

SANITATION AND REUSE COMPREHENSIVE SECTORAL AND INSTITUTIONAL ASSESSMENT & WADIS PROGRAM DESIGN STUDY

ASSESSMENT REPORT – FINAL VERSION

30/06/2025



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ACRONYMS

Acronym	Definition
ADA	Austrian Development Agency
AFD	Agence Française de Développement
ANERA	American Near East Refugee Aid
BWSU	Bulk Water Supply Unit
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CMWU	Coastal Municipality Water Utility
COSTEA	Comité Scientifique et Technique Eau Agricole
ECU	Environmental Control Unit
EIB	European Investment Bank
EQA	Environmental Quality Authority
EU	European Union
EWASH	Emergency Water and Sanitation-Hygiene Group
FAO	Food and Agriculture Organization
GBV	Gender-Based Violence
GIZ	Gesellschaft für Internationale Zusammenarbeit
GUs	Gender Units
ICA	Israeli Civil Administration
ILS / NIS	Israeli Shekel
IWRM	Integrated water resources management
JOD	Jordanian dinar
JSC	Joint Service Council
JWC	Joint Water Committee
JWU	Jerusalem Water Undertaking
KfW	Kreditanstalt für Wiederaufbau
LGU	Local Government Unit
MBR	Membrane Bioreactor
MCM	Million Cubic Meter
MDLF	Municipal Development & Lending Fund
MNE	Ministry of National Economy
MoA	Ministry of Agriculture
MoF	Ministry of Finance

Acronym	Definition
MoLG	Ministry of Local Governments
MoH	Ministry of Health
MoM	Minutes of meeting
MoPIC	Ministry of Planning and International Cooperation
MoSD	Ministry of Social Development
MoWA	Ministry of Women Affairs
NDC	Palestinian Authority's Nationally Determined Contributions
NGEST	Northern Gaza Emergency Sewage Treatment
NGO	Non-governmental organization
NL, MFA	Government of the Netherlands, Ministry of Foreign Affairs
NRO	Netherlands Representative Office
NRW	Non-revenue water
NWC	National Water Company
O&M	Operation & maintenance
PA	Palestinian Authority
PARC	Palestinian Agricultural Relief Committee
PCBS	Palestinian Central Bureau of Statistics
PHG	Palestinian Hydrology Group
PMU	Program Management Unit
PSI	Palestinian Standard Institute
PT, ST, TT	Pre-treatment, secondary (biological) treatment, tertiary treatment
PWA	Palestinian Water Authority
PWWN	Palestinian Women Water Network
PWWSD	The Palestinian Working Woman Society for Development
RSWD	Rural Society for Women Development
RWU	Regional Water Utility
SBR	Sequential Batch Reactor
SDGs	Sustainable Development Goals
SP	Service Provider
TA	Technical Assistance
TDS	Total Dissolved Solids
TEI	Team Europe Initiative
TSS	Total Suspended Solids
TWW	Treated Waste water
UAWC	The Union of Agricultural Work Committees

Acronym	Definition
UPWSP	Union of Palestinian Water Service Providers
USP	Union of Service Providers
VC	Village Council
WADIS	Water sector Development and Institutional Support
WB	World Bank
WBWD	West Bank Water Department
WSRC	Water Sector Regulatory Council
WSSA	Water Supply and Sewerage Authority
WU	Water Utility
WUA	Water User Association
WW	Waste Water
WWTP	Waste Water Treatment Plant

A. METHODOLOGY

A.1. Objectives of phase 2

The final purpose of the study is to structure and design the WaDIS program on the basis of a 360° diagnosis of wastewater and reuse management in Palestine. After carrying out the inception phase between October 2024 and January 2025, this report is one of the outcomes of the second phase of the assignment, aiming to achieve i) a sectorial and institutional assessment and ii) a diagnosis of institutional capacity, at central and local levels in order to establish iii) a gap analysis and recommendations.

A.1.1 Main areas

The **assessment of sanitation and reuse sectors management and governance** focuses on 5 main complementary areas or 'angles' for which respective objectives were established during the inception phase. The main assessment areas and associated objectives are summarized in this section.

Main area 1: Sectorial strategy for wastewater and reuse

Objectives:

- Provide a situation analysis of the vision, strategies and priorities in the WW and reuse sectors.
- Carry out a specific review of current and planned investments in order to identify key development topics and geographical areas that could be supported by the WaDIS program.
- Provide a comparative analysis between the existing strategy and the recent development (based on the investment review).
- Provide a specific analysis of PPP regarding to wastewater and reuse (vision/strategy existing, opportunities). This point also needs to be considered from a legal/regulatory point of view.

Main area 2: Legal and regulatory framework

Objectives:

- Provide an exhaustive situation analysis of the legal and regulatory framework covering the wastewater and reuse sectors.
- Identify and characterize:
 - Gaps between text and reality implemented that need to be highlighted and investigated
 - Weaknesses that need to be consolidated
 - Grey areas that need to be clarified
 - Gaps that need to be filled.
- In this area, particular attention will also be paid to the issue of sludge and industrial wastewater, which are key issues raised during the inception phase (for instance slurry, or sludge from olive harvests or tanneries, etc.).
- Identify the responsibility of the various institutions, particularly with regard to implementation and decision-making as well as formulation of bylaws.

Main area 3: Global and local sectorial organization and governance

Objectives:

- Provide a global picture of the organizational framework, the human resources and existing procedure at central and local levels related to wastewater and reuse management.
- Identify role and responsibilities of each institution.
- Carry out a critical analysis of the existing situation on the two previous points with a view to proposing recommendations, the gap between the vision and the reality.
- Carry out a diagnosis of coordination mechanisms in the wastewater and reuse sector.

Main area 4: Socioeconomic and financial analysis of wastewater and reuse sector

Objectives:

- Characterize the socio-economic dynamics of the wastewater and reuse demand in the areas targeted by the study.
- Assess current and projected demand over the WaDIS project timeframe (5 to 10 years) while considering key socio-economic indicators, demographic trends, and stakeholder inclusion.
- Analyze the robustness of existing financial models (for wastewater to cover the service, the O&M, and investments) at the level of the SPs targeted by the study.
- Analyze the robustness of the forecast financial models (for treated wastewater to cover the service, the O&M, and investments) at the level of the WUAs targeted by the study;
- Analyze the current tariff framework/structure for wastewater and reuse (this aspect will be analyzed under two angles: through the institutional component mixed with the financial analysis).
- On the basis of these two previous analyses, provide a more general analysis of the robustness and sustainability of the financial model for the wastewater and reuse sector.

Main area 5: Gender analysis in the water, sanitation and reuse sector

Objectives:

- Analyze the inclusion of gender, equality and parity in the organizational structure of the wastewater and reuse sectors.
- Identify existing gender inequalities of the legal, political, and institutional framework and more specifically in relation to reuse (at institutional, operational and household level).
- Identify existing commitments of the country in terms of gender equality.
- Evaluate the level of institutional capacity to integrate gender, both at internal level and in their activities. Identify strategic needs and practical tools to implement gender approach.
- Analyze gender awareness, existing tools and their use. Identify gaps and how to address them.
- Based on gender disaggregated data, identify the appropriate approach for establishing collective accountability, pertaining to the reuse sector from a gender lens.
- Identify projects with gender-responsive approach in the reuse sector, how such projects address women's needs and mobilize gender mainstreaming principles in WUA's management and decision-making.

A.1.2 Specific issues

In order to support the diagnosis and highlight certain issues considered crucial in the structuring of the sector, the inception phase identified **3 specific issues**, which were the subject of a holistic study, on both a local and global scale.

Specific issue 1: Transboundary wastewater issues

Objectives:

- Take a cross-sectional look at current programming and the potential for reuse, by looking at realistic and significant opportunities (agricultural and other) for reducing the volume of transboundary wastewater.
- Provide an analysis of available data, of the process, impacts on sector financing and long-term deduction reallocation strategy.
- Assess the state of discussions with Israeli counterparts with regard to water selling, water tariff, deductions and net lending, project related authorizations.

Specific issue 2: Industrial wastewater issues

Objectives:

- Analyze the regulatory framework associated with industrial water, and its level of application.
- Examine the role and responsibility of the water police in applying the 'polluter pays' principle.
- Take a more local look, at the scale of the localities targeted for the field investigation phase, in order to identify the various sources of industrial water and gain a better understanding of the difficulties encountered.

Specific issue 3: Sludge management issues

Objectives:

- Analyze the existing legal and regulatory framework addressing the sludge issue.
- Evaluate the potential for recovery of sludge from treatment plants.
- Identify specific training needs, at central and operational level, relating to the sludge stream from treatment plants and the potential for recovery.
- Assess the need for specific studies to be included in the WaDIS project (in a broader sense, possibly including the issue of decentralized systems, which are very present in towns that do not yet have mains drainage).

A.1.3 Institutional capacity assessment

On the basis of this sectoral and institutional assessment, the objective of this second phase is also to carry out a **assessment of institutional capacity**, the specific objectives of which were established during the inception phase:

Objectives:

- Carry out a mapping of capacity-building programs underway and planned for the coming years, targeting central institutions linked to the wastewater and reuse sectors, as well as SPs/municipalities (identify existing gaps and leverage for future developments).
- Propose an analysis of both human resources and processes and procedures, restricted to wastewater and reuse management at both, central and regional/local level (including with the objective to reinforce the capacity on crisis preparedness and response management).

A.1.4 Gap analysis and recommendations (separate deliverable)

These two structural analyses presented above will lead to a **gap analysis and recommendations** that will be the subject of a **second deliverable (DEL 2.2)** with the following objectives:

Objectives:

- Summary the main findings of the diagnostic study.
- Carry out a set of recommendations, based on the institutional and sectorial diagnosis.
- Propose the broad outlines of the project roadmap, driven by the following goal: improving and strengthening the sector of wastewater management and reuse.

A.2. Content of this report

This **first deliverable (DEL 2.1)** of the second phase thus presents a sectoral and institutional assessment and a diagnosis of institutional capacity, at central and local levels, as well as an initial set of recommendations for each of the main focus areas of the study. A **second deliverable (DEL 2.2)** will contain the gap analysis and recommendations for the design of the WaDIS program.

A.3. Categorization of actors to be analyzed

In order to meet the previously defined objectives and to have a 360° understanding of the wastewater and reuse sector in Palestine, it was essential to carry out the assessment by analyzing the roles, responsibilities and capacities of the sector's stakeholders at both central and local level.

A.3.1 At the central level

The Water Law established a new institutional framework for the water sector that includes a separation of policy, regulatory and operational functions. At the central level, the assessment focused on the institutions identified in the law in order to practically analyze their roles and relationships with other actors:

- Palestinian Water Authority (PWA)
- West Bank Water Department (WBWD) / National Water Company (NWC)
- Water Sector Regulatory Council (WSRC)

Beyond the central institutions dedicated to the water and wastewater sector, other line ministries and agencies with leadership on specific issues have been analyzed as part of this assessment:

- Ministry of Agriculture (MoA)
- Ministry of Women Affairs (MoWA)
- Ministry of Local Government (MoLG)
- Environmental Quality Authority (EQA)
- Palestinian Standards Institute (PSI)

A.3.2 At the local level

At the local level, the assessment focused on three types of key actors:

- **Local branches of central institutions**, mainly regional directorates of the Ministry of Agriculture and regional representations of the Chamber of Commerce.
- **Service providers** according to the scope of the field assessment determined during the inception phase. 8 SPs have been targeted as part of the assessment and 2 additional SPs have been considered as case studies guided by the exchanges organized with the PWA during the inception mission, with the aim of benefiting from the lessons learned, both positive and negative:

Interest	Service Providers	WWTP/infrastructures	Governorate
P1	Hebron Municipality	Hebron Regional WWTP (under construction)	Hebron
P1	NW Jenin Water Utility	Anin WWTP (planned upgrade) + Jenin West WWTP (construction planned)	Jenin
P1	Jenin Municipality	Jenin WWTP (planned upgrade)	Jenin
P1	Al Bireh Municipality	Al Bireh WWTP with transfer project	Ramallah
P1	To be defined	Baqa Sharqiya and Nazlat WWTP (planned construction)	Tulkarem
P1+CS	Nablus Municipality	Nablus West WWTP and reuse scheme	Nablus
		Nablus East WWTP (planned construction)	Nablus
P1+CS	Tubas Water Utility	Tayassir WWTP and reuse scheme	Tubas
P1	Ramallah Municipality	North East Ramallah (Birzeit cluster) sewage project + Al Tireh WWTP and reuse	Ramallah
CS	North Hebron JWWSC	Sa'ir Arrub WWTP (planned transfer to NHJWWSC)	Hebron
CS	Jericho Municipality	Jericho WWTP	Jericho

Table 1: List of Service Providers targeted during the assessment phase. Source: Hydroconseil

- **Water User Associations**, which play a pivotal role in the implementation of reuse projects. The assessment focused on 3 of the 5 WUAs currently registered with the MoA:

Id	Name	Governorate
1	Wadi Shaiir WUA	Nablus
2	Marj Ibn Amer WUA (Cooperative Association)	Jenin
3	Safeh Al-Jezah WUA	Tubas

Table 2: WUAs targeted during the assessment phase

A.4. Methodological framework

The assessment phase began with an 11-day field mission in the West Bank, from 28 January to 7 February, in which 4 international experts and 3 local experts took part (schedule in Annex 1). Part of the team travelled to Nablus in order to facilitate meetings and exchanges with local stakeholders throughout the northern part of the West Bank. Due to the Israeli interventions in the north of the West Bank, the team was unable to travel to Tubas but was still able to meet with all the stakeholders previously contacted, either in person or online. The possibility of staying for an extended period in Nablus was a strong point of the methodology, reinforcing the analysis at the local level by having access to a large amount of data and making it possible to deal with any unforeseen events or obstacles.

At the same time, another part of the team based in Ramallah launched the institutional diagnosis by meeting with most of the central institutions and their various departments.

This field mission made it possible to collect a considerable amount of qualitative and quantitative data, in particular through i) the organization of interviews with a number of key actors, ii) onsite field visits iii) the collection of new bibliographic resources, which made it possible to complete the bibliographic analysis work already carried out during the inception phase.

Following this mission, interviews with key sector stakeholders and data collection continued:

- Onsite, thanks to the Al-Ard teams who continued the interviews with the SPs and other local stakeholders in the South and East of the West Bank, particularly around Hebron and Jericho;
- Online, by organizing several interviews with key players in the sector that the team had not been able to meet during the field mission.

The assessment presented in this report is the result of an in-depth analysis of all the data collected in the field and a literature review of all resources made available to the consultant.

A.4.1 Bibliography

The literature review covered approximately 150 documents, provided by the PWA, the AFD or other key stakeholders contacted during the assessment (NRO, GIZ, ADA, World Bank, etc.). The complete list of documents used for this assessment is provided in Annex 2.

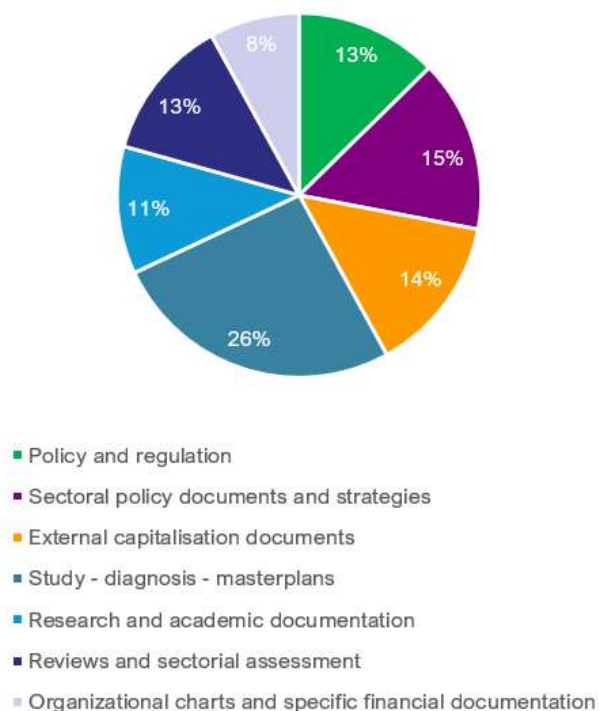


Figure 1: Typology of documents analyzed as part of the literature review

A.4.2 Interviews

40 key stakeholders in the wastewater and reuse sector in Palestine were interviewed during the assessment phase. Given that some stakeholders were interviewed more than one time, a total of nearly 60 interviews were conducted as part of this assessment, either onsite or online. List of key stakeholders met during the assessment phase is available in Annex 3.

In order to prepare for these interviews, preliminary data was collected by the Palestinian experts from the various stakeholders targeted by the assessment. These preliminary data were used to establish different interview grids, adapted to each category of stakeholder.

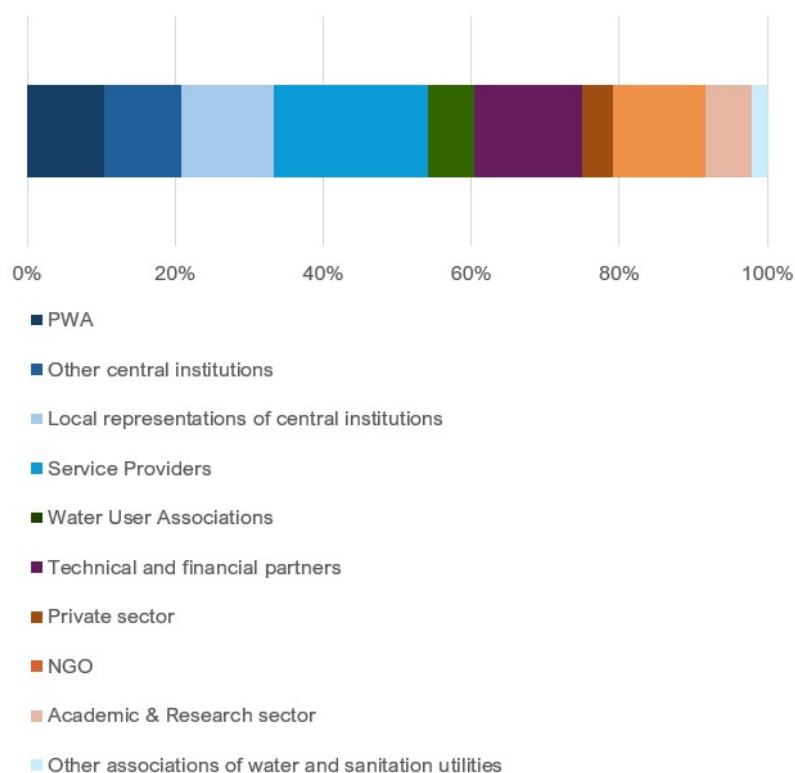


Figure 2: Categorization of actors met during the assessment phase

A.5. Performance factors used during assessment

Whenever data was available, or based on the material collected during the interviews, performance of key stakeholders was assessed using a combination of factors covering all major dimensions: institutional, organizational, human resources, material & financial, as summarized in the table below:

Factor	Key questions
Institutional	Regarding the entity¹ itself: Is the legal form of the entity adapted to its mission? What is the hierarchical position of the entity with the rest of the institution and/or with other sector institutions? To whom reports the entity and how? Is the governance of the entity adapted to its mission and main roles? Are the functions ensured by the entity described precisely? Are these functions consistent with its mission? Regarding the relations between the entity and the rest of the sector: Are communication channels between the entity and the rest of the institution and/or other sector players well identified? Are they efficient enough? Are coordination mechanisms between the entity and the rest of the sector sound enough to allow the entity to correctly ensure its mission?
Organizational (administrative & operational aspects)	Is the entity efficiently organized? Is the organizational chart clear & updated? Are job descriptions clear and precise? Are positions adapted to the functions and tasks to be performed within the entity? Is internal communication well-organized and satisfactory?

¹ An 'entity' can be a stand-alone institution or a division / department within a larger institution.

Factor	Key questions
	Is external communication well-organized and satisfactory? Are procedures performance-oriented? Are procedures accurately described in a single document, accessible to all the persons working for the entity? Are they respected? Is internal coordination satisfactory? Has the entity been regularly audited (internally or externally)? Have the recommendations from these audits been followed up?
Human resources	Does the entity have sufficient qualified staff to carry out the tasks and functions entrusted to it (quantitative)? Do the people currently working for the entity have skills that match the job profiles (qualitative)? If not, is the training in place adequate? What is the entity's age pyramid? Have measures been taken to ensure the renewal of the workforce? Does the entity's recruitment policy allow to access to the necessary skills? What are the bottlenecks in recruitment? Are staff statutes adapted to the functions to be performed? Do existing staff feel valued in their work? Does the entity implement an effective and appropriate human resources management policy? Does the entity implement a policy of transferring skills and experience between old and new staff (particularly in the event of the foreseeable departure of many managers in the next few years)? Is the entity's training policy relevant? Does it give everyone access to the necessary skills?
Material resources	Does the entity have the material resources needed to carry out its missions in terms of: premises (workstations), IT and office equipment, means of travel (in line with its functions)? Are the material resources correctly and regularly maintained? Does the entity have the required human resources to ensure proper maintenance?
Financial resources	Does the entity have sufficient financial resources to meet its operating needs? Are the financial resources of the entity diverse enough? Are there areas of inefficiency, leading to high operating costs (compared to international benchmark of similar entities) that could be reduced? Does the entity have a clear and robust business model?

B. POLICY AND STRATEGY

B.1. Documentation used

This chapter is built on the analysis of the following key documents (in chronological order):

- Institutional water sector review, Hydroconsult, 2011
- National Water and Wastewater Policy and Strategy for Palestine (2013-2032), PWA, 2013
- Strategic Water Resources and Transmission Plan, PWA, 2014
- Strategies for Sustainable Financing of the Water Sector, PWA, 2014
- New Water Law, 2014
- Action Plan for implementing the Policy and Strategy, PWA, 2016
- Capacity Development Policy and Strategy of the Water Sector, PWA, 2016
- Roadmap for the creation of Regional Water Utilities in Palestine, 2017
- Non-Revenue Water Strategy & the Water Safety Plan, PWA, 2017
- Development of West Bank wastewater strategy, 2018
- Water and Sanitation Sector Reform Plan, PWA, 2020
- Water sector strategy and policy study, 2022
- Strategic Development Plan of the National Water Company, 2024
- Strategic Development Plan of the WSRC, 2024
- National Water and Wastewater Policy and Strategy for Palestine (final), PWA, 2024

This analysis has been completed by the interviews of key stakeholders conducted in January and February 2025, and notably during the field mission in the West Bank.

B.2. Water and wastewater sector policy

B.2.1 Brief history of sector policy development

Since the establishment of PWA in 1996, a considerable number of policy and strategy documents related to the water and wastewater sector have been developed, adopted and (partially) implemented. In 2012 and 2013, PWA led a broad consultation of all stakeholders in the water sector to draw up a sector policy and a 20-year development strategy (2012-2032), that was adopted just before the promulgation of the New Water Law (2014). The 2014 Water Law is not a policy or strategy document as such; but it led to very significant changes in the institutional and organizational set up of the sector, notably with the creation of several new entities: WSRC, RWUs, NWC, WUAs, etc. Not all the 2014 law's provisions have yet been implemented, or only partially; in a way, one could say that the water and wastewater sector in Palestine has been in a continuous institutional reform process over the last 10 years, which is perfectly normal as reform implementation always takes time and resources.

Until May 2025, the last valid document regarding the sector's policy and strategy was the National Water and Wastewater Policy and Strategy for Palestine (2013-2032) from 2013, and its Action Plan approved in 2016. Following the development and adoption of the Water and Sanitation Sector Reform Plan in 2020 (which was essentially an intermediary road map focusing on major challenges in implementing the 2013 national policy and strategy), PWA and other stakeholders expressed the need to update the 2013 national policy and strategy, and develop a new document, the Water Sector Policy and Strategy for Palestine Years 2022-2042. PWA, supported by team of consultants² contracted by PWA using World Bank funds, started to work on this updated version early in 2022.

² Hydroconseil, ENFRA Consultants and Jordan Reviser Consultancy (JRCS).

The new and revised national water policy and strategy has gone through several reviews and the final version was approved and disseminated in May 2025 by PWA. The analysis developed in this section is based on the hypothesis that this final version dated May 2025 of the revised national water policy and strategy will be in force when the WaDIS program is being implemented.

B.2.2 Continuity with 2013 national policy and strategy

Overall, the updated version of the national policy and strategy retains the essential elements of the 2013 framework and incorporates new considerations to face new challenges, especially:

- The need to anticipate the negative effects of climate change, especially in terms of pressure put on water resources by the water scarcity foreseen in most recent projections; this aspect is directly linked to the need of developing TWW reuse as a new water resource;
- The challenge associated with the rapid demographic growth (+50% in the last ten years), and the difficulty of services providers to meet increasing demand for water and sanitation services;
- The necessity to accelerate the establishment and the development of the entities foreseen in the 2014 Water Law, and especially the NWC and the RWUs;
- The need for the sector to reach financial balance and more autonomy, in the context of increasing operating costs and high dependency to Israel – cost of deductions related to the purchase of bulk water from Israeli operators and transboundary wastewater treatment;
- The challenge posed by the ongoing war in Gaza, and the devastating effects on both the water and sanitation facilities and the catastrophic situation in terms of public health.

B.2.3 Vision statement

“The water resources and resulting wastewater are managed by qualified institutions and through proper governance in a sustainable and integrated manner to emphasize Palestinian water rights and sovereignty, so as to facilitate the population having universal access to safe and reliable potable water and adequate sanitation with due consideration to the ecosystems, to the equitable water sharing among all Palestinians and to optimal economic use of these water resources.”

B.2.4 Key policy principles

The updated national policy and strategy is based on 15 key principles, most of them directly linked to future WaDIS main preoccupations (TWW reuse as a new water resource and a mean of adaptation to climate change; development of wastewater services; meeting the water needs of agriculture, inter alia – linkages are highlighted in the list below):

- “Sustainable management of water resources, acknowledges water as a finite, vulnerable and public good for which a **sustainable resource development** and protection must be developed.
- Integrated water resources management, promotes an integrated management taking into account all the types of uses in the long term, for an equitable allocation, **including agriculture as a key factor** to consider for planning in the water sector.
- Nexus “water-energy-**food** security”, is the approach to future development plans to ensure equity in water resources use.
- Water rights, sets the objective of obtaining full Palestinian water rights, including right-of-access, right-of-control and right-of-use to all water resources shared with other countries.
- Access to water and **wastewater services**, states the inclusive rights to access water and sanitation services for all.
- Financial sustainability of water Service Providers, establishes that water is not free and its tariff is regulated by the government, encouraging the shift from groundwater to **treated waste water**.

- Governance and management, sets the principle of segregation between regulatory function and the operation function (water service management), through a participatory approach.
- **Protecting the environment from pollution by wastewater**, invokes the polluter-payer principle and the definition of norms for safe disposal of water.
- **Quality standards** for Water Supply and **Wastewater Reuse** in Palestine fully considers **wastewater as an alternative resource** for which standards and specifications must be developed to optimize the different uses of water.
- Gender and Youth issues in the water sector, recognizes the key role played by women and youth in the management of water and the need for inclusion.
- Climate change impact on water resources, states that the policy will contribute to the Palestinian **climate change adaptation measures**.
- Enhancing rainwater harvesting, sets rainwater as a strategic additional resource, collected at 3 levels (on-site, district and central).
- Supporting Private Sector Participation in the Water Sector, recognizes the benefit of private sector participation in the sector.
- Scientific Research and Knowledge, advocates for partnering with universities for innovation.
- Capacity Building, emphasizes the crucial role of **building the capacity of the sector actors**, in terms of training, institutional development, resource allocation, knowledge transfer, monitoring and evaluation."

B.2.5 Specific objectives related to wastewater and reuse

The updated national policy and strategy has been built on a baseline dated 2022. The last version of the document contains very precise indicators and targets for the 2022-2042 period (pages 152-153), under the strategic goal N°3 (improving the sanitation service provision and reducing its environment impact):

Results	Indicator		Baseline	Strategy				
			2022	2026	2030	2034	2038	2042
Raising the efficiency of sewage systems from collection, transportation and treatment	Percentage of houses connected to sewage systems		61%	65%	69%	73%	77%	81%
	Percentage of collected WW treated inside Palestine		42%	50%	58%	66%	74%	82%
	Percentage of TWW that corresponds to the Palestinian specifications for WWTPs		82%	84%	87%	89%	92%	94%
Increasing the area of irrigated land from treated water sources	Percentage of TWW reused for irrigation or MAR		23%	35%	47%	59%	71%	83%
	Irrigated agricultural land from treated wastewater (donum)	West Bank	2,000	5,500	8,000	15,000	20,000	25,000
		Gaza	10,000	14,000	31,000	34,500	34,500	40,000

Table 3: Results framework associated with strategic goal N°3 of the national policy

The targets set by the national policy and strategy in terms of wastewater treatment and TWW reuse are very ambitious, especially in terms of surface area to be irrigated using treated wastewater, that would grow from 12,000 donums (2022) to 65,000 donums in now less than 20 years.

Moreover, the 2022 baseline is sometime inconsistent with other sources of information and – logically, as it was carried out in 2021 – does not take into account the situation created by the ongoing war in the Gaza

Strip, and the unprecedented level of destruction (including of agricultural land) that has been generated over the last 18 months and that will continue to be generated, considering the latest developments.

Two examples of inconsistencies in the 2022 baseline:

- 82% of treated sewage that corresponds to the Palestinian specifications for WWTPs: in the legal and regulatory chapter of the assessment report, we clearly demonstrate that such standards are not clearly established; moreover, field observations in the 8 municipalities / WUs selected for the assessment phase show significant operational difficulties of the existing WWTPs, leading to a deterioration in the wastewater treatment efficiency;
- 23% of treated wastewater reused for irrigation or MAR: the baseline indicates that out of the 50,6 MCM/y of treated wastewater (Gaza), 24,4 MCM/y (i.e. 48%) are used for irrigation and MAR; the same percentage is estimated at 23% for the West Bank, leading to 44% for Palestine. At the same time, there is no recent assessment of the situation regarding wastewater treatment in Gaza, and the 9,4 MCM/y of reuse for irrigation only is inconsistent with other sources (e.g. COSTEA, 2023).

In the perspective of the design of the WaDIS program, Strategic Goal N°4 (developing and building water sector institutions to establish the foundations of good governance in an integrated legal and institutional environment in response to gender and youth participation) is also interesting to analyze:

Results	Indicator	Baseline	Strategy				
		2022	2026	2030	2034	2038	2042
Water Sector Institutions Reform: Structuring the various water sector institutions in harmony with the new Palestinian water law	Establishment of RWUs	0	2	4	6	8	10
	Total number of Established RWUs	2	4	6	8	10	16
	Number of water service providers	324	240	160	90	50	16
	Number of acting bylaws	6	8	12	13	14	15
	Progress in establishing National Water Company	15%	80%	100%	100%	100%	100%

Table 4: Results framework associated with strategic goal N°4 of the national policy

Institutional development is only measured by the number of established institutions or by-laws, which is a rather restrictive way of considering the development of the sector. Considering the need to build the capacity to reuse treated wastewater, it could be relevant to also set targets in terms of creation of new WUAs, even if it is more related to the agricultural sector policy and strategy. Regarding the capacity building, it would probably be interesting to include in the results framework quantitative and qualitative targets related to staffing, training, development of human resources, etc.

B.2.6 Grey areas in the policy and strategy

Although the updated version of the national policy and strategy clearly represents an improvement compared to the 2013 version, by integrating new orientations and challenges (for instance related to the effects of climate change), there are a few 'grey areas' in relation to wastewater and reuse:

- NWC will become a key institution in the new sector landscape. However, the exact definition of its perimeter remains unclear as far as wastewater is concerned. NWC is clearly responsible for the management of bulk water supply; what about its responsibilities in terms of transferring bulk amounts of treated wastewater, as it is foreseen in the framework of future projects, especially when these transfers involve several service providers and potentially several RWUs?
- The national policy and strategy remains vague about how enough demand for treated wastewater will be created, especially in the case of agricultural use. Considering the very high long term-target (83% of reuse in 2042, all usages included), creating the demand (and the associated capacity to

pay) will require the establishment of hundreds of new WUAs across the country, receiving all the necessary support to succeed and reach financial sustainability.

- The updated national policy and strategy often refers to “Palestinian standards” in terms of quality of treated wastewater, would there be reuse or not. A careful review of existing standards and regulations (see chapter C of this assessment) clearly demonstrates that such “Palestinian standards” for measuring the performance of WWTPs are not clearly defined, although there are many consequences in terms of operating costs and required skills for the staff.
- As the national policy and strategy was finalized after the war in Gaza started, it is logical that the consequences of the war could not be taken into consideration in the final version of the document, in the absence of reliable and recent information on the state of the facilities and of the agricultural lands in Gaza. In this context, adjustments to the national policy and strategy are inevitable and should be done when – hopefully – the situation stabilizes at some stage in the future.

B.2.7 Major ongoing projects supporting the implementation of the national policy and strategy

Work is underway to implement a number of projects and programs supporting the construction of water utilities based on the national policy and strategy. Major projects and programs are:

- As part of the program to strengthen the efficiency of water service management in the municipality of Jenin, institutional, financial and technical capacities shall be improved at the water department in the municipality. This program is funded by the Japanese International Cooperation Agency with an implementation completion rate of 80% so far.
- Establishment of the Hebron Municipal Water Utility with support from the French Agency for Development (AFD) and the EU. Work is underway to complete the institutional building of the water department at the municipality including the strengthening of the department's capacities to efficiently manage the water and wastewater infrastructure so as to achieve the necessary financial and administrative stability. Furthermore, to improve the level of service provision and sustainability with a program implementation completion rate of 70% so far. Work will resume upon approval to transform the department into a Regional Water Utility.
- Roadmap-based institutional development in the Tubas and Maythaloun areas within the interconnection program regarding water and, energy that is funded by AFD and the EU (despite the many challenges facing the establishment of the facility, which the local government and donor partners are collaborating to address.)
- Strengthen the institutional building within the framework of facility management and service delivery enhancement at the North Hebron Water and Wastewater Services Council and at the Salfit Municipal Water Department, in partnership with the Dutch Water Authority in the Blue Deal and Water Work program.
- Begin work to institutionalize the Coastal Municipalities Water Authority within the framework of a reform process at the authority to convert it into a service provider, including the process of transferring water service from municipalities to the Coastal Municipalities Authority. This process includes administrative, financial and technical reform. Under Water Authority guidance, an initial action plan was developed to transfer water services from municipalities. The Water Authority is currently working on preparing a detailed plan for the transfer of water service to the Authority and is setting up clear mechanisms to address a number of central issues, especially the transfer of assets, staff and financial resources to the Coastal Municipalities Water Utility (CMWU).

B.3. Focus on other reuse elements in national policies, strategies and action plans

PWA considers reuse as one of the five strategic objectives of the water sector for the 2017-2021 period. This was already the case in the previous strategic objectives 2012-2016. This section focuses on strategic documents or programmatic documents (from the water sector, from the agricultural sector or national cross-cutting) containing elements related to the reuse of treated wastewater or 'non-conventional' water.

B.3.1 National Policy Agenda (NPA) 2017-2022

Under pillar 3 "Sustainable development", the National Priority #10 "Resilient communities" lists several policies related to water, sanitation, agriculture:

- National Policy "Meeting the basic needs of our communities"

The following policy interventions are mentioned:

- Expand community access to clean water and sanitation;
- Ensure food security.

- National Policy "Ensuring a sustainable environment and adapting to climate change":

The following policy interventions are mentioned:

- Expand solid waste management and recycling;
- Expand wastewater management, treatment and reuse;
- Manage, protect and promote sustainable use and conservation of natural resources (land, water, energy).

- National policy "Revitalizing agriculture and strengthening our rural communities

The following policy interventions are mentioned:

- Increase agricultural plant and livestock production and develop value chains;
- Protect and support farmers, particularly in areas under threat.

B.3.2 FAO context analysis for the country programming 2018-2022

This 2019 document is quoted as an explicit reference in the update of the agricultural sector strategy:

"Climate change

Climate change model projections show high confidence that temperatures will increase, a medium confidence in an annual mean precipitation decrease in the Eastern Mediterranean and, paradoxically, an increase in extreme rainfall events in spite of the decrease in rainfall totals thus suggesting longer drought periods (CMIP5, 2016). In addition to heat stress, drought stress resulting from the combined effects of high temperatures, reduced precipitation and higher evapotranspiration will reduce crop productivity of major crops (wheat, barley, corn) with strong adverse effects on national and household livelihood and food security.

These conditions necessitate urgent mitigation and adaptation measures. Indeed, a societal consequence to climate change is the susceptibility to food insecurity and the depletion of farmers' productive assets following multiple crop failures. Candidate mechanisms for reducing these impacts include climate-smart agriculture, treated wastewater reuse, water resource management, and any intervention that enhance the resilience to food and nutrition insecurity at household as well as national level (e.g. through Disaster Risk Reduction and Management interventions).

Agricultural inputs and productive resources

Water is a critical input for both crops and livestock, but restrictions to access by Israeli Authorities have hindered economic activity, thus affecting the livelihoods of communities, deepening poverty levels and further increasing vulnerability. Overexploitation of the accessible water further depletes the aquifers and contributes to decreasing their quality. The effects of prolonged Israeli restrictions on the access of Palestinians to water resources are exacerbated by natural conditions and climate change, which is expected to increase the severity of water scarcity through increased spells of drought.

In this situation, recycled wastewater might be a precious resource for Palestinian agriculture. However, the potential offered by reclaimed water is not being realized due in part to the lack of efficient irrigation schemes, of enabling institutional framework, capacities for monitoring and management of reclaimed water utilization in agriculture, and disincentives to private investment in agriculture. Most fundamentally, establishing wastewater treatment plants and other sanitation and reuse infrastructure faces the same restrictions by the Israeli authorities as other infrastructure.

Access to land and agricultural expansion have been severely undermined by the protracted occupation. Most land resources are located in Area C, which is sparsely populated and underutilized by the Palestinian population, mainly as a result of impediments to infrastructure and urban development. Systematic erosion of the agricultural productive base, because of settlement expansion and urban expansion (particularly in Gaza), has deprived farmers and herders of their land.

Agricultural land is also affected by land degradation due to lack of proper tending, discharge of untreated wastewater into nearby wadis and release of solid domestic and industrial waste from settlements onto Palestinian lands. This also affects the productivity of cultivated land.

Non-conventional water use has a significant, but as yet untapped, potential in Palestine. On a small scale about 800 household level grey water treatment plants are currently operating locally, with a total annual effluent of about 0.5 Mm³/y. In the Gaza Strip, there are scattered wastewater reuse pilot projects for agriculture with a total reuse capacity of not more than 1.0 Mm³/y." Regarding recharge, NGEST discharges more than 45 000 m³/day of partially treated and Khanyounis WWTP discharges about 15,000 m³/day of well-treated effluents for infiltration (yet this data needs to be updated after the massive destructions caused by the war)

B.3.3 National Agricultural Sector Strategy Update 2021-2023 (2020)

Update of National Agricultural Sector Strategy 2017-2022, for the following reasons:

- New developmental approaches and priorities: new agricultural cluster-based development approach; new disengagement policy from the Israeli economy and promotion of local products;
- Outbreak of Covid-19 pandemic and its consequences in Palestine;
- Israeli plan for the annexation of Palestinian land in the Jordan valley;
- Integration of intermediate evaluations (results of semi-annual reviews).

Among guiding pillars:

- Facilitating access to agricultural land, water, natural resources and markets
- Promoting innovation and adaptive solutions that mitigate the effects of climate change

Analysis of facts of the ground:

Scarcity of water resources due to consequences of climate change (decrease of rainfalls, increase of demand) and Israeli occupation (obstacles to the access and the use of resources).

Second strategic objective:

- Natural and agricultural resources are sustainably managed and better adapted for climate change
- Expected results:

- The volume of water available to farmers and livestock breeders from traditional and non-traditional sources is increased and is managed more efficiently (expected additional 3.5 million m³ available for agriculture by 2023)
- Climate smart and adaptive [...] agricultural policies and technologies are promoted and enforced.

Priority areas of intervention:

- Establish large water facilities in arable irrigated areas through the transfer of water, water collection or water treatment and increase the efficiency of available water;
- Take measures and arrangements to adapt with or avoid the negative impact of climate change and natural disasters, particularly high temperatures and fluctuating precipitations or declining rainwater.

The strategy (2014-2016) for the agricultural sector set as a priority target 'the provision of 15 million m³ of non-conventional water, including REUSE'. However, until 2020, the volume of REUSE for irrigation did not exceed 2 to 3 million m³ in the West Bank and Gaza³.

B.3.4 Agricultural Cluster's Development Plan in the West-Bank (ACDP, 2021)

6 clusters: i) Jenin, ii) Tulkarem, iii) Qalqilya, iv) Salfit, v) Tubas, vi) Jericho and Jordan valley

Among strategic objectives of ACDP:

- Sustainable management of agricultural natural resources and adaptation to climate change: The ACCP relies on interventions related to increasing the irrigation water and improving the efficiency of its use. This includes establishing transmission and distribution networks, harvesting rainwater, developing the use of treated wastewater, land protection from degradation and attacks through reclamation, rehabilitation and agricultural roads.

B.3.5 National Food and Nutrition Security Policy 2020-2030 (NFNSP) and National Investment Plan 2020-2022 (NIP)

a. NFNSP 2020-2030

Strategic objective 4: By 2030, sustainable food production systems ensured and resilient agricultural practices implemented.

Sectoral result 4.1. Access to management of land and water resources enhanced

Domestic food supply critically depends on access to natural resources, primarily land and water. This means that it is key to stand for the right to land and to water of Palestinians that is severely impaired by the Israeli occupation. Moreover, unsustainable land use practices and human pressures on resources are reaching critical limits. Overexploitation and poor farming methods are depleting soil nutrients faster than they are able to form. At the same time, water is frequently ill-managed and ever scarcer.

Examples of interventions under this heading are the following:

- Improve water efficiency developing capacity at all levels: improved knowledge, research, innovation and implementation towards more sustainable use of water (e.g. water recycling, wastewater treatment, etc.);
- Favor integrated approaches, such as watershed management and sustainable land management, to help in sustainably manage these resources.

³ Source: REUSE final synthesis report, COSTEA, 2022.

Results	4.3. Climate change challenges addressed and farming systems adapted
Responsibility	MoA, EQA and PWA
Indicator	4.3.1 Percentage of treated WW (TSE) over Effluent (SE) used by agriculture
Meaning / rationale	Percentage
Baseline	Gaza: 5,000; West Bank: 8,000
Year	2017
Target 2022	Gaza 24,700; West Bank: 52,300
Target 2030	N/A
Frequency (Years)	Yearly
Means of verification	PWA files
Source of Verification	PWA

Table 5: Results framework of the NFNSP

b. NIP operationalizing the Food and Nutrition Strategy 2020-2022

Component 4. “Sustainable Natural Resources Management and Climate Change Adaptation”

- Rationale. In a context of limited, overexploited, and depleting natural resources, environmental sustainability is a pre-requisite of any intervention as well as for ensuring socio-economic sustainability. In Palestine, agriculture remains the most untapped sector for food and nutrition security. Land and water are the bases of agriculture practices, and their access restrictions (coupled with limitations on the movements of people and goods) are considered the root causes of food insecurity in Palestine. In addition, the potential risks related to climate change (temperature increase, increase of extreme events such as droughts, possible reduction in precipitation), combined with limited water governance represent an additional issue in the country that require support. These limiting factors represent the main rationale to select the critical priority investments for food and nutrition security, including: land/rangeland rehabilitation, increased water availability (including wells rehabilitation, construction of new small dams and reservoirs, as well as incrementing access to unconventional water sources such as reuse of treated wastewater), increased adaptation capacity and enhanced access to energy (especially in context of increasing temperatures this might affect protected agriculture’s requirements).
- Outcome. By 2022, access to land, rangeland and water is increased by 10 percent and is utilized with more sustainable and climate adaptive practices.
- Under this Component the Programme 4.3 especially aims at “ Improving water resources management. This programme includes enhancing the development of alternative water resources, rehabilitation of agriculture wells and springs, and scaling up water harvesting projects to increase water harvesting capacity and improved governance:
 - Rehabilitation and use of treated wastewater investment. The proposed interventions include the conveyance system, as well as the required support to catalyze the utilization of treated wastewater (TWW) like the formation of TWW user association, the enhancement of extension staff and farmers capacities in the TWW reuse and management. This component targets the utilization of 15 and 25 million cubic meters of TWW in West Bank and Gaza

B.4. Operational implementation

B.4.1 Existing masterplans

In order to implement the national water and wastewater policy and strategy, Palestinian authorities have received external funding support to draw up masterplans, with the aim of planning the development of the sector in different areas of the country, prioritizing investments and projects according to the needs and issues of the areas covered.

These documents are intended to link the national strategy with its implementation on a more local scale. They must serve as a basis for the public service centers to develop the network and projects in the areas in which they provide the service.

Before the adoption of this new strategy, most of the governorates of the West Bank were not covered by masterplans or were covered by obsolete documents (Nablus masterplan for water and wastewater: 2007, Tulkarem master plan for water and wastewater: 2011).

Since 2017, most governorates are now covered by masterplans for their territory or at a regional level:

- Hebron governorate water and wastewater masterplan (2024);
- North of Westbank water and wastewater masterplan, including 6 governorates Jenin, Nablus, Salfit, Tubas, Tulkarm and Qalqiliya (2017);
- Middle of Westbank water and wastewater masterplan, including 2 governorates Ramallah and Al Bireh, and Jerusalem (2017).

The governorates of Jericho and Bethlehem are the only ones not to be covered by a strategic sectoral planning document. According to the PWA, these governorates have detailed studies that enable them to develop projects in the territory in accordance with national strategic guidelines, however these documents were not submitted as part of this assessment.

Although the context is quickly changing in the territory, nearly 80% of the West Bank is covered by a sectoral masterplan that should serve as a guide for service providers to develop their services and projects at the local level based on recommendations and prioritization presented in the masterplans.

However, interviews with the various service providers have shown that they are encountering difficulties in planning wastewater and reuse projects in their territories. Most of the SPs indicate that they do not rely on the recommendations of these masterplans, mainly for the following reasons:

- Mismatch between the scale covered by the masterplan and the scale covered by the Service Provider.
- Document not sufficiently operational in view of the difficulties encountered locally by the SPs.
- Lack of knowledge of the content of the masterplans or of accessibility to the most recent versions.
- Secondary investments often dependent on projects or structuring infrastructures that take time to implement and do not allow for a coherent phasing of activities.

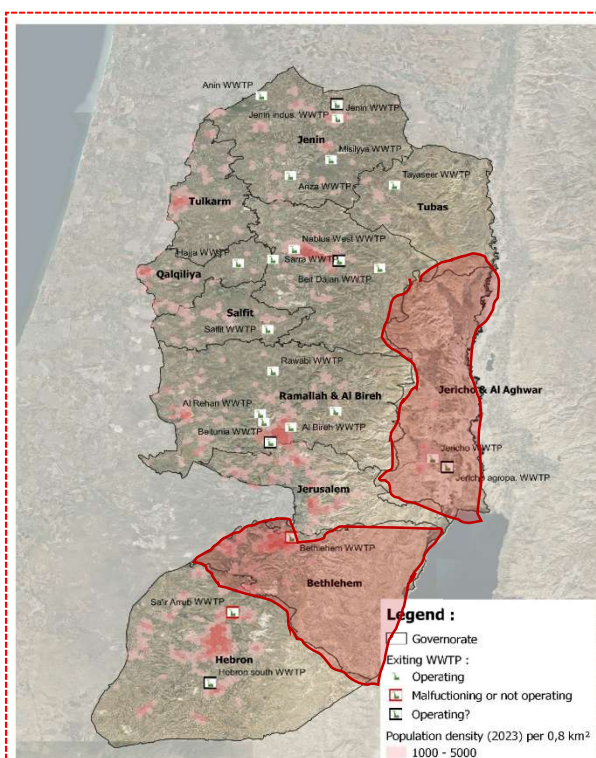


Figure 3: Governorates not covered by water and wastewater masterplans within the West Bank

A detailed analysis of the implementation of this strategy at local level and of the capacity of the public services to define a medium-term strategy is provided in section D.5.3 of this report.

