks to treated wastewater carrying nutrients coming from the Jenin wastewater treatment plant, July 2018

Villages north of Jenin, such as Arrana and Al-Jalame, have licensed agricultural wells that have become dry since 2006. Yet, as in the rest of the West Bank, no project has aimed to use treated wastewater to recharge the aquifer to supply them with water once again. Treated wastewater is systematically brought to fields that had never been irrigated before. An unintended consequence of the reuse project in Jenin was the replenishment of wells in the neighboring village of Kafr Dan. The reuse project directed the flow of treated wastewater in part, as planned, to plants for transpiration and, in part, unwittingly, to these agricultural wells.

In 2019, the Jericho wastewater treatment plant also produced an outflow that was entirely reused in agriculture, in this case to grow date palm trees. The 2013 PWA strategy aims to direct most of the reused water to the Jordan Valley to irrigate date palm trees (Palestinian Water Authority, 2013). This could entail a trunk line carrying treated wastewater from Al-Bireh to Al-Auja, bringing water over a distance of 40 km to land that has never been irrigated before. This project is so far unfunded, but an environmental and social impact assessment was completed thanks to European Union funding. Such expensive projects could be avoided if the treated wastewater was instead used to recharge the upper unconfined aquifers supplying existing agricultural wells and springs with water. The PWA specifies that reusing treated wastewater will reduce the pressure on the aquifer because less groundwater will be abstracted (*Study of the state and the economical importance of the reuse of treated wastewater in the West Bank (Palestine)*, 2017). But, this could only occur if the treated wastewater was supplied to farmers previously using groundwater on the condition that they should stop pumping and this is not happening.

In Gaza, the NGEST wastewater plant finally came into operation in March 2018 after over 15 years of construction and delays. In 2019, it was treating 34,000 m³/day and infiltrated this treated wastewater into the soil. But this did not aim to recharge farmer operated agricultural wells. The PWA drilled 14 wells and is expected to drill 14 more to abstract water and channel it into a planned irrigation system. For over a decade, it had no other choice than infiltrating untreated wastewater from Gaza into the ground through infiltration ponds located as far east as one can go in the Gaza Strip. The trajectory of underground water means this untreated wastewater has been progressing towards Gaza city and its drinking water wells. With the support of donors, the PWA undertook drilling its own agricultural wells and developing an irrigation system in order to intercept this untreated wastewater underground before it would reach the drinking water wells. Using it in irrigation improves its quality while it percolates back to the aquifer. Moreover, pumping it creates a cone of depression underground which reverses the flow. This way, they aim to protect the drinking water wells further downstream. However, Gaza has long suffered from over pumping which induces sea water infiltration in its aquifer. Reversing the underground water flow from the East is not contributing to reducing the sea water infiltration from the West. Here, once again, treated wastewater is not directed towards agricultural wells managed by farmers. Actually, the case of Gaza is rather unique. Elsewhere, treated wastewater is reused in agriculture to increase productivity through irrigation. Here, waste water is pumped from the soil to irrigate fields in order to improve its quality before it percolates back into the soil, so that domestic wells will provide water of a better quality.

A project proposed to reuse the treated wastewater produced by West Nablus wastewater treatment plant over three different expanses of land located next to the plant. USAID funded the 12 hectare irrigation scheme south of the plant while the German Kreditanstalt für Wiederaufbau (KfW) funds the 280 hectare planned north-east of the plant, as well as the 12 hectare scheme next to the plant. The land that is targeted is presently mostly covered with rain fed olive trees. Most of the land making up the two expanses belongs to people whose main activity is not farming. They have no experience with irrigation. Their plots are so small that, even if irrigated, they will not supply a full income. Thus, the 280 hectare project plans to transform land tenure as well as the crops on this land. It aims to introduce the cultivation of *barsim* (a type of fodder) and pecan trees, crops that have not been cultivated there before. To be profitable, such agriculture requires much larger plots. Aggregating plots and transforming land tenure is made especially difficult by the fact this land is split among five villages.

