Pilot Application of the Guidelines on improved water allocation

Al Fara'a Watershed as a case study

Prepared by Palestinian Team

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General

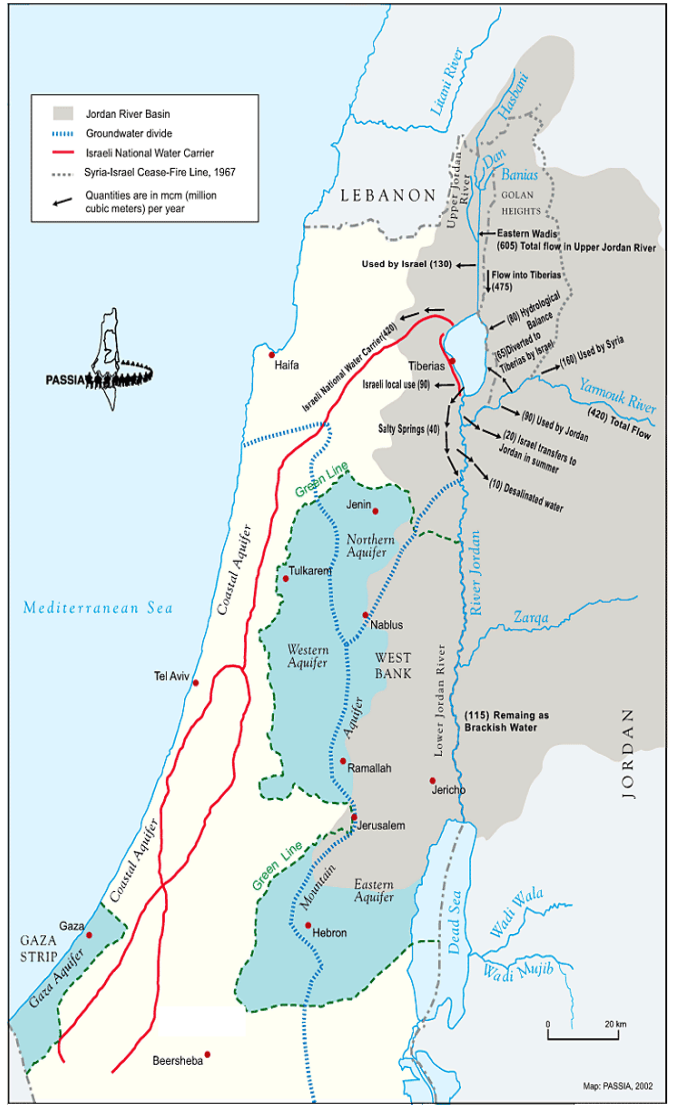
- West Bank area: 5845 km2
- The area of Gaza Strip: 365 km2
- The climate of Palestine: a desert and semi-humid climate
  - Rain falls in winter and spring months,
  - Its amount is limited and fluctuating from 600 mm in the western highlands to 100-450 in the eastern highlands.
  - Average annual: 460 mm in West Bank, 356 mm in Gaza Strip
  - Rainwater is the main source of water, as it feeds the aquifer, waterways, valleys, and torrents

Water Resources in Palestine

Groundwater Three groundwater basins (Western, Eastern and Northeastern) represent the groundwater aquifer system in the West Bank. Part of Costal Aquifer exists in Gaza Strip**. GW** represents 95% of Palestinian water supply.

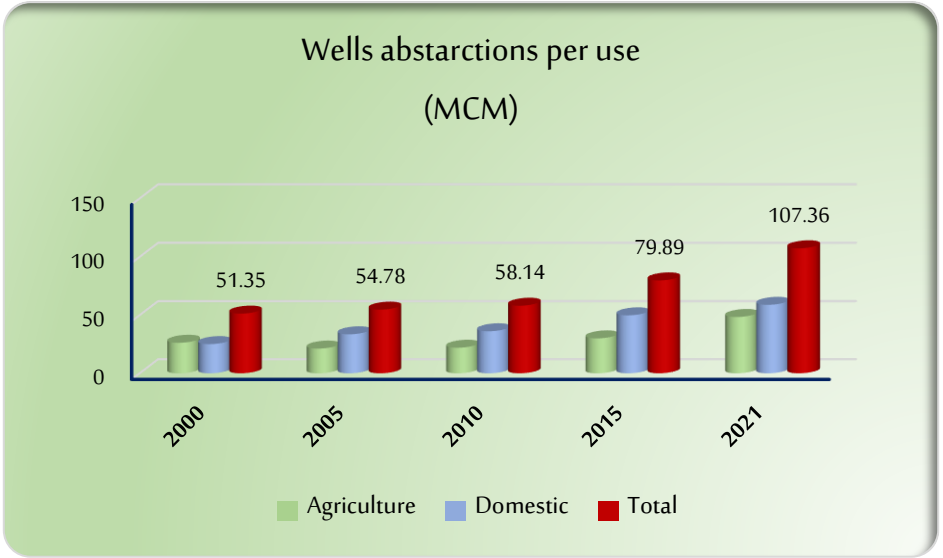
Surface Water (Jordan River, flood Wadis & Dead Sea)