Key ongoing and planned programs in wastewater and reuse sectors

In order to support the PWA in the implementation of structuring projects, several technical and financial partners are supporting the development of the wastewater and reuse sector by investing in capacity-building programs or directly in the financing of infrastructure. These projects aim to implement the national strategy by providing support at a central or local level. The data collected during this assessment phase has helped to support the preliminary work carried out during the inception phase.

The coordination of the various stakeholders involved in the implementation of these projects is a crucial issue for the development of the sector. The WaDIS program will be included in the list of projects aimed at strengthening the capacities of the sector's stakeholders, and its structuring involves exchanges with the main funders and partners of ongoing projects.

It should be noted that the interviews conducted with the service providers also made it possible to identify certain projects financed with equity capital, particularly in Al-Bireh and Ramallah, where external financing has decreased pending the transition to the RWU provided by the Jerusalem Water Undertaking (JWU). Main projects in the wastewater sector financed with the SPs' own funds are presented in Table 6 and those funded by donors are presented in Fig.4.

SPs	Partners	Year - Object	Amount
Al-Bireh municipality	Palestinian Authority + Self-funding	2024 - Extending sewage lines and paving roads in Shaab Kasab and the Anti-Corruption Commission Road in Al-Balou'.	1,530,000 NIS (380 KEUR)
Al-Bireh municipality	Self-funding	2023-2024 - Paving internal roads and extending rainwater and sewage lines.	5,800,000 NIS (1,35 MEUR)
Hebron municipality	Self-financing	2022 - Annual maintenance and new subscriptions for the water network 2023 - Annual maintenance and new subscriptions for the water network	500 KEUR 375 KEUR
Hebron municipality	Self-financing	2024 - Extension of sewage in Khallet Abu Aqil 2022 - Subscriptions and annual maintenance for the sewage dept 2024 - Wadi Al-Hussaini Project, sewage networks and rainwater drainage	27 KEUR 250 KEUR 1,400 KEUR
Ramallah municipality	Self-financing	2023-2025 - Establishing a Batn al-Hawa purification station with a capacity of 4,500 m ³ per day	20 million NIS (approx. 5 MEUR)
Ramallah municipality	Self-financing	2023-2025 - Establishing a 15 km Batn al-Hawa sewage network with different diameters	10 million NIS (around 2,5 MEUR)

Table 6: Self-financed wastewater projects according to field interviews with SPs

AECID – PARC support to small scale WWTP and reuse projects in Anza-Jenin, Beit Dajan-Nablus **2023-ongoing**

AFD Feasibility study for construction of a new wastewater treatment plan (JWWU area) **2024-2025**
World Bank Associated work

NRO, NL MFA Capacity Building to SP in finance and organizational aspect Support Programme (WSRC) **2022-2026**

Green Climate Fund Capacity Building to PWA on climate change aspect **2023-2025**

ADA Institutional Support Programme (PWA-ISP) **2023-2025**

JICA Third Country Training program in JORDAN (PWA-SP) Scada, WWTP operation, GIS **2023-2025**

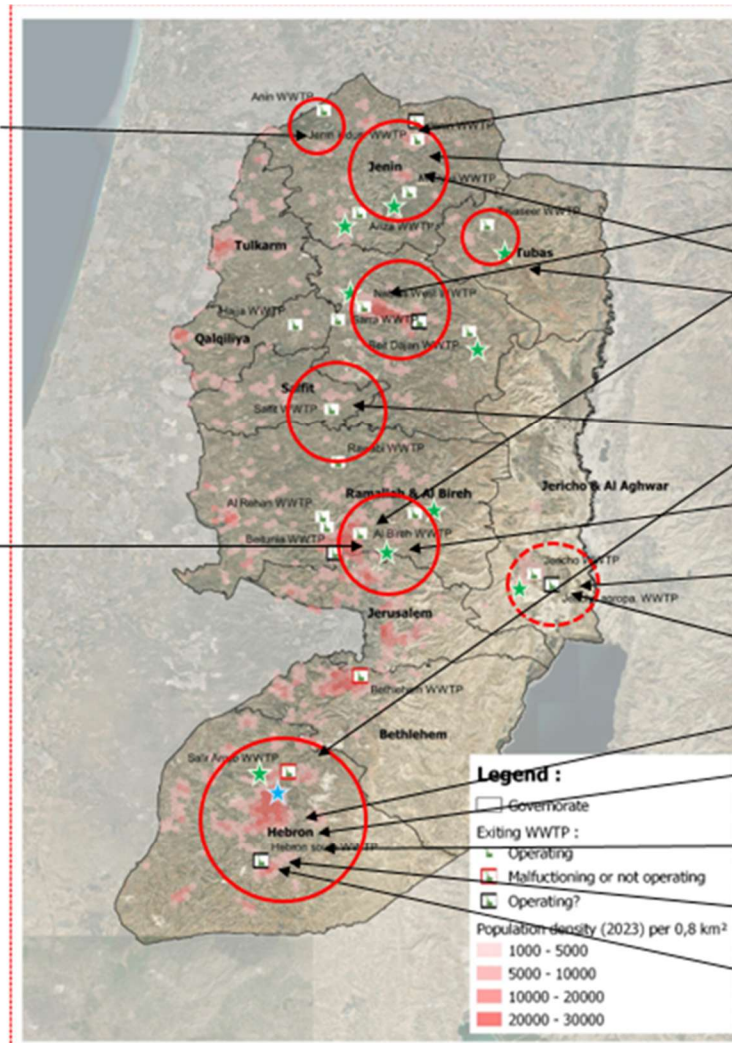
Canadian Foundation + Ramallah municipality Extension of Al-Tireh WWTP and implementation of a reuse project **2023-2024**

EU – Road Map for the creation of RWU 2016-2018

AFD – Feasibility study for a professional training system (WB/ Gaza) **2024**

AFD – Roadmap to transfert the CMWU into a Regional Water Utility (Gaza) **2021-2023**

GIZ – Sustainable use of water resources, Water dialogue process, clarification of institution responsibilities in WW reuse, WW reuse standards, roadmap for WW and reuse, CB to PWA, CB for SP, institutional support process for WUA development (3 municipalities) **2024 - 2027**



USAID Rehabilitation of the WWTP, including capacity-building activities for the Water and Wastewater Department (Jenin) **2024-stopped**

JICA Advisor for Water Service Management of Jenin Municipality (Jenin) **2022-2024**

KFW – TA to agricultural actors **2019-2024**

AFD/EU – Design connection point (Ramallah + Jenin)

Decentralized cooperation for CB of JSC/RU of Tubas (NGO Hamap)

AFD – Wastewater and Reuse project (Tubas) **2023-2025**

NL MFA RWU-Blue Deal TA + Water works CB to JSC (Halhul + Salfit) **2021-2025**

Decentralized cooperation between the city of Toulouse and Ramallah (Al Tireh WWTP – sludge treatment)

Decentralized cooperation between the city of Paris and the city of Jericho (sanitation)

JICA– TA Capacity Development for Sustainable Wastewater Management of Jericho Municipality (Jericho) **2021-2023**

AFD – Reuse project (Hebron) **2023-2025**

AFD – TA to Hebron Municipality - WWWD (Hebron) **2018-2023**

AFD/WB – Water and wastewater master plan (Hebron) **2019-2023**

AFD/WB/EU –Hebron Regional - WWTP (Hebron)

Gov. of Netherland CB to Yatta Municipality **2023**

OXFAM Implementation of a water and sewage network and a pumping line in Khallet Al-Qubba

Figure 4: Key ongoing and planned Donors funded projects in wastewater and reuse sectors, 2025

B.4.2 Concerning reuse projects

A list of on-going reuse projects can be found in Annex 4. Despite efforts to collect data in the literature, in the field and through interviews with key players, it has been very difficult to identify and document reuse projects. This list has been reviewed by MoA but is certainly still not complete and probably contains errors.

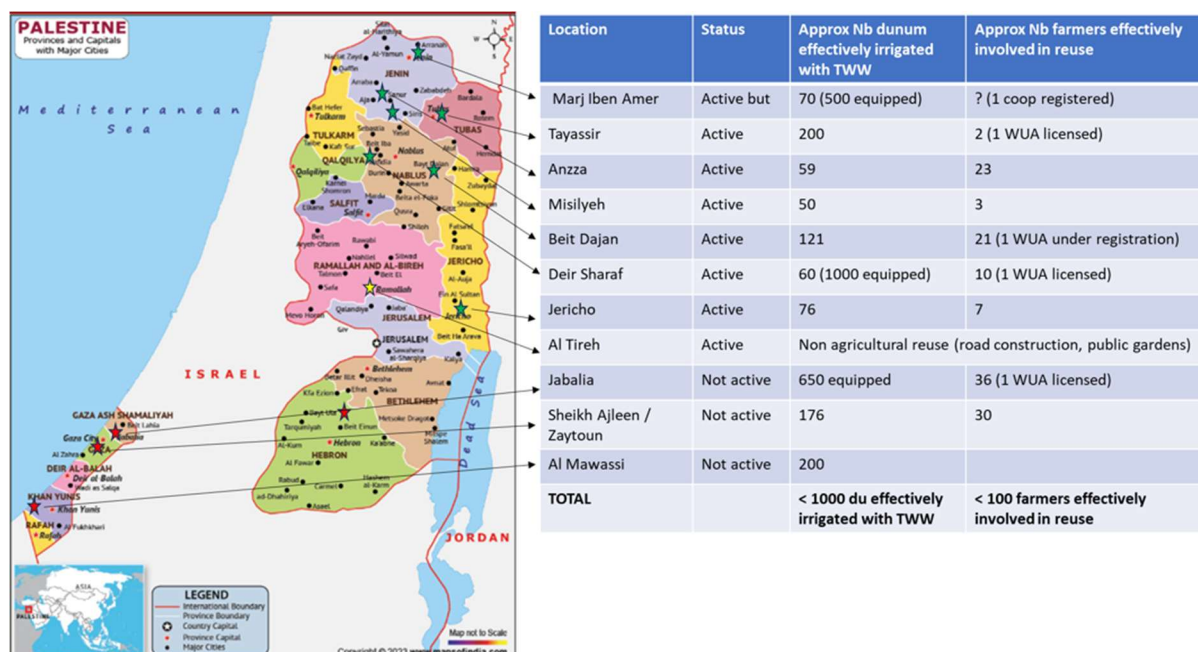


Figure 5: Overview of reuse projects in Palestine

As shown on the map and table above (Fig 5), reuse is still underdeveloped in Palestine:

- There are only 7 active projects at the moment: in Jericho, Tayassir, Deir Sharaf, Beit Dajan, Anzza, Misilyeh and Marj Iben Amer (for this last one, reuse is unofficial since the quality of TWW does not meet standards). All together these projects involve around 200 active farmers (which is consistent with the fact that the MoA has issued 210 individual reuse permits up to now) and concern around 1000 dunum of irrigated land. Yet these numbers should be considered as orders of magnitude, as it is difficult to obtain up-to-date and reliable information.
- There are 4 non-active projects: 3 of them are located in the Gaza Strip (one large scale project in Jabalia, and two pilot projects in Sheikh Ajleen-Zaytoun and Al Mawassi) and have been stopped because of the total destruction of the infrastructure and the impossibility for farmers to access their land since October 2023 and the beginning of the war with Israel. There were other pilot projects planned in Rafah but they never reached the operational stage because of water quality issues. In the West Bank, the reuse pilot project in Sair/Hebron has not been active since 2022 because Al Arroub WWTP is not operational at the moment.
- There is 1 planned reuse project in Wadi Samen in south of Hebron Governorate which depends on the progress of the operationalization of Hebron WWTP.

Despite this low level of implementation, there is a growing interest regarding reuse:

- The acceptance of farmers toward reuse is relatively good: a survey realized in 2020 among 115 farmers in the West Bank revealed that 75% of them were willing to cultivate with TWW. The main decisive factor being the absence of conventional resources⁴.

⁴ Willingness of farmers to use treated wastewater for irrigation in the West Bank, Palestine, Maher Hamdan, Ahmad Abu-Awwad & Maher Abu-Madi (2021).

- The actual most active on-going projects are driven by private initiatives from farmers like in Jericho and in Tayassir which is a good sign of interest and ownership.

Recommendations:

1. There is a need for setting-up a more accurate **database of on-going reuse in Palestine**. Data should be updated on a yearly basis and should reflect the actual situation corresponding to each agricultural campaign. Key information should be at least: evolution of the number of farmers irrigating (and distinction between members of WUA and non-members), evolution of total area irrigated, evolution of crop patterns, key issues...
2. There is a need for an **in-depth assessment of the existing projects** whether they are active or not active with the perspective of gathering lessons learned and capitalization.
3. **A greater attention should be paid to the on-going projects**, whether active or non-active, and more coordinated efforts should be put to turn them as much as possible into success stories. As of now, they represent the only existing practical opportunities, at small and medium scale, i.e. at a manageable scale, to build capacities of a large range of stakeholders (water users, service providers, institutions, development organizations and civil society...) and gain experience. On the contrary, the failure of these projects may have a negative impact concerning the interest of both local stakeholders, especially farmers, as well as donors and investors.

C. LEGAL AND REGULATORY FRAMEWORK

C.1. Objectives and method

The objective of this chapter is to provide a comprehensive situation analysis of the legal and regulatory framework concerning the wastewater and reuse sector, by identifying and characterizing:

- Gaps between text and reality implemented that need to be highlighted and investigate
- Weaknesses that need to be consolidated
- Grey areas that need to be clarified and gaps that need to be filled.

Particular attention will also be paid to the issues of sludge management and industrial wastewater treatment, which are some of the key issues raised during the inception phase.

The objective is also to identify the responsibility of the various institutions, particularly with regards to implementation and decision-making as well as formulation of bylaws or standards.

The analysis is based on documents that the consultant either collected or were provided by the client and authorities involved in the project. It is worth noting that some documents were not available, or that the format, legal value or translation into English presented some challenges and limits to our legal and regulatory analysis and diagnosis of the wastewater treatment and reuse sector in Palestine.

C.1.1 Documents supporting the analysis

The documents made available to the consultant are the following ones:

- 2014 Water Law
- Water Law 2/2003
- By-law "On the House and Facilities' Connection System to the Public Sewage Network", 2014
- By-law "Tariff System", 2011
- By-law "Regional Water Facilities System in Palestine", 2011
- By-law "System Linking Public Sewage Network", 2011
- By-law "Establishing Water Users' Associations", 2018
- By-law "Establishing Regional Water Utilities", 2021
- By-law "Water Union Service Providers", not dated
- Palestinian Standards "Treated Wastewater Effluent for Agricultural Purposes" 742-2015
- Technical Instructions 34-2012 "Treated water for agricultural irrigation"
- Palestinian Standards "Standards WW effluent", 2011
- Palestinian Standards "Use of treated sludge and Sludge disposal" 898-2010
- Technical Regulation 59-2015, Treated Sludge for Agricultural Reuse
- Palestine Standards 227-2019 Treated Industrial Wastewater
- Council of Ministers decision Regulation of Water Users Associations n°4 (2018)
- Guidelines for REUSE Gaza, 2002
- Environment sector strategy 2010
- EQA Law n°7 concerning the environment (1999)
- National Biodiversity Strategy Palestine 2022
- Decree-Law n°14 (2018) amending the Agriculture Law n°2
- Law on Agriculture n°2 2003
- National Water and Wastewater Policy and Strategy for Palestine, PWA 2024

The consultant was not able to obtain, consult and analyze the following documents:

- Palestinian regulatory framework from the WW strategy of 2018
- PS 227-2010 Industrial Treated Wastewater
- Palestinian Standards "Treated Wastewater Effluent for Agricultural Purposes" 742-2003

- Environmental Assessment Policy of 2000

C.1.2 Institutions involved and regulatory actors

As a reminder, the 2014 Water Law sets up the following organization of the regulatory and institutional framework and relations for the different actors and stakeholders involved in wastewater treatment, agricultural and other reuse of the treated wastewater:

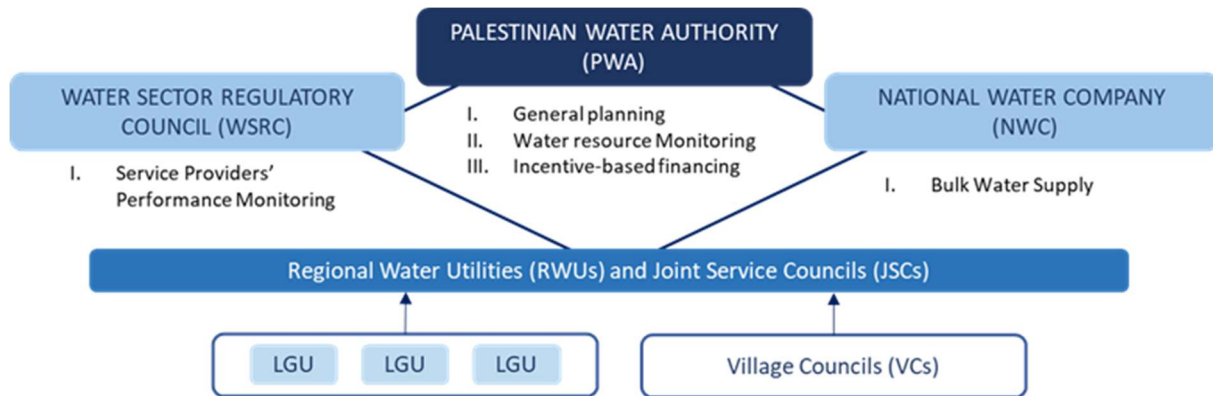


Figure 5: Main institutions involved in the sector⁵

It is important to first identify the scope of the legal and regulatory analysis we set around the sector of water resources management, water supply, wastewater management and reuse, notably by determining the key actors and stakeholders involved. The December 2024 National Water and Wastewater Policy and Strategy for Palestine **summarizes the roles among the water sector institutions:**

“The PWA has the overall responsibility for managing and regulating water resources, setting policies, determining water allocations, protecting water quality, and developing projects.

The law authorizes the commercialization of water supply through the establishment of a National Water Company through restructuring the West Bank Water Department (WBWD).

The law also provides for performance monitoring of water service providers by an independent Water Sector Regulatory Council, with legal status and budget independent from the PWA.

Additionally, the 2014 Water Law requires that PWA establishes regional water utilities for the provision of water and wastewater services as legally and financially independent entities, which in turn requires merging existing water and wastewater service providers into regional entities.

Other line ministries and agencies have leadership on specific issues:

- Ministry of Agriculture (MoA): irrigation and promotion and organization of farmers' associations.
- Environmental Quality Authority (EQA): defining environmental regulations, including standards for the discharge of treated wastewater into natural water courses.
- Palestinian Standards Institute (PSI): standardization of rules for water facilities, sewerage, on-site sanitation, carbon footprint and water footprint regulations.
- Ministry of Local Government (MoLG): implementing and supporting Joint Service Councils (JSCs) and local governmental units (LGUs) and implementing water and wastewater projects in coordination with PWA.”

⁵ Source: December 2024, PWA, National Water and Wastewater Policy and Strategy for Palestine, page 109.

As per the Water Law of 2014 and as reaffirmed in the PWA National water and wastewater Policy and Strategy for Palestine of May 2024, the responsibilities of the sector have been divided between a regulatory function and an operational function, institutionally set up to evolve independently.

C.2. Legal and regulatory framework of the WW sector

C.2.1 Wastewater management

a. Provisions of the 2014 Water Law

Wastewater management and wastewater service structuring has a marginal place in the 2014 Water Law, which focuses more on the major institutional issues of resources management and bringing drinking water to citizens. The law also sets out a number of operating provisions for the authorities in charge of regulating the water and wastewater sectors, which should be defined by decree.

The law aims to develop and manage the water resources, to increase their capacity, to improve their quality, to preserve and protect them from pollution and depletion, and to improve the level of water services through the implementation of integrated and sustainable water resources management principles.

According to Article 3, *“All Water Resources in Palestine shall be considered public property, and the Authority has the power to manage these resources in a manner that ensures justice and efficiency in distribution”*. It is implied that all water resources are public property (including conventional and non-conventional waters as per the Article 1 Definitions) and that the Authority (PWA) is responsible for the management of such resources. This leads to the conclusion, although it is not written explicitly, that the PWA manages TWW and that its ownership is public. However, the beneficial ownership of it is not clearly addressed. (This is relevant in the development of a TWW reuse system, including the considerations of prices and tariffications applied to reuse of TWW, the development of reuse through the development of WWTPs). There is a fragmentation of responsibility visible already in Article 4, where the implementation of WWTP is dependent on a decision of the Cabinet of Ministers, and not of the PWA directly. This paragraph highlights the gaps or weakness of the law in clearly and precisely establishing rules and norms for TWW.

The Authority shall determine, in cooperation with other official and relevant authorities, and within the framework of the annual water budget, the amounts and means of water utilization for the various sectors and regions, provided that domestic uses shall have absolute priority over all other uses in determining the allocation of available water resources.

Articles 8-28; 37-49, specify the roles, responsibilities and financial resources of key institutions in the water sector: PWA, WSRC, NWC, RWU and WUA. The roles of the following institutions are not addressed, particularly regarding their contribution in the wastewater and/or reuse sectors: PSI, EQA, and MoA.

Chapter 9 deals with environmental aspects. The issue of protecting water resources is at the heart of the Water Law, in line with the Environmental Law. Article provides a *“Partake in regulating the use of industrial and agricultural materials that may cause the contamination of water resources or water supply systems”*. This point touches on a sensitive aspect of the way in which the issue of wastewater and sludge from industry and the agricultural environment is managed. According to Article 50, the ultimate responsibility in (i) regulating the use of industrial and agricultural materials, and (ii) in the committees responsible for conducting environmental impact assessments, lies with the PWA.

According to Article 53, *“any natural or legal person that causes pollution to any Water Resource or water supply system shall remove the pollution affecting the Water Resource or water supply system”*. The article does not specify, at least clearly, the case of industrial pollution, for example, affecting the wastewater collection network and wastewater treatment systems. On the other hand, the ‘polluter pays’ principle is clearly defined in the article. The PWA can also require an industry to bear the costs of managing this pollution. This is also reasserted in the Cabinet decision n°16 on House and Facilities’ connection system to the Public Sewage Network (2013) and Article 16 where additional fees can be collected by the water and sewage service provider in case of a higher level of chemical oxygen concentration than the maximum allowed for the Public Sewage Network, *“in line with the ‘polluter pays’ principle”*.

Article 55 positions PWA as the main representative for the judicial police; the Authority's inspectors shall have the status and powers of the judicial police to apprehend crimes and violations prohibited under the Water Law, including when these crimes and violations are related to the mismanagement of wastewater. The fact that the PWA is only present at central level raises the question of the resources available and their own organization to fulfil this function operationally.

Article 56 gives the PWA the possibility of requesting the acquisition of any land, property or water facility for the public good (with compensation). Public good is not clearly specified, but wastewater and reuse systems appear to be eligible.

b. Provisions of Environment Law

Article 29 of the Environment Law n°07-1999, lays down the general principles of wastewater management for environmental protection purposes: *"the ministry [of Environment] shall formulate, in coordination with the competent authorities, the standards and criteria necessary for the method of compiling, treating, reuse or dispose of the wastewater and rain water in a sound manner which is consistent with the preservation of the environment and public health"*. Article 30 provides that *"it shall be prohibited for any individual to dispose of any solid, liquid or other material except in accordance with the conditions and standards determined by the competent authority"*.

The application of these very broad articles, in line with the principles defined in the Water Act, is covered by several regulatory documents that are analyzed in the next section.

c. Regulatory provisions

On treatment standards

Regarding the standards applying to the wastewater treatment, the "PS-Standards for wastewater effluent" indicates that *"Document No 2 'The sixth draft of treated wastewater standard' has been prepared by a special committee. Now it is too close to be accredited by the Palestinian Standards Institute (PSI, 2004)"*. However, this document has not been collected, so it is difficult to make the link between the standards applied by regulation to wastewater treatment plants and the standards applied to reuse, which are scattered and repeated in several regulatory documents.

Although, various regulatory documents address reclaimed treated wastewater, setting the standards of quality, methods of treatment and evaluation and final characterization into a 4-classes system of classification of TWW, there does not seem to be a regulation setting out the quality of treatment obligations for WWTP design and service operators or the monitoring framework of the treatment capacity and quality, (or this regulation has not been made available to the consultant).

The standards of quality for treated wastewater are partially addressed in Article 12 of Cabinet resolution 16 (2013): *"The service provider ensures that the treated water is compatible with the Palestinian standard specifications concerning treated water number (2003-742 mf), its amendments and the related binding regulations issued by the Institute of Specifications and Standards as well as the instruction manuals of the World Food and Agricultural Organization (FAO) and the World Health Organization (WHO)"*. The WHO international guidelines referred to are the WHO Health Guidelines (1989), also mentioned in the PS Standards for Wastewater Effluent (2011) page 1, which were updated by WHO: *"Guidelines for the safe use of wastewater, excreta and greywater"* (2006, superseding previous editions of 1973 and 1989).

It is worth mentioning that in PS 742-2015 (amending PS 742-2003) regarding treated wastewater for agricultural purposes, complementary references are made to American standards on water and wastewater examination and methods to further bring technical and scientific support to the examination of quality levels of wastewater (see Article 2-1 PS 742-2015, and for instance the "Standard Methods for the Examination of Water and Wastewater" by the American Public Health Association in 1992).

Nevertheless, all texts regulating the reuse feature a table of reclaimed treated wastewater classes, both to indicate the level of quality of the TWW, its possible uses and the available barriers of treatment and preventive measures to ensure a safe and secure use of the resource. This 4-classes table (class A – being the highest quality TWW – to class D TWW) is described notably in PS Wastewater effluent (2011).

Class		Water Quality Parameters		
		BOD ₅	TSS	Faecal coliforms
Class A	High quality	20 mg/l,	30 mg/l,	200 MPN/100 ml.
Class B	Good quality	20 mg/l,	30 mg/l,	1000 MPN/100 ml
Class C	Medium quality	40 mg/l,	50 mg/l,	1000 MPN/100 ml
Class D	Low quality	60 mg/l,	90 mg/l,	1000 MPN/100 ml

Table 7: Classification of treated wastewater quality

The sector strategy also includes a reference to these 4 quality levels, page 81: “Wastewater reuse for irrigation is reigned by Instructions (sic) No. 34 of 2012 on the reuse of treated wastewater in agriculture. This regulation sets requirements for four classes of water (A-D). Properly treated wastewater will answer class A”. Then on page 119, in the expected results at national level, the percentage of reuse for agricultural and recharge is indicated (for example, 59% in 2034). So, by crossing these sources, it is possible to assume that in 2034, for example, 59% of WWTPs will have to produce class A TWW.

However, none of the collected documents specifies the quality standards for treatment when there is no reuse purpose (and TWW simply discharged into the environment).

In conclusion, it appears from these elements that there is a lack of specific regulatory provisions for wastewater treatment that set enforceable treatment efficiency targets for operators and structure the monitoring of WWTP performance, regardless of whether the treated water is intended for reuse or not.

On house and facilities connections

House connections are addressed in the Cabinet resolution n°16 (2013). First, the discharge of wastewater from any source (residential, industrial, agricultural or commercial) into the environment or into the public sewage network without treatment nor approval is strictly prohibited by Article 20 of the resolution.

Two scenarios are presented in the Cabinet resolution n°16 with regards to wastewater management, in terms of collection and transport from the wastewater production location to the WWTP.

As wastewater (from any source) is required to be collected and treated, connection of houses and facilities directly to the public sewage network is set up by Article 5 of the resolution.

Measures of inspection (Article 18) and sanctions (Article 19) in case of non-compliance with this by-law and other relevant legal and regulatory measures around the connection to the public sewage network are also laid out in the text. However, it is worth noting that Article 19 on “Stopping or Suspending Approval to Connect Facilities with the Public Sewage Network” does not make detailed mention of any appeal process for the facility with suspended or stopped connection.

The second option of collection of wastewater falls under Article 7 tackling the setup of septic tanks, within restricted conditions of technical difficulties to connect to the public sewage network or in the absence of one. The process for emptying them, in Article 8, is also regulated clearly and allows for the portion of wastewater not directly discharged into the public sewage network to join the wastewater treatment process in a WWTP. Both the installation and clearing of septic tanks are subjected to requirements of permits and to fees covering both administrative and logistic aspects of this wastewater collection process. Cabinet resolution n°16 addresses the fees for clearing the septic tanks in Article 14, allowing for the recovery of fees to still be carried out outside the connection system to the public sewage network. This second scenario of house and facilities connection is clearly set and detailed, which allows the scope of all wastewaters to be fully collected and treated.

Overall, the Cabinet resolution n°16 sets up comprehensive conditions and scenario for the connection of house and facilities to the public sewage network, or by default the collection of the wastewater via septic

tank. An important part of the document focuses on financial aspects of managing the connection to the Public Sewage Network, which is consistent with the National Water and Wastewater Policy and Strategy for Palestine of May 2024, the 2014 Water Law and the by-laws Standard on Wastewater effluent (2011), where “*water utilities must run based on a commercial basis (...)*” (page 109).

Specific requirements and provisions are dedicated to wastewater coming from industrial, commercial and agricultural sources, as opposed to “residential” sewage (defined in Article 1). The following articles of the Cabinet resolution n°16 tackle different aspects pertaining to industrial, commercial or agricultural wastewater or sewage connection: Article 9 on “Discharge of Commercial, Industrial and Agricultural Waste Water”, then permits (Article 10) and conditions (Article 11) for connecting their own sewage system to the public sewage network, Article 13 for the connection fees and O&M fees (Article 15 and 16).

Article 20 of the Cabinet decision n°16 refers to the two main Palestinian standards in relation to industrial wastewater (PS 227-2010 and its amendments) and to wastewater for agricultural purposes (PS 742-2003 and its amendments) and related technical Instructions. This article makes the link and clear reference to the more specific and detailed regulatory instruments, increasing the consistency, complementarity and cohesion of the legal framework around connection to the Public Sewerage Network and other related topics. In the case of industrial wastewater, the related standards PS 227-2019 (amending PS 227-2010) do operate the reciprocal reference in provision 9-1 to the Cabinet resolution n°16 for the connection to the Public Sewerage Network, which is however not the case for agricultural purposes.

On industrial wastewater

Treated industrial wastewater is defined in the Palestinian Standard 227-2019 “Treated industrial wastewater” 3-5 as “*Industrial wastewater that has been treated and complies with this standard according to the established methods*”.

First, industrial wastewater (as well as agricultural and commercial wastewater) is required to follow a pre-treatment at a satisfying level considered by the relevant authorities and given a specific authorization before it can join the public sewage network and the wastewater treatment plant, according to Article 9-1. “Discharge of Commercial, Industrial and Agricultural Wastewater” of the Cabinet resolution n°16 (2013): “*It is prohibited to discharge commercial, industrial and agricultural wastewater into the public sewage network until it is treated, and a written approval is provided by the service provider in line with the instructions provided in the annex.*”

While Article 9 sets up several prohibited behaviors in relation to discharge of industrial wastewater, it does not set the sanctions associated in case of non-compliance.

Article 19 mentions that the service provider has the right to cease or suspend the approval for linking facilities with the public sewage network, for a period of time it sees fit “and/or to make facilities carry the civil and criminal liability for violations in the following cases” (among which the violation of the provisions and terms set by the SP when approving the connection; the failure to commit in fees payment etc.).

Article 20 entitled “Sanctions” applies to violations and non-compliance with this “system”, according to penalties set in the 2002 Water Law (which would be replaced by the 2014 Water Law) and the Palestinian Local Authorities law No. (1) (1997) and Environment Law No.7 (1999).

After being pre-treated, conveyed to a WWTP (see section “On House and facilities connections” above) to be treated to a quality category ranging from A to D (see section “Treatment standards” above in this chapter), industrial treated wastewater can be reused under certain conditions and is regulated in its use mainly by Palestinian Standard 227-2019.

The reuse of industrial treated wastewater is regulated and governed by the categorization of its planned final uses. As established in provision 4-1 of PS 227-2019 “*Treated industrial wastewater from industrial facilities must comply with the properties specified in Tables 2 to 7 of this standard, depending on the planned final use, to prevent harm to different environmental elements.*” The Palestinian Standard PS 227-2019 sets up 4 categories of final uses for industrial treated wastewater, see provision 5:

“1/ *Water discharges into streams, valleys and water bodies*

2/ *Water reused for irrigation purposes*

3/ *Water recycled within industrial facility*

4/ Water connected to public sewer network.”

Following these 4 categories of final uses, quality requirements (chemical, physical and microbiological properties and the concentration of heavy metals) are set and measured to determine the level of quality of the industrial treated wastewater needed for each reuse.

Limits, for each of these final uses, are set by regulation in the same document. For instance, the discharge of industrial TWW into the environment in areas highly sensitive to water source pollution is prohibited (4-2 in PS 227-2019). The use of ITWW for irrigation purposes is prohibited for fruit trees, fruits and vegetables from specific types of industries (7-2 PS 227-2019), and entirely forbidden with industrial wastewater coming from chemical and cosmetics industries or pharmaceutical companies for instance (7-3 PS 227-2019). These limits are described and measured in a detailed and restrictive manner, framing well the reuse of industrial wastewater in order to ensure the protection of health for humans and for the environment.

Text	Existing	To be clarified / completed
Standard N° PS 227-2019 – Reuse of industrial treated wastewater	The treated industrial wastewater is divided in 4 categories: • Water discharged into streams, valleys, and water bodies. • Water reused for irrigation purposes. • Water recycled within the industrial facility. • Water connected to the public sewer network. For each category, the quality requirements are detailed. Concerning the ITWW to be reused for irrigation, the list of allowed/forbidden crops as well as the list of forbidden sources of TWW are detailed. For each category, the procedure for quality control is detailed (monitoring and sampling). However, sanctions are vague or inexistent	Comprehensive and well-structured standard. Clear set of sanctions in case of non-compliance could be added to strengthen the regime

Table 8: Synthesis of the analysis of Standard PS 227-2019

The standards set for industrial wastewater, its treatment and reuse are generally comprehensive, precise and well-structured in the PS 227-2019. But, despite the obligations and criteria being set in a comprehensive way, the enforcement mechanisms and sanctions in case of non-compliance remain vague, weak or non-existent.

Article 11 of the PS 227-2019 does set up a scenario addressing non-compliance but only in the case of one of the four final uses, “water discharge into valleys, streams or water bodies” with a quality of discharged water inferior to the one required. In this specific and limited case of non-compliance, the first non-corresponding water sample must first be confirmed by a second sample. In case of violation of the quality of discharged water, the relevant authority will be notified to take corrective action. After three months of consecutive non-compliance, the use of this treated wastewater is to be suspended until the appropriate quality is reached again. We can therefore note the nature of this sole measure, which is only a corrective measure and not a sanction per se. Although, broader provisions in the 2014 Water Law are applicable to situations of pollution, from whichever sources. Chapter 11 of the Water Law tackles several provisions, notably the principle of “polluter pays” (set in Article 53), which could also force the discharging industry to clean the pollution caused to the environment (or bear the costs of PWA cleaning). Different sanctions go

from monetary sanctions or prison sentences. The potential for the application and enforcement of the PS 227-2019 can thus be doubted due to the lack of remedial measures for non-compliance.

It is worth mentioning that the document received by the consultant does not indicate clearly the stage of adoption of this regulatory instrument, as compared to other documents clearly stating the relevant authority and adopting a more standard legal format. The analysis above therefore only stands if PS 227-2019 has indeed been adopted and has been provided to the consultant in its definitive form.

C.3. Legal and regulatory framework of reuse

C.3.1 Legal framework

a. Provisions of the Water Law

As reiterated in the PWA National Water and Wastewater Policy and Strategy for Palestine of May 2024, one of the objectives is to develop wastewater services and reuse of treated wastewater, and it constitutes an “unconventional” water resource, added to the water budget of the country. The 2014 Water Law integrates the concept and stakes of TWW reuse, as opposed to the 2002 Water Law, notably in the definitions in Article 1 and subsequently in Article 18. However, it is worth noting that this new inclusion of TWW reuse in the legal landscape is limited to two mentions in the 2014 text:

- Article 6 refers to the distribution of water budget. In the law, this issue is focused on the distribution of ‘conventional’ water; the question arises concerning the distribution of TWW, which will have an impact on the availability of ‘non-conventional’ water for agriculture and possibly other uses.
- Article 34 refers to by-law “The Unified Tariff Regulation for Water and Wastewater”. But the water law does not address the tariff framework for unconventional water as reused water.

The PS Standards for Wastewater Effluent (2011) indicate the possible uses for TWW as being (page 1):

- *“Urban Reuse*
- *Agricultural Reuse*
- *Potable Water Recharge*
- *Industrial Reuse.”*

The National Water and Wastewater Policy and Strategy for Palestine of May 2024 reaffirms and encourages the reuse of TWW for “*irrigation and some of industrial process on a commercial basis.*” (page 22).

b. Provision of the Agriculture Law

The use of water for agriculture is mentioned in articles 54 and 55 (Title IV – Plant protection. Chapter IV – Agricultural water).

Article 54 of the Water Law stipulates that: “*In cooperation and liaison with the Water Authority and other competent authorities, the Ministry shall put forward the water plans and policies related to the agricultural sector in accordance with the following principles:*

- *The best use of water and the use of modern irrigation systems and methods;*
- *Define aspects of the use of water sources designated for agriculture;*
- *Preserve water sources and purify them in a manner that makes them usable;*
- *Conduct regular tests and analyses on agricultural water and verify the extent of its suitability for agriculture;*
- *Benefit from the non-potable water and treated water;*
- *Construct small dams and pools to catch rainwater for agricultural uses;*
- *Promote investment in water projects and maintain them;*

- Dig agricultural wells.”

According to Article 55: “The irrigation of agricultural crops with wastewater shall be totally prohibited unless it has been treated in accordance with the national standards which are certified by the technical competent authorities.”

C.3.2 Regulatory framework

The regulatory framework for reuse of TWW is rich and detailed but fragmented and disseminated in different types of regulatory instruments. Palestinian Standards detail this orientation, notably PS 742-2015 (“Treated wastewater for agricultural purposes”, replacing PS 742-2003), PS 227-2019 mentioned earlier for the reuse of industrial wastewater. Technical instructions then specify and implement these standards, for instance, the Technical Instruction N°34-2012 on “Treated wastewater for agricultural irrigation”.

In addition, it is worth mentioning that religious authorities also have issued decisions (fatwas) authorizing the reuse of treated wastewater:

- Fatwa authorizing reuse of wastewater, issued by the Palestinian Supreme Fatwa Council – Decision 68-1
- Fatwa authorizing reuse of wastewater, issued by the Jordanian Supreme Fatwa Council – Decision 217

a. Treated wastewater reuse for agricultural purposes

Regulations and Palestinian standards

Text	Existing	To be clarified / completed
Standard N° PS 742-2015 – Treated Wastewater for agricultural purposes	Detailed classification of TWW according to quality properties (physical / chemical, microbiological and toxic parameters): 4 classes A/B/C/D Comprehensive lists of usages are provided in provision 7 for both * Unrestricted reuse * Restricted reuse: matrix combining type of crops x quality of water (i.e. treatment focused approach) x multi- barriers approach The procedure for quality control is detailed (monitoring and sampling). Responsibility for providing quality TWW as per standards given to the operators of WWTP (users are not responsible).	Discharge of TWW in the environment (land, sea) is included in agricultural reuse which causes lack of clarity. A very large number of parameters are used for the classification of TWW which increases dramatically the cost of analysis. In practice, many Palestinian laboratories do not have the capacity to analyze all parameters which complexifies the organization of control. Not allowed to mix TWW with fresh water (provision 4-3. unlike Jordan with the objective of finding a solution for winter storage of TWW in dams). Very strict limitation of irrigation before harvesting (1 month before harvesting) compared to other countries (limitation only 2 weeks before harvesting). In addition, this barrier is in practice almost impossible to control in a situation where public institutions face huge difficulty to move on the ground. The place where samples should be collected for control should be specified (at the outlet of the WWTP, in the storage tank, in the field). Frequency of controls should be clarified.

Text	Existing	To be clarified / completed
		The frequency of control is not respected in practice. It should be assessed whether the frequency of controls should be adapted to reality and/or if the capacity of the controlling authorities should be reinforced.
Technical Instruction N°34-2012 – Treated wastewater for agricultural irrigation	Reuse is authorized if the following two conditions are met: Compliance with standards And Being licensed for reuse MoA is responsible for monitoring the quality of TWW and compliance of reuse with standards List of forbidden usages of TWW is provided.	Problem of circular reference, duplication of information and need of coherence with Standards 742-2015
Palestinian Supreme Fatwa Council Decision 68-1	Water is not rendered impure unless one of its three characteristics – taste, color, or smell – is altered. Any change in one of these characteristics leads to the water becoming impure and unsuitable for purification. However, it can be used for irrigation purposes.	N/A
Jordanian Supreme Fatwa Council Decision 217	There is no harm in irrigating crops with treated wastewater, and there is no harm in consuming the produce of these crops. However, health regulations established by the competent authorities must be observed to ensure the irrigation process is safe, does not pollute the environment, spoil the crops and fruits, or harm people. They must adhere to scientific and medical standards in this field.	N/A

Table 9: Gap analysis of existing regulations related to TWW reuse

In addition, international standards for the reuse of treated wastewater for agricultural purposes are referred to by PS 742-2015 (page 8), notably the WHO “Guidelines for the safe use of wastewater, excreta and greywater” (2006), with three volumes specifically dedicated to health considerations, precise measures of pollution and standards applicable to agriculture. These standards are relevant to mention here because of their international recognition and use in other countries, but also because they appear to complete the Palestinian Standards in case of ‘gaps’ of these (provision 6-5 PS 742-2015).

Scope of standards

Standards are globally comprehensive and cover the full spectrum of usages of TWW except for the following two issues which could be made clearer:

- Reuse other than for irrigation, such as reuse in industry, construction, cleaning of streets and roads, flushing of networks, etc., is not covered by any standard.
- The regulations do not tackle the issue of emerging pollutants. This is an internationally recognized and highly debated issue, with consumer protection groups advocating their inclusion in Europe and the US. These pollutants, whether synthetic or naturally occurring chemicals (pharmaceuticals, pesticides, antibiotics, detergents, cosmetics, etc.) can be present in considerable quantities in untreated wastewater. Conventional treatment processes are not designed to remove them, and most of them are not monitored by wastewater treatment plant managers. Including these pollutants, of which there are thousands, on a massive scale in regulations would be prohibitively expensive and undoubtedly excessive in relation to the potential health benefits. Nevertheless, the competent public bodies should study these pollutants further (their physicochemical properties, their risks to health and the environment) in order to be prepared to include a certain number of them in the future, should this prove justified.

Clarity of standards

Since the standards are by definition in numerical form, they are unambiguous and the question of clarity does not arise at their level. Yet, the different regulatory documents could be reorganized to be clearer, for instance considering the two following points:

- Discharge in the environment is isolated but is mentioned among other restricted agricultural reuse falling under two categories: i) groundwater recharge through infiltration (corresponding to the discharge in terrestrial ecosystems) and, ii) discharge to the sea – 500 m far (corresponding to marine ecosystems);
- There is a circular reference between Standard 742-2015 and Technical Instructions 34-2012 which refer to one another. In addition, a reorganization of the information would bring more clarity and coherence to both documents. For instance, the list of forbidden usages is mentioned in the Technical Instructions whereas the list of authorized usages is mentioned in the Standard. The table of classification of TWW quality is duplicated in both documents but does not exactly overlap.

Applicability of standards

The main standards setting the treatment classes (BOD₅, TSS and fecal coliforms) are in line with the regional average, less stringent overall than the Egyptian and Lebanese standards for class A, more stringent without significant deviation than the Jordanian standards for BOD₅ and TSS, and less restrictive for fecal coliforms. European standards are indicated as a reference value in terms of severity of the level of requirements applied to the quality of treated wastewater for agricultural reuse.

Class	Water quality parameters Palestine			Water quality parameters Egypt (REUSE CODE 2015)			Water quality parameters Lebanon (LIBNOR 2024)			Water quality parameters Jordan (JS 893/2006)			Water quality parameters Europe (Regulation 2023)		
	BOD ₅ (mg/l)	TSS (mg/l)	Fecal coliforms MNP/100ml	BOD ₅ (mg/l)	TSS (mg/l)	Fecal coliforms MNP/100ml	BOD ₅ (mg/l)	TSS (mg/l)	Fecal coliforms MNP/100ml	BOD ₅ (mg/l)	TSS (mg/l)	Fecal coliforms MNP/100ml	BOD ₅ (mg/l)	TSS (mg/l)	Fecal coliforms MNP/100ml
A High quality	20	30	200	10	10	100	20	25	100	30	50	100	10	10	10
B Good quality	20	30	1000	30	30	1000	25	25	1000	200	200	1000	25	35	100
C Medium Quality	40	50	1000	60	50	5000	100	60	10000	300	300	1000	/	/	1000
D Low quality	60	90	1000	350	300	/	/	/	/	/	/	/	/	/	10000

Table 10: Comparison of TWW quality classes and parameters in various countries

The PS 742-2015 sets out a very long list of additional criteria to define the classification of the reclaimed treated wastewater (see Annex 5 for the full version of the criteria).

Generally speaking, the applicability of this abundance of criteria and standards is a massive problem. With regard to pathogens, the WHO itself admits that for helminth eggs, tests that allow for single-unit-per-liter detections are expensive and difficult to carry out routinely. Many studies also note the inadequate technological levels in many countries to meet all of these standards. In Palestine, Class A water is even stricter than Israeli standards and effectively only allows TWW reuse for fodder and fruit trees. The recovery of sewage sludge is also subject to overly strict standards.

Consistency of standards

One of the main issues regarding consistency is the often very significant difference between value limits for domestic wastewater discharge and reuse standards. The fact that these standards are different is in itself normal, since not all wastewater is intended to be reused and the vast majority of WWTPs were not built to allow reuse. However, WWTP managers are only responsible for discharge standards, which is problematic when these are less stringent than reuse standards. The question of who is responsible for the necessary additional treatment, and its operation, then arises acutely. **This pleads for reuse to be systematically considered in the future, from the design of WWTPs and the choice of treatment systems. Moreover, there is also the issue of regulating industrial wastewater when it enters the sewage system.**

The main lack of consistency concerns the link between controls and sanctions. Apart from the outright revocation of authorizations, which is often impractical, the legislation does not specify who risks what for which infringements. In order to be credible, these sanctions should be proportionate to the fault observed and the health risks actually incurred.

The control mechanisms put in place are poorly accompanied by specific sanctions, such as legal reminders or financial penalties. The only sanction officially foreseen remains the pure and simple temporary or definitive suspension of the authorization, as described in section 2. It can naturally be expected that the authorities would be very reluctant to take such a decision, which would generate local tensions. In this respect, it should be noted that the 2019 EU Regulation states that only when non-compliance presents a significant and immediate risk to the environment, human health or animal health, is the operator entitled to immediately suspend the distribution of TWW.

Similarly, for toxic parameters, the EPA and FAO distinguish between long-term limit values, which serve as a reference, and short-term values, which indicate momentarily acceptable deviations. Thought could be given to the establishment of similar gradation mechanisms, which would be more applicable.