Projects proposing to reuse treated wastewater systematically portray its release to the environment as a waste. The *National Water and Wastewater Strategy for Palestine* aimed to supply 4,200,000 m^3 a year of treated wastewater to irrigation by 2017. It planned for 31,700,000 m^3 a year in 2022 and 93,000,000 m^3 a year in 2032 (Trottier & Perrier, 2018). This strategy planned to leave, on the long term, only 40% of the treated wastewater to recharge the aquifer. It expected a reduction in groundwater used in irrigation from 51,000,000 m^3 a year in 2012 to 45,800,000 m^3 a year in 2017 and 30,000,000 m^3 a year in 2032.

Treated wastewater reuse projects have been put forward as a solution to reduce pumping from the aquifer. But these projects have been targeting previously rain fed land or, in the case of the Jordan Valley, land that was no longer or never cultivated. So they are not reducing pumping from the aquifer carried out for irrigation. Within these projects, new crops are imposed upon farmers. This is put forward according to a productive logic on the basis of health concerns. Palestinian law presently forbids irrigating vegetables with treated wastewater. Yet, the West Nablus plant produces water of a quality such that, under Israeli law, it could be used to grow vegetables. *Barsim* (fodder) is a notoriously water hungry plant. Maximizing transpiration by the plants may be a surprising goal in a region that is considered water scarce. However, it contributes best to reducing the bill presented to the Palestinian Authority by Israel to treat the waste water flowing from the West Bank through six entry points along the Green Line. These projects have demonstrated they may inadvertently replenish dried up wells, but none of them aim to recharge the upper, unconfined aquifer.

Constructing Efficient Water Use

Allan (1992) has long urged Middle East states to develop their scarce water resources to nonagricultural activities generating higher added value. He argued this would allow importing food from states better endowed with water resources, thus ensuring both environmental sustainability and food security. He designated the water necessary to produce such imported crops “virtual water” because it was imported in a virtual manner together with the crops. The concept of virtual water now has far reaching consequences on the ways national administrations and international organizations shape their policies. It has shaped the manner they define who is an efficient and successful farmer. It has thus shaped the social category that their policies seek to support.

From its inception, the term “virtual water” designated the water embedded in commodities, such as cereals, that could be traded (Allan, 1992). This focus on trade distinguished the concept of virtual water from the pre-existing notion of hydric productivity. This new idea relies on the substitutability of water. In other words, water necessary to produce a crop is believed to become available for another activity generating more added value if that crop is imported. Champions of virtual water concluded that water scarce states needed to import water intensive commodities such as food in order to save their resources. Hoekstra developed calculations to estimate the amount of water needed to produce different crops in various countries (Hoekstra & Hung, 2005). They intended this as a method to guide states’ commercial and agricultural policies.

A prolific literature quickly burgeoned, producing values for the virtual water content of every crop possible in every country in the world. Yet, this concept accommodated questionable hypotheses that were invalidated by field work in the West Bank (Trottier & Perrier, 2017). The manner Palestinian farmers access water, via water turns from a spring or by queuing for a water hour from a farmer managed well, means they cannot access water at will. The Hoekstra calculations rely on their using irrigation calendars destined to maximize vegetal mass. Palestinian farmers, like 2 billion smallholders around the world, are in a position where they neither access water at will, so cannot possibly deploy these irrigation calendars, nor do they usually maximize vegetal mass. Generally, they prefer maximizing revenue. This may mean bringing the produce on the market at a time when the price is higher, even if this means irrigating at a time of the year that requires more water, for instance.

Vine growing along the edge of a guava plot

The very concept of virtual water is further flawed by several underlying assumptions that do not resist scrutiny. It assumes a monoculture on every plot of land. Yet, most plots show several crops.

It assumes that a given crop only yields one product, yet many crops, such as corn for instance, yield cobs that are sold on the market and stalks that feed the sheep once the cobs have been harvested. It assumes that water serves only one use: the evapotranspiration of the crop that will be sold. Yet, farmers may use water to wash off the salt from the land after it has accumulated because they use drip irrigation. Palestinian greenhouse farmers also use water in July and August to sterilize the soil.

Most crucially, the concept of virtual water relies on the assumption that climatic and agronomic variables alone determine the quantity of virtual water. This means that the many institutional trajectories water follows between the point it emerges from the ground to the point it is transpired by the plant, whether these trajectories are spatial, institutional or sectoral, are not considered. Representing efficient agriculture in terms of virtual water content of crops means treating water as an immobile stock within national borders. It makes the institutional trajectories of water invisible. Yet, these institutional trajectories determine the loci of decisions whereby a licensed well will keep a secure supply of water, whether khubbezeh will keep benefiting from leaks and "wastages", whether springs will dry out or not. In other words, local food security relies on the spatial and institutional trajectories of water.