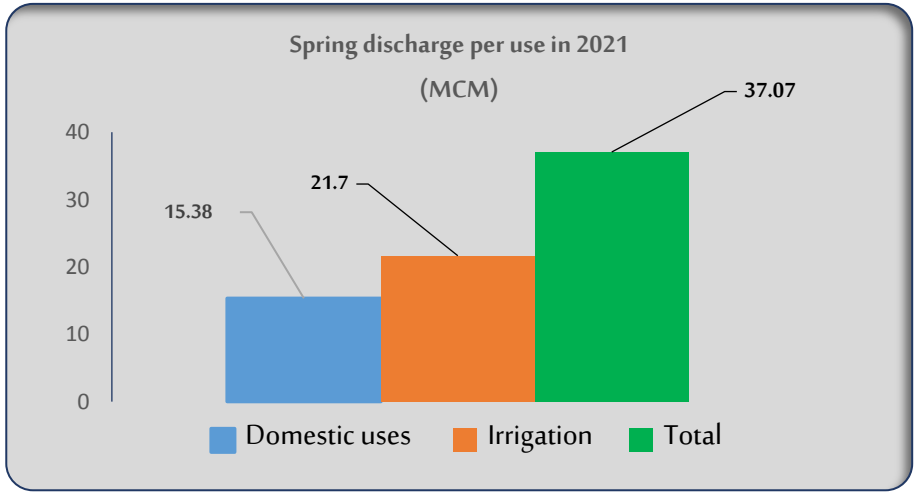
1. Surface water: includes seasonal streams and rivers, the Jordan River and the Dead Sea.
    1. No Access, No use of the Jordan River and Dead Sea water.
    2. Few water harvesting attempts due to occupation restrictions, lack of experience, lack of finance, and high cost.



Water uses in the West Bank (2021)

No.	Source	Domestic	Agriculture	Toatal
1	Groundwater (wells)	58.68	48.68	107.36
2	Groundwater (Springs)	15.38	21.7	37.08
3	Water Harvesting	0	4.75	4.75
4	Purchased water	77.5	4.2	81.7
5	Treated wastewater	0	2.34	2.34
total (MCM)		151.56	81.67	233.23

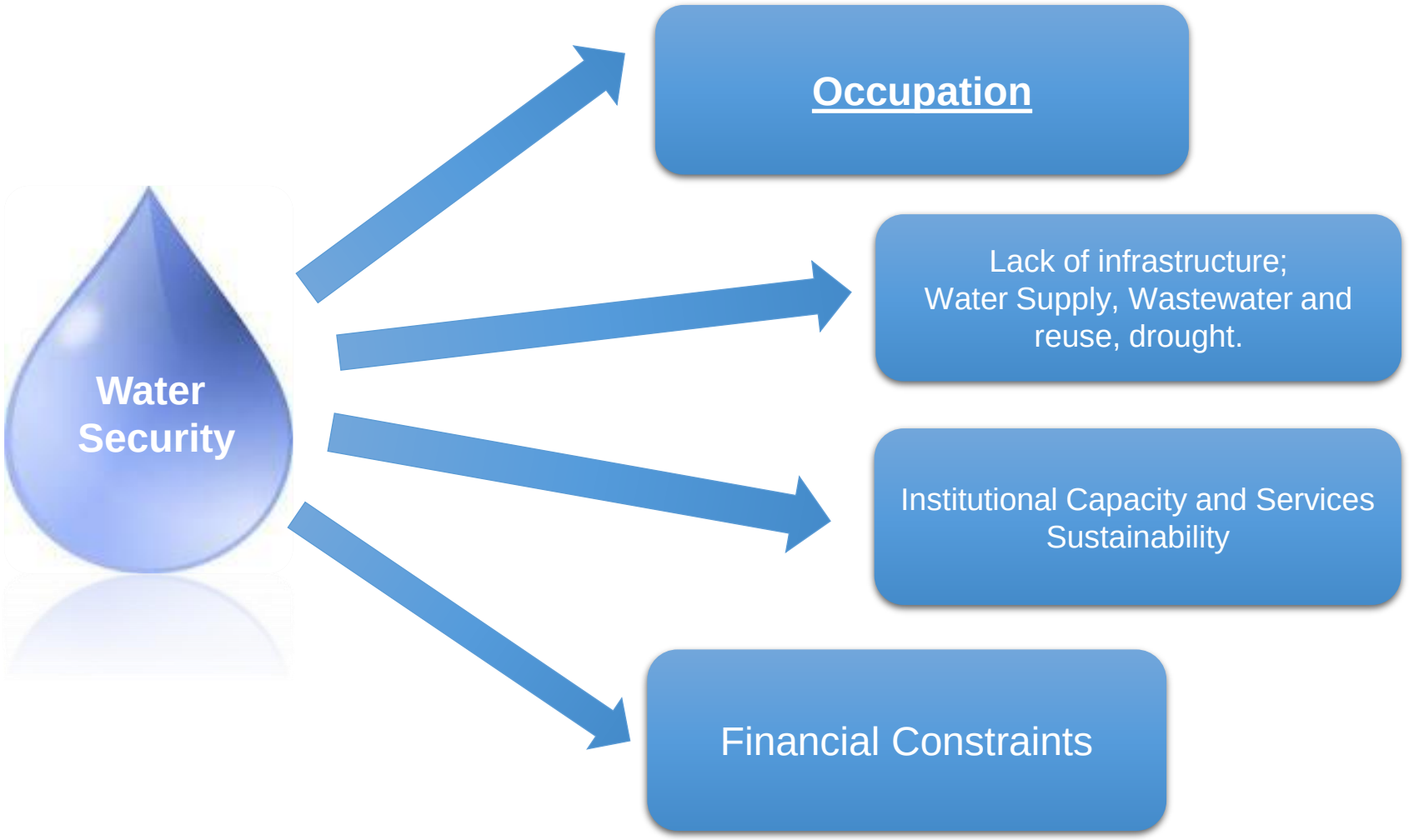




The average amount of water consumed in Palestine - the West Bank and Gaza Strip - is about 448.4 million cubic meters annually

233 million cubic meters are used in the West Bank (151.56 MCM for drinking and industrial purposes and 81.67 MCM for irrigation and agriculture