The legal framework, given by the Agricultural Law 2-2003 and the Decree-Law 18-2018, explicitly authorizes the reuse in agriculture of both wastewater as well as other solid or liquid wastes coming from wastewater treatment plants. This authorization comes with clear specific conditions:

- Obligation of treatment: the use of untreated wastewater and other liquid and solid waste from WWTP is forbidden. Wastewater and other waste must be treated before being reused.
- Compliance with technical standards: the treatment must comply with national standards. The standards are issued by the Palestine Standards Institute (PSI).

The Palestine Standard 742-2015 (replacing PS 742-2003) on treated wastewater – Treated wastewater effluent for agricultural purposes imposes strict and detailed provisions on the quality, evaluation and use of treated wastewater in the context of agricultural reuse. Table 1 of the PS 742-2015 details the strict and restrictive conditions and situations in which any class of TWW can be used for agricultural purposes. The 4-classes table of the wastewater quality characterization was already mentioned and detailed in PS Wastewater effluent (2011). The standards also develop the regulatory framework for the entire process of TWW reuse, including quality control sampling period, corrective measures in case of non-compliance and sanctions in case of persisting non-compliance with the standards set.

The PS 742-2015 also develops a detailed table as to the available barrier types for the use of each class of TWW and what constitutes one or several barriers. This is based on and refers to the multi-barrier approach to wastewater treatment and reuse developed by the WHO and widely used throughout the world.

Based on the water institutions reform initiated by the 2014 Water Law, additional regulatory instruments develop the reuse of TWW for agricultural purposes at other scales of governance than the national level.

For instance, the Council of Ministers Decision n°4 (2018) develops on the regulation of the Water Users Associations, which are responsible for the management of irrigation water at the local level, including TWW.

In conclusion, the reuse of treated wastewater for agricultural purposes is limited from a legal and regulatory perspective by strict and demanding standards. The production and thereafter reuse of wastewater for agricultural purposes is very limited by the requirement of a quality of water often set higher than the capacity of the Wastewater treatment plants available. In addition to the restrictive high quality of water required by law and technical standards, the types of crops, irrigations methods and locations of such reuse is also legally restricting agricultural reuse of TWW. Notably, the use of treated wastewater, of any of the 4 classes, is strictly prohibited for cultivating vegetables by article 4-5 of PS 742-2015.

However, as mentioned in the core analysis, the standards set for treated wastewater reuse for agricultural purposes are set and adopted from the international standards of health and safety (notably the WHO “1989” Health guidelines and American EPA guidelines), also adopted by countries in similar situations, and cannot be eased or made less strict, for safety reasons.

Therefore, the legal and regulatory framework limits the reuse of treated wastewater for agricultural purposes and cannot be modified or made more lenient or less demanding but in this context, although irrigation is envisioned as the primary purpose of treated wastewater reuse, different types of reuse are mentioned in the legislations and decrees which could suggest other avenues for treated wastewater recycling and promote a solution, depending on the legal framework set up for it.

b. Treated wastewater reuse for industrial sector

One of the other types of treated wastewater reuse mentioned notably by PS Standards for Wastewater Effluent (2011) addresses “industrial reuse”.

However, as considered by the PWA National Water and Wastewater Policy and Strategy for Palestine of May 2024, *“the main demand for treated wastewater is for irrigation, as demand from industry is insufficient to absorb such a large volume of water”* (page 94). No clear standard has been established to regulate the use of TWW in industry, although some mentions are made of wastewater recycling within the industrial facility, as a planned *“final use”* (see PS 227-2019, provision 5 and provision 8). The reuse other than for irrigation, such as reuse in industry, construction, cleaning of roads and flushing of networks, etc., is not covered by any standard.

Treated wastewater for “urban reuse” (PS Standards for Wastewater Effluent (2011) page 1) has not been addressed by the available literature review and could constitute a gap in the legal and regulatory framework of the reuse of treated wastewater. A possible reference to an urban use of TWW in the regulatory framework could be the reuse for the specific irrigation purpose related to “Gardens, playground, parks”, however highly restricted to a class A-only quality level (Table 3 in the PS 742-2015 (replacing PS 742-2003)). This scenario, although addressed in the “agricultural purposes” regulatory framework, could be linked with the category of “Urban reuse”.

➔ It is worth mentioning that the PWA National Water and Wastewater Policy and Strategy for Palestine of May 2024 lists that the *“EQA, PSI, MoA and PWA will work together to develop and enforce all regulations pertaining to the Environmental Limit Values (standards and guidelines) for wastewater reuse, altogether the required specifications for different crops”* (page 86), highlighting a potential and propensity to a fragmented and disseminated ensemble of legal and regulatory instruments and provisions governing treated wastewater reuse, coming from different authorities.

c. Treated wastewater reuse for Managed Aquifer Recharge (MAR)

The practice of Managed Aquifer Recharge (MAR) is the purposeful recharge of water to aquifer, notably by infiltration of water into the ground.

Water recharge is defined in Article 1 of the 2014 Water Law and includes specifically the infiltration of “wastewater treated in accordance to approved standards” through the lower layers (“ground layers”) directly by natural recharge or by artificial one.

Several documents in the TWW and reuse legal framework of Palestine address or suggest that groundwater aquifer is allowed and regulated by these texts. The PS Wastewater Effluent (2011) provides

in Table 18 that the “Groundwater recharge by infiltration” is possible for wastewater effluent of Class A, B and C with no barrier required and is forbidden for low quality Class D wastewater (the same table is available as Table (3) in the PS 742-2015 on “Treated Wastewater Effluent for Agricultural Purposes”). Table 19 also lays out basic indicators/maximum values on the water quality required for specific uses (including the pH and other chemical and microbiological criteria), among which “Groundwater recharge by infiltration”.

We can conclude that the Palestinian legal framework does provide for the possibility and scenario of aquifer recharge, as long quality standards and other requirements set in these legal documents are respected. It is worth mentioning that one of these criteria is set clearly in Technical Instruction 34-2012 “Treated Wastewater for Agricultural Irrigation” Article 8 where the use of treated wastewater is prohibited for groundwater recharge “through direct injection”, opening up the scenario of groundwater recharge through infiltration.

To further prove this conclusion, we can also account for ongoing projects of managed aquifer recharge already undertaken in Palestine. This technique has been adopted and promoted notably by several pilot projects through international funding in collaboration with the Palestinian State, for instance the Groundwater Artificial Recharge in the Marj Sanour Watershed, funded by the Netherland Representation Office (NRO) as part of a project to drill recharge wells. These recharge wells also go through a water infiltration process which is included in the consideration of “groundwater recharge by infiltration” referred to in Palestinian law and bylaws.

C.4. Legal and regulatory framework of the sludge management sector

C.4.1 Legal framework

Sludge (defined in the Palestinian Standard 898-2010 “Use of treated sludge and sludge disposal” as “Solid materials which have textures wet or dry resulting from operations treated domestic wastewater before the treatment”) is a natural by-product of the wastewater treatment that needs to be either disposed of or reused according to certain standards and allowed uses set in law, by-laws and standards.

Treated sludge is defined in the Palestinian Standard 898-2010 (“Use of treated sludge and sludge disposal”) as “Sludge which Exposed to one of treatment methods and the ability to achieve the requirements of this standard” and is more detailed in the Technical Instruction N°59-2015 (“Treated sludge for agricultural reuse”) in Article 2 (2-2) as “Sludge that has been treated biologically, chemically, thermally or stored for a long period or any other process which prevents sludge fermentation and reduce health and environmental risks due to reuse of sludge in agriculture”.

In the PS 898-2010, table (2) refers to the “quality and the content of the physical, chemical and microbiological” aspects of the classes of sludge designated in Article 1-3.

It is mentioned in Article 4 of the Technical Instruction N°59-2015 that the sludge must be treated notably against heavy metals in order to be used in agriculture (listed in the Annexes of the document, including copper, mercury and lead). However, it is worth mentioning that the analysis of treated sludge (in Annex 4) will include its pH, heavy metals, moisture content, pathogens and microorganisms, density and others.

Table (2-5) mentions notably the steps and methods of treating sludge to reach a class-1 sludge, among which Fermentation (2-5-1); Thermal drying (5-2-2); Drying air (5-2-3); Digestion of air thermal (5-2-4) and “Any other method (...) to achieve the technical requirements” (5-2-5). Other technics for other classes of treated sludges are listed as “anaerobic digestion (2-6-3).

One of the uses mentioned by the Palestinian legal environment (law, by-laws, standards, technical instructions and national strategies) and one of the core objectives initially set by the WaDIS project is the reuse of wastewater and (as we point out or highlight, of the by-product of wastewater treatment) sludges in agriculture.

The use of sludge in agriculture is mentioned in the article 24 of the 2003 Agriculture Law (“Title I – Agricultural vegetation”, “Chapter V – Agricultural fertilizers”:

Article 24: “Crops may not be fertilized by human excrements or by any fertilizer which is mixed with or derived from liquid or solid wastes, except after being treated in accordance with accredited specifications and standards”.

The use of sludge as fertilizers and the licensing of manufacturers producing fertilizers are detailed in the Decree-Law No. (14) of 2018, in two amendments made to the 2003 Agricultural Law:

Article (6): Amendment of Article (24): “Crops may be fertilized using treated solid or liquid waste in accordance with approved Palestinian standards. Solid waste from wastewater treatment plants may be used for agricultural purposes in compliance with Palestinian standards”.

Article (19): Addition of an Article – a new article is added to the original law, numbered as article (26) bis (1), stating the following:

- “Anyone who imports unregistered fertilizers or plant growth regulators shall be fined fifty Jordanian Dinars, or its equivalent in legally recognized currency, per kilogram or part thereof, and the confiscated quantity shall be seized according to applicable legislation.
- Anyone who produces, manufactures, prepares, or processes unregistered fertilizers or plant growth regulators without a license shall be fined five hundred Jordanian Dinars, or its equivalent in legally recognized currency. The production or processing facility shall be shut down until the violation is corrected, and the confiscated quantity shall be destroyed at the violator's expense if necessary.
- Anyone who trades in unregistered fertilizers or plant growth regulators shall be fined five thousand Jordanian Dinars, or its equivalent in legally recognized currency. The confiscated quantity shall be seized and destroyed at the violator's expense if necessary.
- Anyone who trades in fertilizers or plant growth regulators without a license shall be fined three times their monetary value. The place of trade shall be closed until the violation is corrected. If the violation is repeated, the fine shall be doubled, and the license shall be revoked.
- Anyone who produces fertilizers or plant growth regulators that do not comply with the technical standards approved at the time of their registration, or who prepares, trades, sells, markets, advertises, or labels them with incorrect information, shall be fined three times their monetary value, and the non-compliant quantities shall be confiscated.
- Fines shall be collected and stored in accordance with applicable legislation”.

Regarding the obligation of licensing, article 19 of the Decree-Law No 14-2018 refers only to the manufacturers of fertilizers. It is not explicit but a manufacturer of compost using sludge, whether it is a public institution or a private company, should be considered as a manufacturer of fertilizers.

C.4.2 Regulatory framework

a. Existing standards

The existing applicable standards and regulatory instruments for sludge are the following ones:

Text	Existing	To be clarified / completed
Standard PS 898-2010 – Use of treated sludge and sludge disposal	The producer of sludge (i.e. WWTP) must keep record about production (quantities, method of treatment, quality of sludge...). The deposit of sludge is forbidden in wadis and any other place that can harm surface as well as groundwater. It is compulsory that the sludge is treated before being used, the treatment to reach “physical, chemical and microbiological” criteria (the different technics and	Standards are very strict concerning reuse in agriculture especially regarding moisture content that is aligned with Jordan standards.

Text	Existing	To be clarified / completed
	requirements being set both in PS 898-2010 in Table 2 as well as TI N°59-2015) The treated sludge is divided in 3 categories: Class A: soil fertilization, soil amendment⁶ and deposit in landfills are authorized Class B: only soil amendment and deposit in landfills are authorized Class C: only deposit in landfills is authorized. For each category, the quality properties are detailed (physical/chemical, microbiological and toxic parameters). For each category, the treatment methods are detailed. The procedures for quality control are detailed (monitoring and sampling). frequency of testing depends on the amount of sludge yearly produced. The conditions regarding the storage and transportation of sludge are detailed. The list of allowed/forbidden crops that can be fertilized with treated sludge is detailed as well as the conditions for its usage in agriculture.	
Technical Instruction N°59-2015 – Treated sludge for agricultural reuse	The producer of sludge (i.e. WWTP) must keep record about sludge (new: list of users and reuse sites). The list of allowed/forbidden crops is detailed. The maximum concentrations of heavy metals in sludge and in soil are detailed.	Problem of circular reference, duplication of information and need of coherence with Standards 898-2010. Especially maximum concentrations of heavy metals in the sludge and in the soil are at least difficult to understand and seem to be incoherent with standards.

Table 11: Gap analysis of standards related to sludge management

The Palestinian Standard PS 898-2010 (“Use of treated sludge and sludge disposal”) establishes 3 classes of sludge (provision 2-3-4) and characterizes the sludges according to specific and strict technical characteristics (indicated in Table 2 of the PS), for instance the precise moisture level present in either a “wet sludge” or “dry sludge”. For instance, the PS 898-2010 considers sludges to be dry (and therefore to be fit for certain purposes reserved to Class A treated sludges) from a level of 10% of moisture (see provision 1-3-3 and Table 2). The 3 classes of treated sludges allow, as for the 4 classes of TWW quality, to be used for different purposes (see provision 2-3-4).

The provisions of the PS 898-2010 are quite detailed and strict in the technical aspects of sludge management and reuse, including for instance the requirements in terms of evidence of authorization and

⁶ Fertilizers improve the supply of nutrients in the soil, directly affecting plant growth. Soil amendments improve a soil's physical condition (e.g. soil structure, water infiltration), indirectly affecting plant growth.

use of sludge on a land, the sites of use of sludge (both for the user and producer), as well as the crop types and timings at which to use and stop using sludge for agricultural purposes for instance).

a. Clarity of standards

As well as for the TWW, there is a need for clarification and coherence between Standard 898-2010 and Technical Instruction 59-2015.

b. Applicability of standards

Standards are very strict concerning sludge reuse in agriculture especially regarding moisture content. Currently no service provider is capable of meeting existing standards regarding moisture content.

C.5. Conclusions and recommendations

The overall analysis of the legal and regulatory frameworks has required to consult and analyze a wide array and a great number of legal and regulatory documents, ranging from laws, decrees, technical standards, national strategies to fatwas. Notably for the regulation of the use of treated wastewater for irrigation purposes, the combined Palestinian standards, technical instructions and Agricultural Law, is fragmented, less comprehensive and accessible, and therefore less efficient and not enforced.

The legal and regulatory framework of wastewater collection, treatment and reuse, as well as the sludge management is disparate. **The promotion of a unique regulatory text or codified document, centralizing legal, regulatory and technical provisions and criteria, could be a valuable step towards facilitating reuse of treated wastewater and sludge.** This would bring more clarity, transparency and accessibility of the provisions and framework for practical implementation and enforcement. Inspired by the sector-focused strategies and codifications in Lebanon, Jordan or Egypt, Palestine would benefit from a strategy and a comprehensive regulation dedicated to wastewater management and reuse.

On the regulatory content, existing legal provisions and regulatory standards prove to be in general quite detailed and both restrictive and demanding. Some legal and regulatory gaps exist that make the development of practice illegal, uncertain or heterogenous/inconsistent. Thus, the regulation regarding sludge has shown several gaps or weaknesses making the sludge management difficult. The standard for dried sludge set at 10% of moisture is, for example, very restrictive and could be lowered without creating a health risk for the public. Regarding the reuse of treated wastewater for agricultural purposes, the latter can be legally done under very strict conditions, narrowing the practice and its possible development. But these standards (excluding drying sludge) are aligned with international and regional practices ensuring optimal safety and security for the population and the environment, so there is no question of lowering them. The issue of TWW and sludge reuse should then be considered in terms of capacity. Operational capacities of wastewater treatment plants and the sector's human, material and financial resources need to match these standards. Therefore, the definition and implementation of a national program aligned with a comprehensive subsector strategy could allow to properly develop the sector. In addition, the sector could really benefit from considering non-agricultural uses for treated wastewater reuse.

D. SECTOR ORGANIZATION AND GOVERNANCE

D.1. Global organizational framework of the sector

The current organization framework of actors involved in the management of wastewater (including reuse) in Palestine mostly originates from the 2014 Water Law and its subsequent by-laws. Because reuse is very strongly linked to agricultural purposes, the Ministry of Agriculture (MoA) is necessarily included in this framework, as the MoA is specifically tasked by the Water Law to licensing the WUAs.

Figure 6 provides an overview of all the actors involved in the management of wastewater (including reuse) and their main responsibilities, as detailed in Table 12 below:

Entity	Main roles and responsibilities / attention points
Cabinet of Ministers	Oversees all ministries & public institutions Approves legal texts, regulatory instruments & policies / strategies Appoints chairpersons, general directors according to law
Palestinian Water Authority	→ Recognized as 'leader' of the sector Develops wastewater & reuse policies / strategies Organizes the management of water resources at national level Licenses service providers Provides technical advice to other stakeholders
Water Sector Regulatory Council	Develops regulations on tariff setting Monitors the performance of service providers Reports on the quality of services & providers' performance Participates in licensing of service providers by recommending to the Cabinet through PWA license
Ministry of Local Governments	Ensures administrative and financial supervision of municipalities and JSCs as water and sanitation service providers
Ministry of Agriculture (including regional directorates)	Participates in developing reuse policy & strategy Licenses Water Users Associations (in coordination with PWA) Grants reuse permits to farmers Monitors reuse in terms of agricultural practices Provides extension services
National Water Company (formerly WBWD)	Manages the bulk water distribution from water purchased to Israeli operators (Mekorot and Gihon) Manages bulk transfer of treated wastewater (to be determined)
Palestinian Standards Institute	Issues standards and technical instruction Organizes multi-actors working groups on specific topics
Ministry of Environment, EQA, Ministry of Health	Control the respect of quality standards (TWW, industrial WW, sludge), both on environmental and public health issues Participate in the definition of standards related to TWW & reuse

Entity	Main roles and responsibilities / attention points
Service Providers, RWUs, municipalities & JSCs	Produce and/or distribute water to end-users Manage sewer networks and WWTPs Use TWW for other purposed than irrigation Report to WRSC on performance indicators
Water Users Associations	Purchase and use treated wastewater from SPs (and possibly from the National Water Company in the future) Distribute TWW to individual farmers Operate distribution networks and treatment facilities
Farmers	Purchase treated wastewater from WUAs
Industries	Manage pre-treatment facilities (if required) Purchase TWW from SPs for industrial process (if relevant) Discharge (pre-treated) wastewater into the sewer network
Private sector	Provides engineering, construction and maintenance services Operates facilities (WWTPs) under supervision of the SPs Measures quality parameters (laboratories) Provides innovative solutions for WW treatment and reuse
Civil society organizations	Organize or support awareness campaigns Develop pilot projects around wastewater reuse Support WUAs and farmers, especially on gender issues
Universities and research centers	Build knowledge on technical issues, but also on issues relates to social and economic acceptance, cultural barriers, gender, etc. Promote innovative solutions for WW treatment and reuse

Table 12: Main roles and responsibilities of entities/institutions involved in the sector

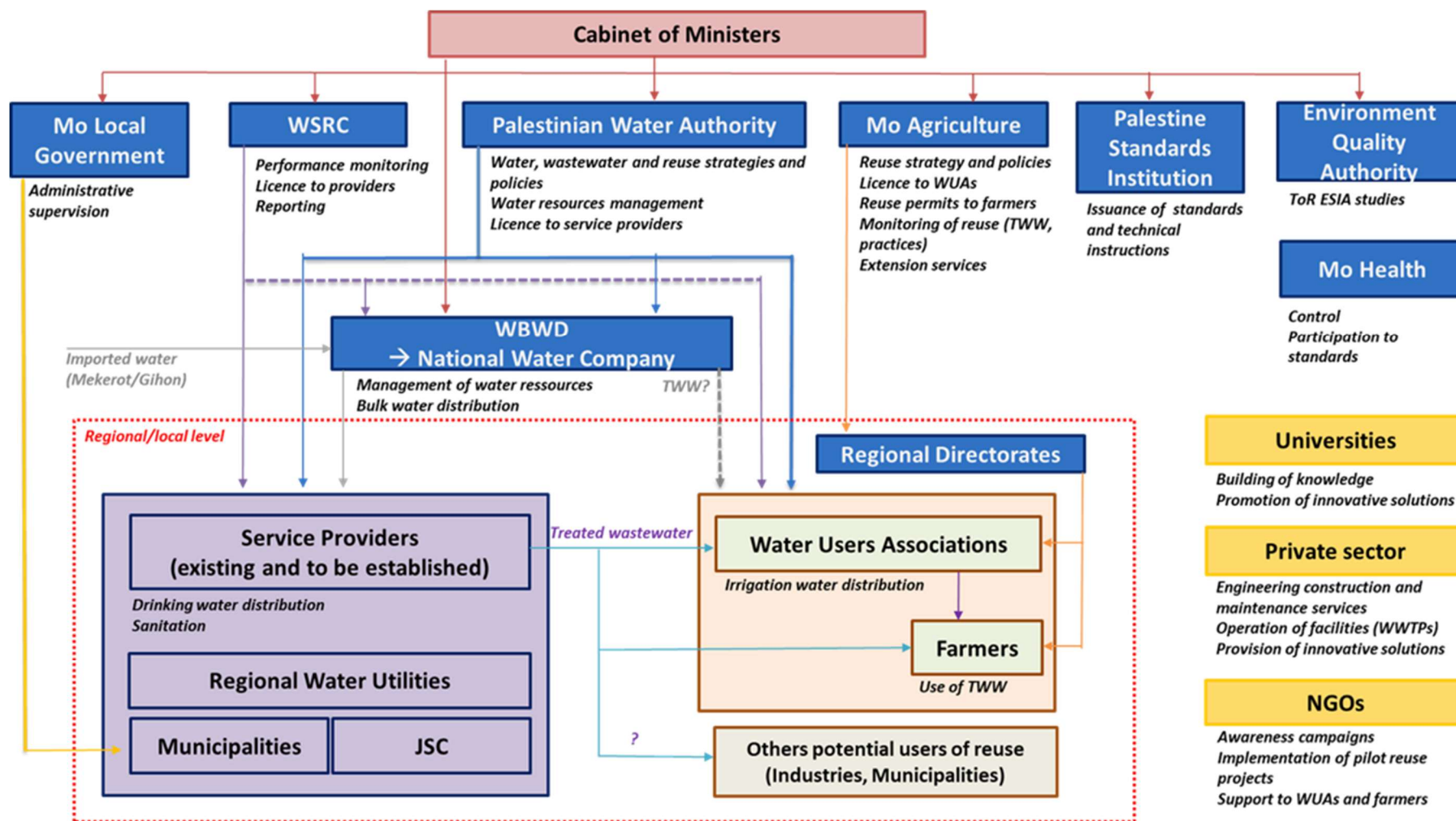


Figure 6: Overview of actors involved in WW management & their responsibilities

D.2. Analysis institution by institution

D.2.1 PWA

According to the new Water Law of 2014 (Article 8. Responsibilities of the Authority):

Id	Responsibilities	WW	Reuse	Comment
01	The full responsibility for managing Water Resources in Palestine, applying principles of integrated and sustainable management of water resources.			Treated wastewater is considered as a "non-conventional" water resource; according to Article 1.
02	Preparing general water policies, strategies and plans, seeking their approval, and ensuring their implementation in coordination and cooperation with relevant parties, as well as submitting periodic status reports on water to the Cabinet of Ministers.			This is one of the PWA's key missions. WW management and reuse have been included in the updated policy and strategy (see chapter C).
04	Protection of Water Resources and their surrounding environment through the establishment of protection zones to prevent pollution, in cooperation and coordination with relevant authorities.			This point refers to the implementation of regulations concerning the quality of treated wastewater returned to the environment.
05	Licensing and development of Water Resources utilization, in cooperation and coordination with the relevant authorities.			Licensing and development of treated wastewater utilization is a key point to be clarified.
06	Setting a general policy for the planning and evaluation of water and wastewater projects in terms of their economic and social feasibility, setting design and quality control standards, technical specifications, and monitoring their implementation.			The role of PWA is focused on global planning, control and monitoring in relation to sector objectives and national standards/guidelines. This seems to exclude direct project implementation.
07	Taking measures and developing plans as may be required for the establishment and development of the National Water Company and the Regional Water Utilities, in coordination with the relevant authorities.			This is one of the PWA's key missions. NWC is now established but not fully operational. RWUs are still in the process of being established (only 2 exist at the moment).
08	Supervising the organization of awareness raising campaigns in the sphere of water and wastewater and promoting the use of water saving fixtures, in coordination and cooperation with the relevant authorities.			The PWA organization does not seem to integrate this component. The sphere of reuse, for awareness strategy and supervision is a also key point to be clarified (with the MoA).

Id	Responsibilities	WW	Reuse	Comment
09	The development of plans and programs for capacity building, training and qualification of technical staff working in the water sector and supervising their implementation with the aim of improving the management of water resources, in cooperation and coordination with the relevant authorities.			That includes the support on the capacity building of the SPs. Responsibility is not clear in the sphere of Reuse. Is reuse considered in the water sector?
11	Coordinate and supervise scientific research and studies related to water and wastewater and directing such research towards finding creative and innovative solutions to existing problems and following up on their recommendations with the specialized and relevant authorities.			Several topics were raised during the initial discussions: Reuse, which is now at the heart of the strategy, industrial wastewater and sludge.
12	Partake in the development of approved standards of water quality for various uses, in coordination and cooperation with the competent authorities, and ensure their implementation.			It seems clear that the PWA must be a central player in contributing to consolidate water quality guidelines on the issue of industrial water and also of reuse (with the MoA for irrigation perspectives).
14	Proposing draft laws and draft regulations related to water, and submitting them to the competent authorities for their duly issuance.			Is that include the treated wastewater for reuse? Why only water? That excludes sludge management.
18	Develop principles and frameworks of water demand management with the aim of improving the efficiency of water supply, usage, conservation, recycling and reuse.			Developing demand for the reuse of treated wastewater will be key to reaching the targets set by the updated policy and strategy.

Table 13: Analysis of PWA's main responsibilities

According to data collected, PWA currently has 105 staff. PWA's organizational chart remains unclear; during the assessment we have identified 3 different charts including a provisional new one that is in the process of being approved by the PA. This new chart leaves little room for wastewater management and reuse; the only explicitly related department is the "Development of non-traditional water resources" under the "Water resources" division. In the current organization, departments involved in wastewater management, reuse and capacity building are the following general directorates:

- Training and development affairs (capacity building and coordination with other institutions)
- Technical affairs (and especially the Quality control department, staff with 7 people)
- Regulatory affairs (in charge, among other things, of studying licensing requests from WUAs)
- Strategic planning (masterplans, coordination with official bodies & international cooperation)
- Project management unit (overseeing the implementation of ongoing projects)
- Institutional building development (in charge of enhancing the organization's capacities)

D.2.2 MoA at central and regional levels

a. General organization of the MoA

MoA plays an essential role in the organization and monitoring of both WUA and reuse activities. This mission falls within the mandate of the General Directorate of agricultural water and irrigation which is organized in 6 departments:

Department	Divisions and duties
Marginal water	• Treated wastewater • Salt and brackish water
Agricultural water	• Agricultural water resources development • Water information systems • Water harvesting • Agricultural water tariff
Control and licensing (groundwater)	• Monitoring and evaluation • Licensing
Field irrigation	• Irrigation technology • Irrigation requirements • Supplementary irrigation
Drought and climate change monitoring	• Climate data monitoring • Early warning systems
Engineering studies and design	• Engineering studies and design • Facilities and water harvesting systems • Technical and economic feasibility studies

Table 14: Internal organization of the Ministry of Agriculture

The Department of Marginal Water is in charge of controlling and monitoring reuse projects and of the licensing of WUAs.

Other central Directorates have a role with reuse but their role remains to be better explained:

- General Directorate of planning: for the identification of potential reuse areas
- General Directorate of extension services: for the capacity building of WUA and farmers

The general organization of the work between central and regional level work is the following

- The Regional Directorates of Agriculture are the entry points for the farmers. They are in charge of collecting the information and doing a first analysis of conformity. They then transmit the information to the central level.
- The Directorate at central level is in charge of analyzing the information, coordinating with other institutions when needed (especially with PWA regarding water issues) and finally issuing permits and licenses.

b. Main responsibilities of the MoA

The responsibilities of MoA are the following:

Id	Responsibilities	WW	Reuse	Comment
01	Issuance of license to WUA The licensing procedure is backed by external and internal guidelines. The licensing must be endorsed by both MoA and PWA who coordinate through a technical committee.			• The procedure exists and seems to be comprehensive. • The coordination between MoA and PWA is said to be good since the creation of the joint technical committee. • The licensing process is supposed to last 1 month (once conformity is checked). In reality the process of licensing takes much more time, up to 1 or 2 years. An audit should be made to understand the causes and propose solutions. • The creation of WUA is not compulsory for the reuse but is recommended. The rationale and the strategy concerning WUA should be made clearer.
02	Monitoring of the governance of WUA Attendance to general assemblies. Validation of elections.			• A representative of the relevant Regional Directorate attends the assemblies of the WUAs and writes a report. • Reminders are sent to WUA if elections do not happen. In practice it is not systematically done on time.
03	Issuance of reuse permits to farmers The permit procedure is backed by internal guidelines.			• The procedure exists and seems to be comprehensive. • The WWTP from which the water will be sourced must be licensed and the quality of TWW is monitored by the PWA. • The permits are individual and not collective. Being in a WUA does not ease the permit procedure. • A new permit is to be asked each time the farmer is willing to change its cropping pattern.

Id	Responsibilities	WW	Reuse	Comment
04	Control and monitoring of reuse activities The control concerns the respect of standards regarding cropping patterns, irrigation equipment. The monitoring concerns the quality of TWW. Samples of effluents are taken and sent to laboratories.			- As per control of reuse activities, field visits are done by the Regional Directorates who issue conformity reports. - As per monitoring of TWW, the frequency of analyses as per the standards is not respected in practice. The directorates of agriculture sample TWW only when they can. Analyses may be incomplete concerning some parameters. Normally, only analyses from accredited laboratories are accepted (Bir Zeit University is currently the only accredited lab) for initial complete analysis. Yet MoA is somehow flexible: a) complete analysis from accredited lab is compulsory for licensing; but b) partial analyses on main parameters from non-accredited labs are accepted (such as An Najjah University or NARC) because of the lack of consumables in labs.
05	Elaboration of tariff for agricultural water There is no existing by-law for setting the tariff of TWW: neither for the purchase to the WWTP, nor for the selling to users.			- In practice: sometimes the TWW is provided for free to farmers (especially in pilot projects). - Sometimes it is sold (such as in Nablus West, Tubas, Jericho, and Marj Iben Amer when it was active). In this case the breakdown of the cost is variable, unclear and not standardized. The price of TWW sometimes covers part of the treatment cost and/or part of the operational and maintenance cost of the reuse network. The purchase price varies from 0.6 to 0.8 NIS/m³ to WWTP and the selling price varies from 0.7 to 1 NIS/m³ to farmers. There is a kind of consensus among farmers to consider that TWW should be free or should cost not more than 1 NIS/m³.

Id	Responsibilities	WW	Reuse	Comment
06	Provision of extension services. MoA has an annual planning for extension services.			- Reuse is not a specific topic in extension; it is somehow integrated with irrigation extension activities. - In practice the means of MoA for providing extension services are limited and extension is rather done and random bases.
07	Planning of the reuse. MoA is closely associated to reuse projects since reuse is included from the beginning in the planning of WWTP (it was not the case before). The involvement of MoA in planning is done through the technical committee with PWA. Groundwater licensing, WUA licensing and development of reuse are coordinated.			- Before, PWA and municipalities were agreeing on WWTP (location and size) and the reuse was not planned. MoA was not associated. - MoA does not have a strategic plan concerning reuse.

Table 15: Analysis of the main responsibilities of the Ministry of Agriculture

c. Analysis and recommendations

- Staffing and resources:
 - At central level, the General Directorate of agricultural water and irrigation considers that the staffing is enough to fulfil the work in terms of human resources and qualification (12 employees in total, including 2 in the Department of marginal water);
 - Yet at Regional level, the Regional Directorates complain about the understaffing and the lack of resources to fulfil their work (field visits to WWTP and agricultural land, extension activities...). In addition, because of the lack of staff and the relatively important turnover, the staff is not necessarily qualified and well versed for the specific purpose of reuse.
- Planning: the involvement of MoA in the planning of reuse has greatly improved since reuse is almost systematically considered in the new sanitation projects developed by PWA and since MoA and PWA better communicate through the creation of the joint technical committee. Yet after this planning phase, MoA steps in again only when asked to issue licenses to WUA and permits to reuse. There is a need for MoA to anticipate and give orientations to the development of reuse in the planned areas by assessing the situation on technical, agronomical, social and economic basis (through prefeasibility studies).
- Licensing: licensing seems to be well organized thanks to guidelines and qualified staff at central level. Yet the process is slow and suffers from delays, partially due to the MoA, and partially by the time that PWA takes to give its opinion on the conformity of the request. Licensing process should be kept under a reasonable duration – for instance a maximum of 6 months.
- Monitoring and control: monitoring is done partially and on irregular basis. The quality of the monitoring fluctuates according to projects. The consequences of monitoring and control is unclear (application of penalties or sanctions on one hand, implementation of supporting activities to overcome problems observed on the other hand). On the field, monitoring is affected by the limited capacity and sometimes the limited qualification of the staff in charge of taking the samples and of the laboratories in charge. At central level it seems there is no control plan being set up and applied for each reuse project and that then the information is not collected and harmonized in a unified monitoring systems.

- Support to producers: the capacity to accompany and support the users, organized or not in WUA, is not sufficient. Support is mainly done through projects, with variations in term of intensity and duration time and variable according to each project. The participation and involvement of MoA staff is usually limited and lacks consistence. Yet most of the WUA are weak (in terms of financial resources, management capacity and technical qualifications) and farmers are not familiar with reuse. Hence technical assistance and extension services are needed in the medium to long run. But at the moment, reuse is poorly introduced in MoA extension activities and there is no specific reuse extension program. Moreover, there is no sustainable framework for long-term assistance and support to users.

Recommendations:

In order to better accompany the development of reuse, it is necessary that MoA better anticipates, monitors and organizes the support to reuse projects.

- Anticipate every reuse project at early stage: assess the local situation (eventually through quick prefeasibility studies), set-up a diagnosis (covering legal – including land tenure – technical, social and economic aspects), and formulate a development plan (including formal and organizational aspects, capacity building and support to the users).
- Better coordinate functions inside MoA especially in between monitoring and extension., Extension programs should be built and updated based on the outcomes of monitoring.
- Strengthen and structure the monitoring and control: a) improve the staffing and resources allocated to the Regional Directorates regarding monitoring; b) set-up and update a database for reuse projects; c) develop incentives and penalties.
- Build the capacities about reuse: a) develop applied research programs and produce technical and economic references adapted to Palestinian context; b) set-up a comprehensive and tailored training program about reuse for both technicians and users); c) set-up annual extension programs (mobilizing internal and external resources).
- Guarantee the existence of a long-term capacity to provide technical assistance to users: a) improve the staffing and resources allocated to the Regional Directorates regarding extension services; b) develop synergies and pass cooperation agreements with local Palestinian NGOs well rooted in the field.

D.2.3 WSRC

According to the new water law of 2014 (Article 24. Responsibilities of the WSRC):

Id	Responsibilities	WW	Reuse	Comment
01	Approval of water prices, costs of supply networks and other services required for the delivery of water and waste water services, as well as review and monitoring of these costs to ensure compliance with the policy adopted by the Authority.			WSRC has issued general rules for tariff setting of water supply and sewerage services; however to our knowledge, the price of treated wastewater is not included in WSRC's perimeter and therefore not regulated at the moment.

Id	Responsibilities	WW	Reuse	Comment
02	The issuance of licenses to Regional Water Utilities and any operator that establishes or manages the operation of a facility for the supply, desalination, or treatment of water or the collection and treatment of waste water, and the levying of license fees, in accordance with the provisions of this law and a regulation issued by the Cabinet of Ministers.			Reuse management and operations could be explicitly added to the responsibility of the Council.
03	The Monitoring and inspection of compliance with the terms, requirements and indicators stipulated in licenses and permits.			This responsibility could be extended to the WUA. The Water Law makes no provision for this at present.
04	The development of performance incentives programs for Service Providers, in accordance with a regulation issued by the Cabinet of Ministers for this purpose.			This responsibility could be extended to the WUA. For the time being, when reading the water law, this responsibility towards WUAs remains unclear.
05	The approval of the financial and administrative regulations and organizational structure of the Council and their submission to the Cabinet of Ministers duly issuance.			It is an interesting subject that fits perfectly into the WaDIS project. It's also a responsibility that could be extended to the WUAs. For the time being, as per the 2014 Water Law, this responsibility towards WUAs remains unclear.
06	The approval of the annual budget for the Council and its submission to the Cabinet of Ministries.			N/A
07	Monitoring operation processes related to the production, transport, and distribution of water and operational processes of wastewater management.			Reuse could be explicitly included in the monitoring perimeter of the Council, as WUAs can be considered as service providers to be monitored by the WSRC, with adequate performance indicators for all the various uses of treated wastewater.
08	Monitoring water supply agreements.			N/A
09	Ensuring that production, transport, distribution and wastewater treatment costs take into consideration the interests of all concerned parties.			This responsibility could be extended to the treated wastewater (for reuse). For the time being, as per the 2014 Water Law, this responsibility towards reuse remains unclear.
10	Setting quality assurance standards for the provision of technical and administrative services by Service Providers to consumers, in line with relevant laws and regulations, and their dissemination to the public.			It is also a responsibility that could be extended to treated wastewater (for reuse). For the time being, as per the 2014 Water Law, this responsibility towards reuse remains unclear.

Id	Responsibilities	WW	Reuse	Comment
11	Monitoring the compliance of the National Water Company and Service Providers with the adopted standards for the provision of water and Sanitation services.			It is also a responsibility that could be extended to the treated wastewater (for reuse). For the time being, as per the 2014 Water Law, this responsibility towards reuse remains unclear.
12	The establishment of a database for technical, financial and statistical information and the publication of this information periodically.			It is also a responsibility that could be extended to the treated wastewater (for reuse). For the time being, as per the 2014 Water Law, this responsibility towards reuse remains unclear.
13	Addressing complaints of consumers against Service Providers.			Complains of WUAs regarding the quality of treated wastewater provided by the SPs could be included in the scope of this responsibility.
14	Conducting a general review for the performance of the Council and its departments as well as a review of staff performance development plans, at least once per annum.			N/A
15	Contracting experiences and competent experts, advisors, and technicians to implement tasks to be entrusted to them.			N/A
16	Setting the basis for regulating the extent and percentage of local authorities' participation in the general assemblies of water utilities and ensuring implementation, in accordance with the provisions of the law and the applicable regulations.			N/A

D.2.4 Service providers

The water and sanitation sector is structured around a centralized power granted to the Palestinian Water Authority in charge until today of the policy making, strategic planning, as well as the implementation of large investment projects.

The Service Providers (SPs) are responsible for the provision of water and/or wastewater services, each within its specified administrative and geographical scope.

They operate by: direct municipal administration (through municipal water and sanitation departments, sometimes separated), Joint Service Councils (administrative inter-municipal structure set up to coordinate the provision of public services between several localities or municipalities) or Regional Water Utilities (with greater financial and management autonomy), the latter form being the one prescribed in the 2014 Law.

In the performance monitoring report of 2023, elaborated by the WSRC, 286 SPs have been taken into account in West Bank and 25 in Gaza, allocated through different size (large, midsize and small service providers) and through different type/status:

		West Bank		Gaza	
		Total	including WW clients	Total	including WW clients
Municipality <i>"the service is covered directly by the municipality through a dedicated department, under the responsibility of LGU"</i>	Large	22	7	7	7
	Mid-size	55	12	8	6
	Small	-	-	10	7
Village Councils (VC) <i>"the service is under responsibility of Village Council"</i>	Large	0	0		
	Mid-size	13	1		
	Small	-	-		
Joint Service Councils (JSC) <i>"Inter-municipal associations created for the management of drinking water and wastewater"</i>	Large	4	1		
	Mid-size	0	0		
	Small	-	-		
(Regional) Water Utilities (RWU) <i>Specific structure fully dedicated to water and wastewater service under the responsibility of the Water Authority.</i>	Large	2	2		
	Mid-size	0	0		
	Small	-	-		
Other (ex: cooperative, association, etc.)	Large	3	1		
	Mid-size	2	1		
	Small	-	-		
Total	Large	27	11	7	7
	Mid-size	70	14	8	6
	Small	189*	0*	10	7
	All	286	25	25	20

Table 16: Distribution of SP types according to WSRC performance monitoring (2023)

The 2014 Water Act paved the way for the creation of regional utilities independent of Local Government units to provide water and wastewater services to users (RWUs). A roadmap was prepared in 2018 for the gradual establishment of RWUs. The recommended approach consists of gradually reducing the number of SPs from almost 300 in 2018 to four RWUs by 2032 (three in the West Bank and one in Gaza).

According to Article 47 of the Water Law RWUs are responsible for the provision of water and wastewater services each within its specified administrative and geographical scope, in accordance with a regulation issued by the Cabinet of Ministers in this regard. Accordingly, the objectives of RWUs are:

1. The provision of water and wastewater services to consumers for various uses in line with sustainable economic, social and environment principles.
2. Meeting the needs for water of suitable quality and wastewater services through implementation of the required and appropriate measures and the development of the necessary plans and programs to develop these services.

Despite the objectives set out in the roadmap, which aim in particular to structure the service around 26 SPs in the West Bank by 2025, only two RWUs are currently existing:

- Tubas Water Utility (TWU), previously a Joint Service Council, and
- Jenin West Water Utility (JWWU)

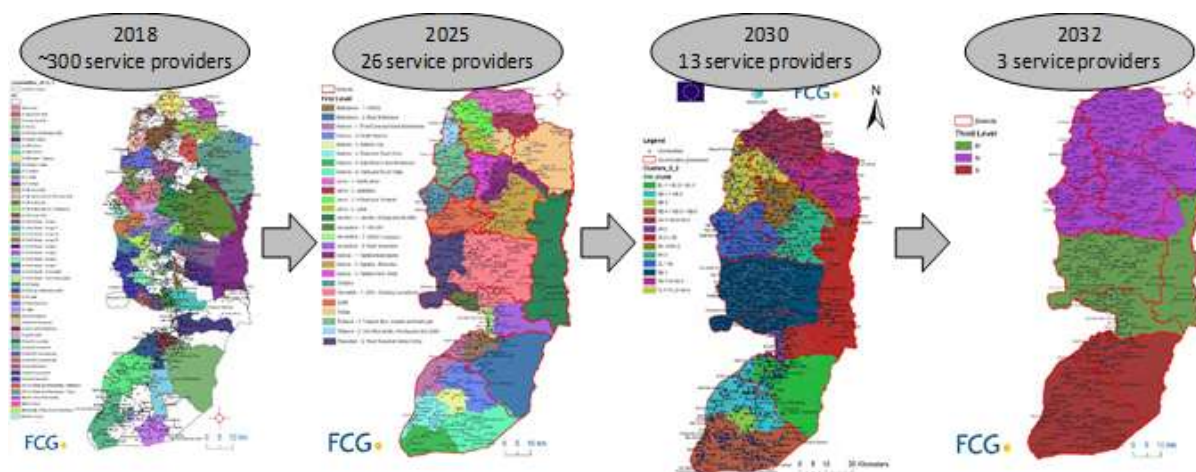


Figure 7: Road Map for the establishment of RWUs, 2017. Source: PWA, ORGUT

The transition of the other SPs, municipalities or JSCs, to RWU status is struggling to get off the ground. In order to understand any obstacles encountered in this transition, it was decided to study, as part of this assignment, the capacities, organization framework, functioning and operational issues of 8 main SPs.

The table below shows the service providers that will be targeted as part of the assessment. This list was established during the inception phase in accordance with project partners and presented at the kick-off meeting on 18 November 2024 in Ramallah.

The choice was based on the following criteria:

- The human and logistical resources available to the consultant;
- The Ministerial committee high priorities for 2023-2027, included in the study's terms of reference and validated during the inception mission;
- The transboundary issues, which is one of the reasons behind the WaDIS project; and
- The potential of reuse, which is one of the strategic responses to transboundary issues and one of the key axis of this study.

Name	Perimeter	Type of Service Provider
AL-BIREH	118,000 people Al-Bireh city	Municipality, with responsibility only for sewerage and wastewater treatment (responsibility of Water supply is entrusted to the Jerusalem Water Undertaking).
RAMALLAH	70,000 people Ramallah city	Municipality, with responsibility only for sewerage and wastewater treatment (responsibility of Water supply is entrusted to the Jerusalem Water Undertaking).
HEBRON	238,000 people Hebron city	Municipality, with responsibility for water supply, sewerage and wastewater treatment
NABLUS	210,000 people Nablus city, Zawata, Ain Beit Al-Maa Camp, Askar Camp, Balata camp	Municipality, with responsibility for water supply, sewerage and wastewater treatment
JENIN	66,000 people Jenin Municipality Boundary & Jenin Camp	Municipality, with responsibility for water supply, sewerage and wastewater treatment

Name	Perimeter	Type of Service Provider
North-West JENIN	67,500 people 13 municipalities (Al-Yamun, Silat al-Harithiya, Kafr Dan, Al-Taybeh ; Ta'anak, Rummana, Zububa, Anin, Al-Arqa, Al-Hashimiyya, Kafr Qud, Saruj, Al-Sa'ayda)	Water Utility, in accordance to the law 2014
TUBAS	55,500 people 8 municipalities (Tubas, Tamoun, Aqqaba, Tayseer, Atoof, Ras El Faraa, AlAqaba, Abu Al-Loz)	Water Utility, in accordance to the law 2014
BAQA AL-SHARQIYAH	6,000 people Baq Alsharqiyah town	Municipality, with responsibility for water supply and sewerage (No wastewater treatment)

Table 17: List of SPs targeted as part of the assessment

The capabilities of the 8 service providers studied were analyzed and summarized in the form of a scorecard, specially developed for the assignment.

This scorecard and its evaluation criteria focus on the following 7 elements:

- Institutional Set up
- Legislation
- Planning
- Finance
- Infrastructure development : Procurement and project management
- Infrastructure management : Service administration & Operation and Maintenance for Sewerage network, WWTP and Reuse
- Monitoring and regulation

Elements	Criteria	Score (0-4)	Average score
INSTITUTIONAL SET UP	The required institutional setup for service authority ⁷ and service provider roles does exist and is in place (in accordance to the law - 2014)	0-4	0-4
	The service provider receives regular back-up or support from service authority.	0-4	
	HR procedures does exist and all the required staff positions of the service providers are filled.	0-4	
	There are institutionalized learning platforms, e.g.: stakeholder platform, thematic working groups, resource centers, integrated with coordination platform, etc.	0-4	
LEGISLATION	By-laws and ordinances for service delivery arrangements, for hygiene and for Environmental protection are in place.	0-4	0-4

⁷ A Service Authority refers to the institution or body that is legally responsible for ensuring that water and sanitation services are delivered within a specific geographic area. Service authorities oversee service providers, ensuring they meet standards and serve users effectively.