Within this scientific representation, water only flows in a virtual manner when agricultural produce is exported abroad. This has important consequences on how we assess which type of agriculture uses water efficiently. An agribusiness that cultivates medjoul dates in the Jordan Valley and exports them abroad automatically appears more efficient than a sharecropper cultivating vegetables sold on the local market. Date palm trees have a low level of water consumption compared to vegetables (Sonneveld et al., 2018).

Medjoul dates bring in foreign currency whereas vegetables sold on the local market do not. And in a paradigm whereby food security can only be provided by international trade of agricultural produce, exporting dates appears to be a contribution to food security at the global level. Representing the world through the prism of virtual water favors export oriented agribusinesses. It makes them appear to lead a profitable and efficient activity. Agricultural policies around the world tend to favor them for this reason.


Drip irrigated date palm tree in the Jordan Valley

Representing the world through the prism of the paracommons of water allows us to reexamine water efficiency. It allows us to consider the gains water users make collectively as they interact successively along the trajectory of water instead of considering the gains a single water user makes. It also allows us to consider long term sustainability of water use in agriculture. For instance, drip irrigation of medjoul dates in the Jordan Valley appears to be very efficient on the short term. But drip irrigation unavoidably leads to a buildup of salt in and on the soil unless rain washes it away or unless additional water is used to wash it away. Rain is insufficient in the Jordan Valley to wash such salt away.


Salinization of soil due to drip irrigation of date palm trees

So, if the farmer does not use his precious supply of water to wash off the salt, the soil becomes sterile. "Wasted" water can be very useful for many people and for many things. Eliminating it can have very adverse consequences.

Which Water Development?

Water development has not been entirely driven by donors and by the Palestinian Authority since 1994. Farmers have continued investing to develop new access to water in order to extend irrigation to new land. Agricultural frontiers (or pioneer fronts) occur wherever agriculture is being extended over previously uncultivated land, or over land that was used non-intensively. This involves an in-depth reconfiguration of farmers' interaction with land and water that goes beyond turning to high value crops. Within a pioneer front, land tenure and water tenure are deeply modified. The modalities of access to both land and water are transformed. Appropriation modalities are transformed. Israeli settler agriculture constitutes a well known case of agricultural frontier. Fieldwork also reveals the existence of Palestinian agricultural frontiers in the West Bank within either uncultivated areas or areas used non-intensively, nestled among villages, towns, Israeli settlements and intensively cultivated areas (Trottier & Perrier, 2018). These interstitial agricultural frontiers are driven by a newly accessed supply of water. In theory, three types of water supply-driven agricultural frontiers can be distinguished: surface, groundwater and wastewater ones.

Springs had long been developed for irrigation and have shown a tendency to disappear since the beginning of the 20th Century. Consequently, no Palestinian surface water-driven agricultural frontier presently exists.

Several types of interstitial groundwater agricultural frontiers now exist in the West Bank. All farmer-led, they fall within two main categories: those relying on pre-existing, licensed wells and those relying on new wells drilled without a license. They both transform the landscape, but they have a very different impact on water appropriation.

Licensed wells drilled from the 1950s until 1967 still operate as common property regimes through their "*sharikat al-bir*". But increasing urbanization now leads villagers to build houses on previously irrigated land. This reduces the amount of water required from the well linked to this land, leading many of them to abstract much less than the quotas imposed upon them since the beginning of the occupation. Moreover, the separation wall built by Israel since 2002 has separated many plots of land from the wells that irrigated them and from the villages themselves. Irrigation of such plots has thus been considerably reduced. As a result, farmers have started cultivating land much further from and higher than their villages, where, until recently, only rain fed olive trees were growing. Some make hefty investments, cutting the mountain into terraces using heavy equipment. A farmer in Tulkarem area, for example, spent 120,000 NIS in 2013 to construct terraces over one hectare of land he had purchased (Trottier & Perrier, 2018). In his village, six wells were pumping far less than their quota. He relies on a large reservoir recently built at an altitude even higher than his newly developed land. Water is pumped from one of the pre-existing licensed wells into this reservoir and then uses gravity to reach his land via a pipe system he set up himself.