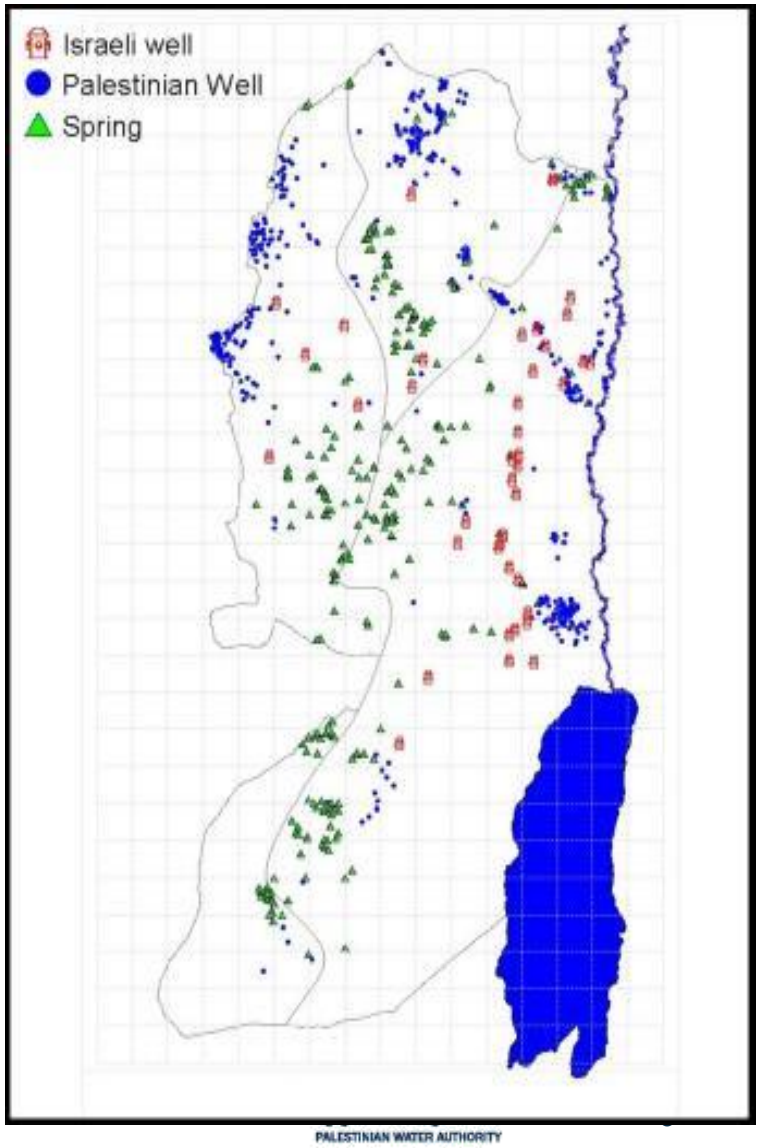
Main Challenges of Water Security



سلطة المياه الفلسطينية
PALESTINIAN WATER AUTHORITY

Israeli Occupation

- Israeli settlements (Israeli wells drying up Palestinian wells).
- Control of Water resources (preventing drilling new Pal wells or rehabilitate the old existing wells).
- Desertification (Israeli military camps, closed areas.. etc).
- Projects in Area C require other permits from the Civil Administration.
- Separation Wall annexed lands and wells
- Disposing more than 30 MCM of untreated WW to environment



Lack of Infrastructure and Water Supply

- Demand in Palestine exceeds the available water supply due to population growth, urbanization, and climate change.
- Large construction needs in water supply infrastructure.
- Agriculture accounts for about 40% of total conventional water supply.
- Water Salinity in Gaza and Jordan Rift Valley.
- Climate change impacts on agriculture and water supply.
- Desertification increase as a result of loosing 50% of the grazing areas to Israeli settlements and military camps and “nature reserves”.
- Excessive pumping of recharge rates, which leads to the deterioration of water quality due to the rush of sea water into the coastal aquifer.

Palestinian Institutional Weaknesses

- Water resource access in the West Bank that is fragmented, makes water management difficult and inequitable access and availability.
- Water Sector performance faces limited capacity to invest and implement projects.
- The challenge is to agree on a doable reform program, that will strengthen PWA planning, strategy and investment programming.
- Water users associations are very important institutional partners in water management. Up to date their efficient rule is not fulfilled.
- lack of official lawmaking power
- The need to endorse and implement Water Management bylaws and regulations agricultural water tariff , etc.

Purpose of pilot application on improved water allocation

The pilot application of the guidelines will support the work on improved water allocation, through:

(1) systematic assessment of improvements of water allocation for agriculture,

(2) scan of the necessary governance arrangements to support optimized water allocation and

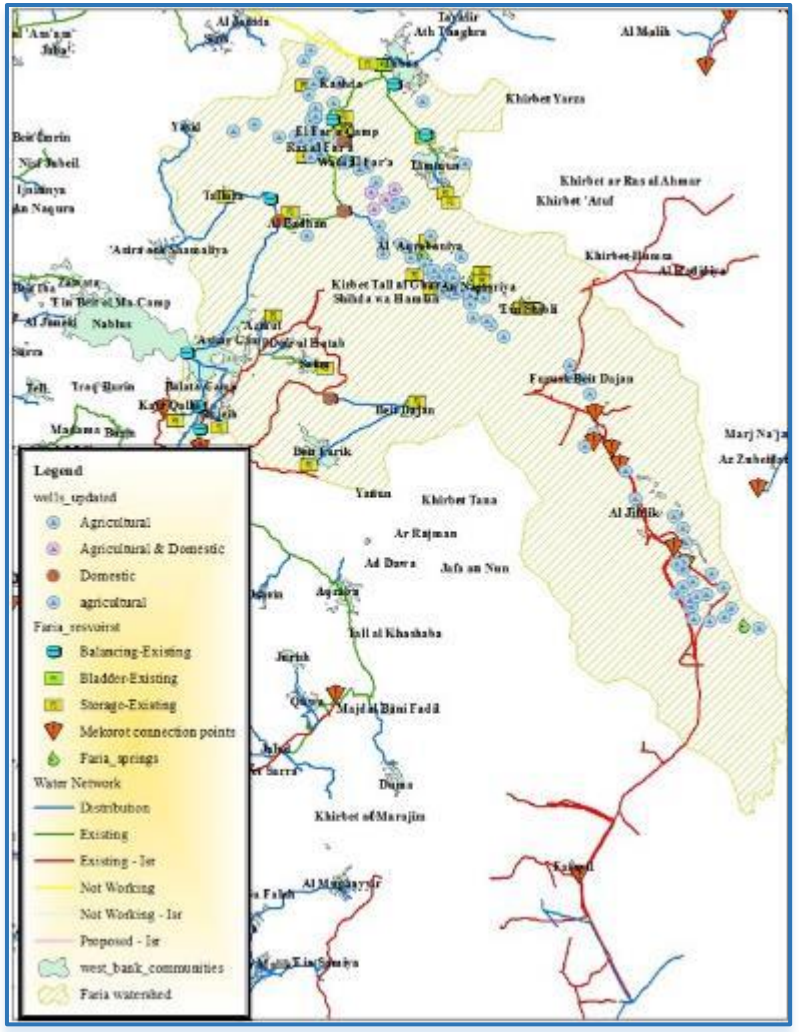
(3) guidance on the process to introduce the necessary changes.