Elements	Criteria	Score (0-4)	Average score
	National sector legislation is locally known.	0-4	
	Local stakeholders can apply it.	0-4	
PLANNING	There are regional / municipal strategies that link to national targets (multi-annual plans and masterplans).	0-4	0-4
	These plans take into account both capital investment needs and needs to ensure sustainable service delivery (operation and capital maintenance needs).	0-4	
	A consultation process with key stakeholders for making the plan is in place.	0-4	
FINANCE	Measures are in place to budget the development of services over the medium term.	0-4	0-4
	There are mechanisms being applied for financing Capital investment costs, Operation and Maintenance costs, and infrastructure renewal costs (including subsidies).	0-4	
	There is sufficient absorption capacity for and a manageable lap between budget and disbursements to follow planning of service development	0-4	
	A specific accounting mechanism is in place for water and wastewater services	0-4	
INFRASTRUCTURE DEVELOPMENT	Procurement and implementation manuals and procedures for capital investments projects exist and are followed.	0-4	0-4
	Sufficient capacity for project management and following procurement and implementation manuals is in place.	0-4	
	Measures are being taken to increase demand (such as awareness-raising campaigns to change behavior with regard to water, hygiene and sanitation, for example).	0-4	
INFRASTRUCTURE MANAGEMENT	Asset ownership is defined in detail between service authority and service provider(s) following the legal framework and an inventory exists of all (or most) sanitation infrastructure assets, including current physical state of assets.	0-4	0-4
	The service provider has sufficient procedures and staff for the service administration (customer management).	0-4	
	The service provider has sufficient procedures and staff for operation and maintenance of the infrastructure : wastewater collection and treatment	0-4	
	Existing staff have the necessary skills to manage the wastewater REUSE services	0-4	
MONITORING AND REGULATION	There is a monitoring system(s) on wastewater in place and linked to the regulatory authority and service authority	0-4	0-4
	Service provider performance data are available and updated	0-4	
	The service provider uses monitoring data to guide its performance management regarding rules and guidelines	0-4	
	A mechanism for assessing user satisfaction and managing complaints is in place and in use.	0-4	
	The regulatory entity applies effective enforcement (incentives, penalties).	0-4	

Table 18: Scorecard used for analyzing the performance of the SPs

Each of the 8 service providers was rated on a scale of 0 to 4 for each criterion. The average of these scores is used to assign a score for the 7 elements assessed.

The following table shows the results of the evaluation of each service provider studied:

	Al-Bireh	Baqa ash-Sharqiyya	Hebron	Jenin	North-West Jenin	Nablus	Ramallah	Tubas
Institutional set-up	1,7	1,3	2,0	2,0	3,3	2,0	1,7	3,3
Legislation	3,0	2,0	3,0	3,0	3,0	3,0	3,0	3,0
Planning	1,3	1,0	2,3	2,3	1,3	1,0	1,7	1,3
Finance	2,0	0,8	2,5	NA ⁸	1,8	2,5	2,8	1,8
Infrastructure development	3,3	2,3	3,3	2,3	2,7	3,3	2,3	2,7
Infrastructure management	2,3	1,5	2,8	2,0	2,3	3,3	2,7	2,3
Monitoring & evaluation	2,2	1,4	2,4	2,0	2,4	2,6	2,0	2,6

Table 19: Performance of surveyed service providers

Details are provided in Annex 6 for each service provider, on a case-by-case basis.

In terms of institutional set up

Only the North-West Jenin and Tubas SPs are Water Utilities, fully complying with the indications of the 2014 Water Law. Their perimeters cover several small municipalities. In these WUs, municipalities are members of the RWU and have representatives at the WU's General Assembly. They participate in the election of members of the administrative board, which includes 5 representatives from municipalities. The Chairman is elected by the board members. Representatives of the PWA and of the MoLG also sit on the board. These focal points provide central and institutional monitoring of the service. They do not have the right to elect the president, but for technical and administrative questions, they participate in the decision-making process. All information and data relating to the WU's activities are monitored by the PWA, the MoLG and municipalities. WU's board meets on a monthly basis.

The 6 other providers studied are municipalities, which have departments responsible for managing water and wastewater services. In these cases, the MoLG oversees the municipality's services (not PWA) and is the government focal point. The relationship between municipalities and the MoLG is mainly considered as good and MoLG provide institutional support, but municipal departments indicate that the MoLG teams are not specialized in water and wastewater issues. MoLG is called upon by municipalities for all projects, and priority is often given to road works or urban infrastructure works for reasons of visibility to the public and political and electoral interests. There is no simple framework for communication with the PWA: Ramallah and Nablus specially consider this situation as restrictive.

The municipalities of Al-Bireh and Ramallah only deal with wastewater collection and treatment services. Water supply is provided by the Jerusalem Water Undertaking, through a Memorandum of Understanding that set out the terms and conditions. These 2 municipalities agree to hand over responsibility for the wastewater service (which is largely loss-making) to the JWU. The lack of funding pending the creation of the RWU is having a significant impact on quality of services. However, they are concerned about the scale

⁸ No sufficient data available. Due to the current situation in Jenin, the municipal team was unable to travel to Nablus. Discussions were organized online and were interrupted due to the mobilization of municipal teams on the ground to help the local population and to supply the hospital with water following the authorization given by the Israelis, as the situation on the ground is under Israeli coordination.

of the project (which covers a very large area: 600 km² covering the municipalities of Ramallah, Al-Bireh, East Jerusalem, 45 villages and 5 refugee camps) and the JWU's ability to take over all these services at once. They fear that if the service is not provided to a high standard by the JWU, there will be an increase in complaints from citizens, impacting the credibility of the municipal teams and raising electoral issues. In addition, both municipalities have invested and committed their own funds to developing collection networks in recent years. Main sticking point at the municipal level concerns the transfer of staff and, above all, assets. It is necessary to enter into negotiations with the municipalities concerned and reach an agreement that suits all parties.

Municipal councils in Hebron, Halhul, and Dura decided to establish an independent water and sanitation facilities in December 2022⁹. The municipality of Hebron states that this transition requires a strong municipal leadership commitment (in particular through negotiations on transfer of assets), a strong involvement (from the PWA and the MoLG) in negotiating a realistic transformation plan, and a large investment in staffing, training, and equipment.

In Jenin, the municipality has worked with JICA to draw up a draft proposal for the transition to water utility status. The document was being finalized, but the work was interrupted by the war. Since the war, the PWA has strengthened its presence by setting up an emergency committee to monitor the situation around Jenin. The municipality's teams are convinced that the transition to a water utility status would be beneficial, but that it is necessary to clarify the details of this transition (staff, offices, equipment, use of the network, etc.), through detailed negotiations between PWA and the surroundings municipalities. However, the current situation does not facilitate the transition to a WU: (1) the network is old and dilapidated, and maintenance requirements have increased, (2) Control of the network in the city is often under Israeli coordination, and it is very difficult to provide minimum services, (3) Cessation of funding from USAID are aggravating an already urgent situation. Jenin municipality is waiting for support from the PWA to strengthen the services and the department, before the transition to a WU. The transition in such a situation could worsen the quality of services provided to citizens, which is already under strain.

In Nablus, from the municipality point of view, the transition to a water utility is a highly political issue that needs a strong clarification and discussion process. The change in status to Water Utility would mean far fewer responsibilities, but also a loss of control for the municipality : despite late payments, water revenues are one of the main sources of funding for the municipality's activities. If the revenues no longer accrue to the municipality, then this transition would have to be accompanied by financial compensation or development projects. Main sticking point are assets transfer and cash flow. It also needs to be clarified whether all current staff working on water and wastewater services will be transferred to the Water Utility.

In Baqa ash-Sharqiyya, the Water and Sanitation municipal department manages the drinking water and wastewater collection network. There are no wastewater treatment plants. All wastewater is evacuated by pipeline through the border. Treatment is then realized on Israeli side and Israelis charge the Palestinian Authority for treatment. According to the authorities we met, the scale of the infrastructure does not require changes to the management structure. This situation would enable PWA to propose a plan for the construction of a RWU covering several other localities. The political stakes are not overriding, apart from the question of the tariff, which could increase as a result of the transition.

Synthesis of recommendations on institutional set up:

Strengthening governance of existing Regional Water Utilities (RWU):

- Encourage municipal participation in RWUs to ensure effective governance.
- Strengthen institutional and technical support and monitoring by the PWA, supporting local decision-making.
- Prioritize infrastructure projects according to real needs..

Transition of municipalities to Water Utility status:

⁹ Roadmap for implementing the Municipal Council's decision to establish an independent water and sanitation facility 2024 – 2027

- Ramallah & Al-Bireh: Clarify the conditions for transferring sanitation services to the JWU, guaranteeing a high level of service to avoid citizen protests.
- Hebron, Halhul & Dura: Ensure strong support from the PWA and MoLG for the transition, particularly in terms of planning, financing and training.
- Jenin: Postpone the transition to a RWU until the security and financial situation improves; strengthen existing municipal services first.
- Nablus: Arrange for in-depth negotiations on financial compensation for the municipality if it loses water-related revenues.
- Baqa ash-Sharqiyah: Evaluate the possibility of creating a RWU including several localities, while controlling the wastewater treatment costs charged by Israel.

Key points for successful transitions:

- Jointly clarify the conditions for transferring assets and human resources to a water utility, whether existing or newly established.
- Guarantee investment in infrastructure, maintenance and training.
- Establish a clear and realistic transition framework to avoid service interruptions.

In terms of legislation

National sector legislation regarding water and wastewater standards is generally well known by service providers (with the exception of Baqa, which has no WWTP and no dedicated treatment team). All the service providers interviewed deplore the fact that legislation on the reuse of treated wastewater and sludge disposal are too restrictive to be implemented in a way that is both affordable and sustainable.

Regarding reuse of treated wastewater, the legislation framework is very dense and based on international standards that do not take into account Palestinian situation and reality, according all the service providers. Only 4 of them have experimented reuse of TWW (Jenin, Nablus, Ramallah and Tubas). For them, the national strategy for REUSE is not clear. This prevents municipalities from implementing other solutions. There is a need to clarify legislation for TWW reuse other than agricultural reuse.

Faced with the lack of solution and supervised opportunities for reuse, the municipality of Ramallah has already taken initiatives:

- (1) Treated wastewater was offered to companies in charge of road works as part of a Chinese-funded project. The municipality thus provided several thousand m³ of reuse water for free (as these uses are not regulated by law, the municipality did not charge for the treated water).
- (2) The municipality reuses treated wastewater to operate the jet flushers used to clean the sewer network.
- (3) The municipality sell treated wastewater in some areas for household for irrigation with annual fees.

Local initiatives could help to illustrate the different uses of reuse and argue in favor of new regulations and standards for non-agricultural reuse. More success stories concerning wastewater reuse are needed to facilitate the approval of new regulations and also social acceptance. Extend the reuse market surveys to companies and other private sectors, not just farmers, to encourage other reuse sectors and demonstrate the need for new regulations.

Regarding sludge disposal, the current regulation imposing a dry matter content of 90% for the use of sludges as soil improvement, which is very restrictive and considered as unrealistic without specific equipment and subsidies. There is no other solution provided to Service Providers. For example, in Jenin, the situation is critical : the plant is saturated with sludge, which cannot be disposed of for lack of a solution (since the Jenin landfill is also saturated and sludge disposal there is prohibited). This is causing breakdowns in the ventilation pumps, which the municipality cannot afford to maintain or replace.

This is a national problem for which there is no short-term solution or strategy on how sludge should be managed long-term (disposal in solid waste landfills is costly and unsustainable). Water Authority's role in sludge management remains unclear: it still needs to be agreed what are the role of PWA and of the MoA, and to what level they are involved. Centralized composting system for sludges would be feasible, but the

regulations in place do not allow for this. They request to clarify the regulations and define other uses for sludges. This issue is not mentioned in the master plans, when they are available and up to date.

Ramallah municipality is considering opportunities for reusing sludge. Example: potential of the village of Ein Qinya in the south of the municipality and the interest of local farmers in reusing sludge. The municipality sends trucks of sludge to local farmers, who mix the sludge with animal fertilizer as a fertilizer for the crops. According to the manager results were excellent and farmers were satisfied. Sludges must be seen as a potential income for WW service providers and not as a waste. The absence of a standard allowing sludge to be used for agriculture, despite discussions with the Ministry of Agriculture and PWA, is problematic.

Synthesis of recommendations on legislation (SP's point of view):

Easing and clarifying regulations on Treated Wastewater Reuse (TWW):

- Adapt national legislation to better reflect Palestinian realities and make it more practical for service providers.
- Clarify regulations for non-agricultural reuse (e.g., construction, urban cleaning) to expand usage possibilities.
- Establish a clear national strategy for TWW reuse to encourage new local initiatives.
- Promote pilot projects and document success stories (e.g., Ramallah's initiatives) to demonstrate feasibility and increase social acceptance.
- Expand market studies to include companies and private sectors beyond agriculture.

Easing standards on sludge management:

- Revise the current regulation requiring 90% dry matter for sludge to be used as soil improvement, as it is too restrictive without specialized equipment.
- Clarify the role of the relevant ministries in sludge management and develop a long-term national strategy, based on international experience, to avoid critical situations.
- Promote the idea that sludge can generate income rather than being treated as waste.
- Conduct a study on the quantities of sludge expected with the increase in wastewater treatment and the estimated fertiliser requirements associated with the expansion of agriculture.
- Define alternative sludge utilization solutions and incorporate them into master plans.
- Encourage the establishment of a centralized sludge composting system, currently restricted by regulations.
- Pilot sludge reuse projects to prove its agricultural value, following Ramallah's initiative in Ein Qinya.

In terms of planning

Each of the 8 service providers are working on different basis in terms of planning. It is recommended that master plans for water and sanitation be developed in towns that do not yet have them. These master plans should cover all long-term needs and determine, in phases, the extension of services to cover them. Multi-stakeholder consultations, including public consultations, are necessary for this.

In Hebron, there is an existing short- and long-term development strategy (for water), but there is a disconnection existing between the municipality's master plan and the governorate's one due to lack of communication. A separate master plan for sanitation is being developed by the Wastewater Department, unaware of an existing Water Authority master plan. It raises concerns about potential conflicts between local and national plans (risks of duplication of efforts, misalignment of priorities, and inefficiencies in project implementation).

The municipality of Jenin has a master plan for water and sanitation, which was drawn up in 2015 and provides for activities related to the service up to 2045. It includes a hydraulic model specific to the area covered by the municipality. It does not include reuse but does include the rehabilitation of the WWTP. This document defines the development strategy and priorities, and the municipality allocates the available funds according to the priorities defined in the master plan.

The Municipality of Ramallah has a masterplan dating from 2017 (funded by KfW for JWU), including water and wastewater with the aim of moving to RWU. A new masterplan is being drawn up at JWU with the support of CEB (Council of Europe Development Bank) and a German consultant. In general, the masterplan is useful for defining the overall strategy, Ramallah municipality is using these strategic documents as a basis for extending the service. Annual budget and schedule are produced (only for O&M costs, and some extensions of sewerage network). In the case of certain projects, activities are planned for the medium or long term (fi. the development of the new WWTP south of Ramallah).

The Municipality of Al-Bireh has a specific wastewater strategy (2022-2027), implemented using its own budget. In the medium term (10 years), the aim is connecting all households to the sanitation network and having 0% septic tanks. But it is not a master plan (with detailed technical design and description of needs).

Tubas and North-West Jenin Water Utilities, are covered by the masterplan for the north and north-west of the West Bank, published in 2015 (funded by KfW and AFD). However, this document does not provide a sufficient level of detail to plan and structure the service at local level. An intermediate document would be useful for establishing a strategy. There are not formally established medium- and long-term strategies, that must aim to improve and extend the service (for instance, the construction of a second WWTP to the south of Tubas and the installation of pumping infrastructure to overcome topographical challenges and connect households in this area will be among the main elements of this mid-term strategy). The WU's draw up annual budgets and schedules, but this does not include investments, only operating and maintenance.

Nablus water and wastewater masterplan dates from 2007 and is out of date. According to the manager assistant, the document lacks detail and doesn't enable a coherent strategy to be defined that is representative of current challenges. The municipality has no short, medium or long-term strategy, planning or budget : Projects and interventions are generally decided on a case-by-case basis, according to urgency and requests. This is one of the main obstacles facing the organization : There is no consistency between projects and planning.

In Baqa ash-Sharqiyya, there is no short-, medium- and long-term development strategy for water and wastewater. In 2022, the municipality developed a strategic plan for municipal projects in coordination with the Municipal Development and Lending Fund (MDLF) and MoLG, not specific to water and wastewater services but covering all types of projects (roads, education, etc.).

Synthesis of recommendations on planning:

A coherent and well-coordinated master planning approach is needed across Palestinian municipalities to improve water and sanitation services. Ensuring alignment between local and national strategies, integrating long-term investment planning, and enhancing technical coordination will be key to overcoming current inefficiencies.

Develop Comprehensive Water and Sanitation Master Plans:

- Towns without master plans should develop them to ensure long-term service expansion.
- Plans should include phased service extensions to meet future needs.
- Multi-stakeholder consultations, including public participation, are essential to meet users' needs.
- Ensure that sanitation and water master plans are aligned between local and national strategies, to prevent inefficiencies and duplication (e.g. Hebron case).
- Strengthen communication between Service Providers and the Water Authority to coordinate efforts.
- Provide technical planning support for municipalities lacking expertise (e.g., Baqa ash-Sharqiyya).

Update and enhance existing plans:

- Jenin and Ramallah: Existing plans should incorporate reuse strategies and WWTP rehabilitation.
- Nablus and Baqa ash-Sharqiyya: Develop and update water and wastewater master plans to provide clear long-term strategies, avoiding case-by-case interventions (e.g., Nablus).

📌 Tubas & North-West Jenin WUs: Create an intermediate-level strategy to complement the broader West Bank master plan and address specific local needs.

In terms of financing capacity

When it comes to finance, each SP has a different level of capability. The analysis reveals, unsurprisingly, that the largest cities are those with the highest financing capacity. In municipalities, accounting and finance departments are 100% responsible for budgets, accounting and financial control of all municipal services combined (not specific to water and wastewater). In all service providers studied, finance department's team has relevant background on accounting, but capacities in financial analysis and budget management have to be strengthened on a case-by-case basis. In each SP studied, the tariff does not cover all the O&M costs of wastewater collection and treatment and the costs of asset depreciation. Bill recovery rates vary a lot from one case to another. Municipalities have to finance network and WWTP maintenance operations from their own funds. Only the municipality of Hebron reported receiving government subsidies for network extension. Wastewater management in the refugee camps is generally the responsibility of the providers and they collect little or no fees for this (even if the UNRWA provides network maintenance, they do not contribute to the cost of treatment).

In Ramallah and Al-Bireh, annual budget and schedule are produced (on the basis of the masterplan in Ramallah, and on the basis of the four-years municipal budget in Al-Bireh). Annual financial plan includes setting financial targets and analyzing deviations from expected results. O&M costs and assets depreciation are taken into account in the annual budget. Both municipalities invest each year in the extension and maintenance of the sewerage network. The tariff does not cover all operational and treatment cost. WWTP's operating costs are very high (particularly for electricity and maintenance). In Al-Bireh, JWU is in charge of billing : The WW price is 2.2 NIS/m³. The JWU deducts 10% from the amounts collected for wastewater for management costs, and the remaining 90% is paid to the municipality. This special status with the JWU limits the municipality's possible recourses to improve the recovery rate and initiate proceedings in the event of non-payment. The average bill collection rate is 54%. In Ramallah, the municipality invoices annually the wastewater service directly and is not dependent on the JWU (prices are set according to the surface area of the dwelling and not the quantity of water consumed - WW price: 2.5 NIS/m²/year). Ramallah municipality has not introduced specific tariffs or procedures for low income households or vulnerable groups. The sewage bill collection rate was 55% before the war, but has since dropped to 50% due to the economic impact of the ongoing crisis. In both municipalities, no funds have been paid by the PWA since 2014 and the ongoing negotiations for the transition of services to the JWU. Their finance departments have 19 employees in al-Bireh and 13 in Ramallah (considered as understaffed), with relevant background for accounting work but not for financial analysis and project/budget management. No specific external training in the financial department has been hold in the last 5 years. New employees are trained internally (internal skills transfer from experienced staff). Both municipalities utilize the Ghassan Program¹⁰, that allows financial accounts related to sewage to be managed and tracked separately. There is no separate bank account for sewage services. A financial auditor is responsible for ensuring the accuracy and transparency of accounts.

In Nablus, the municipality has an annual and multi-annual budget for water and wastewater. Municipality invest each year to extend and maintain water and sewerage network (see list of projects) but it is not sufficient and it depends on available resources rather than actual needs. Costs for O&M are not cover by tariff. 60% of water and sanitation bills are paid late. Nablus municipality holds annual financial and accounting statements, showing the income and expenditure of the various departments. Overall financial monitoring is carried out using a database on a dedicated financial system, in which the financial monitoring of water and wastewater is separated from that of other services. This financial system is different from other SP's thanks to GIZ project. Nablus municipality has separate bank accounts for water and sanitation. The finance department has 175 employees in total (of which 25 employees for accounting and 150 for collection with 30 for water and sanitation collection). Accounting department is adequately staffed, but the collection department is understaffed. The staff have a relevant background in finance and accounting.

¹⁰ Ghassam program is a financial management software developed specifically for municipalities

In Hebron, the municipality follows a strategic plan renewed every four years with an annual budget, applied based on available resources. Depreciation policy follows the utilities system, with specific rates for buildings, equipment, and assets. There are some subsidies from government to extend network. There is a low bill recovery rate (35-40% for water) not affected by war so much. The current water tariff covers 60% of operation and maintenance costs, but does not yet include the cost of advanced treatment or sludge management. Once the treatment plant is operational, adjustments will be made. The new wastewater tariff is set at 0.5 NIS per cubic meter for domestic, calculated as 80% of water consumption. However, the current absence of a clear financial model for this tariff remains a significant concern. It exists a separate account for water and wastewater. Ghassan program is used for accounting, providing ease of use and effective financial analysis, but it has limitations in report generation and outdated programming languages. ERP system development is recommended for a fully integrated and automated financial and administrative system. The Finance Department is responsible for budgeting, accounting, financial control, and revenue collection. The team has strong financial expertise and capabilities in financial analysis, budget planning, and project financial management. Employees have received training from the MoLG in asset management, project management, and financial planning, but there is a need for updated training programs. The department suggests a "train-the-trainer" approach to internally train employees on asset management and project financial planning. The municipality plans to establish a separate financial and administrative department for water and wastewater services, requiring hiring and capacity building for new staff.

Both Tubas WU and North-West Jenin WU prepare an annual budget but does not have a business plan with clearly defined financial targets. According to them, it would be useful to have such a document in order to have a medium-term strategy, but the teams would need support to carry it out. The annual budget does not include investments, only operating and maintenance costs and depreciation. Tariff only cover operating and maintenance costs. Depreciation costs cannot be fully covered by the water tariff, just as the development of infrastructure, even if the recovery rate is 100% thanks to the prepaid system. In the case of public and government institutions, the collection rate is very low¹¹. There is no external subsidy. Both WU have a single bank account for water and sanitation. Accounting and financial monitoring is carried out using the same software, but with separate files for the two services. Administrative and Finance divisions have 6-8 employees. Financial managers have a relevant background for accounting work, budget management and financial analysis. They are assisted by field operators at the municipal sales stations, but they need assistants in the office.

The smallest municipality (Baqa-al-Sharqiyah) has the lowest financing capacity. This municipality has no budget for extending the service and no financial model including investment. O&M costs (without treatment) are covered by tariff, fixed by municipality. The municipality does not follow the government's recommended tariff system but rather sets its tariffs based on operational costs (cheaper than in other areas in West-bank). The bills recovery rate is 80%, as bills are combined between water and electricity to ensure higher collection rates. There is no specific accounting mechanism for water and sanitation services. Finance department is responsible for all financial aspects. The department has 3 employees, with relevant background on accounting, but not for financial analysis or budget management.

Synthesis of recommendations on financing capacities:

Strengthen financial analysis and budget management capacities:

- Train finance departments in financial analysis, budget planning, and project management, as current expertise is mostly limited to accounting.
- Implement regular external training programs, potentially using a "train-the-trainer" approach to ensure continuous knowledge transfer.

Develop clear financial strategies and business plans:

- Municipalities without medium- or long-term financial strategies should define financial targets.

¹¹ An initiative by the Ministry of Finance is underway to create a site specifically for government institutions, with the aim of summarizing debts owed to SPs and ensuring that they are paid.

- Move beyond annual budgets that only account for O&M costs and include investment planning for infrastructure development.

Improve cost recovery and tariff structures:

- Tariffs do not cover full operational costs in many cases (revisions and adjustments are needed).
- Consider introducing targeted subsidies or social tariffs for vulnerable households.
- Improve bill collection mechanisms (e.g., Nablus struggles with late payments, Al-Bireh has a low 54% collection rate).
- Expand prepaid systems to improve recovery rates (e.g., Tubas WU benefits from a 100% collection rate due to prepayment).
- Automate and integrate financial systems (e.g., upgrade the Ghassan Program, develop an ERP system in Hebron).
- Introduce separate bank accounts for water and sanitation services to improve financial transparency (currently not the case in many municipalities).

Strengthen financial autonomy and government support:

- Reduce dependency on municipal budgets by securing external funding and clarifying the role of the PWA in financial support.
- Advocate for targeted government subsidies, especially for network expansions and wastewater treatment infrastructure (as the tariff cannot finance new infrastructures).

In terms of infrastructure development

The standards and procedures used for procurement are those of the government (High Council for Public Procurement Policies). They are followed by all the SPs we met. These standards include different procedures depending on the type of contract (works, services, supplies). Existing standard procurement and tendering documents depending on the value, specific ones for big constructions or for consultancy services (different from other services). They are aligned with the World Bank's standards for public procurement.

Hebron, Nablus and Al-Bireh have a specific division dedicated to tendering and purchase. In Hebron, the procurement process is automated, ensuring efficiency and transparency in tendering procedures. In Nablus, the municipality has procurement policies specific to each type of contract. The rules and procedures are clear and differentiated according to the type of contract (works/ supplies/ consultancy services/ other services). In al-Bireh, since 2018, the municipality adopted a centralized approach to procurement for all municipal services. Other SPs reported that having procedures guidelines or a summary operational manual, could improve productivity (teams would waste less time referring to the correct standards).

In Hebron, the Procurement and Tenders department has 7 employees, with appropriate qualifications. Trainings received in Contract management, Public procurement law, FIDIC courses and arbitration. There is no dedicated unit for managing foreign-funded projects (handled within the Planning and Projects Department). In al-Bireh, the procurement department has 3 employees with relevant backgrounds and experience, but no specific training had been provided.

In Nablus, the Procurement Department has 8 employees, which is sufficient in view of the workload and the number of projects. The staff have a relevant background, are organized and qualified. Staff receive regular training to ensure they are consistent with the public procurement policies, particularly on tendering laws and contract management. In theory, Nablus Municipality has a unit responsible for managing externally funded projects. In practice, however, only one employee works on these issues and most of his activities involve fundraising for new projects rather than supervising ongoing projects. Projects are monitored independently by the various departments.

In Ramallah, Jenin, Baqa-Al-Sharqiyah, Tubas WU and NW Jenin WU, there is no dedicated project management unit in charge of supervising projects and monitoring the planning of the various activities. Each technical department manages its own projects (in Ramallah and Jenin) or projects are managed directly by the manager with the support of the head of technical department (WU) or by the municipal engineer (in Baqa-al-Sharqiyah). In this last case, external support will be needed if big project is planned

with new type of infrastructure (such as WWTP). NW Jenin WU plans to develop a procurement department to anticipate the contractual management of new projects and be more autonomous.

There have been no recent awareness campaigns to boost demand for connections to the sewerage network. In general, they are considered unnecessary. Demand is constantly increasing and the authorities are unable to meet it, either because of a lack of funds or because of the topography. Households that are not connected use cesspits. To reduce emptying costs, many households discharge cesspits directly into the street or nearby, particularly in winter. Some awareness campaigns were regularly organized in Nablus by NGO's and civil society organizations. But over the past 2 years, these initiatives have become increasingly rare, and projects that include awareness-raising on behavioral changes concerning hygiene and sanitation are also less frequent.

Synthesis of recommendations on infrastructure development:

Strengthening procurement management capacities

- Develop and distribute simplified operational guides to streamline procurement procedures, especially for smaller service providers without a dedicated procurement department.
- Train staff on contract management, public procurement law, and international standards (e.g., FIDIC), particularly in municipalities where employees have not yet received specific training (e.g., Al-Bireh).
- Support the structuring of a procurement department where it doesn't exist to ensure better contract management for future projects and train staff on development of tender documents and evaluation of tenders.

Establishing and strengthening project management units

- Create dedicated units for managing externally funded projects, especially where this role is handled by a single person or spread across multiple departments (e.g., Ramallah, Jenin, NW Jenin WU).
- Anticipate the growth of infrastructure projects by reinforcing technical teams' capacities (e.g., Baqa-Al-Sharqiyah will need external support for complex projects).

Improving awareness of sewerage network connections

- Relaunch awareness campaigns on the importance of connecting to sewerage networks, drawing inspiration from past initiatives in Nablus.
- Implement targeted actions on hygiene and sanitation behaviors to reduce illegal wastewater discharges, particularly in winter.

In terms of infrastructure management

Service administration:

All 8 service providers (WU or municipalities) have an asset register which is periodically updated. Tubas WU, NW Jenin WU and Baqa-al-Sharqiyah have no GIS system to locate assets accurately. Digital capabilities are particularly weak in Baqa-al-Sharqiyah. Ramallah, Nablus, Hebron and Al-Bireh have GIS division or service, with dedicated team. In Jenin, asset register needs to be fully rework (not updated since the war, Israeli occupation and operations are often destroying infrastructures).

Some service providers have a dedicated customer service department: Hebron (30 employees), Al-Bireh (7 employees), Jenin (18 employees), Nablus (20 employees). Most of the time, these employees work on all municipal services, not just water and sewerage. They are assisted by collection agents in the field, who are responsible for organizing meter readings and billing. In Baqa-Al-Sharqiyah, Tubas WU and NW Jenin WU, there are 1-2 employees dedicated to customer management. These employees are, respectively, part of Public Relations Department of the municipality (in Baqa-Al-Sharqiyah), part of financial Department (NW Jenin WU) or part of technical departments (Tubas WU).

The customer register is generally linked to the financial system, using Ghassam software or Al-Shammel software, so that customers can be tracked by name, ID number, water meter numbers and payment status.

Sometimes, customer register is separated for water and wastewater (Tubas WU, Nablus, Baqa ash-Sharqiyya).

In Hebron, a Request Procedures Guide had been developed in 2010, but it requires updating to: (1) Develop a comprehensive procedures guide for citizens, (2) Enhance and manage electronic services for better accessibility, (3) Establish a collection incentive guide and (4) Enhance customer data management (on data security also). Other SPs don't have specific customer service procedures manual, which would be interesting to better understand the procedures associated with frequent customer request. For example, in Nablus and Al-Bireh, customer service is unable to access all financial and engineering information when requesting a certificate of good conduct (customer must go to review the financial and engineering departments, stamp the papers and then return to customer services, taking time and effort).

Almost all payments are made in cash (either at the bank / local council / WU office / municipal sales stations or through bill collectors). In Hebron, water payments can be also made through electronic payment methods (e-SADAD, Janwal Pay, Ooredoo Pay). In Nablus, payment by VISA bank card has recently been introduced, but only for customers going to the Nablus municipality to pay bills. New payment method via the E-SADAD online application from Palestinian Monetary Authority (recent). This application is already operational for water and sanitation services. This is an initiative designed to make it easier for customers to pay their bills, but results are not yet assessable.

Recommendations on infrastructure management:

Enhancing digitalization and asset management

- Equip Tubas WU, NW Jenin WU and Baqa-al-Sharqiyah with a GIS system to precisely locate infrastructure.
- Fully update Jenin's asset register, damaged by conflict and military operations.
- Improve digital capabilities, particularly in Baqa-al-Sharqiyah, where they are particularly weak.

Optimizing customer service

- Standardize procedures for managing customer requests by drawing up a specific manual for each service provider.
- Facilitate access to financial and technical data for customer service agents to avoid back-and-forth between departments (e.g. Nablus and Al-Bireh).
- Update Hebron's "Request Procedures Guide" to include clear procedures, electronic services and a payment incentive guide.

Modernization of payment systems

- Expand electronic payment options, extending solutions such as e-SADAD, Janwal Pay and Ooredoo Pay to all municipalities.
- Encourage the use of bank cards for payments, drawing on Nablus' recent experience with VISA payments.

In terms of human resources, the service providers in Baqa ash-Sharqiyya, NW Jenin WU, Tubas WU, Hebron and Nablus estimate that they have sufficient staff for the work to be done. Teams have relevant backgrounds and are qualified for the job. **However, new infrastructures will require recruitment and comprehensive training for these new staff.** In Nablus, the main issue is related to field staff that is mobilized by others municipal departments (as field collectors), which complicates the WW department's work.

Conversely, the service providers in Al-Bireh, Ramallah and Jenin are suffering from a lack of staff, both for network maintenance operations and for the management of their WWTPs. The main need is for additional field operators and qualified technical staff (mechanical, laboratory). They also feel that training opportunities are rare, and when they do arise, they mainly concern engineers and management staff. **There is a great need for practical training for technicians in charge of maintenance and laboratory analysis.**

Operation and maintenance

None of the 8 service providers studied has a procedures manual for managing operations and maintenance on the wastewater network. Technical manuals exist for each appliance in some cases. In

many cases, networks are managed with very few tools and equipment. This is an obstacle to extending the network and improving the service. Maintenance is particularly difficult when the network is old (Baqa-al-Sharqiyah) or heterogeneous¹² (Al-Bireh) or deteriorated requiring rehabilitation (Hebron).

There is no procedures manual for the existing WWTP in NW Jenin WU, Jenin and Al-Bireh. In Tubas, there is a draft version but it has not been finalized due to COVID. There is no WWTP in Baqa-al-Sharqiyah. In Hebron, one WWTP is under construction but not yet operational. In Ramallah, Al-Tireh and Al-Rehan WWTPs are operated by the private sector (current contractor being the Global Environmental Services (GES) group).

Preventive maintenance is rarely carried out, with maintenance teams often working on an emergency basis (Jenin, Nablus, Al-Bireh, Ramallah, Baqa-al-Sharqiyah). In Baqa-al-Sharqiyah, there is a lack of specialized equipment for WW network maintenance. Frequent blockages occur, and the municipality relies on manual and primitive methods to address them, without sufficient safety equipment.

In Nablus, preventive maintenance exists for the WWTP. A general procedures manual and specific procedures manuals are available for each task within the plant (drawn up in 2012 following capacity building in Germany). Training on procedures is provided every 6 months. Every 2 or 3 weeks, a team meeting is organized, at which the different activities, procedures, issues and difficulties are discussed collectively. A WhatsApp group has been set up to facilitate communication within the team.

Safety manuals and equipment are available only in Nablus, Ramallah and Hebron, and a Health & Safety training has been organized in Al-Bireh with fundings from JICA. In general, there is too little awareness and training on these aspects. In Nablus, the safety manual is available in English and Arabic for WW network and WWTP. Signs and panels reminding employees of safety measures are posted throughout the plant. A remote security system has also been installed from the management telephone, with camera control to ensure remote monitoring, particularly if it is impossible to move around the area due to the context.

For large city networks, a SCADA system is required to improve the efficiency and productivity of interventions. There is an existing SCADA systems for water network in Hebron, but not implemented for sewage management.

Recommendations on operation and maintenance:

Improve operations and maintenance

- Develop procedure manuals for the management and maintenance of wastewater networks and treatment plants (WWTPs) in all municipalities.
- Implement a preventive maintenance program to limit emergency interventions and improve infrastructure durability.
- Equip maintenance teams with specialized equipment, particularly in Baqa-al-Sharqiyah, where the lack of equipment leads to frequent blockages.
- Provide technical and practical training for technicians (not only for managers and engineers) in charge of maintenance and laboratory analysis.

Digitizing and modernizing the network

- Deploy a SCADA system for wastewater network management, like the one in place for drinking water in Hebron, to improve the efficiency of interventions and the productivity of teams.

Safety and risk management

- Generalize occupational health and safety training, drawing on the initiative carried out in Al-Bireh with JICA support.
- Make safety equipment compulsory, following the example of Nablus, Ramallah and Hebron, which already have safety manuals and appropriate signage.

¹² In Al-Bireh, some pipes date from the 1960s and made of clay. Other pipes are made of concrete and do not always have the same technical specifications.

Reuse experience

Only 4 SPs have experimented reuse of treated waste water (TWW): Jenin, Nablus, Ramallah and Tubas.

In Jenin, the WWTP was accompanied by a reuse project, started in 2015 for an initial period of 4 years and monitored by ANERA. The quality of the wastewater treated at that time was excellent. Treated WW were redirected to reservoirs under supervision of WUA and MoA. Tertiary treatment was provided by gravel filters, under the supervision of the WUA and MoA (not within the WWTP). Irrigation was also the responsibility of the WUA, and the treated wastewater was sold by the municipality to the WUA for 0.7 NIS/m³. Then, aeration pumps then ran into problems, with sludge accumulating in the lagoons and water quality deteriorating. The treated wastewater is now discharged directly into the valley and the water is no longer reused. According to the Jenin municipality, demand for reuse water is now low, at around 1,000m³/year. Reuse for agricultural uses is particularly complex in terms of monitoring, regulation and cost. Treated WW should be first reused for other uses in order to build capacities at the local level. MoA was dealing with WUA when the reuse project was operational, but there has been no exchange between Jenin municipality and MoA since few years as PWA is monitoring most of the ongoing issues.

In Nablus, the Nablus West WWTP is responsible for treating wastewater to ensure environmental protection. It removes contaminants from the water before releasing it, preventing pollution of surface and groundwater. The plant also facilitates the reuse of treated water for irrigation, promoting sustainable water management. About 300 m³/day of TWW are reused (less than 5% of total TWW). Users are WUA, Farmers, nurserymen and have a contractual relationship with the municipality. TWW are sold by the municipality to them for 0,7 NIS/m³. Tertiary technology is used on-site (Sand filtration and UV disinfection). Nablus municipality made many reuse projects with area more than 200 Donum¹³, now prepare to plant 800 Donum with fruit trees and 1700 Donum more are planned.

In Ramallah, there is a reuse experience only in one WWTP (on 4). In AL-Tireh WWTP, 1000 m³/day are reused water, representing 50% of total TWW. Tertiary treatment technology used is chlorination after MBR (Membrane Bioreactor). Uses are watering public green area and private gardens, road construction. REUSE tariffs set by the municipality depend on the size of the irrigated plot : the selling price varies from 200 NIS/year (plot < 500 m², approx. 90% of customers) to 2500 NIS/year (larger plots). Ramallah municipality need more staff to manage reuse project : staff were trained and supported during last reuse project (2018), but this added to the workload of the department's existing staff. The WW department tried to negotiate with the municipality's agricultural department to share the responsibility for these projects, but this was not followed by concrete decisions.

In tubas, treated water is reused 100% in summer, partially in winter (650 m³/day are reused in summer). There is a Memorandum of Agreement with a Water User Association (Safah Giza Association). TWU sell treated water to Safah Giza Association, which redistributes to farmers users. Selling price vary from 0.5 to 1.0 NIS/m³. Available effluent volumes are insufficient in summer, leading to conflicting relations with users. Treated wastewater is directed to two separate reservoirs. The WU is responsible for treating and pumping the treated water to these reservoirs, as well as maintaining the reservoirs built on land owned by the WU. The WU is not responsible for tertiary treatment, as the WWTP is not equipped to do so. Tertiary treatment (chlorination) is the responsibility of the WUA with the support and control of the MoA (internal by-law). Treated wastewater is pumped to the reservoirs at the WUA's request at any time, unlike in Jericho where treated water is systematically sent to the reservoirs. The use of water in reservoirs is the responsibility of farmers. A new WUA (2 farmers) has recently been formed and steps are underway to irrigate vegetables using fresh water transferred by a specific network. The Tubas WU is concerned about controlling the use of this water, which represents a risk to human health if consumed (confused with drinking water).

¹³ One donum is equivalent to 1,000 m² (0,1ha).

Recommendations on reuse development:

- Carry out a national study of experiences in reusing treated wastewater, to learn from experiences throughout the Palestinian territories.
- Carry out a benchmarking study of reuse experiences in neighboring countries.
- Organize peer exchanges on the reuse of treated wastewater (within the Palestinian territories or abroad).
- Develop a national reuse strategy based on experience gained at national level and in neighboring countries.
- Support services providers in setting up reuse projects (equipment and trainings).
- Organize training sessions for WUAs to professionalize their operations.
- Develop the infrastructure and treatment capacity of existing WWTPs and build new ones to meet needs and limit the transfer of untreated wastewater to Israel.

In terms of monitoring and regulation

Monitoring WSRC indicators

The 8 SPs studied provide data to the Water Sector Regulatory Council (WSRC), using precise managerial, financial and technical indicators, to monitor their performance. Indicators are collected within different departments and sent by the manager. Technical and financial reports are sent annually to the WSRC.

WSRC provide regulatory guidelines on performance indicators and tariffs. Tariffs are generally developed in cooperation with the WSRC and approved by the Council of Ministers. WSRC use indicators on service levels requirements (relating to norms and standards). However, there is no specific indicator for sludge management, which could be useful for Service Providers.

Most of the time there is no response/following issues with WSRC: monitoring processes exist and are followed by service providers but there is no solution in case of non-compliance with standards and no sanctions options. Weak enforcement of compliance measures results in inefficiencies.

Service providers do not have a formal reporting framework for water and sanitation with the PWA. In the case of the WU, PWA attends regular board meetings (monthly or quarterly): this enables closer monitoring and more regular advisory support from PWA, appreciated by the WU.

Internal monitoring processes vary from one Service Provider to another

Monthly, or quarterly, and annual reports are produced internally, both on technical performance (water quality, flow rates, quantities treated, non-revenue water or maintenance operations, for instance) and financial statement (operating costs, recovery rates, balance sheet). These reports are shared with board or municipal councils to take decisions. Technical data are available and updated. Some service providers share difficulties in generating financial reports due to system limitations (Ghassan), especially in Hebron.

In general, WWTPs are closely monitored, with daily tests (to monitor water quality). However, there is no monitoring for wastewater that are not discharged at the WWTP.

For instance, in Nablus, all the activities carried out at Nablus WWTP (wastewater treatment, sludge management, biogas and energy production) are the subject of monthly, quarterly and annual activity reports. Activity reports are published on the official Nablus WWTP website, which is regularly updated. This enables the results and progress of activities to be communicated to the public and professionals in the sector, guaranteeing transparency about the activities carried out.

In Al-Bireh, the municipality has been supported by KfW in drawing up the report frameworks and monitoring reporting for 3 years, which has facilitated the department's supervision of activities.

In Jenin, monthly reports are now sent to the emergency committee, recently set up.

Assessing user satisfaction and managing complaints

Most service providers have not conducted any user satisfaction surveys for their water and wastewater services. In addition, the mechanisms for receiving and managing complaints are generally not formalized and implemented. The absence of complaints is not an indicator of satisfaction. If mechanisms aren't in place to receive complaints, then users aren't making them.

In Tubas, decentralized offices in each municipality, managed by the WU, bring them closer to their customers. Applications and complaints can be registered in these offices and transferred to the central system at the WU. However, there is no clear mechanism to ensure that complaints are/ have been addressed effectively.

Hebron et Nablus have good experiences to be shared. In Hebron, a customer service survey had been conducted 5 years ago. The survey revealed high levels of customer satisfaction with the municipality's handling of customer interactions, but revealed also a low level of satisfaction with service levels. However, there is no clear mechanism to ensure that complaints are/ have been addressed effectively. The municipality has also established a specialized social committee responsible for monitoring the needs of marginalized groups and providing necessary support.

In Nablus, the last customer service survey was carried out in Nablus 10 years ago (2014). According to Customer Service, the results of the last survey were fairly positive, with the productivity of the customer service teams good (around 80%). However, productivity has fallen around 60% since Covid-19, the difficult political situation in Nablus and the war. According to the customer service department, customers should be less satisfied now than when the last survey was carried out. The municipality is not carrying out a new survey because the current situation does not allow the service to be improved. Nablus municipality communicates regularly with the public via the official website, social networks, press releases and public information meetings. Customer complaints about the price of the sanitation system are few, mainly because the price varies according to the area in which the customer lives and is connected to the network. This situation can lead to misunderstandings.

In Al-Bireh, there has been a satisfaction survey on municipal services (in 2023), but not specific to water and sanitation services and little detailed on the subject.

Synthesis of recommendations on monitoring and regulation:

Strengthening performance monitoring and regulatory compliance

- Improve monitoring of regulatory indicators, particularly by introducing specific indicators for sludge management.
- Establish a clear framework for corrective actions in case of non-compliance with WSRC standards, including enforcement mechanisms. PWA is expected to be involved in supporting the implementation of corrective measures.
- Enhance financial reporting capabilities, particularly in municipalities where existing systems limit report generation (e.g., Ghassan software in Hebron).

Enhancing internal monitoring and transparency

- Encourage standardized internal reporting among service providers, ensuring consistency in financial and technical performance tracking.
- Promote public access to performance data, following the example of Nablus, where WWTP activities and reports are transparently shared online.

Improving complaint management and customer satisfaction monitoring

- Establish formalized complaint mechanisms to ensure issues raised by customers are properly recorded, tracked, and resolved.
- Conduct regular user satisfaction surveys, as recent data is lacking in most cases (e.g., Hebron's last survey was 5 years ago, Nablus' was 10 years ago).
- Clarify tariff structures to reduce misunderstandings about sanitation pricing, particularly in municipalities where prices vary by location (e.g., Nablus).
- Draw inspiration from best practices, such as Hebron's social committee for marginalized groups and Tubas' decentralized offices, but ensure proper follow-up on complaints.

Focus : The Union of Palestinian Water Service Providers (UoPWSP)

The Union of Palestinian Water Service Providers (UoPWSP) is an umbrella organization for water and sanitation service providers in Palestine. It was established in 2007 by decision of the PWA. Its primary objective is to provide a framework for consultation for all WSPs in Palestine, to implement capacity building activities and to organize/facilitate the transfer of skills and the sharing of experiences between SPs.

GlZ provided financial support to set up this union as well as the first capacity building programs. AFD and the Italian agency for development cooperation (AICS) have also contributed significantly to the financing of the UoPWSP activities, particularly with regard to capacity building, energy efficiency, peer-to-peer training, internal skills transfer and wastewater treatment and reuse projects in the West Bank and Gaza.

The organization brings together the 280 SPs active in Palestine, both in Gaza and within the WB. The union has an office in Ramallah and used to have one in Gaza (destroyed since the war). The current chairman of the board is the executive manager of the Coastal Municipalities Water Utility in Gaza. All executive managers of main water service providers are board members. The board of directors meets monthly; these meetings have been less regular since the war and are held online. **Service providers see in this union a framework of trust and sharing on the difficulties encountered and the governance of the sector. The PWA could rely on the union to lead discussions and encourage the transition of the various SPs to WU.**

The main activity carried out concerns the organization of training courses and capacity-building sessions, which are listed in a database summarizing the training courses provided and the people trained. This database is used to centralize information, better identify needs and distribute training courses among the various SPs and on different aspects (financial, technical, managerial). It also helps to avoid duplication of training, facilitating projects implemented by donors or the Palestinian Authority. Training has been organized for a wide range of expertise and staff, including engineers, mayors, field operators, technicians, accountants and financial department managers.

Between 2014 and 2019, 60 training sessions were organized by UoPWSP. Of these:

- 34 sessions were cross-cutting and concerned service administration (communication with users, safety measures, tariff calculation, for example)
- 17 sessions related to water services (non-revenue water, water quality, O&M of water networks for example)
- 7 sessions concerned wastewater treatment (mainly O&M of waste water collection networks)
- 2 sessions (including 1 study-tour and 1 training session) specifically on REUSE.