This farmer uses drip irrigation to produce greenhouse grown strawberries for the local market.

Palestinian agribusiness growing greenhouse-irrigated herbs within export-oriented contract farming

His reliance on a faraway well, located below his land forces him to pump water into a reservoir higher than this land. This entails great expense and water leaks. Yet such reservoirs have been funded by donors from 2011 onward within projects claiming to increase efficiency. Donors have thus participated in the groundwater driven agricultural frontier led by local Palestinian farmers. Drilling a new well close to his land is forbidden, a rule that is enforced in this part of the Western Aquifer. This farmer is structurally constrained into use of water that is labeled "inefficient" in spite of the heavy investments he has made.

Interstitial agricultural frontier relying on a licensed well

Pipes laid at the farmer's expense to irrigate these terraces high in the mountain

The second category of groundwater agricultural frontiers, relying on the drilling of unlicensed wells, often occurs in the Eastern Aquifer and in the Northern Aquifer. Since 1995, any well drilling or refurbishing in the West Bank, whether by the Palestinian Authority or by a farmer, requires a permit from the Joint Water Committee. Facing the impossibility of securing such permits, many Palestinian farmers drill wells without a license. This places them in a vulnerable position because the Israeli military is liable to appear any time to pour cement in the unlicensed borehole or otherwise destroy it if it lies in Area C or B. Such destruction of unlicensed wells is not systematic however. In the Jericho governorate, unlicensed wells dug in Area C, where Israel has sole authority, fare well whereas the Palestinian Authority prevents unlicensed well drilling in Area A of the governorate. In Al-Far'a Valley, however, unlicensed well drilling is frequent in Area A and Area B. Some of these wells have been licensed by the Palestinian Authority *a posteriori*, but have not secured a license from the Joint Water Committee. The result is an unregulated mining of underground water originating from the upper unconfined aquifer.[4]

In Wadi Al-Far'a, both Ein Miske and Ein Far'a springs started disappearing in 1995 and 2005 respectively.

The unlicensed drilling of wells in the surrounding area caused their disappearance (Tomazi & Naslun, 2005). Both springs had been entirely used for irrigation. A communal property regime managed each spring according to water turns and maintained several kilometers of stone channel. Spring users wrote to the PWA and to the Ministry of Agriculture to protest, to no avail (Trottier & Perrier, 2018). Some of these wells were later licensed by the PA. Ein Miske Spring used to discharge 1,370,000 m³ of water annually until 1994 (Tomazi & Naslun, 2005). Its complete disappearance has been a major loss for peasant run common property regimes. Some of their members now have no choice but to purchase

4 The 1995 Oslo II Agreement created, as an interim (5-year) measure, three distinct zones – Areas A, B, and C – with different security and administrative arrangements. The current status is frozen at the levels of the 1999 Sharm El-Sheikh summit: A = 17.7%, B = 18.4%, C = 59.6% of the total area of the West Bank.

water from the private unlicensed wells that dried up their spring. Unlicensed wells have no written statuses at the moment they are drilled. Whereas the older licensed wells operated according to common property regimes, these new unlicensed wells are private. Their owners achieve resource capture in an unregulated environment because they resort to a technology, wells and pumps, that did not exist at the time when the local water tenure had been elaborated around strings.

The third category of water driven Palestinian agricultural frontiers is driven by wastewater reuse. The reuse project carried out in Jenin involved local farmers working on their own land. The reuse project planned around West Nablus wastewater treatment plant foresees a transformation of land tenure in the target area. But the biggest upheaval in water and land tenure will occur in the Jordan Valley if the present plan to direct most of the wastewater there is carried out. Between 1999 and 2016, Palestinian date palm trees went from covering 25 ha to covering 1584 ha. In the same time, Israeli settlements' date palm trees inside the occupied West Bank went from covering 524 ha to covering 2560 ha (Trottier et al., 2019a). All Israeli trees are irrigated using treated waste water supplied by Mekorot from wastewater treatment plants and reservoirs along the valley. This waste water originates mostly from the area around Jerusalem and Bethlehem. Palestinian trees, however, are irrigated using freshwater with the exception of those supplied by the Jericho wastewater treatment plant.