Al Fara'a Watershed as a case study

Why Al Fara'a???

Rapid Water Accounting and Governance was conducted

- Data was collected
- Water issues and problems were identified
- Significant change in agriculture development since the last twenty years. It shifted from a primarily rainfed, cereals and legumes oriented to an irrigated export-oriented horticulture production zone
- Inequities in water access and allocation leading to to impoverishment of small farmers and environmental degradation
- Legal pluralism in water tenure and institutional fragmentation in water domain



Issues / study questions related to water sustainability

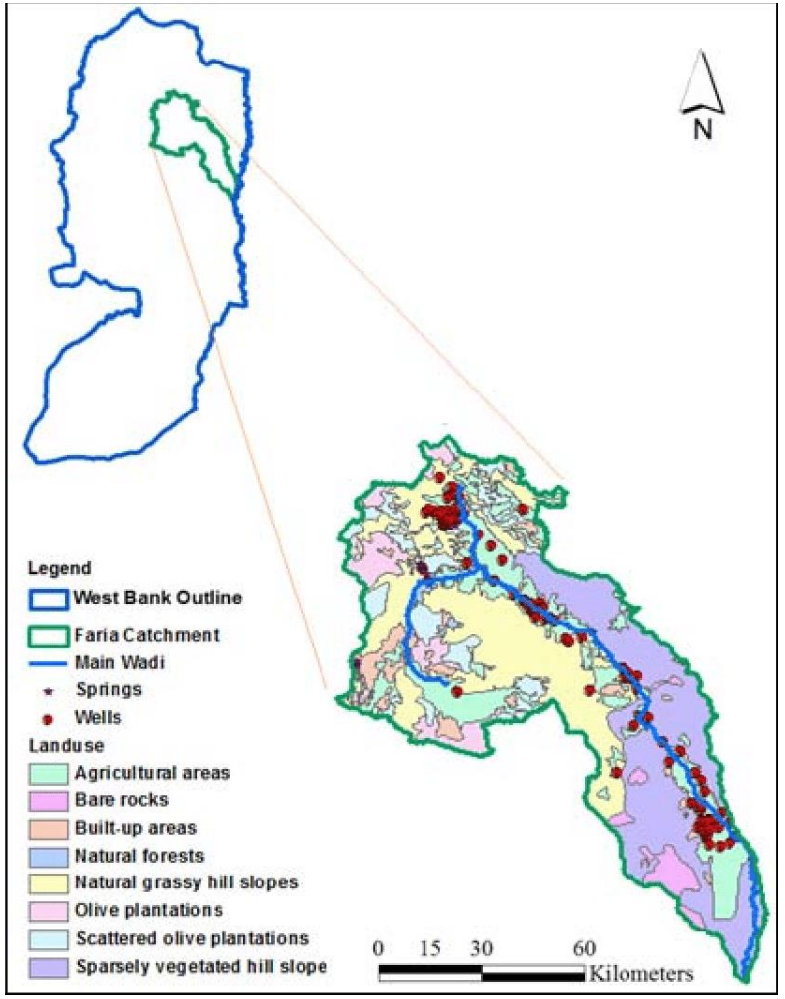
- Touristic activities mainly in the upper area specially Al-Bathan which are growing fast.
- Rainfed agriculture is mainly located in the upper areas, while the lower areas are irrigated.
- Spring discharge data shows high variability. Annual discharge from these springs varies from 1.5 MCM in 2017 to more than 33 MCM in 1992
- Pollution and deterioration of water quality is an issue where the untreated wastewater from Eastern Nablus is flowing and mixing with storm water in winter and with springs flow into the wadi.
- Some springs especially Al Fara'a Spring have encountered quantitative and qualitative problems due to climate conditions (rainfall variability and climate change), upstream well development, and over pumping, urban activities… etc.
- The reduction in the quantity and quality of water allocated to farmers lead to leave cultivating the land.
- Different existing water laws (Ottoman, British, Jordanian) and transition to new Palestinian water by-laws impacted the strict enforcement.
- Formalization of the customary water rights of spring water users
- High competition on water resources abstraction and use between upstream and downstream users.
- Water transfer out of the basin mainly to Nablus city for domestic use, caused reduction in water available for agriculture.

Description of the Study Area

Al Fara'a watershed is located in the northeastern of the West Bank, and drains east towards the Jordan River.

Its topography starts from Nablus Mountains at an elevation of about 920 m above mean sea level in the western edge of the watershed and descends to about 385 m below mean sea level in the east at the confluence of the Jordan River.

It lies over the Northeastern and the eastern aquifer basin in the West Bank, with an area of 320-km^2 including wadi Al-Fara'a watershed which is one of the major irrigated agricultural areas in the West Bank.