This union offers an ideal training environment for water and wastewater SPs. This could help to align and harmonize procedures and approaches, which could then be implemented at local level in line with specific requirements. Only 15% of training courses were related to wastewater management, and none to WWTP treatment and management. **There is therefore significant potential for further training in this area.**

The union is also implementing an international conference on the management of water and wastewater services. The first of these conferences was organized in 2009 and the last, held in July 2023, brought together around 1000 experts from the sector in Ramallah. This event provides an opportunity for exhibitions and conferences on specific topics (new technologies, gender mainstreaming) and to create a framework for international exchange enabling the sharing of experiences.

The UoPWSP has also set up a committee specifically for NRW. The members of this committee (who have received appropriate training) work with the various SPs thanks to the intervention of technicians specialized in this subject. **This kind of committee could be put in place regarding waste water and reuse.**

D.2.5 Water Users Associations

The establishment, the licensing and the monitoring of water users associations are covered by several legal and regulatory documents:

- The 2014 Water Law establishes WUAs and fixes the delegation of service in the agricultural sector:
 - Article 48 - Establishment of Water Users Associations: Water Users Associations shall be established with the aim of managing the service of supplying irrigation water at the local level in a sustainable manner, in accordance with a regulation issued by the Cabinet of Ministers upon a joint recommendation of the Minister of Agriculture and the Head of the Water Authority. The regulation shall stipulate the licensing procedures, responsibilities, powers, management, financial resources, dissolution and all other matters related to the work of Water Users Associations.
 - Article 49 - Legal Personality of Water Users Associations: Water Users Associations enjoy a legal personality, are financially independent, and have the right to own, use and dispose of movable and immovable assets with the aim of achieving their objectives. They also enjoy the full legal capacity to carry out their activities and responsibilities, including the conclusion of contract, the right to sue or be sued, or delegate and authorize a person of its choosing to act on their behalf in judicial proceedings with the aim of achieving their responsibilities and mandate.
- The Council of Ministers Decision 4-2018 details the procedure concerning the licensing of WUA.
- MoA internal guidelines detail the procedure concerning the licensing of WUA and provides templates of application forms.

The overall mandate of the WUAs is to manage agricultural water:

Id	Responsibilities	WW	Reuse	Comment
01	Production of water when WUA owns a groundwater water well or a spring, or purchase of water (incl. TWW from WWTP), and distribution of water to farmers Billing farmers and recovery			• Bylaws allow that water is sold to non-members at a price slightly over the members' tariff. (It is the case for Wadi Shair WUA/Nablus, not for Safeh Al Jizeh WUA/Tayassir)
02	Operation and maintenance of collective reuse networks			

Table 20: Analysis of responsibilities of the WUAs

Overview of WUAs

A list of registered WUA and of WUA that have applied for licensing is shown in Annex 7. This list has been reviewed by MoA and is supposed to be exhaustive.

The experience regarding WUAs is still very recent and limited in Palestine:

- There are only 5 licensed WUAs at now and 3 of them deal with TWW (Wadi Shair/Nablus and Safeh al Jizeh/Tubas, East Jabalia City/Gaza). The agricultural cooperative in Marj Iben Amer/Jenin, established in 2015, can be considered as a 4th acting WUA dealing with TWW.
- 5 additional WUAs have started the licensing process but it is still pending; among which 2 WUAs deal with TWW (in Beit Dajan/Nablus and in Al Fakhary/ Khan Younis).
- All WUAs are young (the oldest one, Wadi Shair, was licensed in 2019 and the youngest one, Safeh al Jizeh, in 2023)

Analysis

Regarding accountability:

- The most motivated WUAs are the least supported ones (Jericho, Tayassir). On the contrary the WUAs that have been heavily supported for many years are not the most dynamic (Deir Sharaf, Marj Iben Amer). The intensity of support (in terms of equipment, technical and financial assistance) could be questioned as a limiting factor concerning the empowerment and the accountability of members of WUAs.
- Many farmers in the WUAs are not active and do not irrigate their land with TWW. The conditions regarding membership can be questioned (for instance, should the members of WUAs be the owners of the land or the ones who are cultivating it?).

Regarding governance and administration:

- Most WUAs hold general assemblies but not on a regular basis. The monitoring of general assemblies and the control of elections are done by the Regional Directorates of agriculture who keep records.
- Most WUAs have bylaws as well as administrative and financial systems. Yet these systems are operational and updated only to a certain extent.
- Many WUAs are not in a good financial situation. Some are indebted (like Marj Iben Amer) and in most cases the financial balance does not plan provisions for the depreciation of the irrigation infrastructure and equipment.

Regarding technical issues (especially operation and maintenance):

- The presence of technical staff is limited and depends on external support. WUAs do not have the financial capacity to recruit technical staff on their own. Only Marj Iben Amer and Wadi Shair have had technicians for a while, hired through supporting projects (ANERA and KfW).
- Operation and maintenance: WUAs are able to do basic operation of their systems especially the ones who have received heavy support in terms of equipment, capacity building and technical assistance. Since most of irrigation networks are new, maintenance is not needed but the technical and financial capacity to do proper maintenance is at stake when it will be needed.

Conclusions

- Like most of producers' organizations in Palestine, WUAs are still rather weak organizations. In addition, unlike other types of farmers' organizations, such as agricultural cooperatives, WUA are new in Palestine and all users do not have a full understanding of the mandate of a WUA.
- None of the WUA that were assessed can be considered as well organized, professional and autonomous at this stage. It is very unlikely that at this stage any existing WUA can properly operate and maintain on the long-term the irrigation infrastructure.
- WUAs needs to be monitored and supported at all levels, governance, administrative, financial and operational management.
- The support should be on the long-term, especially regarding operation and maintenance. Most irrigation networks are new and operational, but maintenance will need to be done in the coming years (Nb: the subsurface irrigation network in Marj Iben Amer is totally clogged and needs heavy maintenance immediately).
- The support should be finely tuned in order not to limit ownership and empowerment of WUAs. Some heavy supports, like in Wadi Shair, seem to have been somehow counterproductive.

Recommendations

- WUAs should be built from motivated users and not for project purposes. **In-depth social studies** have to be planned from the beginning of projects and interested **users should be associated to the design at early stage. Interest, accountability and financial contribution should be prerequisites.**
- Support activities toward empowerment and capacity building should rather be designed following a low intensive but long-term approach rather than being highly intensive on a relatively short period of time.

- **Monitoring and evaluation of the performance of WUA** at all levels (governance, administration, operations) should be reinforced and strongly linked with the support activities.
- Set-up a **fine-tuned long-term support program to WUAs and farmers** (to be defined according to the WUA's experience and the profiles of its members on a case-by-case basis).
- Develop **progressive training modules, enabling WUAs to become more professional** in the management of reused treated water distribution networks.

E. SOCIO-ECONOMIC ANALYSIS

Detailed version of the socio-economic analysis can be found in Annex 8

E.1. Methodology and hypothesis

E.1.1 Data used

The socio-economic diagnosis is based exclusively on secondary data, as primary data collection through a household survey was not included in the assessment phase.

The data utilized rely on qualitative data collection conducted during the field mission with service providers and water utilities, as well as various statistical sources from the Palestinian Central Bureau of Statistics (PCBS). When available, data specific to the municipality under the jurisdiction of the service providers or water utilities have been used. In cases where municipal-level data were not available, analyses were conducted at the governorate level.

E.1.2 Assumptions used for projections

The following assumptions have been applied to develop projections:

- **Population growth and water demand:** these projections are based on a linear model:
 - To estimate population growth, the average annual increase was calculated using data from 2017 to 2023, resulting in a mean growth rate.
 - The linear population projection model assumes a steady, arithmetic progression over time. This method was chosen because it requires minimal data and is effective for short- to medium-term projections. As the objective is to develop projections for 2030 and 2035, this model is deemed appropriate.
- **Wastewater projection:**
 - Calculations are based on the projected population, the connection rate to the sewage network, and its planned increase according to service providers or water utilities.
 - The volume of water consumed by the population, as reported by service providers or water utilities, was used.
 - A 80% of water availability for treatment was assumed, following the guidelines outlined in the Wastewater Master Plan.

This methodological approach ensures that projections are grounded in the best available data while considering practical constraints and sector-specific planning parameters.

E.2. Detailed socio-economic analysis

The following table details the socio-economic indicators of the 8 municipalities / water utilities that we included in the scope of the assessment phase: (a) population growth; (b) employment; (c) water demand; (d) WASH access; (e) agricultural sector; and (f) reuse potential.

Indicators	Al Bireh municipality	Baqa ash-Sharqiyya municipality	Hebron municipality	Jenin municipality
Population growth	The population of Al Bireh Municipality (51,730 in 2021) is projected to grow by over 21% by 2035, increasing pressure on already scarce water resources.	The population of Baqa ash-Sharqiyya municipality is 5,486, with a density of about 1,599 people/km ² . It is expected to grow to 6,031 by 2030 and 6,485 by 2035, increasing pressure on water resources. Water scarcity poses a significant challenge to the region's growth and livelihoods.	Hebron Municipality's area has a current population of 238,308, projected to grow by 25% to 298,871 by 2035. This rapid growth will intensify water stress, as scarcity already threatens livelihoods and constrains development.	Jenin Municipality currently has a population of 43,880, projected to grow by 23.8% to 54,325 by 2035. With average households of 5 persons, this rapid growth (+13.9% by 2030) will significantly increase demand for services.
Employment	In Al-Bireh governorate, unemployment is 9.5%, with most workers in construction (27%), services (28.5%), and commerce, hotels, and restaurants (23.7%). Agriculture represents only 3.7% of the workforce. The average daily wage in 2020 was 123.6 NIS, with a poverty rate of 9.7%.	In Tulkarm governorate, unemployment is 11.3%, with most employed individuals working in services (27.9%), commerce and hospitality (24.1%), and construction (22.3%). The average daily wage is 106.3 NIS, and the poverty rate is 15.5%.	The population has a 16.5% unemployment rate, with most employed individuals working in construction (33%), commerce/hotels/restaurants (24.8%), and services (16.3%), while agriculture represents just 5.1%. The average daily wage is 111.1 NIS, with an 11.4% poverty rate based on consumption levels.	The Jenin Governorate has a 13.5% unemployment rate, with employment concentrated in commerce/hotels (25.8%), construction (24.5%), and services (22.9%), while agriculture represents only 10.5%. Workers earn an average of 111.1 NIS monthly, with an 11.4% poverty rate based on consumption levels.
Water demand	Water in Al Bireh is supplied by Jerusalem Water Undertaking, with a consumption of 114.1 liters per capita per day. Demand is projected to rise to 3.23 million m ³ /year by 2030 and 3.51 million m ³ /year by 2035.	The population consumes 108 liters of water per capita daily, totaling 212,676 m ³ /year. Water demand is expected to rise to 237,735 m ³ /year by 2030 and 255,639 m ³ /year by 2035.	Current water consumption in the area is just 50 liters per capita/day—the lowest in our study—barely meeting the UN's minimum recommendation. Demand is projected to rise from 4.34 million m ³ /year (2024) to 5.45 million m ³ /year by 2035, worsening water stress.	Current water consumption stands at 70.4 liters per capita/day, totaling 4.08 million m ³ /year, with projected increases to 4.56 million m ³ /year (2030) and 4.96 million m ³ /year (2035) with a water billing collection rate is low (35%), yet service providers and residents report affordability, with no complaints regarding water and sanitation pricing.

Indicators	Al Bireh municipality	Baqa ash-Sharqiyya municipality	Hebron municipality	Jenin municipality
WASH Access	Al-Bireh's water services are managed by Jerusalem Water Undertaking (JWU), with a 95% sanitation connection rate (16,259 connections) and 89% linked to two overloaded WWTPs treating 6,500 m³/day. Wastewater tariffs are set at 2.2 NIS/m³, with a 54% billing collection rate. Despite room for improvement, prices remain affordable without major complaints. Service providers seek to harmonize water and wastewater pricing structures.	Baqa ash-Sharqiyya has near-full water network coverage (98%), with high sewerage connectivity (89%) but no wastewater treatment – effluent flows directly to wadi. Water pricing follows a tiered structure (2.2–3 NIS/m³), while wastewater fees vary, averaging 10 NIS/month. Service providers aim to harmonize tariffs, and despite a 60% collection rate, costs are deemed affordable with no major complaints. Vulnerable groups receive financial aid for bills via municipal and Red Crescent support.	Water access in Hebron remains critical with only 46% connection to the drinking water network and average consumption of just 50 liters per capita per day, compounded by severe shortages and water supply cycles extending to every 55 days. The sewage network covers 82% of the population (67% of the area) with annual 10% growth. With only 18% of wastewater currently collected for potential reuse, urgent infrastructure upgrades are needed to address both current deficits and future demand. This situation highlights a pressing need for expanded treatment capacity and network coverage to ensure water security for Hebron's growing population.	Water Access: Jenin Municipality has 76% drinking water coverage (10,000 connections) with 70.4 L/capita/day consumption, but faces summer shortages and worsened supply since October 2023, forcing reliance on wells/trucked water. Sewage Infrastructure: While 76% have water access, only 45% (6,000 connections) are linked to sewage networks, with half directed to Jenin's WWTP (current treatment: 4,000 m³/day vs 10,000 m³/day capacity). Growing Demand: Sewage connections are increasing steadily, highlighting the need for expanded wastewater treatment capacity to match both current and future needs. Current wastewater collection is 4,000 m³/day, with 45% sewage network coverage (6,000 connections), expanding at 10% annually. Reuse potential is calculated assuming 80% of water consumption enters sewers, with 80% treatable and 45% population connected.

Indicators	Al Bireh municipality	Baqa ash-Sharqiyya municipality	Hebron municipality	Jenin municipality
Agricultural sector	Under the respective governorate of the service providers, there are 7,745 dunum of field crops in the Al-Bireh governorate area. Among those field crops dunum 100% are rainfed and 0% are irrigated	Baqa ash-Sharqiyya has 6,040 dunums of field crops, mostly rainfed (84.9%), with only 15.1% irrigated. Despite limited irrigation, yields are significantly higher (0.71 ton per dunum) compared to rainfed land (0.17 ton per dunum).	The Hebron Governorate has 62,268 dunums of field crops, all entirely rainfed (100%) with typical yields around 0.15 ton per dunum. While this rainfed dominance may initially seem to question the relevance of implementing water reuse in the area, this view should be nuanced. The low yields observed suggest that access to additional water resources, such as treated wastewater, could significantly improve productivity. According to the social study done in Hebron, farmers are willing to use TWW during drought seasons where the decreasing rainfalls has forced them to abandon profitable crops.	Under the respective governorate of the service providers, there are 58,997 dunum of field crops cultivated. Among those field crops dunum 98.8% are rainfed and 1.2% are irrigated. While there is only a few areas that are irrigated, the yield of rainfed land is about 0.27 ton per dunum while the yield of irrigated land is about 1.84 ton per dunum.

Indicators	Al Bireh municipality	Baqa ash-Sharqiyya municipality	Hebron municipality	Jenin municipality
REUSE Potential	Currently, no wastewater reuse projects exist - treated water is discharged into wadis. A former UV treatment and irrigation system for greenhouses has been non-operational for 5 years. While PWA plans large-scale reuse in Jericho, Al-Bireh Municipality notes implementation challenges: lack of agricultural land necessitates pilot projects, training, awareness campaigns, and stronger non-agricultural reuse regulations.	Currently, 89% of housing in Baqa ash-Sharqiyya is connected to the sewage network, with connections growing by 35% annually. Based on water consumption estimates, around 585 m ³ /day of wastewater is generated – a figure expected to rise with population growth, offering reuse potential. However, no treated wastewater is currently reused due to low water costs and high freshwater availability. The municipality highlights the need for a wastewater treatment plant (WWTP), with a proposed project (targeting 2032) to treat 1,464 m ³ /day from Baqa's system. This WWTP would address the lack of treatment infrastructure, as all wastewater is currently discharged untreated into the wadi.	Even if there has been no previous experience in reusing treated wastewater at the plant. Regarding the reuse of treated water, the WWTP Department initially proposed pumping treated wastewater to the agricultural areas of Qalqas and Khallet Al-Dar. However, the Water Authority suggested reusing the water in the lower areas instead.	A 2015-2019 ANERA-monitored reuse project demonstrated success, with excellent tertiary-treated wastewater (via gravel filters) sold to farmers at 0.7 NIS/m ³ under Water User Association (WUA) management. Current Status: Despite past success, treated wastewater is now discharged unused, with demand plummeting to 1,000 m ³ /year (Jenin Municipality). Key Gap: Farmer/domestic irrigation demand must be reassessed before relaunching REUSE, as low uptake suggests misaligned incentives or awareness.

Indicators	Jenin West WU	Nablus municipality	Ramallah municipality	Tubas municipality
Population growth	The North West Jenin Water Utility area has 67,512 inhabitants, projected to grow by 20.7% by 2035, increasing pressure on water resources. Average household size is 5 persons, with water scarcity already threatening livelihoods.	The Nablus Municipality area currently has a population of 210,023. Projections indicate growth to 255,407 by 2035, a 19.4% increase from 2024, with average households of 5 persons	Ramallah has 44,762 residents projected to grow 21.3% by 2035, straining already scarce water resources with 5-person households dominating.	Tubas Governorate has 55,648 residents, projected to grow 21.8% by 2035, exacerbating water stress with current consumption at just 74L/capita/day - far below recommended levels.
Employment	Jenin's unemployment rate is 13.5%, with employment concentrated in commerce/hotels (25.8%), construction (24.5%), and services (22.9%). Agriculture employs 10.5%—higher than regional averages—with workers earning 111.1 NIS/month and an 11.4% poverty rate.	Nablus Governorate has an unemployment rate of 14.8%, with employment concentrated in services (24.4%), commerce/hotels (22.8%), and construction (20.4%). Agriculture represents just 5.8% of the workforce. Workers earn an average of 108.4 NIS/day, while poverty affects 16.6% of residents - one of the highest rates in the study.	Unemployment is 9.5%, with jobs concentrated in services (28.5%), construction (27%), and commerce (23.7%). Average daily wages are 123.6 NIS, with 9.7% poverty.	The area has 11.1% unemployment but the highest agricultural employment (28.5%) in the study, with average daily wages of 112.2 NIS and 15.4% poverty rate.
Water demand	Current consumption is 450 L/household/day (~90 L/capita/day), expected to rise to 2.56 million m³/year by 2035. Despite 89% water network coverage, future demand will strain resources.	Current water consumption stands at just 76 liters per capita/day, below regional averages, with total demand projected to rise from 6.56 million m³/year (2030) to 7.08 million m³/year (2035). These conservative consumption figures reflect the unreliable supply situation, where residents receive water only 4-5 days weekly - the least reliable service in the study area.	Residents consume 150L/day per capita (supplied by Jerusalem Water Undertaking), with demand rising to 2.97M m³/year by 2035.	Projected demand will rise from 1.65 million m³/year (2030) to 1.79 million m³/year (2035), threatening already scarce resources critical for the agriculture-dependent population

Indicators	Jenin West WU	Nablus municipality	Ramallah municipality	Tubas municipality
WASH Access	Water: 89% connection rate, with no shortages in 4 years. Sewage: 74% coverage in Anin (only 4% overall), with a 600 m³/year WWTP at 61% capacity. Unconnected households use cesspits, often dumped illegally, posing health risks. Anin's WWTP treats 600 m³/year, but 80% of water consumed could enter sewers. Only 4% is currently collected for potential reuse, though connections grow at 10% annually	While Nablus boasts 100% water network coverage, service is intermittent (4-5 days/week). The sewage network covers 98% of households (14,893 connections), with 65% of wastewater treated at the West WWTP (11,000 m³/day of 14,000 m³/day capacity). However, 45% still flows untreated into valleys. Connection rates grow at 5% annually, highlighting the urgent need for expanded treatment capacity to match both current and future needs. With 98% sewer connectivity and 80% of water consumption entering the network, Nablus has significant reuse potential. Currently, only 300 m³/day (5%) is reused agriculturally, sold at 0.7 NIS/m³ to farmers. The municipality plans to expand reuse to 1,700 dunums of fruit trees but faces regulatory hurdles regarding sludge standards (requiring 90% dry matter versus the proposed 50%). Negotiations with authorities continue to unlock this resource.	Sewage Network: Ramallah has 97% sewer coverage (4,850/5,000 buildings), with wastewater treated at three WWTPs (total capacity: 7,000 m³/day using MBR technology). O&M costs reach 3.5M NIS/year, while demand grows slowly (0.4% annually, with 20–30 new connections/year). Tariff System: Wastewater fees are 2.5 NIS/m²/year (based on dwelling area, not consumption). No tailored tariffs exist for vulnerable groups, though Qaddura refugee camp receives municipal maintenance despite low bill collection rates. Affordability & Demand: The 50% collection rate reflects systemic gaps, but prices face no public resistance due to cost savings versus septic tanks. Providers seek tariff harmonization as network expansion continues.	Tubas Municipality achieves 100% drinking water coverage, supplying an average of 74 liters per household daily with reliable service, interrupted only by political or security-related infrastructure damage. No water shortages have been reported in recent years. Tubas has a 15.9% sewage connection rate, with only 22% of wastewater treated at the Tayseer WWTP (current load: 500 m³/day, expandable to 4,400 m³/day by 2032). Demand for connections grows at 2% annually, but expansion is hindered by funding shortages and topographic constraints, particularly in southern Tubas, where costly pumping systems or a new WWTP are needed.

Indicators	Jenin West WU	Nablus municipality	Ramallah municipality	Tubas municipality
Agricultural sector	Under Jenin Governorate, there are 58,997 dunum of field crops cultivated. Among those field crops dunum 98.8% are rainfed and 1.2% are irrigated. While there is only a few areas that are irrigated, the yield of rainfed land is about 0.27 ton per dunum while the yield of irrigated land is about 1.84 ton per dunum.	Nablus Governorate has 29,334 dunums of field crops, with 98.8% rainfed (1,51 tons per dunum yield) and only 1.2% irrigated (0.12 tons per dunum). This higher rainfed productivity suggests either data anomalies or unique agricultural conditions warranting further investigation.	Ramallah Governorate has 7,745 dunums of field crops, all exclusively rainfed (100%), with no irrigated areas (0%). Farmers rely entirely on rainwater for agricultural production, raising questions about potential needs for supplemental water resources.	There are 31,740 dunums of field crops in the Tubas governorate. Among those field crops 99.6% are rainfed and 0.4% are irrigated. While there is only a few areas that are irrigated, the yield of rainfed land is about 1.42 tons per dunum while the yield of irrigated land is about 0.09 ton per dunum.
REUSE Potential	The Jenin Water Utility has no prior REUSE experience, with the Anin WWTP (originally managed by PARC, now under JSC) lacking reuse projects despite farmer interest in the dry, fertile region. A feasibility study (due June 2025) aims to establish REUSE systems, addressing past funding gaps and evaluating socio-economic factors like farmer acceptance and willingness to pay. Awareness campaigns are critical to drive adoption, as treated wastewater could alleviate agricultural water shortages in this irrigation-scarce area.	Nablus currently reuses 300 m ³ /day of treated wastewater (<5% of total), primarily for agriculture through Water User Associations at 0.7 NIS/m ³ , with plans to expand to 1,700 dunums of fruit tree irrigation. A major barrier is restrictive sludge standards requiring 90% dry matter for agricultural use, prompting negotiations with authorities to lower this to 50% to enable broader reuse. Despite ongoing projects (more than 200 dunums irrigated), regulatory hurdles and low adoption rates highlight the need for policy adjustments and farmer engagement to scale reuse potential.	Ramallah has demonstrated proactive efforts in TWW reuse, particularly through the Al-Tireh WWTP project (2018), funded by ANERA (1 M USD) and the municipality (1 M NIS). This initiative established a 1,000 m ³ /day reuse system, including a booster station, storage tanks, and a 15 km irrigation network supplying treated water to 35 beneficiaries, primarily for agricultural and municipal landscaping (e.g., Al-Tireh Park). Despite the absence of active water user associations, the municipality has successfully integrated TWW into municipal operations, such as road construction (in partnership with Chinese-funded projects) and sewer jet-flushing, though these uses remain unregulated.	There has already been a reuse project. 100% of TWW (500 m ³ /day) was used during summer by the WUA Safah Giza. New agricultural initiative: a new WUA (2 farmers) plans to irrigate vegetables with freshwater, raising concerns about proximity to untreated TWW pipelines, which pose health risks due to inadequate WWTP design. Proposed alternatives: Tubas WU explores non-agricultural reuse to generate income and provide affordable water, but regulatory framework is lacking. Need for Assessment: a comprehensive study is required to evaluate potential reuse applications, demand, and regulatory adaptations.

E.3. Synthetic analysis

Population growth and projected population: the population of various municipalities in Palestine (Al-Bireh, Baqa ash-Sharqiyya, Hebron, Jenin, Tubas, Nablus, and Ramallah) are projected to grow significantly by 2030 and 2035, increasing pressure on water resources.

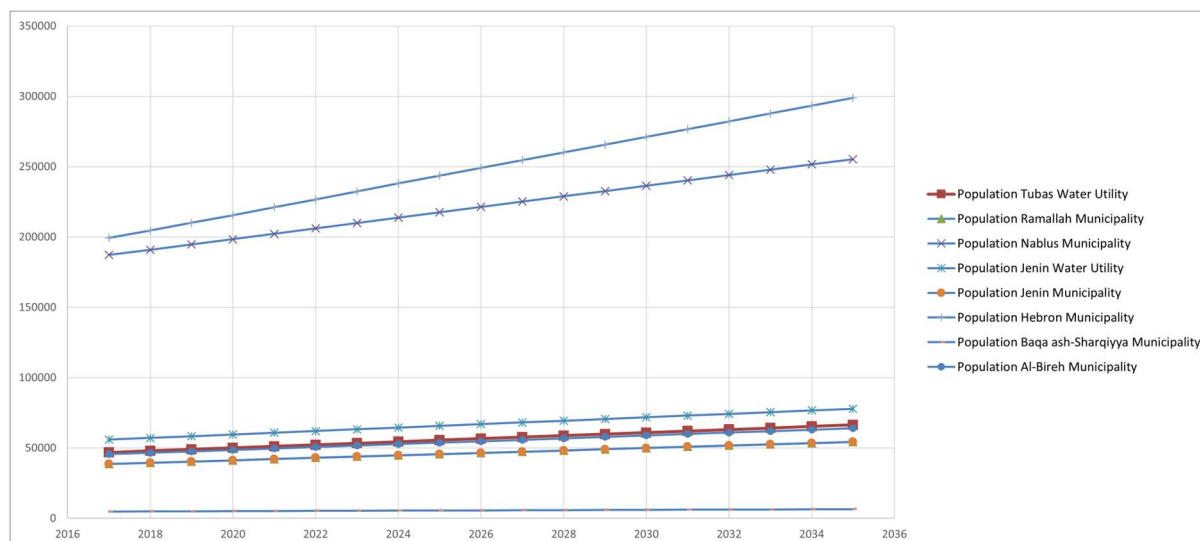


Figure 8: Projected population in the municipalities and water utilities analyzed

Employment statistics: each municipality has varying unemployment rates and employment distribution across sectors. Al-Bireh has a 9.5% unemployment rate with 27% employed in construction, while Hebron has a higher rate of 16.5% and a significant workforce in the construction and commerce sectors.

Water demand and consumption: water consumption varies by municipality, with average daily usage reflecting both the population's needs and available resources. For example, Hebron has an alarming low water consumption of 50 liters per capita per day, substantially below the UN recommendation of 150 liters.

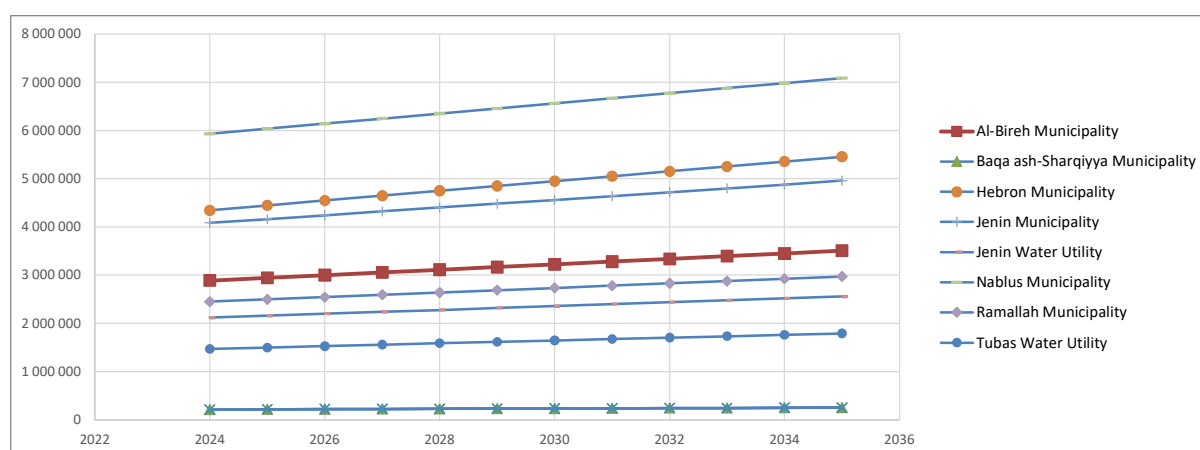


Figure 9: Projected water demand in the municipalities and water utilities analyzed (m³/year)

Water supply and sanitation access: the connection rates to sanitation and water supply differ considerably. For example, Al-Bireh has 54% collection rate for sanitation bills, while Baqa ash-Sharqiyya has nearly 100% connection to the drinking water network, indicating varying levels of service availability.

Wastewater management: many municipalities are facing challenges with wastewater management, with connection rates to the sewage network often low (e.g., only 18% in Hebron). Existing plants are often at

or near capacity, indicating a significant need for additional infrastructure, while the potential for wastewater is going to increase in the next years:

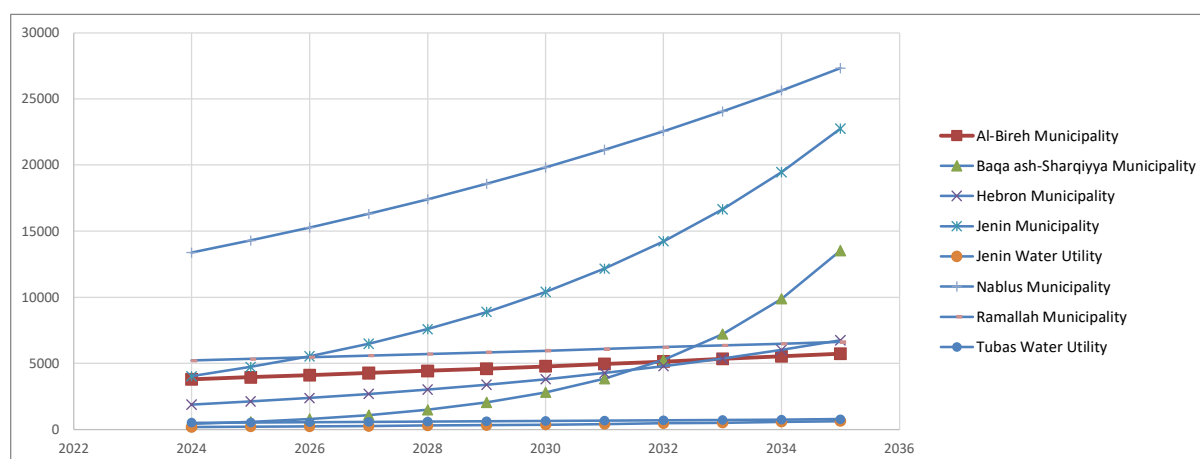


Figure 10: Projected wastewater production in the municipalities and WUs analyzed (m³/year)

Water prices and tariffs: water pricing is set by local authorities and varies between municipalities, with some indicating affordability while others align prices with consumption. For example, prices can vary from 1.5 NIS/m³ for wastewater in Jenin to 10 NIS/m³ for domestic water in Baqa ash-Sharqiyya.

Agricultural sector reliance on water: agriculture is a significant consumer of water, accounting for 70% of water use in Palestine, but irrigation coverage remains low, with the majority of land receiving only rainwater.

Potential for reuse of TWW: many municipalities have expressed interest in reusing treated wastewater for agriculture and other purposes, but existing infrastructure and regulatory frameworks often limit this potential. For instance, there are no re-use projects currently operating in Baqa ash Sharquia or Jenin.

Socio-economic challenges: high poverty rates exist across municipalities, with Baqa ash-Sharqiyya experiencing 15.5% poverty and Tubas 15.4%. These socio-economic challenges are compounded by the limited effectiveness of existing water and sanitation services.

Need for comprehensive analysis and community engagement: a comprehensive baseline analysis is crucial to address the specific needs and challenges of communities regarding wastewater reuse to ensure sustainability and scaling of such initiatives in the future.

E.4. Conclusions

The socio-economic assessment reveals that reuse projects are still in an early, pilot phase, heavily reliant on international funding for their operation. While some initiatives have been implemented, their long-term sustainability remains uncertain due to financial, technical, and institutional challenges. To ensure the viability and scalability of these projects, **it is paramount to conduct a comprehensive baseline analysis**. This analysis should focus on understanding the specific needs and constraints of the beneficiaries of treated reused wastewater, ensuring that future developments align with local demand, economic feasibility, and environmental sustainability. Strengthening governance framework, securing diversified funding sources, and fostering community engagement will also be key to transitioning these projects from pilot initiatives to long-term, self-sustaining solutions.

F. FINANCIAL ANALYSIS

F.1. Analysis of the current tariff framework for water, wastewater and reuse

F.1.1 Regulatory framework

The present analysis is based on this legal and regulatory framework, particularly the instructions issued under the authority of Law No. 4 of 2021, which defines the tariff structure, cost components, and implementation mechanisms applicable to all licensed water and wastewater service providers in Palestine.

The unified framework for water and wastewater tariff in Palestine is grounded in a series of legal and institutional reforms aimed at enhancing service sustainability and regulatory coherence. This framework builds on the provisions of the 2014 Water Law and its subsequent amendments, particularly Article 71, as well as Legislative Decree No. 14 of 2014 and its updates. These foundations have culminated in the adoption of the Unified Water and Wastewater Tariff Law No. 4 of 2021, which consolidates previous regulations and provides a structured basis for tariff-setting across the sector.

In accordance with the legal authority granted and in the public interest, the following instructions have been issued to ensure unified implementation by all licensed service providers across Palestine.

a. General situation of water tariff

The unified regulatory framework for water supply and sanitation services in Palestine provides a clear, structured, and cost-recovery-based framework for water and wastewater services in Palestine. It promotes:

- Full recovery of operational and capital costs.
- Progressive water pricing.
- A wastewater billing mechanism linked to water consumption.

However, it **does not address the reuse of treated wastewater, leaving a regulatory gap in that domain.**

The regulations apply to all service providers licensed by the Palestinian Water Authority (PWA), which implies a national scope limited to areas under PWA's jurisdiction. Article 2 states:

“The provisions of these regulations apply to:

- Service providers.
- Entities licensed to provide water and sanitation services.
- Subscribers using the services for domestic, commercial, industrial, or tourism purposes.”

This includes:

- The National Water Company
- Regional utilities
- Local authorities, joint councils, and associations
- All categories of users (households, businesses, industry, tourism)

The regulatory institutions responsible for the application of this text are the Palestinian Water Authority (PWA) – technical and regulatory authority – and the Water Sector Regulatory Council (WSRC) – responsible for tariff approval and oversight.

While the document does not explicitly mention the West Bank or Gaza individually, it clearly applies to areas under Palestinian jurisdiction. East Jerusalem and Israeli settlements are therefore not covered.

b. Principles to follow for tariffication of water and sanitation services

The approach proposed in the unified regulatory framework (in accordance with Law No. 4 of 2021) is based on the principle of full cost recovery, structured in three phases:

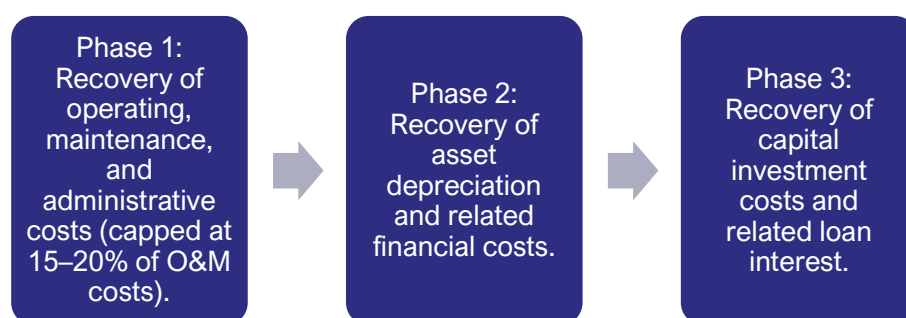


Figure 11: Principles to follow for tariffication of water and sanitation services

The system also includes progressive domestic water tariffs, with consumption blocks and associated price coefficients, aiming to encourage water conservation while promoting social equity.

c. Link between water and sanitation tariffs

Sanitation tariff derives from water consumption:

- 80% of consumed water is considered to be discharged as wastewater unless the consumer can prove otherwise.
- This discharge coefficient (80%) is used to calculate the billable wastewater volume.
- Sanitation charges are therefore based on an indirect formula derived from water consumption.

This tight link between water and sanitation billing may not accurately reflect variations in actual wastewater production, especially in non-domestic use.

It should be noted that in areas where water services are managed by Israeli authorities, specific and separate tariff structures are applied for sanitation (see section on “Price benchmarking” below).

There is no explicit reference to the reuse of treated wastewater or any specific tariff mechanism related to this practice in the current regulatory framework:

- Terms such as “treated wastewater” or “reuse” are not mentioned.
- No pricing mechanism is outlined for the sale, agricultural use, or valorization of treated effluent.
- The current framework appears designed exclusively for collection and treatment, without addressing the potential of reuse as an economic resource.

F.1.2 Benchmarking of international reuse prices

Wastewater reuse is a strategy for addressing water scarcity, particularly in arid regions such as the Middle East. The costs associated with wastewater reuse can vary significantly based on factors like treatment technology, scale of operations, intended use, and local economic conditions. Below is a concise

benchmark of reuse prices in the Palestinian Territories, Israel, Jordan, Lebanon, Spain and France, followed by a comparative table summarizing the findings.

- In the **Palestinian Territories**, comprehensive data on wastewater reuse prices are limited and difficult to access. Challenges such as political constraints and infrastructural limitations have hindered the development of wastewater treatment and reuse facilities.
- **Israel** is a global leader in reuse, recycling approx. 90% of its wastewater, primarily for agricultural purposes. The cost of reclaimed water for agriculture is approximately 0.30 EUR/m³. It corresponds to the price charged to farmers. This relatively low cost is achieved through advanced treatment technologies and economies of scale. This price does not cover the full cost of wastewater treatment: the majority of the primary and secondary treatment is financed by domestic users through their water bills. Farmers mainly pay for the additional costs related to advanced (tertiary) treatment and distribution. This low price is made possible by the use of advanced technologies (such as Soil Aquifer Treatment, SBP capsules, and membrane bioreactors) and by spreading costs over large volumes (economies of scale). These innovations, combined with centralized management and cost-sharing between domestic and agricultural users, enable Israel to provide high-quality recycled water at a very competitive price for agriculture. Significant public investment in infrastructure and ongoing government support also help keep end-user prices low for farmers.¹⁴
- **Jordan** reuses nearly all wastewater collected by public sewer systems after treatment and mixing with fresh water stored in dams and reservoirs. Treatment cost for agricultural use is approximately 0.35 EUR/m³. Jordan's proactive policies in water reuse have been instrumental in managing its limited water resources. In 2016, the Jordanian government established a pricing structure for the sale of treated wastewater: 0.04 JOD/m³ for the water itself, plus 0.01 JOD/m³ to contribute to the electrical energy costs associated with pumping. This results in a total of 0.05 JOD/m³, which is approximately 0.052 EUR/m³ at current exchange rates. As for Israel, the full cost of wastewater treatment in Jordan is much higher; estimated at around 0.35 EUR/m³ for agricultural use. The low price paid by farmers does not cover the total treatment cost. Instead, water users (households and businesses) pay for most of the wastewater collection and treatment through their water and sewerage bills (Source: World Bank (2021), "Water Sector Overview – Jordan"). The price charged to farmers is also heavily subsidized by the government to support agriculture and water reuse.

However, this price is highly subsidized. According to the National Water Strategy 2023-2040, end-users (e.g. domestic households and businesses who are connected to the public water supply and sewerage systems and regularly pay water and sanitation bills) only pay about one-third of the real cost of water and sanitation services, with the subsidy estimated at 1.4 JOD per cubic meter (approx. 1.8 EUR/m³).
- **Lebanon** faces challenges in wastewater management, with limited functioning infrastructure for treatment and reuse. Consequently, there is insufficient data on the costs associated with wastewater reuse in the country.
- **Spain**: treated water is used extensively for agriculture, with costs ranging from 0.20 to 0.50 EUR/m³, depending on the treatment level and distribution expenses. These costs reflect the investment in advanced treatment technologies and the scale of reuse applications.
- In **France**, the reuse of treated wastewater is still limited, accounting for less than 1% of water usage. The cost of reused water for agricultural irrigation is estimated between 0.10 and 0.30 EUR/m³, depending on the treatment level and infrastructure.

¹⁴ [EPA: From Water Stressed to Water Secure – Lessons from Israel's Water Reuse Approach \(PDF\)](#) and [IGES: Water Reuse in Israel \(PDF\)](#)

The following table provides a comparative overview of wastewater reuse prices in the specified countries:

Country	Average selling price of reused water (EUR/m ³)	Purchasing Power Parity (PPP) Index (approx.)	PPP Selling Price (EUR/m ³)	Observations
Palestinian territories	0.12	0.35	0.34	Despite the low nominal price, the PPP-adjusted price is relatively high, reflecting limited infrastructure and political challenges that increase the real cost burden compared to other countries
Israel	0.3	1.10	0.27	High nominal price but lower PPP-adjusted price due to stronger purchasing power; extensive reuse (90% of WW in agriculture)
Jordan	0.07	0.4	0.18	Well developed with a national policy. Heavily subsidized (average treatment cost is 0.35 EUR/m ³). Low nominal price combined with moderate PPP adjustment reflects a balance between cost recovery and affordability, supported by strategic national policies and investments.
Lebanon	N/A	0.35	N/A	Limited infrastructure for wastewater treatment and reuse
Spain	0.35	1	0.35	Spain has one of the most advanced water reuse infrastructures in Europe. The nominal price is among the highest in the Mediterranean, reflecting advanced treatment technologies and cost recovery. The PPP factor is close to 1 so the PPP selling price is similar or slightly higher than nominal.
France	0.22	1	0.22	France currently has very low reuse rates (<1%), with recent regulatory changes aiming to increase reuse to 10% by 2030. The nominal price is moderate, but the PPP index above 1 indicates higher purchasing power, so the adjusted PPP selling price is slightly lower than nominal.

Table 1: Comparative overview of wastewater reuse prices in selected countries

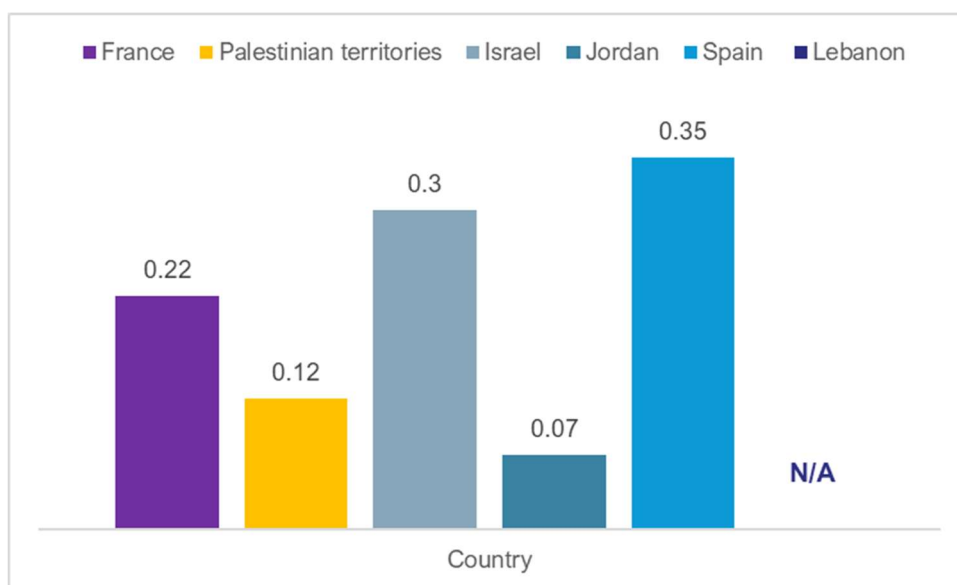


Figure 12: Average selling price of reused water (EUR/m³)

F.1.3 Prices of selected providers in the Palestinian Territories

The analysis focuses on 8 service providers for which benchmarked tariff data has been collected during assessment phase. It examines their drinking water and sanitation pricing structures.

A table presenting pricing details is presented in Annex 9.

a. Water tariff

Among the selected providers, water tariffs vary significantly:

- **Nablus municipality:** up to 9.15 NIS/m³
- **Jenin municipality & Jenin Water Utility:** 8 NIS/ m³
- **Tubas Water Utility:** 6.50 NIS/ m³
- **Hebron municipality:** 6.11 NIS/ m³

These utilities likely operate mainly in urban areas with a stronger focus on cost recovery. Their pricing reflects both operational expenses and capital investment needs.

- **Al Bireh and Ramallah municipalities** are listed in the dataset, but their **drinking water services are managed by the Jerusalem Water Utility (JWU)**. As such, they purchase bulk water and distribute it locally, but the pricing structure is governed by JWU, not set independently by the municipalities.

b. Existence of Wastewater Treatment Plant

Service provider	Existence of WWTP	Reuse?
Jenin Water Utility	Yes (only Anin)	Yes
Baqa Al Sharquiya municipality	No	No
Tubas Water Utility	Yes	Yes
Ramallah municipality	Yes	Yes
Jenin municipality	Yes	Yes
Hebron municipality	No	No

Service provider	Existence of WWTP	Reuse?
Al Bireh municipality	Yes	Yes
Nablus municipality	Yes	Yes

Table 21: Existence of WWTP(s) in 8 municipalities or WUs covered by the assessment phase

c. Sanitation tariff

There is notable diversity in how sanitation services are charged to users:

- **Nablus municipality** applies a flat volumetric fee: **0.8 NIS/m³**.
- **Jenin municipality and Jenin WU** apply a relatively higher rate: **1.5 NIS/m³**.
- **Tubas Water Utility** uses a hybrid model: a **fixed monthly fee of 5 NIS for maintenance** plus **1 NIS/m³**, combining both operational and capital recovery components.
- **Hebron municipality** applies a mixed formula: **0.5 NIS/m³ plus 3 NIS/month**, allowing for partial recovery of fixed costs.

These models reflect varying strategies for balancing affordability with cost recovery, and they suggest a gradual sectoral shift toward more structured sanitation financing.

Although **Al Bireh** and **Ramallah** municipalities do not directly manage their water supply tariffs, they remain **responsible for sanitation services**:

- **Al Bireh** applies a sanitation charge of **2.2 NIS/m³**, which is relatively high compared to other municipalities.
- **Ramallah** applies the same rate (**2.2 NIS/m³**), indicating harmonized practices under JWU's umbrella or coordinated local policies.