Wastewater reservoir/treatment plant used by settlers in Jordan Valley


Wadi Kidron filled with untreated wastewater

As Israeli settlers demonstrated a profitable reuse of wastewater in date plantations in the Jordan Valley, Palestinian agribusinesses advocate for projects such as a trunk line that would carry treated wastewater from Al-Bireh plant next to Ramallah to the Jordan Valley. Agribusinesses growing date palm trees tend to lease the land they cultivate for a period of 30 to 40 years. They are not so concerned by the exact location of the endpoint of this trunk line because they intend to rent land from whoever owns it. The end point, however, is a matter of great importance for land owners. Such a trunk line would create a new spatial trajectory for wastewater as well as a new institutional trajectory. Presently, wastewater produced by Al-Bireh wastewater treatment plant is released in the environment. It re-supplies wells and springs that are managed locally according to communal property regimes. Once directed through this trunk line, the wastewater will be managed by the PWA according to a public property regime. Once directed through this trunk line, this wastewater will no longer replenish the upper unconfined aquifer.

The idioms of virtual water and wastewater reuse have represented the present tidal wave of date palm trees sweeping through the Jordan Valley as sustainable development. Date palms are hailed as the ideal crop for the Jordan Valley because they consume three times less water than banana trees, which used to be the flagship cash crop in the area during the 1990s. Medjoul dates fetch a very high price on the international market, a price that is expected to remain inelastic even if supply increases. Dates are thus considered to contain very little virtual water while they can generate foreign currency. However, date plantations transform land and water tenure in the Jordan Valley. Palestinian agribusinesses rent the land, fence it, and replace sharecroppers with seasonal workers. The displaced sharecroppers can no longer live on the land they used to cultivate all year long. The seasonal labor for men only lasts two months of the year, during the picking season. Fencing the land means that the poorest people can no longer pick nutritious weeds in irrigated fields, such as *khubbezeh*, which used to guaranty food security. Dates may increase the GDP, but they have disrupted local livelihoods. The housing security, food security and year-long subsistence of the sharecroppers cannot possibly be compensated by the jobs created by date palm tree plantations because these jobs are seasonal. A valley clearance is now occurring, akin to the Highland clearance that took place in Scotland in the 18th Century. Already, a careful count of the previously cultivated areas now covered with date palm trees allows estimating that over 7000 members of sharecroppers families have been displaced since 1999 from the land they used to cultivate (Trottier et al., 2019a).

Whether date palm cultivation in the Jordan Valley is a sustainable option remains debatable. Between 1999 and 2016, 7754 dunums of date palm trees planted by Palestinian farmers on desert land have generated a new demand for 10,500,000 $m^3$of water per year where none had existed before. In the meantime, other date palm trees replaced other crops on a total of 7833 Palestinian farmed dunums, many of which had never hosted banana trees, the notoriously water hungry crop in the area. Cultivating date palm trees also involves other consumption of water, beyond evapotranspiration. For instance, trees are sprayed with fungicide diluted in water when they flower in February.

Laborers treating date palm trees for mold in February in an agribusiness

The Palestinian Ministry of Agriculture estimated in 2018 that date palm trees required 50% more than their crop water requirement strictly calculated in terms of virtual water content. Consequently, switching to dates did not free up water to be allocated to other crops in spite of what is usually put forward as the main advantage of such a switch. Moreover, all these trees are drip irrigated which causes an accumulation of salt on the land. The rainfall in the Jordan Valley is too low to wash off this salt. More water is thus required for that purpose. But if an agribusiness moves to another plot of land after forty years, letting the salt build up is a viable business plan even though it makes the soil sterile.

The transformation of the spatial, institutional and sectoral trajectories of water flows since 1994 has resulted in territorial transformation. Projects purportedly aimed at supporting the PWA to develop a state that would manage water according to a public property regime. The PWA emerged in 1994 in a context where a specific understanding prevailed concerning what constitutes an efficient economic management of the environment. The projects donors funded systematically fitted that vision. This led to the rise of new actors. Some are small farmers interested in cultivating land, within reuse schemes, which they intend to rent, one hectare at a time, from their owners, who used to practice rain fed agriculture and polyactivity.