After Sameer Shadeed

Water Resources in the Area

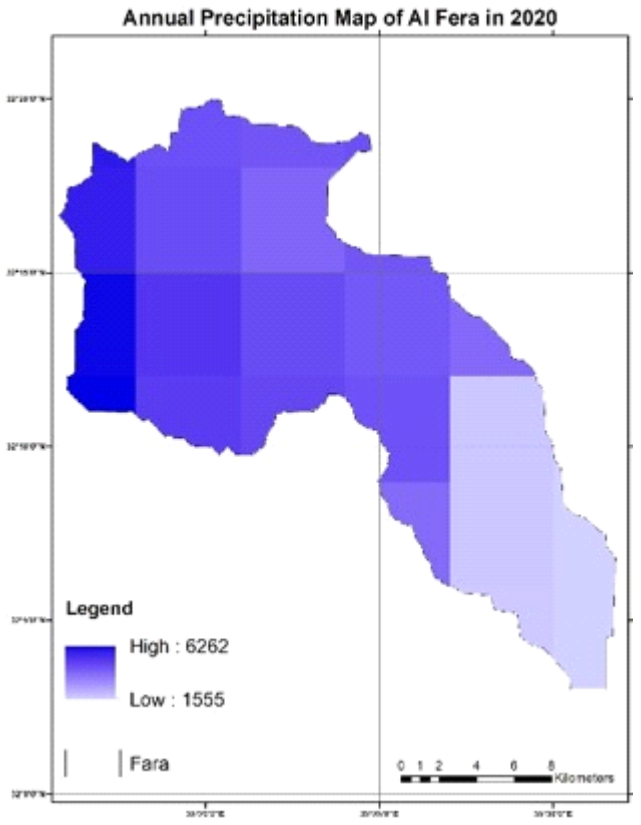
- There are more than 90 groundwater wells to supply additional water to the area. Pumping from the wells in Ras Al-Fara'a has negatively impacted on water discharge from the Al-Fara'a spring which is the biggest spring in the watershed (PWA database, 2021). This situation resulted in a complex relationship between water resources, groundwater withdrawal, land use, and agricultural and other human activities.

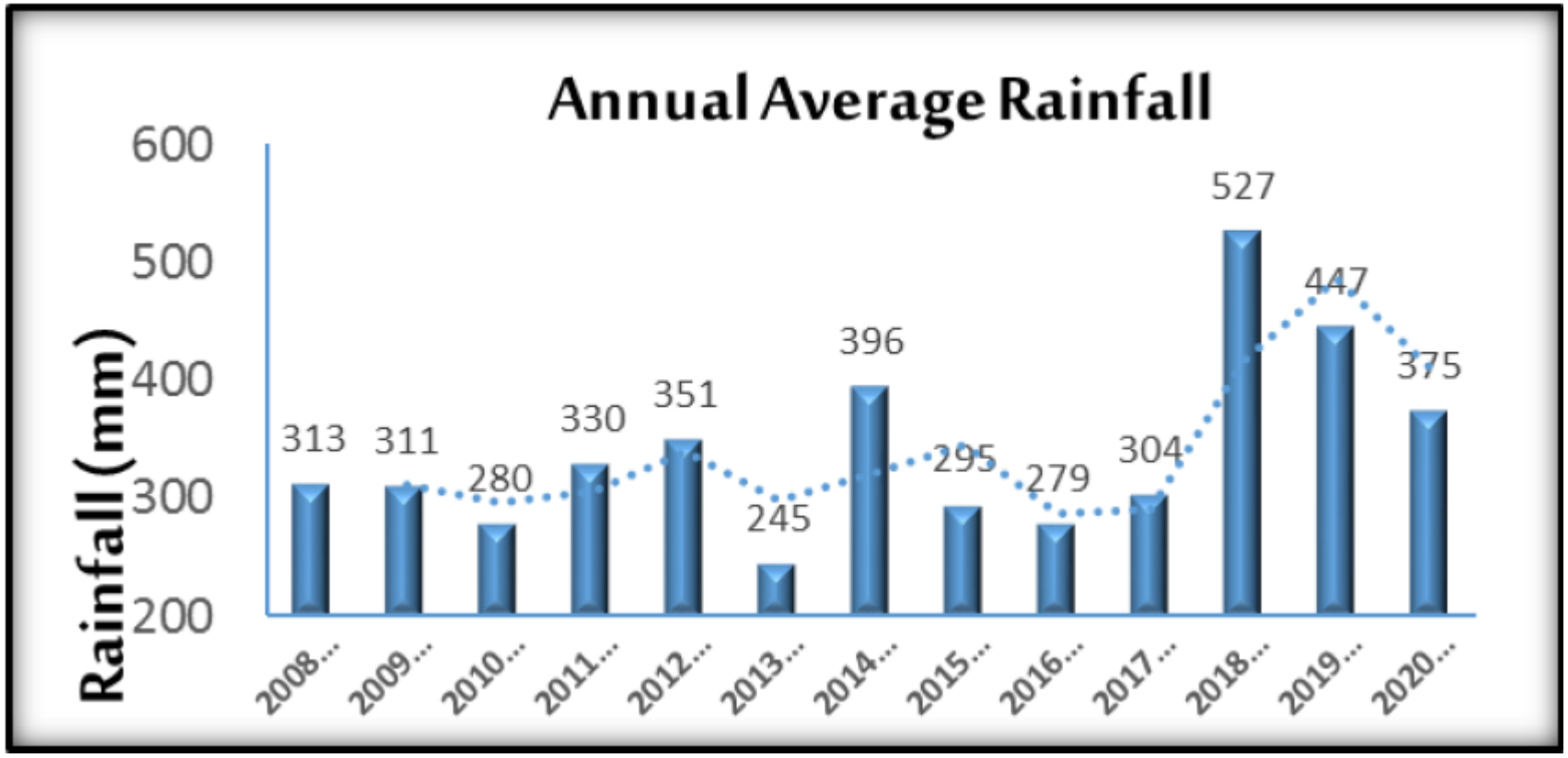
- There are 13 fresh water springs which are located mainly in the upper and middle parts of the wadi. Note that many springs located nearby the drilled wells dried up several years ago, and the only springs that continued to flow to the wadi are from Al-Bathan upstream area

- Thus, this study will focus on the area from Ras Al-Fara'a and Al-Bathan to Al Jiftlik which is known as Wadi Al -Fara'a watershed.