This pricing is exclusively volumetric and suggests a clear cost-recovery intent. It is also one of the **highest sanitation tariffs** among all providers in the dataset, reflecting either more advanced infrastructure, higher O&M costs, or financial autonomy in the sanitation domain.

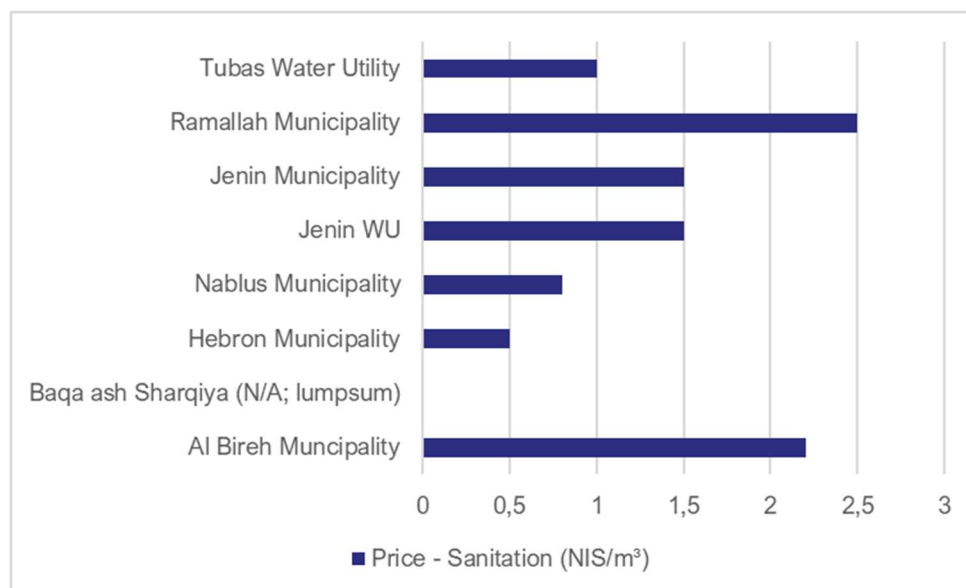


Figure 13: Sanitation tariff - Comparison of selected providers

This chart highlights the lack of harmonization in sanitation pricing and shows how some municipalities emphasize cost recovery through higher or hybrid tariffs, while others apply lower, more symbolic fees.

- Al Bireh and Ramallah clearly apply the highest sanitation tariff (2.2 NIS/m³), even though they do not manage drinking water pricing directly.
- Other providers like Jenin Municipality, Jenin WU, and Nablus apply moderate sanitation rates (between 0.8 and 1.5 NIS/m³).
- Hebron and Tubas use mixed models that incorporate both a variable and fixed fee, resulting in less straightforward comparison but typically lower per-cubic-meter equivalents.

To summarize, **Nablus and Jenin stand out as the most expensive providers in terms of water tariffs, while Al Bireh and Ramallah, though not managing water directly, apply among the highest sanitation charges.**

Sanitation pricing models vary from flat volumetric charges to mixed approaches, reflecting differing strategies in cost structure and service sustainability.

Utilities with higher water tariffs generally also apply more structured sanitation charges, supporting a more sustainable financial model. This coherence between water and sanitation pricing suggests a more mature approach to utility management and a better internal financial governance capable of implementing structured sanitation charges that reflect cost components.

d. Reuse tariffs

Among the selected providers, the volume of water reused is globally low, between 2.74 (Jenin) and 1,000 m³ (Ramallah) per day. The Treated Wastewater (TWW) is used for irrigation through Water Users Associations and inside Wastewater Treatment Plant (WWTP).

Most providers charge under 1 NIS/m³ for REUSE (0.25 EUR/m³), ensuring affordability but potentially lacking financial sustainability because the selling price is half the provider's cost.

For the 8 selected service providers, pricing methods vary:

- Per cubic meter (Nablus, Jenin, Tubas).
- Flat rates based on land area (Ramallah).

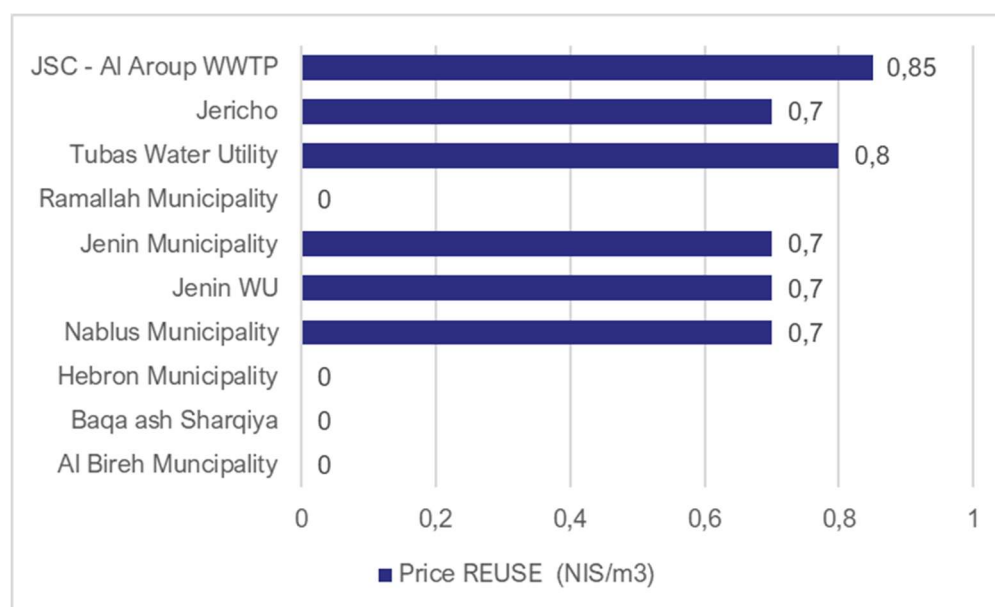


Figure 14: Reuse tariffs comparison chart

Note 1: the tariff for JSC – Al Aroup WWTP is an average. Prices vary from 0.7 to 1 NIS/m³

Note 2: for Ramallah municipality tariff depends on the size of the irrigated plot, not on consumed cubic meters of water. See corresponding Annex for details.

This chart highlights the absence of structured reuse pricing for some municipalities while others apply low, uniform rates. Most providers applying a reuse tariff charge between 0.7 – 0.8 NIS/m³.

The JSC - Al Aroup WWTP shows the highest average price at 0.85 NIS/m³, though it is important to note that this is a mean value, with actual tariffs ranging between 0.70 and 1.00 NIS/m³. Tubas Water Utility follows closely with a tariff of 0.80 NIS/m³, while Jericho, Jenin, Jenin WU, and Nablus apply a standard rate of 0.70 NIS/m³.

In contrast, Ramallah, Hebron and Al-Bireh municipalities offer reuse water free of charge. These providers seem interested in reuse expansion but have not yet structured a formal pricing model. Al-Bireh Municipality states that reuse is "free" and limited to the WWTP operations.

Expansion potential exists, as some municipalities suggest reuse could be sold for municipal applications other than only agriculture, for example street cleaning or road construction. Nevertheless, without pricing and a cost-reflective strategy, reuse will remain an operational cost rather than a revenue opportunity. This analysis indicates that defining a consistent and financially viable reuse pricing model remains a key challenge for most of observed SPs.

- **Focus on the Jericho case study**

In Jericho, the introduction of the reuse followed a gradual and strategic pricing approach. Initially, treated wastewater was provided free of charge during the first year of operation. This offer aimed to encourage user adoption, build trust among farmers, and demonstrate the quality and reliability of the service.

In the second year, a nominal fee of 0.50 NIS/m³ was introduced, covering only the basic operation and maintenance costs – excluding electricity. To manage collection and ensure accountability, a prepaid metering system was implemented, where users pumped water using their own equipment.

Since 2024, the tariff has been adjusted to 0.70 NIS/m³, which now includes electricity costs related to pumping. The tariff is paid in real time by the users.

Period	Tariff (NIS/m ³)	Remarks
1st year	0.00	Water distributed for free to encourage usage
2nd year	0.50	Tariff without electricity, prepayment required
Since 2024	0.70	Includes electricity, payment based on real consumption

Table 2: Jericho's gradual pricing approach

Although modest, this progressive pricing model reflects an effort to move towards partial cost recovery without overburdening users, especially in the early stages of service delivery. Among the key economic highlights of this service provider, we can mention:

Strengths	Weaknesses
• Phased pricing strategy: from free access to gradually increasing tariffs which result on low entry barrier for acceptance and demand from customers • Prepaid metering system: ensures direct payment and limits financial risk for the SP • Direct municipal management: avoids institutional overhead and complexity linked to Water Users Association (WUA) • Targeted beneficiary base: 9 farmers with easy access to the treatment plant • Cost-awareness: Progressive inclusion of electricity costs fosters user responsibility and transparency. This financial sustainability outlook enabled to move gradually toward partial cost recovery with minimal resistance of users	• Limited cost recovery: The current tariff does not cover personnel, full O&M, or capital depreciation. • Municipal dependency: Heavy reliance on local government resources for long-term viability. • No reinvestment mechanism: Lack of earmarked funds for maintenance or expansion. First wave of investments made by JICA. • Narrow user base: With only 9 users, economies of scale are limited and unit costs remain high.

To summarize, Jericho's model provides a pragmatic approach to reuse service tariffing. However, its long-term sustainability remains uncertain, as key operational costs – such as plant staff and maintenance costs – are currently covered by the municipal budget. This calls for the design of a robust public charge or levy mechanism that ensures sufficient and predictable financial resources over time. In parallel, further refinements are needed to broaden the user base, introduce progressive cost-sharing schemes, and institutionalize reinvestment and accountability that support financial resilience and social acceptance.

F.2. Analysis of the robustness of existing financial models for Service Providers

While the SPs demonstrated a cooperative approach in sharing financial information, several key data points remain missing or incomplete, limiting the scope of the analysis. For some providers – notably Jenin and Hebron – it was not possible to obtain reliable figures about revenue and/or cost components.

As a result, a comprehensive financial assessment could not be conducted for all operators; we were able to analyze the financial data of **five** service providers (SPs). **This highlights the need to strengthen financial reporting systems and ensure consistent data availability** across all SPs to enable accurate benchmarking, identify funding gaps, and support evidence-based decision-making for REUSE service sustainability.

F.2.1 Scale of coverage

The comparison between the number of sanitation subscribers and the number of households provides an insight into the potential for increased service penetration.

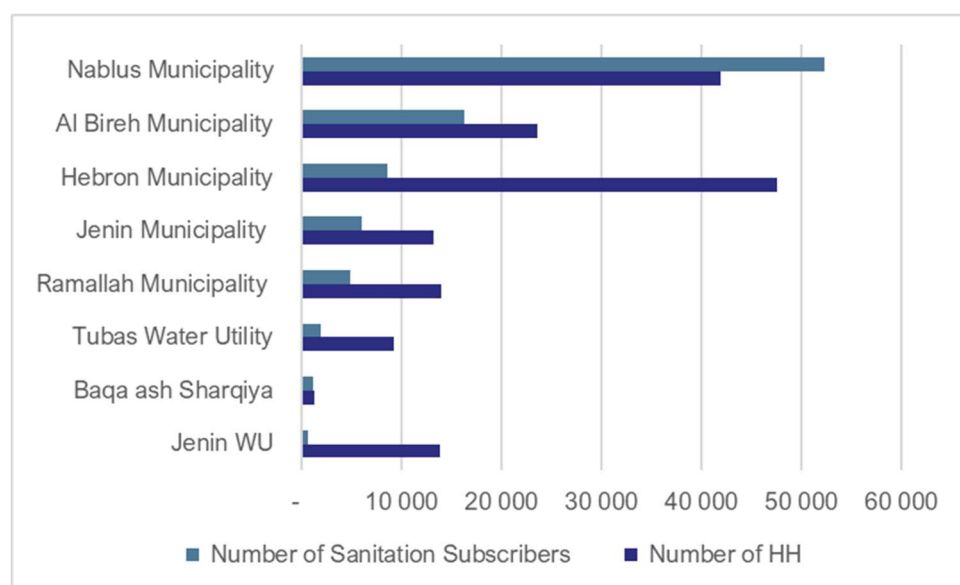


Figure 15: Number of sanitation subscribers vs number of households (HH)

For most operators, the number of subscribers is significantly lower than the number of households, as expected – reflecting partial service coverage or shared connections. Nablus and Al Bireh have the largest operational bases, which may enable greater economies of scale – but also imply higher service expectations and infrastructure demands. Nablus Municipality (2023) displays an anomalous situation: the number of sanitation subscribers appears to exceed the total number of households, which is statistically improbable. This suggests either a data entry issue or a misinterpretation of what constitutes a "subscriber".

In most localities, a clear gap remains between the two figures, indicating that **a significant share of households is either not connected to the sanitation network or not formally registered as subscribers**. In Hebron, Jenin, and Ramallah, the number of households notably exceeds the number of subscribers, suggesting **room for network expansion or the need to formalize existing but unregistered connections**.

F.2.2 Volume of wastewater reuse (m³/day)

This metric measures the extent to which operators are engaged in treated wastewater reuse.

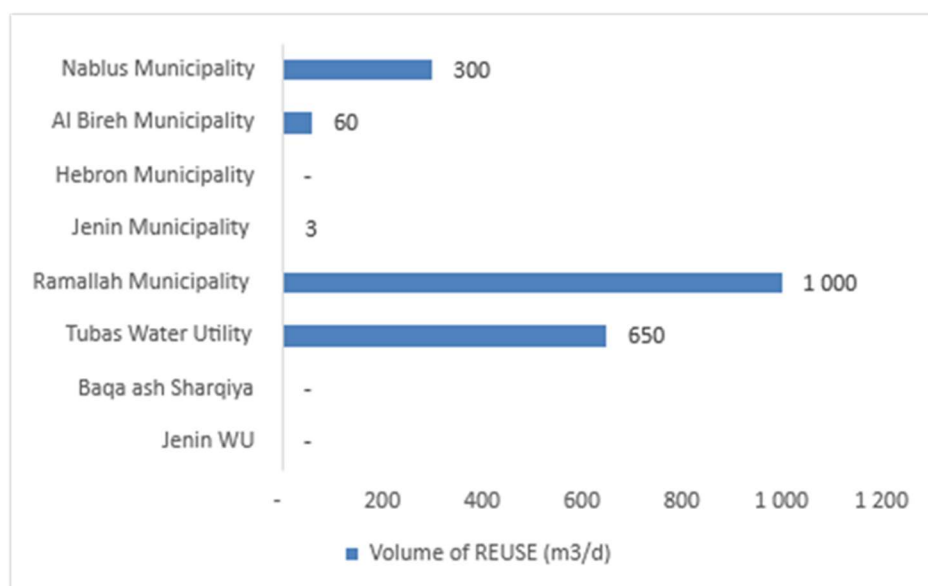


Figure 16: Volume of treated water per SP (m³/day), 2023-2024

- In average throughout the year, **Ramallah municipality (2024) leads with 1,000 m³/day reused, followed by Tubas WU (650 m³/day) and Nablus (300 m³/day).**
- **Al Bireh reports low volumes, while Jenin municipality reports only 3 m³/day, and Hebron (despite its size), Jenin WU and Baqa ash Sharqiya show no reuse at all for the moment.**

There is a strong contrast between reuse performance and subscriber base. When comparing the number of sanitation subscribers to the volume of wastewater reuse, it becomes clear that a **high subscriber base does not automatically translate into high reuse performance.**

For instance, Nablus municipality, which has the highest number of subscribers, also shows a moderate reuse volume of 300 m³/day, suggesting a partial valorization of its wastewater potential. In contrast, Ramallah municipality, with far fewer subscribers than Nablus or Al Bireh, leads in reuse with 1000 m³/day, indicating a more advanced or better-managed reuse scheme. On the other hand, municipalities like Hebron and Jenin, despite having a moderate number of subscribers, report negligible or no reuse.

This contrast highlights that reuse performance is less dependent on network size and more closely linked to strategic investments and policy orientation. While the number of subscribers determines the potential wastewater volume, we can assess that it is political willingness and technical readiness that unlock actual reuse in targeted territories.

F.2.3 Bill recovery rate

This indicator reveals the ability to collect payments from customers.

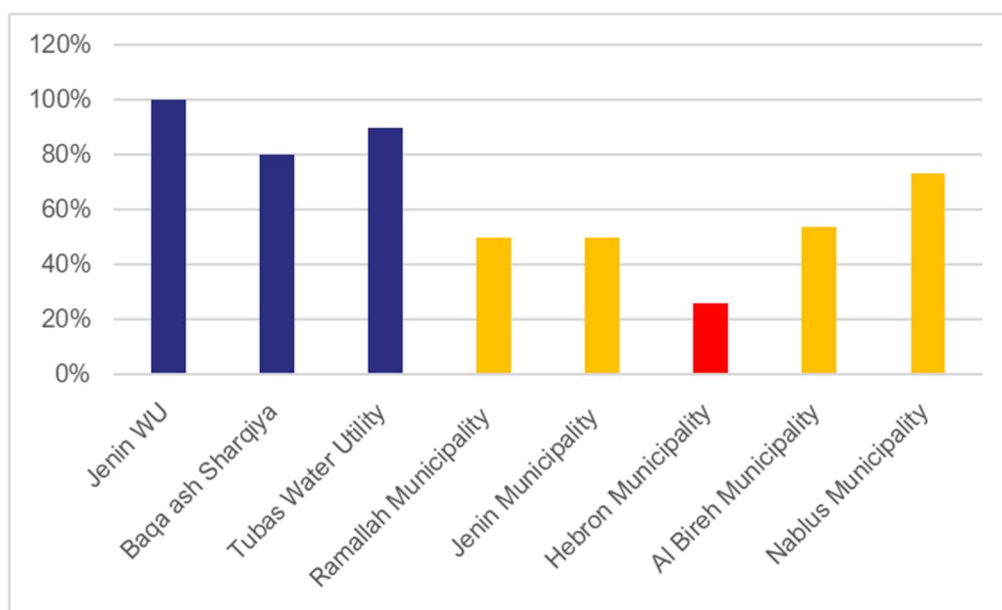


Figure 17: Bill recovery rate (%)

Note: The service providers reported their overall billing rates without specifying user categories. We assume this figure represents an average across all customer types.

Service providers can be broadly divided into three categories based on their bill recovery rates, as presented in the table below:

Service provider	Bill recovery rate (%)	Performance level	Key observations
Jenin WU	~100%	Excellent	Strong collection system due to prepaid meters
Baqa ash Sharqiya	>80%	Very Good	High compliance. Smallest town. According to the SP, bills are combined with electricity payments to ensure higher collection rates.
Tubas Water Utility	>80%	Very Good	Robust billing and recovery structure. Water billing in the WU area is 100% prepaid water meters for households. Only government and public institutions (schools, hospitals, ministerial departments) are not concerned by these billing system and issue bills based on mechanical water meters.
Ramallah municipality	~75–80%	Good	Solid performance, allows operational cost recovery
Nablus municipality	~65%	Moderate	Room for improvement in collection
Al Bireh municipality	~55–60%	Moderate	Room for improvement in collection
Jenin municipality	~50–55%	Moderate	Room for improvement in collection
Hebron municipality	~30%	Critical	Very low recovery

Table 22: Performance of SPs in terms of bill recovery

F.2.4 Revenues and costs

In this section, our analysis concentrates on five selected service providers to ensure a detailed and meaningful assessment. These SPs were chosen based on data availability.

Revenue from water sales is the predominant component of total revenues across nearly all SPs. In many cases, it represents over 80-90% of their total income.

Revenue from new connections contributes marginally and revenue from sanitation is either absent or very low, because sanitation services are not provided, not metered, or not charged for separately. The cost structure may vary slightly between SPs depending on their scope of services (water only vs. water and sanitation). To assess the full cost profile of each SP, costs were categorized into two main groups:

1/ Fixed costs

These are structural and recurrent costs, generally independent of production volume:

- Human resources (HR) – water and sanitation (salaries of operational staff and management)
- Administrative costs (office expenses, support services)
- Logistical costs (vehicles, communication)
- Depreciation of water & wastewater assets (amortization of infrastructure and equipment)

2/ Variable costs

These depend directly on the volume of water produced, distributed, or treated:

- Operations and maintenance (O&M) – water and sanitation (routine system maintenance, materials, small repairs)
- Energy costs (mostly related to pumping and treatment)
- Water purchase costs (applicable to SPs buying bulk water)

Renewal and reinvestment costs were only partially available and are approximated through depreciation.

The following graph compares the total revenues and total costs for each service provider:

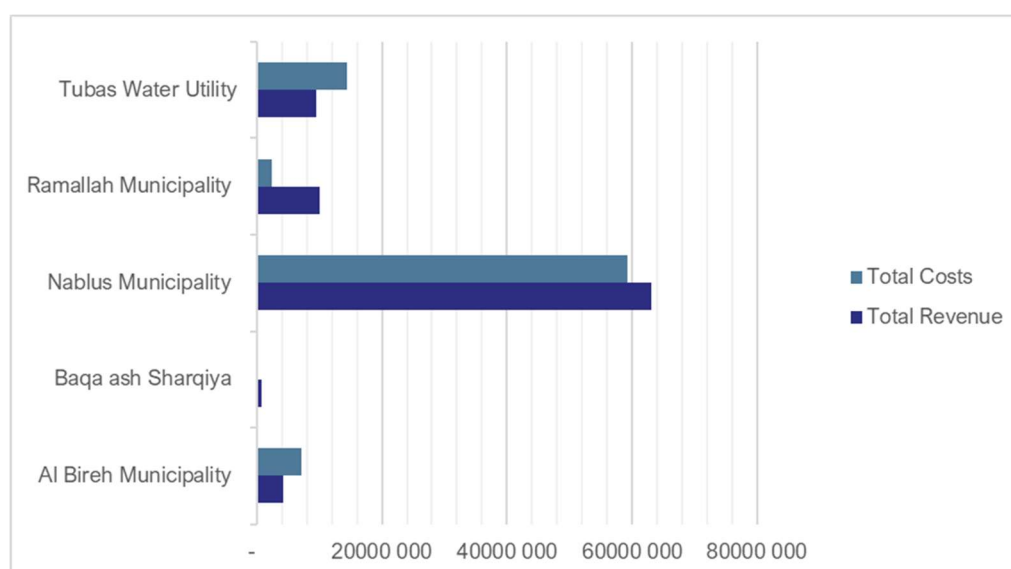


Figure 18: Revenues vs costs (NIS/year) – 2023/2024

Service provider	Total costs (NIS/year)	Total revenue (NIS/year)	Balance
Al Bireh municipality	7,057,060	4,125,207	-2,931,853
Baqa ash-Sharqiya	214,987	770,52	+ 555,533

Nablus municipality	59,253,361	63,017,791	+3,764,430
Ramallah municipality	2,476,000	10,000,000	+7,524,000
Tubas Water Utility	14,353,743	9,412,103	-4,941,640

Table 23: Financial balance of 5 service providers

Financially sustainable providers

- Ramallah municipality stands out with the highest surplus (7.5 million NIS/year). Its combination of high revenue and relatively low costs results in a strong financial position.
- Nablus municipality also demonstrates sustainability, with a surplus of 3.76 million NIS/year, despite its high operational costs.
- Baqa ash Sharqiya shows modest but positive financial performance, with a surplus of over 550,000 NIS/year, indicating efficient small-scale operations.

Financially unsustainable providers

- Tubas WU shows the largest deficit at nearly 5 million NIS/year. Its costs significantly exceed its revenues, posing a major financial challenge. Energy costs are a major driver of financial imbalance, particularly in Tubas, where they account around 43% of the collected revenue.
- Al Bireh municipality faces a funding gap of approximately 2.9 million NIS/year, highlighting the need for either increased revenue or cost control measures.

F.2.5 Cost recovery ratio

There is a tendency for SPs with higher depreciation costs relative to revenue (Al Bireh, Hebron, Tubas) to show lower cost recovery ratios. Conversely, SPs with lower depreciation costs (Baqa ash Sharqiya, Ramallah) are more likely to achieve high cost recovery ratios.

Low	High
Al Bireh Municipality (0.6)	Baqa ash Sharqiya (3.6)
Hebron Municipality (0.6)	Jenin WU (1.4 out of depreciation cost)
Tubas WU (0.7)	Nablus (1.1)
	Ramallah (4)

Figure 19: Cost-recovery ratios of SPs

However, the inclusion or exclusion of depreciation in the calculation is key. For example, Jenin WU has a good ratio, but depreciation cost is not reported, which may inflate its apparent performance.

F.2.6 Reuse revenue share

Two main conclusions can be highlighted concerning revenue from reuse:

- All SPs have negligible reuse contributions ($\leq 0.02\%$)
- Tubas is slightly ahead (0.02%), but the overall impact is minimal

F.2.7 Sustainability: classification of SPs by depreciation cost coverage capacity

Category	Service Providers	Comments
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1. Strong capacity to cover depreciation	Nablus Municipality	High revenue compared to depreciation costs. Strong capacity to fund asset renewal and long-term sustainability.
2. Moderate or partial coverage capacity	Hebron Municipality Tubas Water Utility	Revenues exceed depreciation costs, but with narrower margins. Moderate ability to maintain assets over time.
3. Low capacity to cover depreciation	Al Bireh Municipality Ramallah Municipality Baqa ash Sharqiya	Low collected revenues relative to depreciation costs. Risk of underfunding asset renewal, which may impact long-term service quality and continuity.

Table 24: Classification of SPs according to capacity to cover depreciation

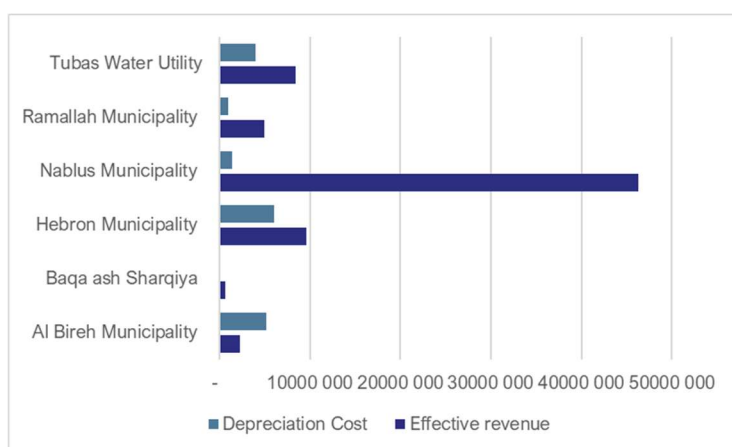


Figure 20: Depreciation cost compared to effective revenue

F.2.8 Key conclusions

The analysis of the selected SPs reveals significant disparities in terms of financial sustainability, cost recovery, and operational efficiency.

Financial sustainability leaders

Ramallah Municipality demonstrates good financial performance, marked by high-cost recovery ratios, effective revenue collection, and operational surpluses. Nablus Municipality also performs well, with a high revenue base and a balanced cost structure, despite significant fixed and variable expenditures. Jenin Water Utility as well shows good performance but financial data at our disposal is incomplete.

Baqa ash Sharqiya stands out as a model of efficiency for smaller providers. Despite its modest size, it maintains a high cost recovery ratio (3.6) through low operating costs and solid bill collection (80%), highlighting the potential of well-managed small-scale operations.

Critical Risks

Hebron Municipality faces a serious financial imbalance, driven by extremely low bill recovery (26%) and high variable costs. Al Bireh Municipality and Tubas Water Utility also show persistent deficits, with low cost recovery ratios (0.6 and 0.7 respectively) and depreciation costs that exceed their effective revenues – indicating unsustainable financial positions over time.

Hebron, Al Bireh, and Tubas require reforms. Key priorities include improving billing and collection efficiency, controlling operational costs – especially variable expenditures – and, where appropriate, adjusting tariffs to ensure long-term financial sustainability. These measures are essential to avoid service deterioration and to secure the future viability of their water and sanitation systems.

F.3. Financial analysis of Water Users Associations

F.3.1 Presentation of the 3 selected WUAs

For this analysis, we compared three WUAs or cooperatives: **Marj Iben Amer**, **Safeh Al Jizeh**, and **Wadi Shair**, focusing on their institutional affiliations, operational scope, financial situation, and main challenges.

1. Marj Iben Amer, located in Jenin municipality, is the most active in terms of number of farmers using treated wastewater, with 45 to 50 out of 71 members actively irrigating 70 dunums. The cooperative set a differential tariff of 0.7 NIS/m³ for members and 1 NIS/m³ for non-members. However, the cooperative is facing a negative financial balance, as farmers refuse to pay due to the declining quality of treated wastewater, which resulted from poor WWTP operation (due to electricity cuts and lack of municipal support). The cooperative is currently burdened by mutual debts with both farmers and the municipality. Key challenges include the deterioration of the irrigation network, unpaid water bills, and weak institutional support from Jenin municipality.
2. Safeh Al Jizeh, affiliated with Nablus municipality, is a recently established WUA (2023) with only 10 members, of whom 2 to 4 are actively using treated wastewater. Irrigation expanded from 180 dunums in 2024 to an expected 240 dunums in 2025. The WUA currently sells TWW at cost (0.8 NIS/m³) with no operational margin, and O&M is managed directly by the farmers without formal staffing. Although highly dynamic thanks to the leadership of two active farmers, the initiative remains largely private in nature. The WUA faces major technical limitations, such as low water pressure and lack of filtration, and needs a more formalized structure to support further expansion and sustainability.
3. Wadi Shair, also linked to Nablus municipality, is the most structurally developed WUA on paper, with 232 registered members and extensive infrastructure (1,000 dunums equipped). However, only 10 farmers are currently active, irrigating a total of 60 dunums. The WUA sells TWW at 1 NIS/m³ and retains one full-time administrative staff, yet its financial situation is negative, with no income from agricultural services and no capacity to fund basic operational costs independently. Despite receiving extensive external support from Nablus municipality and KfW, the WUA suffers from weak internal engagement, limited ownership among members, and underutilization of resources. Its sustainability remains uncertain beyond the end of donor funding in 2025.

In summary, the three cases illustrate distinct trajectories:

- Marj Iben Amer: strong users base but the WUA is weakened by external failures and institutional disengagement.
- Safeh Al Jizeh: promising initiative needing formal structure and technical support.
- Wadi Shair: high investment and institutional backing, but critically low internal mobilization and ownership.

These insights highlight the importance of pairing infrastructure and financial support with effective farmer engagement and governance models focused on long-term operational autonomy.

The following table summarizes key information about WUAs:

WUA / Cooperative	Marj Iben Amer	Safeh Al Jizeh	Wadi Shair
Related municipality	Jenin Municipality	Nablus	Nablus
Members	71	10	232
Area irrigated (dunum)	70	180 (2024) – 240 (2025)	60
Area irrigated (hectare)	7	18 (2024) – 24 (2025)	6
Active farmers using TWW	45–50	2–4	10
Tariff (NIS/m³)	0.7 (members) – 1 (non-members)	0.8	1
Financial balance	Negative. armers don't pay for the water because of the bad quality. The farmers are 70 000 NIS in debt with the cooperative and the cooperative is 40 000 NIS in debt with the municipality	No margin; informal O&M (own farmer's expenses); Admin tasks handled voluntarily	One full-time admin staff. No revenue from agricultural services. Financial balance negative No financial capacity to cover basic operational costs (salaries, office, O&M of infrastructure and equipment)
Key challenges	Poor TWW quality: For 5 years the reuse project worked well then gradually worked less and less. The quality of the WW produced by the WWTP got worse because insufficient aeration of the lagunes due to problems in the power supply (electricity cuts due to the fact the municipality was not paying for the electricity for financial reasons) Unpaid bills, network damage: No commitment of Jenin Municipality in operating properly the WWTP → no payment of electricity bills	The reuse is very dynamic but so far it is mainly a private initiative of two active farmers. Low pressure, filtration, staff and equipment needs	Low usage, weak member commitment of farmers, no staff Self-reliance: Nablus Municipality, along with KfW, has provided substantial support since the WUA's creation—covering assets, capacity building, technical assistance, and staff salaries. Very limited number of active users (10 farmers / 232 members; 60 dunums irrigated / 1,000 dunums equipped)

Table 25: Comparative analysis of WUAs

F.3.2 Key points about WUA's financial situation

The financial situation of the three WUAs reveals a general fragility, with all of them struggling to achieve financial autonomy.

Marj Iben Amer cooperative presents a significant deficit, with unpaid water bills and debts. This financial imbalance is largely due to the deteriorating quality of treated wastewater, which undermined farmers' willingness to pay.

In Wadi Shair, although some administrative structures are in place, the WUA records no revenue from agricultural services, and the limited number of users does not allow it to cover basic operational costs. It currently depends entirely on external support for salaries, office management, and infrastructure maintenance.

Safeh Al Jizeh, being more recently established, does not yet show a deficit but has no surplus either. The WUA currently operates without any margin, and all operation and maintenance (O&M) tasks are carried out voluntarily by two farmers at their own expense. The absence of a financial buffer or structured service provision model makes its financial position highly vulnerable in the medium term.

In all three cases, the lack of structured income streams, low cost recovery, and dependency on external support raise concerns about the long-term sustainability once project funding phases out.

F.4. Overall assessment of the robustness and sustainability of the financial model for the wastewater and reuse sector

Despite the existence of a relatively clear and unified regulatory framework for water and sanitation services under Law No. 4 of 2021, the financial model for the wastewater and reuse sector remains structurally weak and fragmented. While the law promotes cost recovery and tariff coherence, it does not explicitly regulate treated wastewater reuse.

This regulatory gap has led to the proliferation of ad hoc and inconsistent reuse pricing practices across service providers. Most SPs apply low, flat tariffs (generally 0.7-0.8 NIS/m³), and several – such as Ramallah, Hebron, and Al Bireh – do not apply any tariff at all, treating reuse as a public service without economic valorization. As a result, reuse operations often function as cost centers rather than revenue streams, with negligible contribution to overall financial performance ($\leq 0.02\%$ of revenues). The absence of a national reuse tariff structure and lack of reinvestment mechanisms further undermine financial sustainability. Even the most structured initiatives, such as Jericho's phased pricing model, struggle to cover more than basic O&M, leaving capital depreciation and staffing costs unfunded.

From a broader financial perspective, the majority of SPs are unable to achieve full cost recovery, particularly those operating WWTP. Fixed costs (for instance human resources, depreciation) are not matched by reliable income streams, especially when sanitation is not charged or billed indirectly based on water use. Energy remains a key cost driver – up to 43% of revenue in some cases (for instance Tubas) – yet there is little room to adjust pricing due to affordability concerns and low bill collection rates.

Only a few providers, such as Ramallah and Nablus municipalities, demonstrate robust financial performance, thanks to strong billing systems and moderate cost structures. Conversely, providers like Hebron, Al Bireh, and Tubas operate under significant structural deficits, compounded by poor bill recovery and high operating costs. The situation is even more precarious among WUAs, whose revenue base is extremely narrow. Safeh Al Jizeh lacks formal income and staff, and Wadi Shair depends almost entirely on donor funding. None of these WUAs currently operate under a viable, self-sustaining financial model, and all are at risk of collapse once external support ends.

In conclusion, the financial model of the wastewater and reuse sector still lacks resilience. While the water tariff framework is well developed, the reuse segment is largely unregulated, underfunded, and institutionally fragile. To enhance sustainability, the sector must:

- Define guidelines for reuse pricing, including cost-reflective tariffs and reinvestment strategies.

- Support SPs in expanding and formalizing sanitation billing to reflect actual service costs.
- Build the financial and operational autonomy of WUAs, notably by professionalizing their management structures and diversifying income sources; the French model of professionalized collective irrigation management through ASA (*Associations Syndicales Autorisées*), could be explored to inspire a reform of WUAs toward greater institutional and financial maturity.
- Draw lessons from neighboring countries such as Israel and Jordan, which have implemented structured and subsidized reuse pricing models.

Without such reforms, the sector will remain dependent on external subsidies, unable to scale up reuse practices or ensure the long-term viability of wastewater and reuse services.

G. GENDER ANALYSIS

This report provides first (G1) an overview of gender disaggregated data related to women's status and women in rural areas and sector aiming at setting the state-of-the-arts on gender and water reuse challenges. It is followed by (G2) the organizational analysis of legal, political, and institutional framework first in the water and wastewater sector, and secondly, to the specific issue of reuse water that draws an additional analysis of the agricultural sector and its framework. For both, the analysis considers the capacity building aspects and general inclusion of stakeholders. It finally draws (G3) a synthesis of gender awareness in the water and wastewater sector, its specificities for the reuse sector. It concludes with (G4) recommendations that should be brought forward in the design of WaDIS program.

G.1. Key data

	Women	Men
People	49%	51%
Head of House	12%	88%
Education rate	97.2%	95.7%
Degree in agriculture	0.2%	1.1%
Labor force	18.9%	81.1%
Informal employment	67.5%	40.6%
Vulnerable employment	20.9%	17.9%
Service sector	70.7%	28.6%
Revenue (\$)	32.8	44.0
Holding a bank account	25.9%	41.4%
Local government	21%	79%
Managerial position	19.8%	
Land ownership	32%	65%
Agricultural land ownership	15%	
Modern equipment	6.9%	
Traditional tools	15.8%	
Working in family farm	84%	
Water and sanitation sector	4.5%	

G.2. Gender and wastewater reuse key data and state-of-the-art

The section covers the objectives set by the inception report – objective 1: Analyze the inclusion of gender, equality and parity in the organizational structure of the wastewater and reuse sectors; and objective 6:

based on gender disaggregated data, identify the appropriate approach for establishing collective accountability, pertaining to the reuse sector from a gender lens.

G.2.1 Gender disaggregated data in reuse sector

Gender disaggregated data in Palestine includes regular publications and online updates by UN Women¹⁵, the World Bank¹⁶ and the Palestinian Central Bureau of Statistics (PCBS)¹⁷. The Awraq Center study, surveys and interviews concludes that 15% of women own agricultural land, 10.5% own livestock and poultry; 6.9% own advanced agricultural equipment; and 15.8% own traditional agricultural tools which represent a significant gap between men and women. The study shows however that the majority of agricultural lands fall within Area C which means 2,642,000 dunums are under Israeli control, depriving both men and women from utilizing these lands, constituting 76.3% of the total land classified as such.

According to PCBS, women account for 16.1% of workers (PCBS, 2023), at least less than one-tenth of the workers in this activity according to Al Ma'an. For FAO, "Palestinian women provide 87 percent of the labor required for livestock production and 54 percent for crop production" (FAO, 2023).

Most women work as informal workers with 84% of women work in family farming¹⁸. The Palestinian Economic Policy Research Institute documented that "87% of the working hours related to livestock and 54% of the work in the production of agricultural crops, and it is a source of income for thousands of Palestinian families with a production equivalent to about 70%" (report dated 2016 quoted by Al Ma'an). It is estimated that Palestinian women work 8% more hours per day than men but earn 15 % (FAO, 2023)

Female roles in the agricultural value chain differ. FAO conducted a gender survey on specific agricultural roles (cultivation, irrigation roles and the post-harvest roles) for Gaza strip in 2023. This specific study provides key gender disaggregated data on women and men activities in rural areas and agriculture. It starts by an important statement on the "significant disparity between males and females" (p. 1). Men occupy all roles whereas women are excluded from land clearing and tillage, Planting/seeding Pricing products Transport to storage/processing. The processing is considered as the area where women are employed, study shows however disparities depending on locations but also areas.

In PWWSD report, such situation is confirmed with female heading small-scale holdings and reminds the "the Palestinian Agriculture Law lacks mechanisms to protect female farmers with small agricultural holdings, particularly against land fragmentation" (PWWSD, p. 20). Al Ma'an report further underlines that such a situation is related to women's restricted access to inheritance of land. One female interviewee described the difficulties to put her right for inheritance forward which ended up in hiring a lawyer paid and supported by her father. Most women cannot access financial aid without a man's support, 88% of women working in the agricultural sector depend on self-financing. Only 10% benefit from microcredit institutions, and only 2% receive loans from banks (Al Ma'an, 2024). The same report documents that women own 1,327 out of a total of 39,820 agricultural machines.

All combined, many factors restrain women's access to agricultural economic revenues, businesses development opportunities and land ownership.

There is a clear understanding and comprehension of women's role in managing domestic water. As Al Ma'an report states from a FAO report, "Palestinian women have historically developed knowledge and skills related to water collection and storage, food conservation and natural resource management, which will contribute to strengthening local capacity to adapt and maintain livelihoods if passed down from one generation to the next^[1]. Research conducted by Hilmi S. Salem, H. S. confirms the key role of Palestinian woman in role in making water available for domestic and agricultural usages. As such, they play an obvious role in achieving sustainable development of the agricultural sector^[2]. Such statement is confirmed by

¹⁵ UN Women: <https://data.unwomen.org/country/state-of-palestine>

¹⁶ Gender Data Portal: <https://genderdata.worldbank.org/en/economies/west-bank-and-gaza>

¹⁷ PCBS: https://www.pcbs.gov.ps/site/lang_en/1/default.aspx

¹⁸ National Agriculture Sector Strategy Update (2020). "Resilient and Sustainable Agriculture 2021-2023".

UAWC publications, on field and advocacy work that consider that Palestinian women are at the center of its agricultural and rural identity and traditions.

This tradition puts however a heavy burden on women's responsibilities and interactions with men. It perpetuates gender attributed roles, impacting women's mobility and participation in economic activities. Limited access to water and more specifically, Water Sanitation and hygiene (WASH), accentuate socio-economic challenges and risks of gender-based violence¹⁹ (GBV). Such violence happens within the community and outside with Israeli settlers and soldiers harassing women. General data for Palestine sets that women who have experienced intimate partner violence reaches 29% (World Bank and PCBS, 2024). The study by PCBS (2019) shows that the percentage of married women submitted to psychological abuse is higher, reaching 56,6%. According to the Ministry of Women Affairs, 88% of women with disabilities have experienced such violence.

Access to water, wastewater and reuse water is also limited by women's ownership of land and water resources (see previous section). Most gender disaggregated data on reuse water was initiated by several research projects as listed by the Gender Mainstreaming Baseline Study for the selection of consulting service for complementary feasibility study for irrigation scheme (PWA, 2018 in AFD & Green Climate Fund, 2019) and further project outlines major issues related to gender and water reuse.

G.2.2 Gender and water reuse state-of-the art

Most consulted publications for this assessment reprises similar data and analysis which argues for a coherent vision on what needs are and gaps to be addressed by the WADIS program. This present section aims at setting a state-of-the-art of main challenges for ensuring gender equality and its implementation in the water reuse sector.

a. Low revenue and informal workforce

Women's implication in the agricultural sector is clearly documented and estimated with several gender disaggregated data (PCBS, Ministry of Women Affairs, Ministry of Agriculture). Women's equality and the improvement of their conditions depends on:

- Recognizing her work within the family through paid revenues.
- Declaring women's labor work, ensuring her, a formal contract and salary.
- Training women on legal and accounting to ensure they understand the contract and their rights.
- Changing the legal framework to enable and facilitate women's access to both a bank account and loans for rural activities with incentives to women implementing reuse water.
- Raising awareness and facilitate administrative process for women who inherits from lands. There is a need to develop specific loan, bank account, business dispositions and to support women farmers owning a land and producing food. Such a scheme enables access to equipment, training on the production value chain of cultivating, harnessing, transforming, processing and selling rural products. This calls to dedicated support to women farmers entrepreneurship and their reliance of treated wastewater reuse.
- Documenting women's traditional roles and identity within the farming and rural sectors, including relationships with water, wastewater and reuse water.

b. Gender segregation to accessing the workplace

Women's access to work is not a sole gender and reuse water challenge, nor a water and wastewater sector specificity, it applies to the Palestinian society with its double heritage of patriarchy and occupation. The Labor Management procedure 2022 for PWA specifically addresses the issue with a clearly analyzed Labor

¹⁹ WASH Cluster, [Gender & WASH Toolkit for Palestine - Global Shelter Cluster Report - Question of Palestine](#) and Gender and WASH Analysis at Community Level in Area "C" of the West Bank, PHG 2024.

law pointing out major gaps in addressing discrimination. As shown, gender disaggregated data in the water and wastewater sector still lacks a general overview. It also appears, the Palestinian water and wastewater sector need aggregated data to provide a clearer picture of its socio-economic impact on the society. Data should provide the following statistics:

- Total number of employees and its sex-disaggregated repartition.
- Organizations disaggregated data differentiating public/private. Within the public sector, the different key stakeholders (governmental, institutional, municipalities, local governments) and non-governmental organizations (NGO's and local associations are directly involved in the water, wastewater and reuse water sector).
- The distribution of work positions (senior/middle management, technicians, clerical, etc.) with male and female distinction. PCBS provides a relevant distinction by job title (PCBS, 2014: 82).
- Salary data including access to workers' benefits (health insurance, vehicle...).
- Educational level (diploma, certified training, etc.).
- Career evolution data.

There is, however, data about training but needs a data aggregation with detailed numbers and sex disaggregated data (number of training hours per person / per organization, number of training and its typology, quantification of gaps and needed training, etc.). The different involved stakeholders need to aggregate important coordinated data to bring on the number of female employees, their position and document gender gaps. Such information will support the need to establish a quota that enforces women's access to the workplace.

To further document and promote gender equality in the water reuse sector and projects, the following information should be made available with sex-disaggregated data:

- Specify employee's number within the agricultural sector that work on farming, food processing, marketing and market distribution; establish revenues and financial overview (loans, investments rate, profitability...).
- Document gender roles for rural activities with the number of women farmers, women involved in cooperatives, food processing, women businesses and gendered typology of sold rural products.
- Provide a typology of farmers' owners with clear number of small, medium and large businesses, average size of exploitation, equipment, depreciation rates, maintenance costs, etc.
- Establish qualifications (educational level, certified training, training needs).
- State for these categories: land ownership, water ownership, water access, wastewater access, reuse water access, applied tariffs and evaluate women/men farmers' capacities to pay and a typology of faced challenges from a gender approach.
- Develop a gender-based lexicon, uses and perceptions of reuse water for these categories bringing male/female differences and similarities.

c. The socio-cultural barriers

Several interviewees stated that women are subjected to judgements and invisible barriers when it comes to accessing the workplace. They testify that working women are the center of rumors but may also suffer from sexist comments. Many suffered from discouragement from families or closed circles (friends, male colleagues). One reported that women going to work in the street may also be subjected to discouraging comments from their communities. One brought the issue of hijab. The choice of both wearing the hijab and working is not well perceived. For some men, hijab means staying at home. Two women however stated strong support from their father or husband in their career. The majority agreed that the situation has been evolving but resistance can be strong and more invisible, which tends to worsen women's conditions in the workplace. No one mentioned sexual harassment but observed gender biased harassment.

In its report, the FAO documents that the creation of Gender Units has amplified discrimination. The participation of the GUs in this team is considered a vital factor in gender mainstreaming, in line with the agreed-upon intentions and obligations of the State of Palestine. However, despite some limited progress,

these units have not realized the vision and goals that prompted their creation. Instead, decision makers have treated them as employment units for their male and female staff, void of any job description, and have not granted them the decision-making powers provided in the decision taken by the Council of Ministers. On the contrary, the establishing of these units has contributed to an increase in the discrimination against women because all cases related to women are now considered special cases and referred to the Gender Units. This has aggravated the discrimination against women and led to their exclusion from other institutional spaces of the Government (Saadeh, 2014²⁰).

Such barriers relate to domestic violence and gender-based violence, religion and how to introduce gender components when dialoguing with local communities. See full Gender report for more details.

d. Main challenges identified by the MoWA

As stated previously, the Ministry of Women affairs issued a report on women's conditions in agriculture. According to this report, their low representation and participation is due to:

- Weak legislation.
- The Israeli occupation documenting the number of settlers attacks on farmers²¹[2] or the impacts from the Wall on land ownership reducing the Palestinian capacities to farm and live without restrictions.
- The limited access to finance for women.
- The scarcity of water but also the limited training in irrigation techniques.
- The distance between home and land affecting women who are subjected to attack, fear, and capacities to cope with emergencies (from home or from farming the land).
- An insufficient educational background for women farmers and their capacities to use modern materials or devices.
- Limited access to supplies for planting feeding animals, etc.
- Lack of data.