Rain fed agriculture (2013)

Other new actors are agribusinesses that rent large tracts of desert land in the Jordan Valley, 60 hectares at a time, to grow irrigated dates for export. Irrigated agriculture in the Jordan Valley is ancient. But for the past hundred years, it was carried out on the basis of water turns from Ein Sultan, Ein Auja and Fassayil springs, or from the 16 springs that used to flow in Ein El-Beida, Bardala and Kardala (Trottier, 2013) (Trottier, 2015). Such water turns were never monetized. The changes brought to water tenure have transformed the sorts of actors who can access water and the purposes for which they access it. Overall, the changes entailed by the water projects have undermined the livelihoods that depended on a water tenure that was not monetized. They have systematically reduced the recharge of the upper unconfined aquifer and they have increased the dependence of the PWA on water delivered by Mekorot.

An Unimplemented Water Law

Donor funded water projects reportedly aimed at supporting the Palestinian Authority to develop a state that would manage water according to a public property regime. A modern state is supposed to be the sole source of authority to produce legislation over its territory. This idea predominated at the International Conference on Water and the Environment that took place in Dublin in 1992. This conference produced the four principles that became promoted by all international development organizations from 1993 onwards. These principles where:

- Water is scarce and essential for life, environment and development,
- Users, planners and decision-makers needed to participate in water management,
- Women play a key role in water management,
- Water is an economic good.

This conference gathered 500 participants from 114 states, 38 NGOs, 14 intergovernmental organizations and 28 UN bodies and agencies. The document containing those principles was adopted by consensus and participants voted by lifting their hand. Of these 500 participants, 316 were governmental experts (working for a state) and half of them were sent by only 21 states: 11 European states, three North American states, China, Turkey, Iran, Saudi Arabia, Nigeria and Egypt. 52 states out of 114 send only one expert. The FAO and the World Bank each sent 11 representatives, thereby making up 20% of the representatives sent by UN agencies. The document adopted in 1992 in Dublin thus reflected a very specific outlook on water management (Perrier, forthcoming). It reflected the outlook of states for which mastering water is important. It also reflected a neoliberal outlook that promoted a commodification of water according to an understanding of water efficiency that was relatively flawed. Commodification of water excludes its consideration as a flow along several trajectories, several of which, usually labeled as wastage, contribute significantly to food security and environmental sustainability. Commodifying water means treating it like an economic good that can be bought and sold. Once purchased, its owner can dispose of it as he pleases. Considering water as a flow allows recognizing that several users interact successively with the same water along its spatial trajectory. An "inefficient" irrigation system that waters *khubbezeh* at the same time as a cash crop allows the poor to access free food. An "inefficient" irrigation system through which water percolates into the ground and recharges the neighboring spring or waters a neighboring field planted by subsistence farmers also contributes to food security and environmental sustainability. But a neo-liberal understanding of water efficiency considers such water to be wasted. It fails to recognize the multiple uses that occur along the trajectory water flows along.

Water laws adopted by countries relying on foreign donors from 1993 onward all followed this blueprint. More recently, several states have tried to recognize grassroots, local institutions managing water, and to find a way to integrate them into the national law (Boelens, 2009). The Palestinian Water Law promulgated in 2002, written first in English by foreign consultants, and the 2014 law, written first in Arabic by Palestinians, both follow the standard blueprint of water laws adopted around the world since 1993. However, they have not followed the more recent trend to recognize grassroots, local institutions, whether formal or informal, when they carry out water management.

The 2014 Palestinian Water Law reproduces most of the content of the 2002 law. It lays the ground for public-private partnerships, aiming to establish a stable and efficient institutional environment to secure private investments that will ensure the financial autonomy of regional water utilities that do not exist to this day. It differs from the earlier law in a few respects, however (Perrier, forthcoming). It mentions integrated water resources management explicitly. It mentions wastewater reuse. Most crucially, it creates the Water Sector Regulatory Council, an institution that is accountable to the Council of Ministers alone.

According to the institutional structure foreseen by the 2014 law, four regional water utilities are supposed to be supplied by a national water company that does not exist to this day. Domestic and industrial users are supposed to pay regional utilities for the water they receive from them. The performance of these utilities is supposed to be reported twice a year to the Cabinet of ministers by the Water Sector Regulatory Council. In reality, however, municipalities and village councils mostly supply domestic and industrial users.