- Most of the surface runoff in the watershed besides a considerable portion of Al-Bathan springs discharge into the wadi and reaches the Jordan River in winter (which is lost) as there are no dams in the watershed to store excess water.

Rainfall data Analysis





Runoff calculations

The generated runoff mixed with spring discharge into wadi and untreated wastewater. It is utilized totally in Summer and partially in Winter in irrigation.

In Winter, the majority of generated surface runoff exits the catchment towards the Jordan River which lost from the system -as there is no infrastructure to store excess water-.

Year	Average Rainfall (mm)	Runoff (MCM)
2008/2009	313	5.64
2009/2010	311	5.6
2010/2011	280	5.04
2011/2012	330	5.95
2012/2013	351	6.32
2013/2014	245	4.41
2014/2015	396	7.14
2015/2016	295	5.32
2016/2017	279	5.03
2017/2018	304	5.48
2018/2019	527	9.5
2019/2020	447	8.05
2020/2021	375	6.76

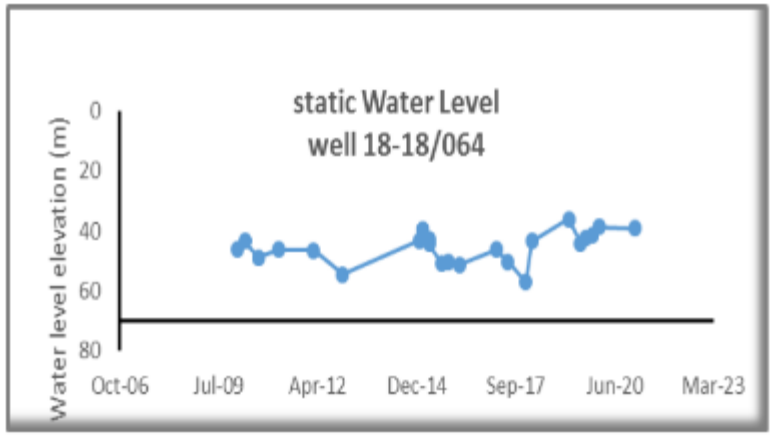
Recharge calculation

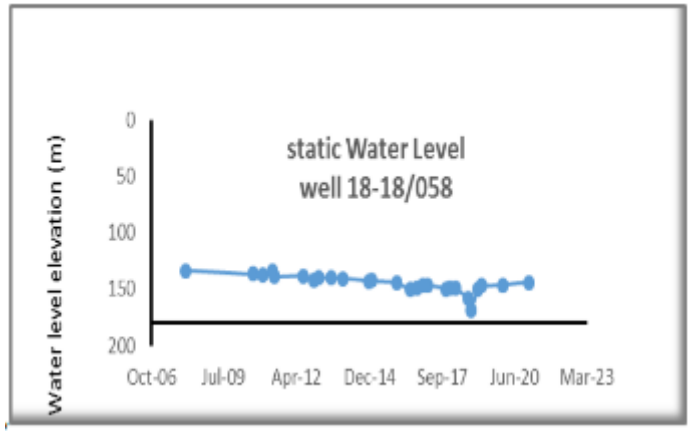
Year	Average Rainfall (mm)	Recharge (MCM)
2008/2009	313	26.11
2009/2010	311	25.94
2010/2011	280	20.55
2011/2012	330	29.73
2012/2013	351	35.13
2013/2014	245	22.07
2014/2015	396	42.28
2015/2016	295	29.53
2016/2017	279	27.93
2017/2018	304	25.36
2018/2019	527	61.54
2019/2020	447	47.73
2020/2021	375	33.78

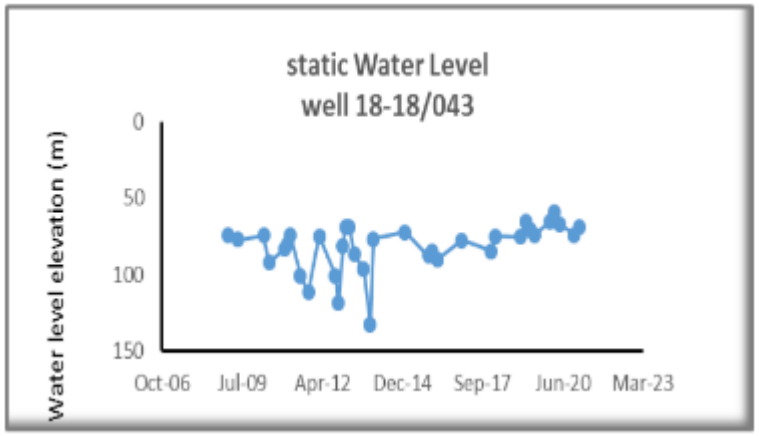
Recharge is highly dependent on rainfall quantity, intensity and distribution

Water Level Analysis

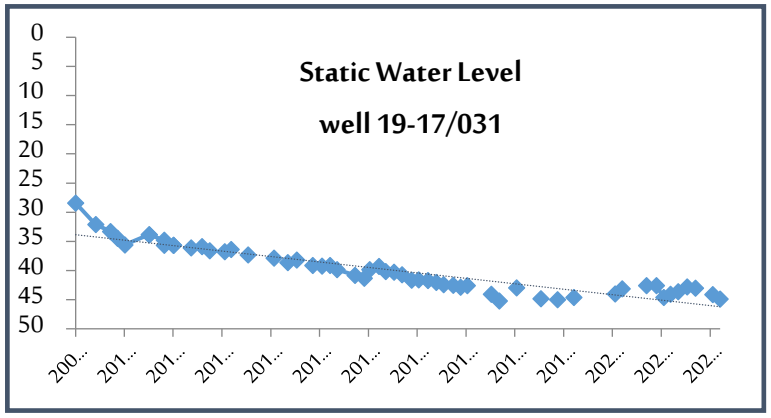
Stable and/or not changing significantly in the upstream