This report also provides key recommendations and best practices to support women in agriculture.

e. Insecurity from outside

Occupation is at the center of many of our discussions and interviews. Reports from institutions and funding agencies document the limitations of the Oslo agreement. The main issue is the fragmentation into three zones, the zone C being under Israeli control. Any activities in this area are subjected to Israeli military forces' actions: opening/closing checkpoints that affect transportation time and conditions for both men and women; seized crops or harvesting crops for its own needs; forbidding access to land or natural resources. Many testimonies have shared a tensed and violent climate between Palestinian living in Zone C or with land in this zone. Women reported abrupt killing of women farmer in their land by Israeli soldiers, stones being thrown at them by settlers or violent verbal aggression or dismissive attitude such a spitting at them. Interviewees specially raised two women specific challenges:

- The first relate to female teenagers who must cross checkpoint to go to school and being touched in private body part by Israeli soldiers for security reasons which eventually ends up in their father risking his life to defend his daughter dignity.
- The second is related to the menstrual cycle with women being uncomfortable about crossing a checkpoint when menstruating.

²⁰ Saadeh, L. 2014. Examining the needs of gender units in PNA institutions. Prepared for UN Women Palestine Country Office (unpublished). Quote by the FAO, 2021.

²¹ Around 16,663 attacks targeting Palestinian lands and properties, p. 20.

As it is, many female interviewees agreed that men's willingness to protect their wives, daughters, cousins from any of these risks, is understandable, or natural, or part of their duties.

G.3. Organizational diagnostic on gender and reuse water integration

The section aims at providing elements to objectives 1, 2, 3, 6 and 7.

G.3.1 Institutional integration of gender in the water and wastewater sector

In the specific sector of environment, water and sanitation; research, funding programs and general awareness notably started in 2008, also the year of women and water at the UN level (2005-2015, International decade of water with each year bringing a specific focus). Previous work on gender and environment dates from early seventies with general debates on environment and was first related to women in development (WID).

See complete Gender report for more details.

- 1988 Declaration of independence
- 1995 First brochure from PCBS on men and women
- 1995 Creation of PWA
- 1998 First statistics disaggregating data on men and women

2002 Water Law	2003 Basic Law	2005-2008 Cabinet Decisions	2012
Identified Ministries	Creation of MOWA	Creation of Gender Units	Creation of GU at PWA
MOE	→	GU	Water and Gender Strategy approved PWA. Nov-2012 (GIZ)
MOH	→	GU	
MOL	→	GU	
MOLG	→	GU	
MOSA	→	GU	
MOP			
MOFA			

- 2014 PWA communication guide
- 2014-2016 Water Sector Strategy
- 2022 Labor Management Procedure for the Water Security and Resilience Program (WSRP)

There is no water and gender report or work at MoWA level (interview) but a report on agricultural and gender dated 2024 (see section below).

G.3.2 Institutional integration of gender in water reuse approaches

In the specific case of gender, local studies have focused on the occupation's impacts, GBV and the economic participation of Palestinian women. Few studies discussed the specific impact of occupation on

women engaged in the agricultural sector (Qazzaz, Mrar and 'Adwan, 2005; Marrar, 2009; Sarafi and Samarah, 2016; FAO, 2011). Starting years 2010, studies and projects on gender and reuse water start to emerge. The work has been facilitated by the Palestinian WASH Cluster but also funding projects involving directly and non-directly the promotion of water reuse, for instance, projects related to solid waste management and soil pollution or programs aiming at tackling climate change impacts on the Palestinian agricultural sector.

Research also progressed on integrating the community in water reuse, a first step before integrating women and gender component. For instance, Rashed Al-Sa'ed, Mohammed Abdellatif, Markus Lechner²² published an article on Community participation and local regulations for sustainable sanitation and water reuse in Anza village that clearly considered women as stakeholders.

a. Research contribution to gender and reuse water

First publications relating to the Palestinian local context on gender and reuse date from 2013 with Hanadi Badr being the first to publish a study on women needs in rural areas to implement wastewater reuse. The 2019 AFD report provides four key reference studies and research work:

- Hanadi Badr (2013), "Women Empowerment Towards Treated Wastewater Reuse: Reconnect Practical & Strategic Women needs in Palestinian Rural Area". As previously stated, Hanadi Badr has been active in the PWA gender unit.
- Marwan Ghanem (2015) titled "Gender Empowerment and Treated Wastewater Reuse in Ein Qinia Village, Ramallah – Palestine." Marwan Ghanem has been related to PADUCO and the German cooperation actions for promoting gender in water and wastewater management.
- Italian Cooperation (2017) titled "Gender & Wash Toolkit for Palestine". This guide is still available online and is part of PWA gender toolbox.
- GCF and UN Women titled "Mainstreaming Gender in Green Climate Fund Projects" (2017) with Rajib Ghosal, an expert in gender and climate change working for the UN and currently holding a position.

The research project conducted by Amro Wawi on the "Governance Assessment of wastewater reuse policies applied to the two study cases of Jenin and Nablus cities" provide an interesting overview of organizations involved in promoting reuse water in the year 2020. Interviewed stakeholders include Water and Wastewater Treatment Plant's management in Jenin and Nablus, Water Users Associations, Water Sector Regulatory Council, Ministry of Agriculture, Palestinian Standards Institution, PARC.

One interesting article "The status of freshwater and reused treated wastewater for agricultural irrigation in the Occupied Palestinian Territories" by Hilmi S. Salem, Yohannes Yihdego and Hadi Hamaaziz Muhammed brings forward the analysis by Hilmi S. Salem on women's "considerable role in making water available for domestic and agricultural usages" (p. 128) and their obvious contributions "to the agricultural sector towards achieving sustainable development in their communities" (p. 129²³).

The Ministry of Women's Affairs refers to Fathi Sarouji's²⁴ research that provides clear results on main challenges faced by women farmers such as women's awareness of their legal right with that 72% of women working in crop farming out of 7,666 women being interviewed are deprived of their rights to inherit from their husbands. They lack access to natural resources which impacts their family quality of life and labor productivity. A factor that is also affecting performance is the low women's educational

²² Online summary: <https://fada.birzeit.edu/bitstream/20.500.11889/5518/1/Al-Sa%60ed%20et%20al.%2C%202012%20Community%20participation%20WWT%20%26%20WR%20Anza%2C%20SSP%2011%2C%2020-28.pdf>

²³ Salem, H. S. (2019) Agriculture status and women's role in agriculture production and rural transformation in the Occupied Palestinian Territories. *Journal of Agriculture and Crops* 5, 132–150.

²⁴ Sarouji, Fathi (2016): "Ways to Promote the Status and Role of Women in the Palestinian Agricultural Sector," Palestinian Economic Policy Research Institute (MAS), Ramallah.

level and capacity to manage modern equipment. This research supports the importance of supporting women led agricultural projects also recommended by the MoWA²⁵.

More recent research has been directly conducted by funding agencies or local NGOs by generating gender-disaggregated data related to specific local projects and by providing literacy review on gender and reuse water that main challenges when implementing gender approach in reuse water projects:

- “Climate change, agriculture and gender in Gaza: Assessing the implications of the climate crisis for smallholder farming and gender within olive and grape value chains in Gaza”, OXFAM, 2022²⁶.
- “Mid-term evaluation and Semi-Annual Performance Report Water Banking and adaptation of Agriculture to Climate Change in Northern Gaza”, Green Climate Fund, FAO, 2024.
- Access to Gender Action Plan of “Water banking and adaptation of agriculture to climate change (WBAACC) in Northern Gaza”.
- “Gender mainstreaming in water reuse Guidelines for planners, investors, project designers and operator”, IWMI, 2023.
- “Gender and WASH Analysis at Community Level in Area "C" of the West Bank”, PHG, 2024.

During our interview with Abdel Fattah, Professor at An-Najah University working on wastewater and reuse water recognized that at the Palestinian level and research “we are still weak in social studies²⁷”.

b. Funded projects on gender and reuse water

The first funded project on gender and reuse of water is pioneered by ANERA and GIZ. For ANERA, the NGO included of women as beneficiaries. GIZ conducted a Gender Analysis Strengthening Sustainable Livelihood in Rural Areas in the Palestinian Territories in 2013 that is later detailed in section relating to referent studies.

Year	Title	Organization
2013 – 2019	Projects development in the Palestinian agriculture sector.	ANERA ²⁸
2018	Increased climate resilience of agriculture, adaptation of cropping systems to climate change (Section of GCF Funded Activity Agreement between AFD and GCF).	AFD / GCF
2018 – 2020	Reuse of wastewater treated for agriculture irrigation in the Southern part of Gaza Strip.	EU / OXFAM
2019	"Gender treated wastewater and the acceptance for the reuse of the treated wastewater" - Ein Qiniya.	PADUCO
2019	Water Banking and Adaptation of Agriculture to Climate Change in Northern Gaza.	AFD
2019	Assessment of the effect of changes in available water on the productivity of agricultural crops. Case study report in Palestine.	ESCWA
2022	Gender, water and agriculture assessing the nexus in Palestine.	FAO / SIDA

²⁵ Agricultural Projects Established by Women as a Lever for Empowering Palestinian Women, December 2024.

²⁶ OXFAM project : <https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621024/rr-climate-agriculture-gender-gaza-140720-en.pdf?sequence=7>

²⁷ Interview held on January the 30th, 2025.

²⁸ [Palestinian Farmers Form Water Reuse Co-op in Jenin - ANERA](#)

Year	Title	Organization
2022	Terms of Reference. To conduct training program for farmer women within the project (WBAACC): “Water banking and adaptation of agriculture to climate change in northern Gaza”.	FAO / AFD
2023 – Running	Wastewater collection and treatment services for the northeast of Ramallah include reuse scheme.	EIB
2023	Inter-regional Technical Platform on Water Scarcity (iRTP-WS) with “Gender Mainstreaming in Water Reuse: Guidelines for planners, investors, project designers, and operators” in Arab countries ²⁹ .	FAO

Figure 21: Overview of funded projects on gender and TWW reuse

The European Joint Strategy provides an overview of what has been done for the governance of the water sector and the PWA during 2021-2024. It provides separated sections on gender issues where nor water or agriculture are mentioned, reuse is mentioned once in the Environment Chapter under the Swedish support for the EQA. The section on water recognized the importance of the role of water for socio-economic development (p. 39). It relates to the Team Europe initiative for Water Resources – Wastewater and Reuse under the leadership of AFD and EU. It supported the signing of a Cabinet plan to promote reuse of treated wastewater in agriculture and states that the project is awaiting PWA’s plan (p. 42).

Main reference studies for the design of the WaDIS program are:

Strengthening Sustainable Livelihood in Rural Areas in the Palestinian Territories, GIZ, 2013

GIZ brings forward key gender analysis and elements on traditional gender roles (hierarchy, internal political paralysis, the occupation). It also provides a comprehensive gendered analysis of laws, the policy structure, education, the economy, GBV. For the agricultural sector, it provides a short historical overview of agriculture as a cultural identity and main challenges for women in the sector: informal work, key role in collection and provision, ownership, and a “qualitative gap”: no control over revenue, lack of training, insufficient legal protection (law for small income businesses), and non-existent recruitment of young women in agricultural education. They also hold a deep medicinal knowledge of plants. In terms of employment at the political level, recruitment has increased due to the creation of gender units.

Gender assessment. Water Banking and Adaptation of Agriculture to Climate Change in Northern Gaza, AFD 2019.

This document brings forward key strategic and practical components to gender implementation. It covers the value of bringing gender approach, a literacy review on gender and reuse water, a lexicon of gender and a documented study based on field survey and questionnaires in Northern Gaza. The study follows a key methodology: socio-economic analysis, water provision and access to irrigation, payments, crops planning and further questions the community about climate change and the use of recovered water. It brings the gendered issues such as gender roles, women empowerment and change factors. It is important to note the intention of the study aiming at bringing sex and age disaggregated data to bring clear but also, “an accurate and nuanced picture of the situation of target communities and social relations within them” (p. 28) which should be the aim of the WADIS design project.

This project produced several reports document the methodology that brought the successful implementation of gender approach through a Gender Action Plan, the election of three women representatives in the WUA, the wording in the WUA’s status, the foreseeing project of funding training for women farmers (not conducted due to the war).

²⁹ IRTP-WS, [Gender Mainstreaming in Water Reuse: Guidelines for planners, investors, project designers, and operators](#)

Climate change, agriculture and gender in Gaza. Assessing the implications of the climate crisis for smallholder farming and gender within olive and grape value chains in Gaza, OXFAM, 2020.

This report includes a section on gender and climate change impacts that shows the “usual” role of women as “assistants to their husband, father or other male family member” (p. 36) and have “limited role in value chains” (p. 37). In the specific under section on “Gender inequalities in the agriculture sector” (p. 37-41) that points out (1) the lack of access to ownerships, natural resources, assets and knowledge for smallholder women farmers. The report brings forward the need for capacity building and support to women that includes access to “banks, business development associations, microfinance institutions, and marketeers” p. 38. In terms of empowerment, it states how women’s groups are a way to support women’s collective voice and strengthen their decision-making roles.

Gender, water and agriculture – Assessing the nexus in Palestine, FAO, 2023.

This report provides results from field data collection in 5 areas, by interviewing 29 representatives from 17 organizations involved in gender, water and agriculture challenges³⁰. This study indexes general information on the 5 areas, assesses the political context and economic situation. It particularly documents the lower enrolment of women in the workplace, educational and health challenges including GBV. It provides a gendered overview of the water and wastewater sector in terms of employment and work roles in agriculture. It contributes to the analysis of gender inclusion in the legal and policy framework for water (FAO, 2023: 24-26) and documents numerous limitations to ensure women’s rights. The report further analyses laws and legal framework for the agriculture sector. After identifying major blockages and challenges, the report fully documents the results of its study providing an analysis of general and political issues from a field perspective. It brings several testimonies and gender generated data. It concludes with recommendations to promote gender equality.

c. Legal, political and institutional framework related to gender and reuse water

The State of Palestine vote several laws for structuring the Agricultural sector including 4 successive laws in 2003, 2005, 2016 and 2018 nut also specific resolutions from the Cabinet.

- The Agricultural Sector Strategy: A Shared Vision 2011–2013.
- National Agriculture Sector Strategy “Resilience and Development” 2014-2016.
- The Agriculture Sector Strategy, “Resilience and Development” 2014-2016, directly contributes to the achievement of the national objectives, which aim at enhancing resilience in its different dimensions. At the same time, it moves economic and social development forward through experience and appropriate response to our national objectives.
- The Land and Water Settlement Authority, particularly following the enactment of Law No. (7) of 2016.
- State of Palestine Environment Quality Authority (2016). State of Palestine National Adaptation Plan (NAP) to Climate Change.
- National Agriculture Sector Strategy (NASS) 2017–2022: Resilience and Sustainable Development.

The FAO report provides an in-depth analysis of the gender component in several key legal frameworks. It quotes and comments the National Plan “Putting Citizens First” (2017–2022) and National Development Plan (2021–2023), Strategic Plan and Action Plan for the Palestinian National Water Sector (2017–2022),

³⁰ Ministry of Agriculture, Palestinian Water Authority, Environmental Quality Authority, Ministry of Women’s Affairs, Palestinian Hydrology Group (PHG), Union of Agricultural Work Committees, Economic and Social Development Centre of Palestine, Palestinian Agricultural Relief Committees, The Applied Research Institute-Jerusalem, MA’AN Development Centre, Farmers field schools, Water user associations, Palestinian National Economic Empowerment Institution, UN Women, OXFAM, FAO, Office of the Quartet.

National Agricultural Sector Strategy Update “Resilient and Sustainable Agriculture” (2021–2023). The report consistently documents weak enforcement of legislation for promoting women’s labor force in the agricultural sector. For instance, it states that “the Agricultural Law, Water Law, and Penalty Code, the legislation on labor, the environment and others, all deal with the issue of gender using a blind lens, assuming that everyone has the same opportunities to access and enjoy rights” and “the Personal Status Law which applies to both Muslims and Christians, whereby women are subordinate to men. By depriving them of their basic rights, the status of women in the public sphere is negatively affected, contributing to the increasing marginalization of women and girls.” This report considers that “agricultural policies are, for the most part, gender-blind”.

Such observation is cocurate by the MOWA. The report documents important gaps from **the weak legal structure including the lack of agricultural laws addressing women’s needs** (p. 3), the restrictions from the Israeli occupation (p. 13), lack of gender equality in agricultural ownership due to women not receiving their inheritance (p. 13), lack of farmer women’s awareness on their rights (p. 14), the low implementation of the Sharia and law for women’s rights (p. 14), the cost to ensure their rights (p. 15), the weak law and legal structure governing farmers cooperatives (p. 17)... Such gaps constitute important barriers for the Ministry. The report supports the actions by the Ministry of Agriculture to finance and facilitate women led projects to go beyond such legal weaknesses.

The Ministry of Agriculture for this study recognized that the gender approach is difficult to implement. First, the unit is recent. Second, there is a lack of data and coordination of reporting, the gathering of information is difficult. Third, gender is usually used as a tool to get funding but is not implemented. Fatuma Ouazara³¹ clearly identifies **the need for coordination and training for both men and women within institutions** involved in promoting reuse water projects and more generally, agricultural projects. With a current assessment of employees’ understanding of gender comprehension and perceptions, her interview reiterates the need for an “internal communication” assessment and training within the institutional realm of water, sanitation, reuse water and agricultural nexus. Her contribution also advocates for the setting of a shared methodology and indicators with precise objectives to implement the gender approach.

Considering the role of PWA, it has been difficult to bring adequate information with no exchange with the head of its gender unit or the lack of sending requested information by the organization³². Interviewees who have been working for the PWA or with the PWA recognized the difficulties for the institution to push for a gender approach. One interviewee considers the PWA gender approach or strategy is just “a façade” with no understanding nor will implement women’s true promotion at decision-making process. One interviewee declared that the PWA struggles for coordinating gender approach with other institutions but is progressing. The FAO report³³ concluded that PWA lacks a gender department even if this department has been created in 2012. The two interviewees from the German cooperation (KfW and GIZ), the first to promote gender within PWA stated that information and documents are difficult to find and to get, they shared an impression of a grey zone that gender represents.

d. Gender and reuse water in municipalities

2024	Water Wastewater Master Plan	Hebron Governate ³⁴ [13]
2024	Pre-Feasibility Study (PFS) for KfW: Potential for Wastewater Reuse West Bank	Tetrattech / KfW

³¹ Online interview held on February the 24th, 2025.

³² Despite several request by email, during meetings and through the AFD.

³³ FAO, gender, water and agriculture assessing the nexus in Palestine, p. vii: “The Palestinian Water Authority (PWA) lacks a gender department, despite the important role it could play in identifying gender needs and directing gender-responsive plans. National policies refer to some interventions directed towards women in the agricultural sector, but there is a gap between policies and actual implementation. The water sector also lacks gender-based indicators, which are essential in the planning and monitoring process to ensure equitable distribution and access to water resources”.

³⁴ One mention of gender-based fears, p. 115 and includes a mention of the necessity to include women as stakeholders and in water management systems and operations.

In general, our study is based on interviews and the collection of data from 8 services providers concludes that gender integration is low. We had access to data from Bethlehem and Jericho's municipalities through GIZ. Most municipalities are aware of what gender means and counts on women being employed mostly in two main positions: clerical / administrative work, engineering work. Master plan or study for the design of project includes a gender component that is variably considered. It varies from a general mention to guarantee the respect of the user's rights or stakeholders' consultation to a pragmatic integration of women.

Our study shows in the case of Baqa ash-Sharqiyya, Al Bireh, West Jenin and Jenin, Ramallah the lack of gender disaggregated data for employees and their positions. In several organizational charters, when names are indicated, women's names will appear, but they are rare. The WSSA of Bethlehem and the municipality of Jericho integrate such gendered inclusion and training³⁵. Most municipalities declare lacking training on gender and consider applying gender main recommendations which is ensuring fair and equitable treatment of employees. Most answers remain unclear and lack concrete examples or data.

The specific case of the municipality of Nablus appears to be one best practice. The study before the implementation of the wastewater treatment plant and the water reuse scheme included the consideration of women's cooperative (the Ibda'a Women cooperative in Deir Ballut)³⁶. It also states the importance of qualified managers to operate and maintain the systems considering that women should be more present. For the Nablus WWTP, one female employee operates in the laboratory. The director of the WWTP confirmed the importance of having women in his team but remembered the difficulties of hiring women when settlers can attack them. Rola Salameh³⁷ shared her passion and engagement for her work. She clearly reported on many challenges faced by working women: transportation and irregular waiting time at checkpoints; her community pressure to stay home or change of work; a role as a mother. She, however, did not report on insecurity when working in the field.

At the municipality, Rima Yaish³⁸ is the head of the Women's affairs department. **There are about 700 women working for Nablus municipality, about 35% of total staffing.** She conducts several activities to ensure women's participation and promotion of rights. She manages a team of 10 to 12 people who can be contacted by women employees whenever facing challenges or for customer-related issues. She supports an "internal group" for Nablus women employee who can meet on Sunday for a walk. She states that this meeting facilitates information sharing on many topics such as health, education but also, divorce, marriage, and women's rights. In the specific case of farmers women, her departments support women who wants to sell their products at the municipality market (within the Nablus mall on Saturday). She also supports the organization of a weekly meeting at the municipality women's hall (a dedicated room for women's affairs).

The municipality will also financially support women when they must attend a training and pay a hotel or transportation. She usually tries to ensure such a financial support through a women local NGOs or network. An important remark considers the methodology and limitations that a municipality must respect in women's promotion. Rima reminds that the municipality should facilitate but not support, women must take charge and empower themselves, women's networking and tools from the municipality provide an enabling structure that should encourage women's confidence but, in the end, women must act and become financially, psychologically and emotionally able to take charge of their own career.

At the Nablus Ministry of Agriculture, two female interviewees considered that **women need confidence** first, they don't evolve in a facilitating environment with a family context or pressure that want them to replicate the same traditional role, to stay at home. The two women stated that they should be visible, should be able to work, should be able to choose. They consider that such an evolution depends on education but also the recognition of women's labor work with financial independence, which means a change of law and mentality. The women working at the laboratory for the Nablus section of the Ministry of Agriculture (one key information provider) reported on the many challenges faced by farmers. For herself, she considers that her

³⁵ Pre-Feasibility Study (PFS) for KfW: Potential for Wastewater Reuse West Bank, p. 43.

³⁶ GIZ Assessment of Institutions working in the Water Sector, 2017.

³⁷ Interview held at Nablus WWTP, on February the 1st, 2025.

³⁸ Interview held at Nablus municipality, on January the 30th, 2025.

work engagement is important and would go beyond insecurity or threats when she works in the field because this is part of the work, and it brings progress to women's conditions and status.

During our meeting with Wadi Shaer cooperative, we noted how important the woman was in providing information, several times, men relying on her to provide data or specific answers. She, however, would not be speaking for more general matters related to vision or key decisions. Many remarks during our field study showed limitations in accepting women in the workplace. Some considered that “having” a woman is enough, not realizing that letting her have a decision-making role is more important than having more women holding administrative or clerical work with no decisional power. Some also considered that women's points of view are not legitimate due to their lack of knowledge of “the global picture” or “technical matters”.

Finally, we must consider the feasibility of recommending and promoting women's participation into the workplace both within institutions and at the societal level. One interview (GIZ) reminded one case when recruiting an engineer for the water and sanitation department for a service provider. One female candidate was considered legitimate and qualified but was refused over a man, less qualified but more adapted to the municipality and organizational context. Interviewee from the civil society (RSWD, PWWSD, UAWC) reminded that the integration of gender and women are usually an isolated component when it should be **transversal with a strong assessment and consultation phase to include women's point of view before the start of any project**. One researcher also reminded the importance of not considering gender as a concept, but a discussion directed at men to make them aware of a fact they easily accept and know: “their” women (wife, mother, sister, daughter) play an important almost sacrificial role to provide their family adequate resources and good living.

e. Women's associations for rural areas and activities

Women Associations are historically an important in the Palestinian society since as for the registered women's charitable associations that fall under the jurisdiction of the Ministry of Women's Affairs, their number is approximately 193 associations working in various fields related to women's empowerment and supporting their rights³⁹.

Palestinian associations involved in women's participation to the water, wastewater and reuse water activities include Rural Society for Women Development (RSWD), Palestinian Agricultural Disaster Risk Reduction and Insurance Fund (PADRRIF)⁴⁰, PARC (Agricultural Development Association), The Union of Agricultural Work Committees (UAWC) as well as NGOs involved in water and wastewater sector with work on reuse water and gender such as the PHG who hosts the Palestinian Women Water Network. The Palestinian Working Woman Society for Development (PWWSD) and Al Ma'an Development Centre were included in this study for their work on rural women economic value, work conditions and rights.

Documenting women's needs is a common approach and aims at providing data to enforce the need to support women's rights and living conditions. They document major gaps for support women in the agricultural sector:

- The enforcement of both Sharia and the law that support equal treatment and equal access to work opportunities and workplace.
- The reinforcement of the law with a change in both agricultural and water laws and legal framework to ensure women's access to resource management, resource ownership and managing positions in both institutional and private water, sanitation and agricultural sectors.
- The need to formalize women's economic contribution through legal status (work contract) and financial status (bank account, loan, business ownership and administrative steps).
- Address the traditional home organization and women's role to facilitate and support women working outside the family farm or being fully trained and employed to gain financial revenue and both familial and social recognition for her work.

³⁹ According to the Ministry of Women's Affairs, there are 193 registered associations that work in various fields related to empowering women and supporting their rights.

⁴⁰ NGO mentioned in the European Joint Strategy in support of Palestine.

- Establish projects outside Zone C or consider a political solution to enable women farmers to access their land, cultivate without risks of violence or expropriation, collect their crops and gain direct revenues from selling and/or transforming their agricultural products.
- Train in pragmatic challenges: how to create and maintain a business, regular training sessions on equipment, new materials or modern methods, legal frameworks and administrative steps, communication tools and skills, etc.
- Integrate women's need from the start when designing a reuse water project and ensure the presence of local women for any collection of data, for training purposes, etc. The trust dimension is particularly important to ensure the longevity of project but also, at a social level.

Reports from such associations also contribute to provide qualitative information on women's conditions through local surveys bringing key data but more importantly, through testimonies or verbatim from personae; Such content constitutes important data to bring pragmatic issues and inhabitants perceptions and struggles. For instance, the report from PHG, "Gender and WASH Analysis at Community Level in Area "C" of the West Bank" documents several concrete examples overcoming gender stereotypes and blockages. This report provides numerous testimonies from various locations on water, solid waste and land challenges without specially addressing reuse water.

The PHG and the PWWN are working in close collaboration together to bring women's place forward in the institutional level. For instance, Eman Duwaik, who is the head of the gender approach for PHG and who has been brought to light in the media⁴¹. She is also part of PWWN which oversees the gender component for the Union of Palestinian Water Service Providers (UPWSP). She is considered a "key player" by Ali Odeh (UPWSP)⁴² and "the gender referent" for Abdelrahman Tamimi (PHG). She brought to the discussion key elements such as the low participation of women to the water and sanitation sector (6%), their lack of knowledge, the limitations from the legal and policy-making structures to implement gender component. As for reuse water, Abdelrahman Tamimi and Ali Odeh referred to the Gender and WASH Analysis mainly written by Hanan Daoud.

When interviewing the main writer and gender expert Hanan Daoud⁴³, she confirmed the necessity of conducting qualitative and quantitative research. She reiterated the lack of gender disaggregated data for addressing agricultural needs and challenges but also, the importance of documenting gender differences and perceptions of farming a land in the State of Palestine. Considering the institutions she worked with (PWA, MOA, MoWA), she stated that institutions are progressing in taking gender into account but mainly, the gender approach and its implementation will depend on the person... "It is easier to work with a gender person which means someone who know what it means in terms of data, qualitative impacts, social perceptions, cultural barriers..." To ensure that gender is implemented and understood usually consists in open discussions with men and separately with women. One key practice is to bring educated women who can bring concrete examples rather than concepts that usually bring blockages and false interpretations. For her and two other interviewees, one key issue is to explain that gender is about equal rights and chances rather than a concept that can be misinterpreted (such as "make them understand gender is not about transsexuality or feminism").

f. Supporting networks

The different associations met for this study support women networking activities. There are two main important mechanisms. The first is the representation of the association with a local office or a local representative in main Palestinian cities. This ensures that women know where to go and whom to speak when they need specific advice. The second is the regular organizations of meeting for both men and women throughout funded projects. They ensure the presence of a woman who will be specifically in charge

⁴¹ Kvinna, [They network to counteract water shortages in Palestine](#)

⁴² Online interview held on February the 20th, 2025.

⁴³ Online interview held on February the 24th, 2025.

of discussing with female farmers in formal or non-formal setting (training sessions, workshop, exchanges at home or discussion while collecting fruits or vegetables, etc.).

The RSWD and PWWSD are historically well implemented with strong networks. They both shared the importance of integrating women working in municipality, for public institutions or private companies in their networking activities. This women's profiles have access to information and network but more importantly, are inspirational figures as working women who hold a position in the society. They facilitate administrative steps but bring what many farmers women need, confidence or a "emotional" / "psychological" component that they need to be able to put their positions forward in the family led farm, at work or at home. The RSWD stated that women networks are invisible force that help women to survive, to support each other's, to change one's life decisions...

g. Supporting training

Many interviewees stated that funding agencies and funded projects will usually support capacity building training sessions without direct impact on women's lives. To organize workshops for women on "gender as a general concept" is useless. Farmers women need certified training on specific planting processes and crops collection, product transformation, modern equipment particularities and maintenance qualification with access to repair materials for ensuring long term use of equipment, etc. The RSWD recommended financing autonomous systems that allows managing water and energy independently from the Israeli occupation and authority. She quotes the best practice in Gaza where a RSWD subsidiary developed a site with a well, a solar panel and an information library in Zone A. This place was appreciated, running and independent but was destroyed by the war.

One representative from the civil society reminded that at some point, funding from international cooperation is punctual and usually serves as a "check list" for donors. "You bring us paint with capacity building workshops. Well maybe we don't need paint, we want guns to change the main problem, the Occupation. With the occupation, the State of Palestine, women, farmers women can't benefit from their lands". She later states that training sessions that are certified and that bring a real financial and legal independence to farmers women are effective, but they are rare and not adapted to women's work hours or home constraints.

Mainly, women from civil society condemned a "white collar male dominant system" bringing privileges to Ramallah's elite rather than bringing concrete solutions to both men and women working their lands. The main challenges are for Gaza, a total reconstruction by answering to basic need of its inhabitants; for West Bank, to reunify and secure Palestinian landowners, and for the State of Palestine, to end the occupation. One person mentions the recommendation, dating from 20 years ago, of creating a Two States coalition.

G.4. Gender awareness & responsive evaluation

The section aims at providing elements to objectives 2, 3, 4 and 5.

G.4.1 Gender awareness, a well-used term and policy driven approach

a. Gender-driven policy

Reports and analysis consider that the creation of the Ministry of Women's Affairs in 2003 constitutes a key cornerstone in promoting women's rights and equal treatment within the Palestinian society. It contributed to the creation of 24 Gender Units (GU) in 2005 by the decision of the Cabinet and now counts 32 units including the Ministry of Agriculture. The MOWA is particularly active in implementing women's rights and ensuring their participation, promoting gender in national policies and gender sensitive budget. The Ministry developed a "gender toolbox", some elements are made available online including a center of communication; legal references, plans and programs at local, regional and international levels; research report; etc. The Ministry is also the counterpart in charge of international relations and ensuring that the State of Palestine comply with international legal requirements (CEDAW, Beijing convention...).

The release of an educational and public video early February 2025⁴⁴ is a concrete example of raising gender awareness by providing key information. This video is simple with key dates, important legislative data and objectives for women's condition. The MoWA is active on four social media platforms (X, Facebook, Instagram, YouTube) and regularly publishes institutional information on the Ministry's activities.

The MoWA is "composed of 5 different departments that aim at establishing collaborative networks from institutional to local levels, to international, to regional and onsite levels". For the Head of the Department of gender networks, Ghada Ghai Elia⁴⁵, a key challenge for their activities is to oversee gender awareness at institutional, organizational and labor, and societal levels. Her department runs data on official associations related to gender (152) or capacity building (139). They work with the Ministry of Labor in charge of registering women's businesses, with the Ministry of Social Affairs for matters related to women's conditions. One of the main challenges is documenting and supporting women against domestic violence. The MoWA also works with the Ministry of Agriculture and issued – as previously mentioned, a report on "Agricultural Projects Established by Women as a Lever for Empowering Palestinian Women".

As for the Ministry of Agriculture, the creation of the Gender unit is recent. It still running assessment to further identify key gaps and needs for rural women. Gender awareness is considered an issue, and the GU is currently assessing the perceptions of the ministry's employees. Fatuma Ouazara clearly stated the absence of a women component in agricultural policies and projects which points out a lack of gender awareness and gender policy driven at the agricultural level. In accordance with her statement, the FAO report on water, food and agriculture nexus further supports the importance of a clear political will to bring both gender awareness and implementation.

b. Gender awareness campaigns

In general, many campaigns have been conducted to raise gender awareness in Palestine. Media campaigns have been widespread for the International Day of Women Rights. Several topics have been raised such as GBV, educating women for the digital transition, or women's rights. In the specific topic of rural activities and women's roles, civil society has been very active since the eighties with the recognition of important NGOs such as PWWSD and RSWD. Their latest campaigns cover major challenges for women in terms of social pressure, access to business opportunities or to defend the voices of Palestinian women's right at the UN level.

For the specific activities for rural women, the PWWSD just finished a study on women's land at a regional scale including neighbor countries such as with Lebanon, Turkey, or Egypt. This program called Fem Pawa shows the progress of women's education or even access to the workplace but documents the lack of water access and lack of access to social rights. "To be frank, you see much progress in general data, in theory but the problem remains... Women have a lower legal status. Women are the first to suffer from poverty and unemployment. They are still discriminated against in accessing the labor market. They usually work in a non-formal economy where they are subjected to abuse, low incomes and their health suffer, and they have poor access to security" stated Basma al Naji.

Parc and UAWC both have extensively supported projects for agricultural activities, they both integrate gender in their approach by specifically funding and/or training agricultural women. Several of their projects are available online. UAWC is leading advocacy work on promoting the agricultural identity of women farmers. The association lately issued a program called Campesina that aims at documenting and wide spreading the values of "peasant women" relating the core activities of cultivating the soil but also social and status differences among women. Such differences are affecting their political voices and visibility. For Yasmeen El Hasan, social structures have been built by women and most of them know how to navigate their own communities. Tensions are brought by the Israeli occupation reinforcing the patriarchal system and need to protect women.

⁴⁴ Available on its website and YouTube: <https://www.youtube.com/watch?v=5-YAigxxZ6k>

⁴⁵ Interview held on February the 6th, 2025.

G.4.2 Gender implementation

Members from public institutions, municipalities, service providers or civil society who are gender specialists or experts all shared a common view on gender for water, sanitation, reuse water and as whole, it is a concept that is not well understood and not applied in pragmatic actions.

a. Concept for funding opportunities

When questioning gender, we observe vague answers or answers referring to conceptual references, international standards or GBV. As mentioned, the report from the FAO written by Luna Saadeh made an important point about creating GU in the State of Palestine, it raised discrimination against women, but we observe that it rather put gender in an isolated corner. Gender is either a concept for women and gender specialists are women, a way to give them a job but keep them in position afar from the organization priorities, or a concept for budgeting with a clear understanding that gender bring funds from donor. In this case, gender is employed as general engagement with a clear lack of sufficient data.

For many members of civil society, bringing gender inclusion means changing the law or at least, applying the law; to involve and listen to women; and for the specific case of reuse water, to bring concrete indicators and funding to support women's conditions and implications in agricultural projects.

"Gender mainstream is very low at the legal and institutional capacity building level/The law and by laws are a barrier for women. When tackling gender issues, you must look at both sides, the institutional and general context and the local, the specific level. The term itself of gender is not understood, included and applied at the legal framework level. Gender inclusion in the legal context means women's rights and women have less rights." Sireen Hosho, Al Ma'an.

"One recommendation is very basic, include them, ask them! Make sure that they are consulted in design, planning, and implementation activities. Women are actors of change. They are very capable. Even if we have women in municipalities, ministries, universities with education or political background, gender approach is still not applied. Donors tend to give more funds when women are included but you must make sure they participate, and they are listened." Basma Al Naji, PWWSD.

"I think we should focus on social rights and data and get gender disaggregated data to have a clear picture of women situation and let women's advancement and transformation comes from within, from an intra communal aspects. This is when focal points are very important. They know the wording, the setting, the social mechanisms and how to accompany social changes. This assessment may have a direct impact on gender transformation." Yasmeen El Hassan, UAWC.

Such statements reiterate the need for pragmatic and local activities with a strong social component. It also points out the need for coordination and gender interpretation at all levels. It also encounters the issue of its conceptuality and origins as gender is considered as a concept brought by donors and continues a form of socio-cultural colonization.

b. The issue of policy coordination

As a transversal approach, one main challenge to implementing gender components is coordination. Looking at the implementation of gender in the Palestinian legal framework and the specific sector of water, sanitation and reuse water management, it clearly progressed from guaranteeing equal rights among Palestinian no matter their sex to include users and, finally, ensure women's participation and key role to resources management. Gender has been driven by a political engagement from the State of Palestine when creating Gender unit. For reuse water, it has been brought through funding projects and donors starting 2011 with the key role played by GIZ in implementing a gender strategy for water and solid management. Such action contributed to the creation of a gender unit led by researcher Hanadi Badr. Unfortunately, as shown, the implementation of gender still lacks clear commitment and consistency. This is shown by the difficulty of collecting papers or documents, even drafts, or getting clear pictures from PWA staff on their current gender projects and objectives.

Lack of coordination appears to be a general institutional weakness with gender units related to water, sanitation and reuse water projects not knowing and working together. Getting data from the MoWA meant to consult with MoWA, MoL, MoLG, MoA, etc. when data should be available in one "information desk". The

MoWA recognized that there is no gender and water specific work within their ministry and that the work on agricultural projects to support farmers women is recent and in the building phase. This means the need to establish work relationships and coordinating mechanisms among institutions related to implementing reuse water projects. One member from MoWA suggested that WaDIS could act as a supporting initiative to coordinate and establish such working relationships. The MoA clearly advocated for the need to get a clear picture of gender perceptions and will among water and agricultural public organizations to establish a shared vision that will clarify the MoA role and mainstream gender in water and reuse programs.

The history of gender inclusion in water, sanitation and reuse water shows a lack of coordination among donors, civil society and institutions. Gender awareness, the progression of gender inclusion in legal framework and the running of gender units with a gender toolbox are important mechanisms to continue gender promotion and implementation. When looking at reports from donors, many donors support the MoA as a key coordinator to implement gender approach. Several recently funded projects show both coordination among donors with local NGOs, there is however still a lack of coordination before allocating new projects. One publication from the Spanish cooperation is particularly revealing with the donor stating that they support such projects and schemes. As such, the Team Europe Initiative and the WaDIS project represent a key evolution factor.

For specific projects on gender and reuse water, we already pointed out best practices from the FAO/AFD project in Northern Gaza or the project supported by OXFAM supporting olive production. These projects follow the adequate methodology for socio-economic projects with an assessment phase with both qualitative and quantitative data collection, inclusion of women in design, training, implementation phase. The impact study was, however, not realized due to the war in Gaza.

c. Socio-economic, socio-political limitations

A consensus states how prevailing social norms and culture in Palestine constrain gender implementation and deepen gender roles. Gender approach is seen as a potential mechanism that reinforces patriarchal structures in both private and public spaces rather than narrowing gender gaps. These norms and rejections of the concept reinforce women's reproductive role and prevent them from actively engaging in the public sphere. In our panel, women used strong words to denunciate a "white collar dominated society" that is reinforced by the Israeli occupation. Masculinity of Palestinian men being threatened by the political tensions and war has direct consequences on women's conditions. Men want to protect women's security but might use this vulnerability to limit women from accessing the workplace.

Many interviewees stated that limitations from Sharia or law are not the problems, these laws encourage women's participation and place as a recognized labor force. The issue is to enforce such laws with pragmatic incentives, by laws or even a new law that ensures women's rights. Many expressed that policies should go beyond the so called "traditional cultural barrier" since women always had a powerful place in the Palestinian rural and agricultural society and identity. The issue is to bring them legal and financial independence.

Finally, regarding the occupation and Gaza's situation, it is important to point out a repeated plea, that what is needed is a response to basic needs. Gender advocacy and promotion makes no sense without guaranteeing access to basic products and basic living conditions. For most of interviewees, the Gaza situation brings back to the occupation which is at the core of all blockages and advancements for the Palestinian society.

"I think we need to focus on basic needs. Women need support for hygiene, transportation, getting through check points, ensure their kids life. We advocate for an "intersectional needs approach" and assess those needs in the specific context of the occupation. We need to ensure sustainable water access, not paint the wall with a check list that is only useful to donors. Maybe we would rather have a gun to change the situation."

G.5. Application to the WADIS project

The section aims at providing elements to objectives 2, 3 and 7.

G.5.1 Legal structure

To implement TWW reuse projects, the WaDIS project needs to address the following gaps by addressing gender inclusion and accountability with precise quantitative indicators and qualitative objectives and measures.

a. Gender specifics to WaDIS project

Water and agricultural law

Clear statement against women discrimination to access workplace, financial support, and natural resources.

Enforcement of Sharia and 2003 Basic Law for equal treatment and equal access to the workplace, land ownership and business.

Authorize financial independence so women can open a bank account for agricultural projects and businesses, get a loan or financial support.

Water and agricultural by-laws, policy and strategic planning

Implement gender components through gender disaggregated data, gender sensitive budgeting and gender dynamic analysis to organizations (equal access to decision-making positions, equal training and career opportunities, internal rules and mechanisms against sexism, sex related discrimination and harassment, gender awareness and training for staff, gender sensitive lexicon).

Set quantitative indicators on women's employment, recruitment and remuneration. If necessary, implement progressive or ambitious quota with a rule to prefer women recruitment at key decision-making positions. Establish voting rules with the presence of a minimum quota of voting women.

Design strategic plans with stakeholders' participations and endorsement, with stakeholders representing farmers women (NGOs, women's network...) and stakeholders bringing key knowledge on their needs (researchers, funding organizations...)

Monitor all strategic plans before any validation by a gender expert, through a specific expert group that will ensure the respect of gender component.

Amend gender obligations with quota or quantitative objectives at all levels public institutions, service providers and municipalities, WUA, farmers cooperatives.

Land and water ownership

Disseminate information on women's legal rights to inherit.

Facilitate inheritance administrative steps through municipalities and specific rural women networks.

Offer financial facilities or funding to pay for inheritance.

Ensure women's land ownership facilitate business operations and management by women: bank account name and authorization, loan access, targeted training for female owner, facilitate access to materials and modern equipment with training.

G.5.2 Design program for WWTP and reuse scheme

a. Socio-economic and socio-cultural assessment study

Before implanting a new reuse scheme and project, when designing or renovating WWTP, WaDIS should ensure a socio-eco-cultural assessment that brings gender components forward and at the core of any new or rehabilitation project. It should:

- Provide legal references enforcing the gender component added value, impacts and vision.
- Set a methodology and tracking table to collect gender disaggregated data at all levels (local, regional, national) and through a coordinating mechanism or “shared collection desk” (online shared document).
- Conduct a pre-designs project study and assessment to bring socio-economic evaluation and socio-cultural pictures on farmers women’s conditions.
- Bring a clear vision of agricultural women’s needs at Palestinian level with clear picture by geographical zones: West Bank/Gaza, Major cities / rural areas, Northern West Bank / Southern West Bank, per major irrigable zones, per small/middle/large agricultural cooperative, per WUAs, per farmers cooperatives.
- Assess women’s needs in terms of economic resources, labor force, financial capacities, training, basic needs, socio-cultural mechanisms, etc. at national and local level (global/local scale).
- Raise gender awareness within the project’s team through training and women’s presence, towards involved stakeholders (training or workshop) and at all levels (institutional, municipalities / SP, civil society and private companies), and to beneficiaries (farmers cooperatives, women farmers, local councils and civil society, women’s networks).
- Set quantitative and qualitative indicators ensuring gender implementation.
- Ensure women’s participation throughout the whole project’s process and phasing.

b. Coordination of gender component implementation, gender in governance and decision-making

Establish a clear governance scheme with each institution’s roles and responsibilities in ensuring gender component implementation.

Enforce gender components as part of their project through setting gender equity as value and guiding principle, gender sensitive budgeting, women’s quota.

Double implementation process with two institutions coordinating gender indicators and implementation.

c. Promote self-sufficient solutions

Promote projects in Zones A and B.

Finance projects with self-sufficient solutions for energy, water and reuse water access and resources.

Enforce simple, low cost and easy replicable technologies.

Train beneficiaries to operate and maintain facilities.

d. Beneficiaries, ensure women’s participation

To ensure women’s participation and equal access to reused water and reuse projects, WaDIS should:

- Offer technical and educational training to women with specific funds for women.
- Guarantee official recognition of training. Provide certification or diploma in cooperation with official training entities or universities.
- Adapt timetable and event’s organization to women’s availability and capacity to attend meeting, workshop, training sessions (outside resource collection time, support transportation and hotel expenses, support women’s absence at home / taking care of kids...).
- Evaluate intimate barriers (hygiene, access to toilets, menstruation when traveling / check point) and potential GBV from women’s participation to the project.

- Support women's networks to widespread information on administrative and legal frameworks but invisible barriers to leave home.
- Open specific "farmer women's corner" or information relay to enable discussion and information access to vulnerable women.
- Address cultural, educational and religious blockages with the participation of recognized local figures in the community (women from civil society, educational referent, religious Cheikh, young leader... both male and female).
- Allocate time and space for discussions on intimate subjects for both men, women, joint men and women groups.

H. SPECIFIC ISSUES

H.1. Transboundary wastewater issues

According to data provided by the PWA, approximately 54% of the total population in the Palestinian Territories is connected to a sewer system (39% in the West Bank and 83% in the Gaza Strip). The relatively recent wastewater service is experiencing constantly growing demand and requires not only to expand existing networks but also to construct the necessary WWTPs, in order to reduce the discharge of untreated wastewater into the wadis, and to limit health risks and environmental impacts.

There are more than 19 treatment plants currently operating in the West Bank, with an annually treated quantity of 10 MCM. Out of this amount, approximately 2.3 MCM is reused for agricultural purposes, while the remaining volume is disposed of into the wadis, where it mixes with raw sewage. Due to the topography of the territory, the wastewater, treated or raw, from many western areas of the Palestinian Territories flows directly towards the Israeli side.

According to the PWA, in 2022, 17.3 MCM of wastewater (treated or mixed with raw wastewater) crosses the Green Line, reaching the Israeli side. This situation generates cross-border political and economic issues concerning wastewater management which have an impact on the development and the economic model of the service. This section addresses the critical issue of wastewater management related to the flow of treated, mixed, and untreated wastewater through wadis into Israel.

H.1.1 Current situation and main issues related to transboundary wastewater management

In several areas bordering the West Bank and Israel, wastewater is discharged into wadis which then flows into Israeli territory. There are 15 streams that cross the Palestinian/Israeli Green Line. Twelve of these are major streams that flow to the West towards the Mediterranean Sea and the other three flow to the East towards the Dead Sea and the Jordan River. Most important streams originating in watersheds located in the Palestinian Territories and flowing towards Israel are presented in table below.