Boosters at Al-Badan pumping station operated by the Municipality of Nablus

The fees they collect from these users constitute an important income for them which they prefer to keep instead of transferring it to the West Bank Water Department. The West Bank Water Department thus cannot pay the bill it owes Mekorot, the national Israeli water company, for the domestic water it purchases from it, which amounts to about $70 million a year. Israel deducts this amount from the import duties which it collects on all goods entering the West Bank, before it hands these funds over to the Palestinian Authority.

The Palestinian Water Law has not been implemented for three main reasons. First, it has not built on the institutional capacity developed by the many local actors involved in water management. Second, the power imbalance with Israel has prevented much of its implementation. Finally, the power struggles within the Palestinian Authority itself have hindered its implementation.

The local institutional Palestinian landscape has been established since Ottoman times. It includes family structures and local administrative structures such as municipalities and village councils. Urban institutions tend to be less important than rural institutions in water management. Yet, a city like Nablus demonstrates a great level of water independence. It relies on local springs located inside the governorate, five important municipal wells and a few agricultural wells (Perrier, forthcoming). The municipality derives a sizeable income from its delivering domestic water. It has no intention of giving up this revenue. The entrenched rivalries between the urban elite and the surrounding villages explain the difficulty in constructing the east Nablus wastewater treatment plant. Wastewater treatment plants need to be located in rural areas, where there is a space for them.

The 1997 Local Government Law (Article 15, paragraph 3) states that municipalities provide water to their inhabitants for domestic and any other use. It also stipulates that municipalities determine themselves which equipment is necessary, such as meters or pipes. Furthermore, it stipulates that municipalities organize to distribute water, and decide on the price they charge for this water. Yet, the 2002 and 2014 Water Laws conferred that competence to regional utilities. If this were to happen, municipalities would lose both power and income (Perrier, forthcoming). The Water Law thus meets with urban resistance.

The Water Law also faces rural resistance. The 2018 regulation on water user associations, foreseen by the 2014 law, defines them as "nonprofit organizations that are established to manage the supply of irrigation water" (Perrier, forthcoming). Written along the same blueprint as in other countries, this regulation subordinates water user associations to both the Ministry of Agriculture and the PWA. It details the statuses, the responsibilities and the structure of these associations. Its second chapter, article 4 paragraph 1 specifies that a water user association needs 10 farmers who collectively "own" at least five hectares. Yet in paragraph 4, it refers to "areas of land owned or used". Instead of addressing the complexity of Palestinian land tenure, it introduces a further confusion. More crucially, the 2018 regulation does not recognize the pre-existing institutions already set up locally by Palestinians to manage their irrigation water. Article 41 specifies "Any association established prior to effectiveness of provisions of this Regulation is considered officially registered, given that it corrects its status in accordance with the provisions of this Regulation during a maximum period of (6) months starting the day it entered into force, otherwise it will be considered in violation with the Regulation provisions." This regulation thus does not recognize the various forms of organizations around water that emerged endogenously and have been in use sometimes for centuries. The Water Law thus meets also with rural resistance.

The only institution foreseen by the 2014 Water Law that was actually set up was the Water Sector Regulatory Council, which stated in its 2017 annual report: "The council was unable, for the second year, to get the West Bank Water Department data due to restrictions by PWA. Although this act is against the Water Law, several attempts to get the data were unsuccessful" (Perrier, forthcoming). The law thus meets also with resistance from the PWA.

The Palestinian Authority's interaction with water has been defined by two successive water laws that never capitalized on existing, functioning Palestinian institutions, especially in rural areas. Importing principles adopted in international conferences dominated by Western experts does not necessarily make for successful legislation. Conflicts are now occurring between Nablus municipality and the three villages where East Nablus wastewater treatment plant had been planned and between unlicensed well drillers and the right holders of springs these wells dry up. A legislation that recognized such actors and the institutions they have set up to manage water sustainably sometimes for centuries would fare better in avoiding or solving such conflicts. Such legislation would contribute to the Palestinian state-building efforts.