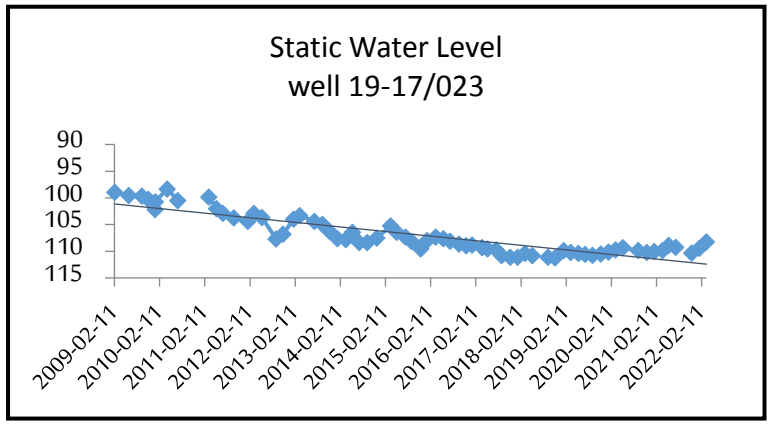


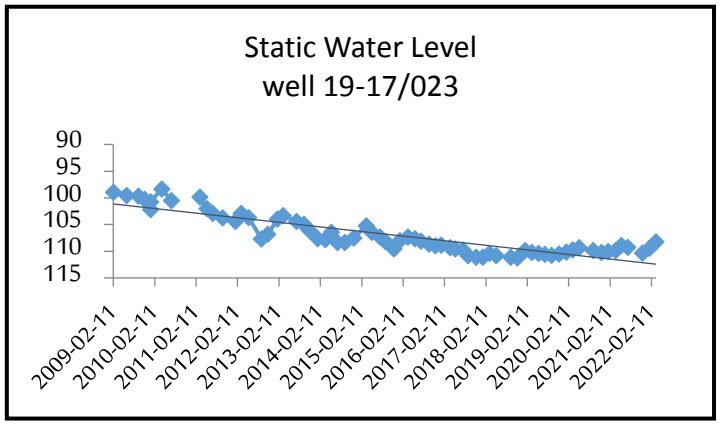




Declining in the downstream mainly in Al Jeftlik Area







Quality Analysis

Fecal coliform was detected in some groundwater wells and springs, this is due to the untreated wastewater that flows into the wadi and mixes with spring which becomes contaminated.

Sample No.	location	Total coliform CFU/100 ml	Fecal coliforms CFU/100 ml
1	Sahl Smait	8	7
2	Sahl Smait	2	Nill
3	Bathan	Nill	Nill
4	Sahl Smait	14	0
5	Sahl Smait	Nill	Nill
6	Sahl Smait	20	Nill
7	Sahl Smait	10	Nill
8	Sahl Smait	Nill	Nill
9	Bathan	Nill	Nill
10	Bathan	10	9
11	Alnassareya	3	1
12	Alaqrabania	8	5
13	Alaqrabania	3	2
14	Beit Hassan	3	1
15	Beit Hassan	7	5
16	Anassareya	4	Nill
17	Anassareya	Nill	Nill
18	Sahl Smait	Nill	Nill
19	Sahl Smait	Nill	Nill
20	Sahl Smait	1	Nill
21	Sahl Smait	Nill	Nill
22	Sahl Smait	Nill	Nill

Water import and export

Water import (Purchased water)

Community	2016	2017	2018	2019	2020
Frush Beit Dajan	68,566	115,380	103,429	117,448	123,213
Al Jeftlik	398,681	411,620	400,177	348,349	327,552
Total	467,247	527,000	503,607	465,797	450,765

Water export outside the area (agricultural wells), 2020.

Community	Source of water	Water Supply (m^3)
Yasid	Agricultural well	84,000
East Nablus	Nablus Municipality wells existing in the study area + Sahl Smeit agricultural wells	4,466,826
Beit Furik	Sahl Smeit Agricultural well	365,000
Total		4,915,826

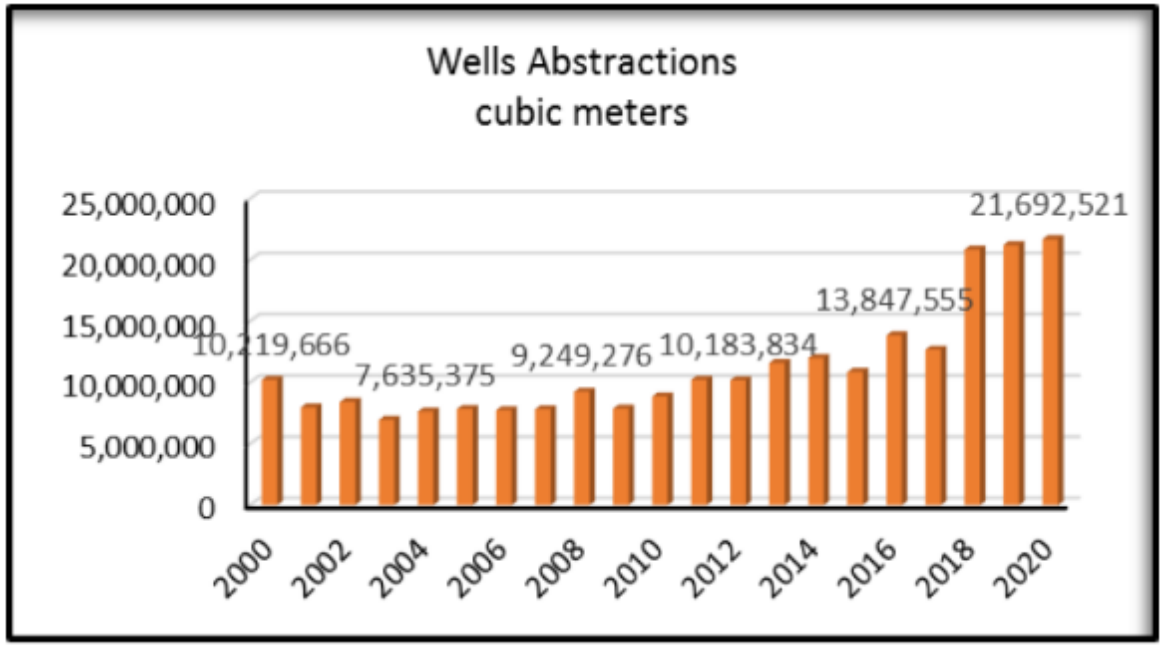
Water export (Israeli Abstractions), 2020.