Conclusion

The purpose and intention of this bulletin is to draw attention to the shortcomings in internal Palestinian water management rather than focusing on the constraints imposed by the Israeli occupation because both donors and Palestinians have far more opportunities to improve and influence the former than to change the latter.

No matter how small one's degree of freedom or space to act, using it fully is important. The issues tackled in this bulletin are environmental management problems that a fully independent Palestinian state would need to solve in any case. As described above, several paths exist to improve the water situation. A few are briefly summarized here.

Restoring springs is still possible. If achieved rapidly, it would not only restore damaged ecosystems, it will also restore some social stability. The common property regimes that used to manage springs that have been drying up in the last years are still well ingrained among the population that developed and used them. However, waiting for another 20 years would definitely mean that these sustainable forms of management will have been lost. Care must be given, however, to which trajectories of water will be transformed in order to restore springs. Forbidding abstraction from unlicensed wells could be very difficult to implement as it would meet with resistance from those who have invested in these wells and rely on them for irrigation. However, releasing treated wastewater in the environment in order to recharge the springs is fully feasible. The present trend which consists of advocating channeling treated wastewater directly to date palm trees in the Jordan Valley needs to be reconsidered.

Any water project needs to include land tenure and water tenure within its environmental and social impact assessment. Post-impact evaluation of projects also needs to consider them carefully. Land owners must not be the only actors considered. Tenants often have as strong an attachment and vested interest in maintaining the resource. The quantity of water consumed by a crop has been demonstrated to depend more on social and economic variables then on climatic and agronomic variables. When these are not understood fully, one can reach erroneous conclusions such as believing that drip irrigation of the date palm trees is profitable and sustainable when it might in fact be salinizing the soil, curtailing food security for the local population and generating a greater water consumption than existed previously.

The efficiency of water use needs to be reformulated in terms of environmental justice, livelihoods and equity. Examining the various trajectories that water follows, whether spatial, institutional or sectoral allows understanding the wider impacts of a water project. Sometimes, increasing the efficiency of one system, such as an irrigation scheme, is detrimental to the overall efficiency of a set of water trajectories. Wastage has to be reformulated as wastage for one user only. Much water wastage provides survival for other users. The impact of a water development project must be considered as part of a wider transformation of the landscape. It cannot be assessed in a narrow fashion as is presently done.

Well suspected of interfering with Al-Auja Spring (2013)

Over the past 25 years, donors and the Palestinian Authority have pursued water development on the basis of a discourse elaborated by experts at the global scale within a process triggered in Dublin in 1992. This discourse failed to include the positive externalities of local, grassroots water management developed endogenously. The UN Permanent Forum on Indigenous Issues has reiterated for several years the importance of recognizing indigenous peoples' collective rights to manage land and water because these resources are not mere commodities but part of their identity, livelihoods and social organization. The UN Declaration on the Rights of Indigenous Peoples was adopted by the General Assembly on 13 September 2007. Bolivia enshrined such rights in its constitution and several states have significantly progressed in recognizing and integrating local water laws in their formal water law. Donors and the Palestinian Authority could strengthen both state building efforts and environmental sustainability by following that path.

Considering what would happen if such paths are not chosen is worthwhile. The recharge of the upper unconfined aquifer will be increasingly compromised. Springs and many agricultural wells such as those in Al-Far'a Valley will dry up completely. Other wells such as those in the Jordan Valley will keep on becoming increasingly saline. The biodiversity springs sustain will disappear. The farmer-run institutions responsible for managing wells and springs will vanish. This will contribute further to the de-structuration of Palestinian society already induced by the occupation. Peasant-run irrigated agriculture will disappear. Treated wastewater will constitute the main resource for irrigation. If channeled entirely to irrigating date palm trees in the Jordan Valley, it will contribute to the salinization of the soil, making it sterile over a few decades while completing the displacement of sharecroppers from the area. This sort of water development will worsen food security for the poorest and will disrupt livelihoods further. As outlined in this bulletin, other paths forward are possible – they are worthy of consideration.

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**Palestinian Academic Society
for the Study of International Affairs**

Tel: +972-2-626-4426 / 628-6566 | Fax: +972-2-628 2819
Email: passia@passia.org | Hind Al-Husseini, Alley, 2 Wadi Al-Joz | PO Box 19545, Jerusalem / Al-Quds

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