Well name	Abstraction (mcm)
Masu'a 1	2.02
Atara 1	1.19
Atara 2	1.0
Total	4.21

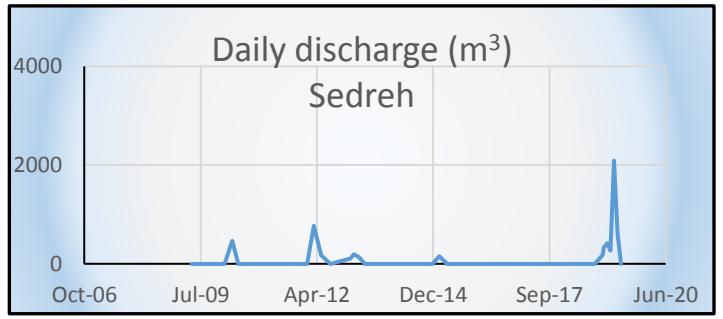
Unconventional water (Treated wastewater and reuse scheme)

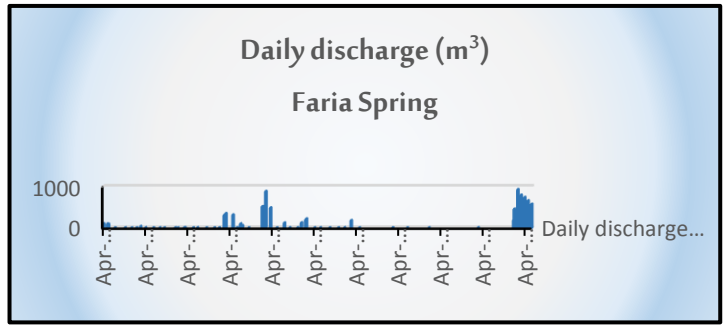
- Wastewater coming from Nablus East besides wastewater coming from Al Fara'a refugee camp flows into wadi Al Fara'a .
- Communities in the watershed are not served by wastewater network or wastewater treatment plants, generally dispose their wastewater in cesspits.
- **Estimations:** annual wastewater dumped to the wadi is about 4.5 - 6.0 Mm^3/yr while between 1.2 – 1.5 Mm^3/yr are infiltrated into the soil.
- No wastewater treatment plants except in Beit Hasan (a small-scale with a capacity of 80 m^3 daily (wetland)). Used by farmers directly.
- No reuse schemes except Beit Hasan in the area,
- Some illegal practices in irrigating crops with water polluted with untreated wastewater coming from eastern part of Nablus city.
- Construction works in Nablus East Wastewater Treatment Plant will be starting soon.

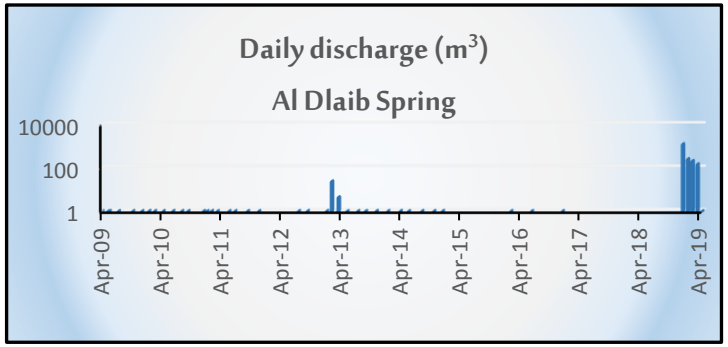
Wells pumping and Spring discharge



Increased trend in pumping from wells in general







Some of the springs dried continues to discharge after 2017, this is due to decrease in well pumping in Sahl Smeit

Demand –supply Analysis

Category	Demand (MCM)	Supply (MCM)	Gap (MCM)
Irrigated agriculture	24,973,689[(1)]	23,069,870	1,903,819
Municipality	1,890,400[(2)]	1,730,922	159,476
Total	24,960,270	26,704,611	2,063,295

(1) Gross Irrigation requirement (MCM) assuming irrigation system efficiency = 0.75
(2) UAF = 34%

Finding s and Recommendations

- Accurate agricultural land statistics and climatic data are required for better water management.
- Due to intensive agriculture in the area, the amounts of water available are limited and there is a need to find other resources to fulfill the irrigation needs.
- The non-agricultural demand has increased due to recreation purposes in the area.
- Agricultural Water quality are becoming deteriorating mainly due to the high pollution from untreated wastewater discharging into the wadi. This implies the urgent need to construct the Nablus East treatment Plant.
- Some farmers are irrigating their crops with untreated wastewater which is illegal in law, actual enforcement is required to prevent this practice.
- Considerable amounts of storm water flow out of the study area (towards the Jordan River), which lost from the system (non-recoverable). Water harvesting facilities are recommended to benefit from this water.


Thank
you!