Stream (wadi)	District
Wadi Al-Moqatta	North Jenin
Wadi Al-Zomar	Nablus and Tulkarem
Wadi Al-Zuhur	Qalqilia
Wadi Suriq	West Ramallah
Wadi Beit Jala	Bethlehem
Wadi Al-Samen	South Hebron

Table 26: Major streams involved in transboundary wastewater management

These streams are collecting treated wastewater from Palestinian WWTPs (Hebron, Nablus or Jenin) but also mixed and raw wastewater that are discharged into wadis without prior treatment. In other cases, wastewater is collected via the Palestinian sanitation network and redirected directly towards Israeli WWTPs, as is the case in BaqaSharqiya which is not yet equipped with a treatment plant. The data concerning the volume of wastewater emanating from the Palestinian territories and discharged from these streams into Israel varies from one to two depending on the estimates of the two parties.

PWA estimated that 17 to 19 MCM of treated or mixed wastewater crossed the border in 2022, while Israeli authorities estimated this figure at 30.4 MCM per year for the same period. Subject to offsetting the costs

associated with the treatment of this wastewater not originating from their territory, Israeli authorities have been deducting substantial amounts from Palestinian tax revenue monthly, invoking the cost of treating wastewater originating from the Palestinian Territories.

According to the data provided by the PWA, in 2022, Israeli authorities deducted 54.4 million NIS, claiming this amount was for the costs associated with transboundary wastewater treatment. Additionally, 16 Israeli wastewater treatment operators invoiced 55,2 million NIS to the PWA during the same period, citing "one-time costs" related to the operation and maintenance of WWTPs and investments in new infrastructure, including transmission lines, pumping stations, and expansion of WWTPs. As mentioned by the PWA, the relationship between these invoices and the flows of transboundary wastewater is not clear, which significantly limits the PWA's ability to contest these charges, as the amounts are automatically deducted from the tax revenue earmarked for the PA, further restricting their capacity to contest such payments.

Overall, Israeli operators charged the PWA nearly 100 million NIS in 2022. The PWA estimates that this deduction translates into a treatment cost of approximately 10 NIS per CM, which includes significant expenses for infrastructure development. Concerns have been raised about the justification for these high costs, particularly as the "one-time costs" continue to rise without clear rationale or supporting evidence.

Data provided by the PWA for 2023 illustrates this trend. Total transboundary deductions amounts to 128.49 million NIS, with relatively stable processing costs compared to 2022 (around 55 million NIS) and a clear increase in one-time costs (around 73 million NIS). Most impacted regions are Hebron, (almost half of the 2023 deductions), Tulkarem and Bethlehem.

The most recent data for 2024 shows even higher amounts for the Hebron region and the wastewater discharged by Wadi Al Samen, with a total amount invoiced by the Israeli authorities of approximately 84 million NIS (around 21 M€), an increase of more than 30% in one year.

These constantly increasing amounts, without formal justification of the quantities or unit costs invoiced by the Israeli side, are imposed on the Palestinian Authority, who is unable to negotiate a reduction in the expenses incurred.

According to PWA, the Israeli-Palestinian Joint Water Committee (JWC) should serve as a framework for discussing these issues, but the Palestinian Authority is struggling to make its arguments heard. Moreover, the JWC meetings have been impacted by the war since 7 October 2023, and despite a revival of discussions at the beginning of 2025, there is no bilateral solution that would allow the Palestinian Authority to envisage a reduction in these costs.

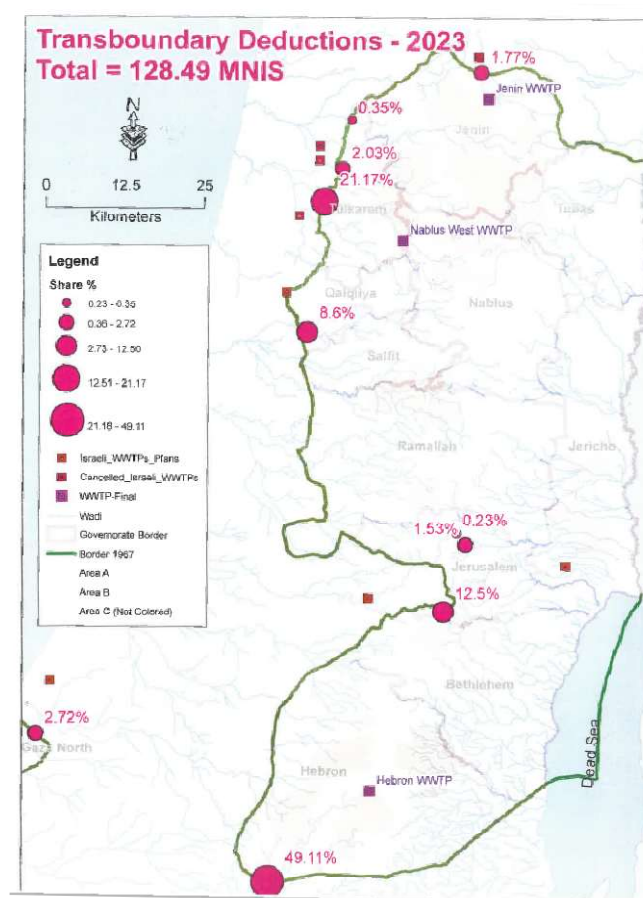


Figure 22: Transboundary wastewater deductions shares between concerned areas (PWA, 2023)

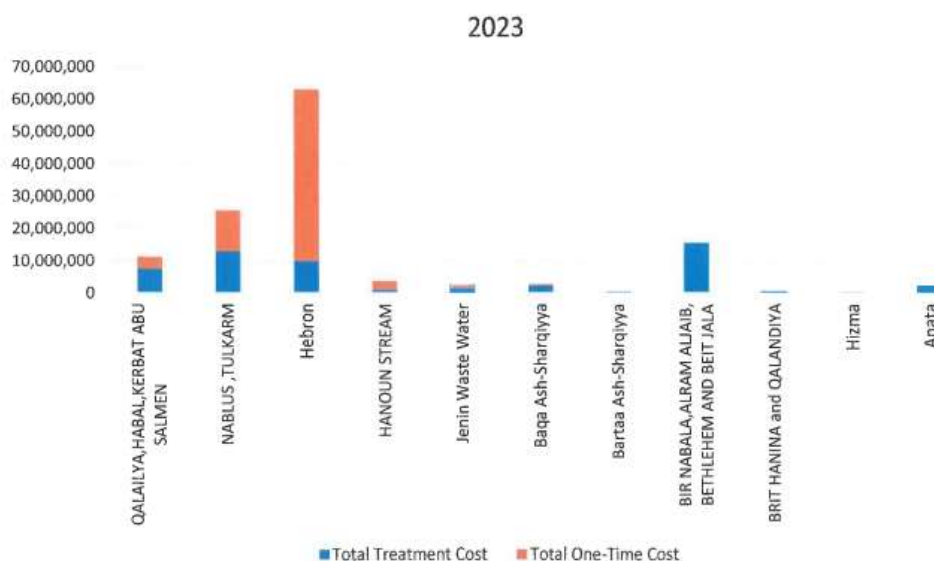


Figure 23: Transboundary WW treatment and one-time costs for impacted areas (PWA, 2023)

H.1.2 Palestinian strategy to reduce transboundary wastewater treatment deductions

Apart from the significant costs deducted for the treatment of transboundary wastewater, the Palestinian Authority derives no profit from treated wastewater that could then be reused. PA is therefore strained to pay for their own wastewater treatment, without being able to collect it after treatment for reuse.

As a reminder, the National Water Policy of Palestine recommends to:

- Reuse treated wastewater preferably within the national territory, wherever technically feasible.
- Where expedient, consider the transboundary export of treated wastewater from Palestine in return for the transboundary import of fresh water over and above the agreed allocated quantities from shared resources.

Issues related to transboundary wastewater and reuse are therefore closely linked, since the development of treated wastewater reuse projects would make it possible to reduce the volumes discharged through the Green Line and, at the same time, to produce an economic resource aimed at offsetting treatment and maintenance costs. The extension of the sanitation network, the construction of new WWTPs, the improvement of wastewater treatment and the development of reuse projects are complementary axes towards common objectives, clearly identified in the new Palestinian sectoral strategy.

The National Water and Wastewater Policy and Strategy for Palestine 2022-2042 (not yet endorsed) defines clear objectives regarding the reduction of transboundary wastewater.

- Short-Term Objectives (by 2030): Achieve a 50% reduction in transboundary wastewater through the construction of wastewater treatment facilities and the reuse of treated wastewater in agriculture and industry, where feasible.
- Medium-Term Objectives (by 2042): Achieve a 80% reduction in transboundary wastewater through the continued expansion of wastewater treatment facilities and increased reuse in agricultural applications.

In order to reach these targets and reduce the deductions related to the discharge of wastewater into Israeli territories, the Palestinian authorities have considered, around the main wadis and border areas concerned, the implementation of large-scale projects aiming at:

- Increasing the volume of treated wastewater directly in Palestinian territory, in particular by extending the sanitation network, rehabilitating and extending existing WWTPs (Al-Bireh) and building new WWTPs in the areas most affected by the cross-border wastewater problem: Baqa ash-Sharqiyya / Nablus East / Hebron / Ramallah with Ein Jarout WWTP.

- ii) Transporting treated wastewater from the western parts of the territory to the eastern regions through the construction of pipelines (pressurized or not) and pumping stations with the aim of reusing this treated wastewater for the irrigation of large agricultural areas in zones where water resources are scarce and where demand is considered high (Al-Auja area, Yaabad area, An Nassariya Beit Hasan area. These areas, some of which have up to 30,000 irrigable donums, would thus benefit from treated wastewater from border areas.
- iii) Amortizing investment and operation and maintenance costs associated with the construction of this new infrastructure by providing for the creation of energy infrastructure (solar panels, hydropower system) to produce electricity and improve the energy efficiency of the projects.

To date, several projects aiming at reducing transboundary wastewater are under consideration, some of which are the subject of ongoing preliminary studies. These projects concern the areas most affected by the transboundary deductions: Hebron, Tulkarem, and Ramallah/Al-Bireh. The first details and conceptual plans have been shared by PWA and illustrate planned infrastructure (Annex 10). By example, the conceptual plan below presents the details of the proposed project to consolidate the treated wastewater from the existing Nablus West WWTP and the two future Tulkarem and Nablus East WWTPs in order to redirect treated wastewater eastwards to reuse water and irrigate large agricultural areas.



Figure 24: Conceptual plan - Tulkarem-Nablus treatment and reuse scheme - PWA

Another project involves the Baqa Sharqiya area in the north-west of the West Bank, in the governorate of Tulkarem, where wastewater is currently being treated in Israel for the last five years. PWA indicated that there is an urgent need to implement a local WWTP and to develop reuse. In this respect, the Palestinian authorities have been working on the development of one of the projects mentioned above, which includes:

- The construction of a WWTP with a capacity of 5,000 m³/day located in En Nazleh Al Sharqya.
- The construction of a pumping station and a 5.2 km pipeline to transport wastewater from the Deir al Ghusun wadi, where untreated wastewater from surrounding villages is discharged, to the new WWTP located in En Nazleh Al Sharqya.

- The construction of a 12 km pipeline to transport treated wastewater from the WWTP to the irrigable area of Yaabad, comprising approximately 30,000 irrigable donums.

These large-scale projects aimed at reducing the deductions on transboundary wastewater raise significant issues of technical and financial feasibility and institutional coordination.

H.1.3 Issues related to the implementation of large-scale wastewater and reuse projects

The implementation of projects on a national scale raises multiple challenges including institutional, technical, environmental, organizational, social, political, and financial issues.

a. Governance and monitoring of national scale projects related to wastewater and reuse

At the institutional level, it seems important to specify the division of roles and responsibilities, particularly with regard to the maintenance of the facilities, which will cross areas covered by several service providers. In the absence of established RWUs to provide service on a regional scale, the implementation of such projects would require increased coordination between the various actors at the central and local level. The identification of the stakeholders responsible for the operation and maintenance of the infrastructure must be clearly established in advance to avoid any overlap of competencies or responsibilities. In cases where the infrastructure serves territories under the responsibility of multiple RWUs, specific management committees may need to be established between institutional stakeholders and field operators to facilitate coordination.

According to the work carried out by NIRAS (technical assistance to rehabilitate the West Bank Water Department and establish the National Water Company), the NWC will play a pivotal role in ensuring the efficient and sustainable management of water resources across its area of operation. To achieve this, NWC has defined several key functions that are essential to its strategic vision and operational success among which: "Ensuring reliable and efficient operation and maintenance of water production, transport, and bulk water distribution, including chlorination".

However, the role of the NWC with regard to treated wastewater and reuse remains unclear to date. Projects and infrastructure could be under the authority of the NWC, but this would imply strong coordination with the main service providers, in terms of the collection of treated wastewater as well as the rights of the areas that will benefit from this wastewater for reuse projects. Furthermore, this approach implies that the NWC has the necessary capacities, in terms of staff but also in terms of technical, financial and project management training, to ensure the management and monitoring of such infrastructure.

Although these projects are currently in the preliminary phase, it seems important to consider the institutional set-up for their governance and operationalization.

b. Consistency between large-scale projects and existing masterplans

The discussions held during the field mission showed that the service providers were not always aware of the masterplans aimed at structuring the water and wastewater services in their respective territories.

In some instances, the integration of ambitious, large-scale projects in masterplans complicates the development of the services at the local level. In the case of the Ramallah region, the construction of the Ein Jarout WWTP, aimed at discharging some of the wastewater directed to the Al-Tireh WWTP and treating wastewater from many villages west of Ramallah in order to limit the flow of wastewater flowing towards Israel, is planned in the 2019 masterplan financed by KfW for the area covered by the JWU.

"Masterplans are useful for defining the overall strategy, but most of the forecasts have not been implemented, requiring regular updates, and it is not really useful to the municipality"

Ramallah municipality is using the masterplan as a basis for extending the service. For example, with a financial support from the French city of Rennes (1 M€) through AFD, the municipality of Ramallah has just signed a MoU with the municipality of Beitunia to cover a new catchment area between both municipalities. Service in this area should have been the responsibility of the JWU after construction

of the new WWTP in Ein Jarout, as specified in the master plan; however, to date, this WWTP is not operational.

In view of the urgency, Ramallah municipality has taken up the matter and has planned to build a sanitation network covering 25% of the area and allowing wastewater to be discharged to the future WWTP in Ein Jarout. However, pending the completion of the WWTP, this wastewater will be discharged directly into the wadi and then be redirected directly towards the Green Line.

In other cases, analysis of the masterplans has shown that they do not always include these large-scale projects and that some recommendations, or investments recommended by the masterplans, are not aligned with the objectives of these projects. By example, the Hebron masterplan, finalized in 2024, proposes several avenues for the development of the sector, involving the construction of new WWTPs accompanied by reuse projects, and includes the transboundary issue as an assessment criterion but does not mention the PWA project aiming at reducing transboundary wastewater.

This means that the municipality of Hebron or the other service providers covered by this document could implement smaller-scale projects, recommended by the masterplan, which would limit the feasibility of the planned project aiming at reducing transboundary wastewater.

It is worth emphasizing the risk of inconsistency in the development of the sector between local service provider initiatives that do not have an up-to-date masterplan (Tulkarem masterplan dates from 2011), service provider initiatives that are aligned with more recent masterplans, and the desire to develop larger-scale projects, possibly across several existing masterplans. There is therefore a challenge of consistency between the feasibility studies in progress, or planned for transboundary wastewater projects, and their alignment with the existing masterplans or those under review.

c. Technical and financial issues

Due to the topography of the Palestinian Territories, the transport of treated wastewater over long distance raises technical and financial feasibility questions.

The analysis conducted at local level showed that most service providers did not have the financial or technical resources needed to extend the wastewater network, often due to topographical issues and the associated infrastructure costs. This is particularly the case in the Tubas region, where the Tubas water utility cannot extend the network to the entire southern part of the city and the Tammun area due to the difference in altitude and the cost of the pumping infrastructure.

This situation has also been raised by the municipality of Al-Bireh, which faces a growing demand for connections to the wastewater network, particularly in the northern expansion areas of the town. According to the manager of the service provider, connecting these new households to the existing network is complex and costly, due to the topography of the municipality.

Similarly, feedback from the field reports difficulties in carrying out preventive maintenance on existing infrastructure, with service providers often having to deal with a significant number of emergencies and a small number of technicians operating in the field. The maintenance of major infrastructure (costs, responsibilities, frequency) must be integrated from the feasibility studies onwards in order to avoid facing problems similar to those currently encountered at the local level.

The information provided by the PWA concerning these projects includes the installation of energy infrastructures along new pipelines to capitalize on investment costs and produce energy to compensate for the energy costs associated with the operation of pumps and other related infrastructures. Nevertheless, it seems important to study in detail the question of amortizing the transport costs of treated wastewater in order to work meticulously on the financial model to make this infrastructure functional and profitable.

d. Reuse specific issues

Similarly, the sectoral analysis carried out at the local level shows that reuse is still limited to the pilot project stage in the West Bank and that the capacity of both institutional (PWA, MoA) and operational (SPs, WUAs) actors to develop reuse projects has not yet been demonstrated. While it seems important to lay a solid foundation at the local level to structure reuse development, planning large irrigation projects using treated wastewater could represent a risk.

It seems essential to study the demand beforehand through market research and in-depth social surveys in areas identified as potentially irrigable by projects aimed at reducing transboundary wastewater.

e. Political issues

Finally, the difficulties encountered at local level in wastewater management, due to the constraints linked to the Israeli occupation, are numerous. The stalling of the reuse project implemented at the Nablus West WWTP, problems encountered by the municipality of Hebron in the management of industrial wastewater, high quality standards requested to approve new WWTPs construction and the ban on the extension and rehabilitation of the WWTP in Al-Bireh are examples of the obstacles to the development of projects and the improvement of wastewater services.

The construction, management and maintenance of large-scale infrastructure, particularly in Area C but also throughout the Palestinian Territories, would require licenses and authorizations to be issued by the Israeli authorities. Given that these projects should allow, among other things, to limit the taxes imposed on the Palestinian Authority and thus reduce the amounts collected by the Israelis, the likelihood of an agreement on these projects is questionable.

Although the reduction of Israeli deductions for transboundary wastewater treatment is legitimately considered a priority by the PA, the implementation of projects to reduce these expenses raises several issues. It seems important to consider all these potential obstacles and to consider to break down these projects in smaller projects having a “low cost, high impact” approach.

H.1.4 Conclusion and recommendations

Obstacles encountered at local level concerning wastewater management (technical issues regarding the extension of the network, capacity to carry out preventive maintenance activities, difficulties related to Israeli occupation, consistency between strategic planning and operational planning) and the development of reuse (analysis of demand and potential market, capacity of existing wastewater treatment plants, issues related to the financial model and the amortization of wastewater treatment costs) are likely to be multiplied by the implementation of projects on a national scale.

Main recommendations from the assessment are the following ones:

- Develop a regional water credit system by quantifying treated wastewater reuse and pollution reduction efforts, allowing these to be deducted from transboundary charges. At the same time, **advocate for mutual cost-sharing agreements**, where Israel contributes to WWTP investment in exchange for reduced cross-border pollution, fostering a more balanced and incentive-driven approach to transboundary wastewater management.
- Leverage regional and international legal frameworks for fair cost-sharing by advocating for a **formalized transboundary water (and wastewater) agreement under international legal frameworks**, such as the UNECE Water Convention or the Barcelona Convention, to establish clear rules on wastewater-related deductions and equitable cost-sharing mechanisms. This should be complemented by engaging third-party mediators to facilitate negotiations, ensure transparency, and promote fair and balanced agreements.
- Establish **joint data monitoring and transparency mechanisms** by deploying real-time water quality monitoring stations along transboundary wadis to track pollution levels and challenge unjustified deductions. Additionally, advocate for independent third-party monitoring, such as under the UN or a neutral international agency, to ensure transparency and fairness in quality assessments.
- Ensure **consistency between the identified projects and the completed masterplans**, in order to consider the possibility of reducing transboundary wastewater by initially implementing smaller-scale projects with a ‘low cost, high impact’ approach.
- Favor the **construction of small WWTPs and pilot reuse projects in the areas most impacted by transboundary deductions**, considering, if the region does not allow agricultural reuse, other opportunities for the reuse of treated wastewater. In case of a possibility from a political perspective, develop larger scale projects can be a convenient approach if technical and financial challenges are addressed properly.

- Conduct an **in-depth demand study in the areas identified for reuse**, in particular through social surveys on interest in reuse, social acceptance, farmers' willingness to pay and the related availability of water resources in the identified regions.
- Integrate into the feasibility studies related to these projects governance-related issues, the **institutional set-up** and the division of roles and responsibilities among the targeted actors.
- Precisely analyze the issues related to the **financial and economic profitability of these projects**, in terms of investment but also O&M costs and resources generated by reuse, in order to compare with the amounts currently deducted and to build viable financial targets.

H.2. Industrial wastewater issues

H.2.1 Legal and regulatory framework of industrial wastewater

The legal and regulatory framework for industrial wastewater is presented and analyzed in section C.2.1 of this assessment report (On industrial wastewater)

As a reminder, the cabinet resolution number 16 from 2013 on the House and Facilities' connection system to the public sewage network defines three types of wastewater: domestic wastewater, industrial wastewater and commercial and agricultural wastewater.

Industrial waste water is defined as “the water emanating from using water in some or all phases of industry, cleaning or cooling whether treated or not” whereas commercial and agricultural wastewater concern “the water emanating from using water in non-industrial fields and containing additional pollutants such as: water emanating from restaurants, gas stations, carwash facilities, mechanic workshops, slaughterhouses, poultry and livestock farms, vocational workshops, shops selling live poultry as well as waste water emanating from medical facilities which do not contain dangerous material”.

This bylaw also specifies the rights and responsibilities of the various parties involved with regard to connection to the public sewage network (service provider, central authorities, private sector). More specifically, this text defines the instructions and procedures for connecting to the public sewage network for industrial, commercial and agricultural wastewater. An appendix clearly specifies the standards required for different types of wastewater to be connected to the network. The list of these parameters and criteria is available in Annex 11.

More recently, in 2019, a specific standard (PS 227-2019) was established for treated industrial wastewater. This standard outlines the requirements, conditions, and limitations for the discharge of treated industrial wastewater from industrial facilities or their treatment plants into streams, valleys, rivers, public sewer systems, water bodies, or for reuse in irrigation or other designated purposes.

This standard provides precise indicators for each type of industrial wastewater discharge, differentiated according to the type of pollution (chemical, microbiological, heavy metals, etc.). It also defines the quality control and sampling procedures, differentiating the obligations in this respect according to clearly defined industrial sectors (see Annex 12).

WWTPs within the West Bank are not designed to treat commercial or industrial wastewater and the discharge of polluted wastewater. In order to identify the various sources of industrial water and gain a better understanding of the difficulties encountered, it was necessary to have a more local focus, at the level of the localities targeted for the field investigation phase.

Feedback collected from the field indicate that the issues relating to commercial or industrial wastewater differ according to the regions and the SPs. Municipalities of Nablus, Jericho and Hebron are more concerned and face serious issues as heavy industries are installed in the areas covered by the network, whereas most of the other SPs have to manage these issues on a case-by-case basis, mainly with regard to commercial and agricultural wastewater.

H.2.2 Local issues related to industrial wastewater for major industrial cities

The major cities of the West Bank are facing challenges related to the treatment of industrial wastewater. The presence of heavy industries can impact the operation of WWTPs or cause significant damage to the environment, and recent initiatives have been taken to find solutions.

According to Article 5 of cabinet resolution number 16 from 2013, “the service provider has the authority to impose obligatory connection of all existing buildings within the scope of their franchise area”. Based on this regulation, Nablus municipality has an Environmental Control Unit (ECU), set up in 2016 with funding from KfW, at the initiative of the municipality.

The aim of the ECU is to monitor industrial wastewater, protect water quality and Nablus west WWTP. ECU organizes regular tests to monitor industrial wastewater, conducting two types of test: a complete test of all the indicators carried out twice a year and a daily (or every other day) analysis to check the general indicators. The main objective is to encourage industries to connect to the domestic sanitation network by controlling industrial wastewater upstream, in accordance with Nablus WWTP standards and indicators. The indicators used to monitor industrial wastewater depend on the size and type of industry (CO₂, TSS, TDS, pH, oil), according to technical requirements presented in PS 227-2019. This unit is not monitored by WSRC because it has only recently been implemented and Nablus is the only SP to host this type of unit.

ECU helps industries to implement technical solutions specific to their activities so that industrial wastewater complies with Nablus WWTP standards. Ex: installation of oil retention grids for restaurants, solid waste filters for slaughterhouses. This approach helped to convince and connect several industries: juices, oils, beans, medicine factories, restaurants and slaughterhouses. ECU is also monitoring wastewater from oil presses which are not connected to the public sanitation system but collected by tanks. It is then transferred to Nablus WWTP, directly in the digester. As a reminder, Nablus WWTP is the only WWTP equipped with a digester in the West Bank, allowing this specific approach for a common issue.

In order to understand how this unit, which is an exception within the Palestinian SPs, operates, it seemed worthwhile to look into details at the connection, control and pricing procedures used by the ECU.

Process followed by the ECU to connect an industry to the wastewater network:

- i) Industry sends a request to Nablus municipality then transferred to the ECU.
- ii) A site visit is organized to monitor the industry's processes and take samples.
- iii) Samples are sent to An-Najah University, with which the ECU has a specific contract. The results are compared with the bylaw. If the results are positive, the industry is connected.
- iv) If the results are not satisfactory, the industry must pre-treat the wastewater or modify its industrial process. These activities are under the responsibility of the industry, and the ECU supports the industry in implementing appropriate technical solutions.

Control of industrial wastewater and responsibilities:

The ECU signs a contract with each industry specifying the control procedures and penalties. A focal point is designated within each connected industry to communicate with the ECU at all times in the event of an incident that could have an impact on wastewater. In the event of an incident, there is an emergency plan and a risk management study, but no safety manual or procedures manual. The ECU is in daily contact with Nablus WWTP to inform of any risks and relay incidents reported by the industries.

If an industry does not comply with procedures, the ECU issues a warning a first time. Then, the ECU can normally disconnect the industries from the network. **According to the ECU, this is difficult in practice because the legal procedures are unclear. Legislation allows legal action to be taken, but does not make it easy to disconnect an industry that does not comply with the standards.**

Financial cost of treating industrial wastewater:

The general tariff for industries is based on PWA tariff. Regarding access to water households pay 4 NIS/m³ whereas industries are paying 12 NIS/m³, this price is the same for all industries. With regard to wastewater tariffs, industries connected to the network pay the same price as households. The financial margin realized by the SP concerning industrial wastewater is therefore included in the water bill. According to the ECU, this encourages industries to connect to the sewer network.

Pre-treatment is the responsibility of the industries and does not represent an additional cost for the SP. According to the ECU, costs generated by the ECU's work and the monitoring of industrial wastewater are amortized by the water tariff for industries.

Staff and training:

ECU is composed of 4 full-time staff. According to the ECU, the staff is sufficient for the moment but won't be once Est Nablus WWTP is finalized so it's important to plan ahead for the recruitment and trainings of support staff. The team is supported by technical controllers (around ten) in the field. This number is considered insufficient and the ECU needs to mobilize other wastewater's department's technical operators.

The ECU feels the need for additional advanced training to better understand the technical challenges of each industry sector and to be able to help industries implementing high-performance pre-treatment solutions. Material and human resources will also need to be strengthened, particularly if the Nablus municipality ECU continues to be the only industrial wastewater control unit.

This initiative is used by the PWA as an example and encourages other service providers to implement similar units to manage industrial wastewater, particularly Jericho and Hebron, main industrial towns of the Westbank. According to the executive manager of Nablus municipality, discussions are already ongoing with the municipality of Jericho to share information about the unit's administrative status, activities and organization. If this approach is supported and facilitated by central institutions, transfers of skills could be implemented between Nablus ECU and other service providers.

The implementation of a service similar to the Nablus ECU is an interesting option for improving the management of industrial wastewater, however this requires a case-by-case approach for each industry, the multiplication of administrative and monitoring procedures, and the mobilization of large numbers of staff in the field. The establishment of this type of unit must be supported by substantial funding aimed at establishing the regulatory and organizational framework of the service, recruiting competent personnel and strengthening the capacities of existing staff through training adapted to the management of industrial wastewater and the installation of specific pre-treatment units.

"We are fortunate to be able to work with the An Najah laboratory given daily monitoring induced by industrial wastewater management"

The implementation of an ECU also requires ensuring the capacities of the service provider to carry out regular water quality tests, involving the availability of the required laboratory staff and equipment. The ECU in Nablus has a partnership with the laboratory at An Najah University. The municipalities of Jericho and Hebron will need to take these factors into account from the outset and consider potential partnerships with university laboratories in order to reduce the associated costs.

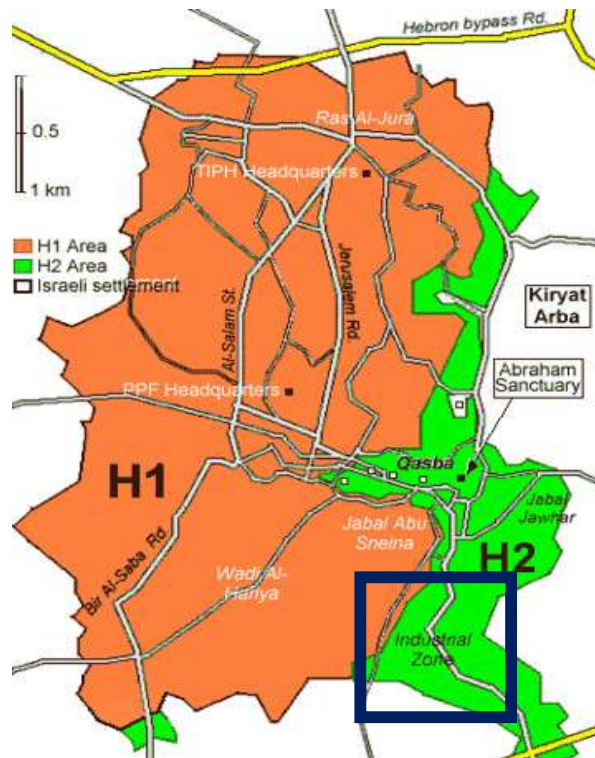


Figure 25: Map of Hebron city, showing areas defined by the Hebron Protocol

Although this approach is interesting, it involves regular interventions by the service providers with the industries, which is complex in Hebron's case. Regarding Hebron, the situation is unusual because industries are grouped together in an industrial area under Israeli military control. Under Hebron Protocol, signed in 1997, Hebron was divided into two areas: H1 and H2 (see Figure 25). Control of H1 shifted to the Palestinian Authority and H2 remained under Israeli military control.

As the industrial area is located in H2 area, factories are operating outside the local authority's control, limiting enforcement and Hebron municipality is struggling to ensure factories comply with wastewater regulations. These geopolitical constraints limit the Service Provider's ability to work towards a solution on a case-by-case basis for each industry.

Main industrial wastewater collected by Hebron municipality are coming from dairy factories, stone sawmills, tanneries, plastics, and chips industries which are linked to the network. Actual issues include :

- Network blockages due to stone cutting waste.
- Corrosive damage from dairy industry effluents.

To resolve these issues, and in order not to have to regularly intervene in zone H2, the WWTP Department proposed establishing a separate wastewater network and pipeline for the industrial zone. This pipeline would be linked to a dedicated industrial wastewater treatment unit, preventing slurry from stone cutting wastewater from disrupting the main treatment process.

The installation of this industrial water treatment unit in zone H1 would enable the SP to strengthen its control over the quality of wastewater but requires significant funding for infrastructure and capacity building within the wastewater department.

One proposed measure by Hebron municipality in order to cover generated cost is to amend existing laws and regulations to increase export fees for factories, ensuring that industrial producers bear a larger share of the cost for treating the wastewater they generate. By implementing higher export costs, factories would be financially incentivized to invest in pre-treatment solutions or to participate in joint wastewater treatment initiatives with the municipality. This would reduce the pollution load on the public treatment facilities while securing additional financial resources for proper wastewater management.

Hebron's WW department also stressed the importance of revising and strengthening environmental compliance policies to ensure that industrial wastewater dischargers contribute fairly to treatment costs. According to Hebron municipality, such regulatory reforms would create a more sustainable and equitable financial framework for wastewater treatment, rather than relying solely on voluntary cooperation from private sector entities.

Financial considerations aside, and although the issues surrounding industrial wastewater are complicated by the political context, Hebron municipality indicated that it would be important to quickly establish a monitoring unit to oversee industrial and domestic wastewater discharge and to prevent damage to the newly constructed WWTP.

Hebron municipality could benefit from sharing experience and training with Nablus municipality (for the implementation of an ECU) or the municipality of Jericho which has established an initial treatment plant to treat industrial wastewater before it reaches the main treatment plant.

Regarding Jericho, industries are also located in a specific industrial zone, and industrial wastewater can be separated from residential sewage. All industries are required to obtain a connection permit before discharging wastewater into the municipal sewage system. The permit ensures that the water quality complies with the standards set for industrial wastewater and with the initial treatment plant standards.

The municipality has set regulations to control and manage industrial wastewater, ensuring that it is treated appropriately before entering the main treatment facility. The rules are designed to protect the treatment plant's operations and ensure compliance with environmental standards. If the quality of wastewater differs from that of domestic sewage, the pump is shut off, and no industrial wastewater is received by the treatment plant from the industrial area until the issue is resolved.

Industrial wastewater issues in Jericho seem to have been handled better by the SP by installing a preliminary treatment plant specifically dealing with wastewater from the industrial area; however, according to the municipality of Jericho, it is still necessary to improve the legal framework and set up higher penalties for non-compliance, that could help enforce better practices and foster accountability in industrial wastewater management. According to Jericho municipality, there is also a need for enhanced common training programs for municipal staff and industrial operators to ensure proper wastewater management and legal compliance.

Although the three main industrial cities of the West Bank face different situations and challenges, common obstacles emerge from field interviews, concerning the strengthening of the legal framework regarding sanctions against non-compliant industries, or the capacity building needs of service providers to continue their efforts regarding industrial wastewater management.

It also seems important to encourage cross-disciplinary initiatives and the transfer of skills between these service providers in order to benefit from the experiences specific to each area and to lay the foundations for a national approach to industrial wastewater.

H.2.3 Local issues related to industrial wastewater for non-industrial cities or rural areas

Most of the SPs encountered for this assessment are not confronted with issues related to industrial wastewater, as defined by the bylaw, but with commercial or agricultural wastewater. The executive manager of the Union of Palestinian Water Service Providers confirmed that it was a very localized issue, therefore affecting large urban and populated areas.

In predominantly rural areas such as the water utilities of Tubas or Jenin West, the main issues concern slaughterhouses and olive mills whereas in urban areas like Jenin, Ramallah or Al-Bireh municipalities, SP's are sometimes facing issues with wastewater from carwashes, restaurants or auto-mechanic workshops. The existing regulation concerning these types of wastewater is clear and precises that it is strictly forbidden for these businesses to discharge, cause or allow the discharge of waste water into the public stream.

The specific appendix of the House and Facilities' Connection System to the Public Sewage Network, regarding commercial and industrial wastewater discharge, explicitly mentions olive press and slaughterhouses as businesses that cannot be connected to the network without prior installation of

compensatory measures to enable pre-treatment and thus obtain wastewater matching the quality of domestic wastewater.

Article 9 of Resolution 16 from 2013 describes more specifically the pre-treatment solutions that must be installed at these businesses under the control of the service provider and prior written authorization for any connection, as shown in the table below:

Type of commercial/agricultural wastewater	Recommended pre-treatment
Olive mills	Modify the manufacturing process so that wastewater's concentration of emulsified vegetable and animal oils, greases and fats or wax do not exceed 100 milligram/liter. Set up an oil trap unit
Slaughterhouses	Set up a bone / solid waste trap unit
Carwashes and auto-mechanic workshops	Set up an oil trap unit
Restaurants / commercial kitchens	Set up a fat trap unit

Table 27: Pre-treatment solutions recommended by Resolution 16 from 2013

These pre-treatment units must be installed at the company's expense under the supervision of the SP. The connection should, by law, only be made once the business has obtained written approval from the service provider while committing to upholding maintenance. These regulation should enable service providers to require businesses to install these technical solutions in order to connect them to the network and prevent polluted wastewater from being redirected directly into the wadi.

Despite these measures, during discussions held amid the field mission, SPs indicated that they are still facing obstacles concerning commercial wastewater and that they did not always manage to ensure businesses and industries in their service areas complied with the standards.

According to the data collected, main difficulties encountered by SPs fulfilling their role regarding polluted wastewater are:

- SPs do not have the resources to manage commercial or industrial wastewater. Meaning that SPs do not have the necessary (technical and financial) capacity to monitor the pre-treatment units within the various industries. The lack of qualified technicians in the field to visit, monitor and make the connections according to the standards is often emphasized.
- For some service providers, the approach aimed at formalizing the connection of businesses generating non-compliant wastewater is recent. In the case of Ramallah and Al-Bireh, for example, installation of oil, bone or fat traps is a prerequisite for any connection and is monitored by the municipality. The problem is that these measures, taken by the municipalities in accordance with the law, were implemented from 2018 onwards, meaning that previously connected restaurants or carwashes have not necessarily installed these traps.

Most of the SPs mentioned that it is not possible to disconnect businesses that did not comply with the pre-treatment and wastewater quality standards, making them reluctant to proceed with the connection. After a thorough review of the regulation, Article 19 of Resolution 16 only mentions that SPs have the right to “stop or suspend approval to connect any facility's private stream with the public sewage network” but do not mention that SPs can disconnect a non-compliant businesses from the network. The article also mentions that SPs have the right to revert to the law to pursue non-compliant businesses but, according to different service providers, these cases are rare and do not allow them to have proper authority over the shops in order to monitor commercial wastewater.

“It is very difficult to disconnect a business, as the law does not really provide for any measures in this regard.”

- Some SPs indicate that they do not have the necessary laboratories to carry out all the tests required for the control of agricultural or commercial wastewater. The laboratory specialists and equipment available in some WWTPs would not allow for checks to be carried out in accordance with the standards of the bylaw. Without going as far as installing a centralized pre-treatment unit at the WWTP level, some SPs are calling for the strengthening of material resources and capacities concerning laboratory work.

For most of SPs in Palestine, which are not facing major issues with industrial wastewater, it seems that actual obstacles can be fixed by supporting SPs to strengthen their capacities to monitor and control pretreatment unit's within concerned industries or shops. The recruitment of qualified field operators or the sharing of experience with service providers monitoring this type of pre-treatment unit (Nablus municipality Environmental control unit) could enable service providers to connect most businesses to the network without risking damage to the WWTP or threats to the environment.

H.2.4 Conclusions and recommendations

Reinforce the institutional management on industrial wastewater

- Strengthen collaboration at the central level by promoting a specific framework for exchange between the PWA, EQA and the Ministry of Industry on institutional wastewater management.
- Clarify EQA's role with regard to authorization and controls specific to the collection and treatment of industrial wastewater, in particular with regard to the issue of dedicated environmental permits.
- Establish specific indicators for industrial or commercial/agricultural wastewater so that this issue can be monitored by the WSRC.
- Strengthen cooperation at the local level by promoting a framework for exchanges between service providers, industries and decentralized chambers of commerce.

Increase the responsibility of industries in the management of industrial wastewater

- Clarify legal compliance measures regarding the rights of service providers in relation to non-compliant industries and ensuring industrial wastewater meets required treatment standards.
- Provide incentives for industries to comply with treatment standards.
- Revise environmental compliance policies to ensure that main industrial wastewater dischargers contribute fairly to treatment costs.

Anticipate obstacles and operational issues in future development projects in the sector

- Integrate the issues related to industrial wastewater management into the master plans or development strategies of future RWUs, particularly for areas affected by the presence of heavy industry.
- Reinforced service providers capacities with regard to industrial wastewater in order to raise awareness and support industries in the installation of pre-treatment units adapted to the standards and capacities of existing or planned WWTPs.
- Promote partnerships with universities and the academic sector to facilitate the monitoring of indicators specific to industrial wastewater and limit the costs generated by the acquisition of additional equipment.

Build knowledge on successful regional experiences to improve the management of industrial wastewater

- Establish an environmental monitoring unit as existing in Nablus, with dedicated staff with relevant background, within RWUs to oversee industrial and commercial wastewater discharge.
- Facilitate the sharing of experiences and the transfer of skills between service providers with the aim of prioritizing internal training and jointly considering solutions on a larger scale.

H.3. Specific issues related to sludge management

H.3.1 Legal and regulatory framework of sludge management

As mentioned in the legal and regulatory section of this assessment (page 48), in Palestine, the management, disposal and reuse of sewage sludge are regulated by the following reference texts:

- Palestine Standard PS 898-2010 “Use of Treated Sludge and Sludge Disposal” which sets the legal framework and requirements regarding treated sludge. This standard also determines three different categories of treated sludge according to the concentration of elements and other parameters such as the moisture percentage. The list of elements concerned and the concentration limits per element for each sludge class are presented in Annex 13.

This standard allows different type of reuse for treated sludge according to their classification:

Treated sludge Types of possible use	Class A	Class B	Class C
	Class A	Class B	Class C
Organic fertilizer for agricultural reuse	x		
Soil improvement	x	x	
Disposed in landfill sites	x	x	x

Figure 26: Possible uses of treated sludge according to PS 898-2010

- Technical Instruction 59-2015 which sets the framework for the use of treated sludge in agriculture.

H.3.2 Current practices around treated sludge management

Although regulation concerning sludge is established according to precise standards, the interviews conducted during the field mission revealed that sludge is considered as a main operational issue for all service providers met. Beyond SPs included in the scope of this diagnosis, sludge-related issues seem to be one of the main concerns of SPs at a national scale, according to the executive director of the Union of Palestinian Water Service Providers (UoPWSP), Ali Odeh, who was met as part of this assessment.

The main problem encountered by SPs concerns the maximum moisture content set by the standards in order to categorize the treated sludge as class A or B and to consider the possibility of its reuse in agriculture either as a fertilizer or as a soil amendment. In fact, in addition to the limits set for metallic contaminants or other pathogens (fecal bacteria, salmonella, live eggs of worms and viruses), PS 898-2010 sets the maximum moisture content at 10% for class A sludge and 50% for class B sludge. A comparative study of sludge treatment and disposal practices in the Middle East and Palestine was conducted in 2022 by the International Office for Water (OiEau) and supported by Toulouse Metropole. This study allows a comparison between several countries (Jordan, Lebanon, Tunisia) for sludge regulatory frameworks, existing opportunities for reuse and disposal and responsibilities of the various stakeholders. This studies specifies “that a target of 90% dry matter, regardless of the technique used, is quite ambitious.”⁴⁶

To assess this situation, the data collected from the SPs reveal that, on average, sludge at the outlet of WWTPs reach, in the best case scenario, a moisture content of around 75% as shown in table below.

⁴⁶ Source: State of play of sludge treatment and disposal practices in the Middle East and Palestine – 2022 – OiEau and Toulouse Metropole

SPs	WWTP	WW sludge average volume (t/day)	Minimum sludge moisture content after treatment (%)
Nablus municipality	Nablus west WWTP	18	75%
Ramallah municipality	Al-Tireh WWTP / Al-Rehan WWTP	4	80%
Hebron municipality	Hebron WWTP (planned)	30-35	70%
Al Bireh municipality	Al Bireh WWTP	1,4	80%
Tubas WU	Tayaseer WWTP	1	75%
West Jenin WU	Anin WWTP	0,6	75%
Jenin municipality	Jenin WWTP	NA ⁴⁷	

Table 28: Daily volume and average dry matter percentage of sludge according to SPs

The data collected and the feedback from field operators illustrate a gap between i) the regulation, established according to international and regional standards and consistent with the health risks incurred by the unregulated or uncontrolled reuse of sludge and ii) the reality concerning the type of sludge discharged from WWTPs and the resources invested in infrastructure adapted to meet the standards.

“We have no choice but to find solutions at our own level in the absence of realistic regulations”

According to the SPs, the main obstacles to achieve a higher percentage of dry matter at the treatment outlet mainly concern the operational energetic costs to dry sludge and political or financial obstacles to the construction of sludge management infrastructures such as drying pits or digesters.

For instance, Al Bireh municipality used its own budget to buy the land needed to expand the southern WWTP in anticipation of the overload of wastewater and in order to install drying pits and greenhouses for pilots sludge reuse projects. However since then, as the WWTP is located in area C, Israeli authorities have never agreed to build sludge management infrastructures or new aeration and sedimentation tanks. As any work or initiative must be approved by Israeli authorities, the municipality has no power over this situation despite a constantly increasing problem.

In another case, the Jenin WWTP, under the responsibility of the municipality of Jenin, is equipped with sedimentation lagoons to allow sludges to be deposited at the bottom of the basin and regularly evacuated so as not to affect the treated wastewater. However, the aeration pumps that enable the treatment system to function have not worked for several years due to a lack of funds for maintenance on sedimentation lagoons and replacing aeration pumps. As a result, sludge are accumulating and affecting quality of TWW that is no longer reused by the WUA.

⁴⁷ Biosolids accumulate at the bottom of the sedimentation ponds and sludge evacuation planned every 5 years to be deposited to landfill

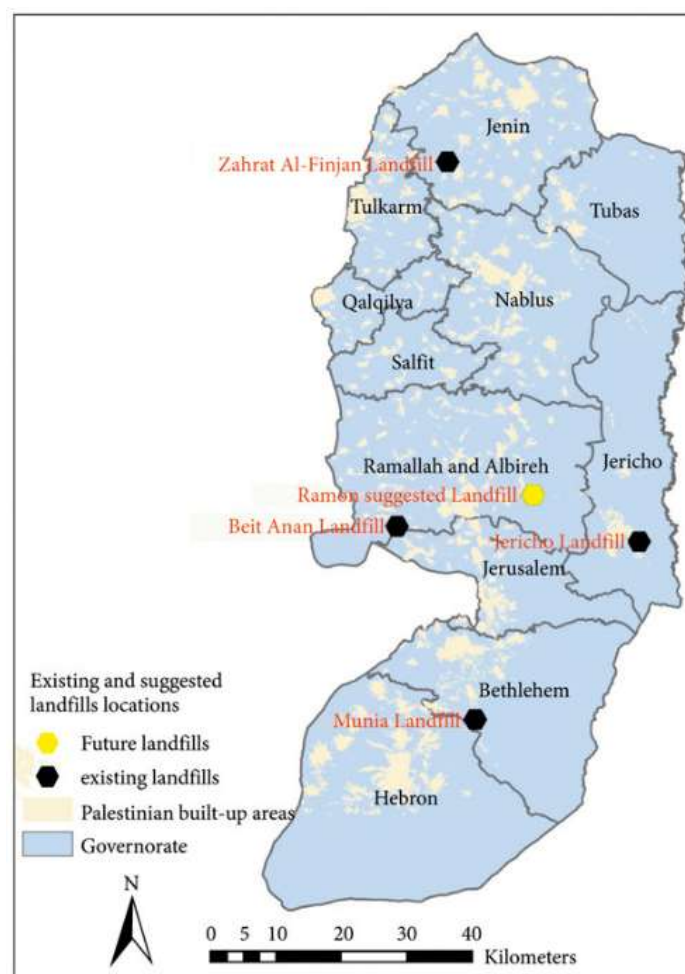


Figure 27: Existing and suggested landfills in the West Bank

Despite an issue which seems to be known to the various stakeholders in the sector, it is worth noting that the current projects and the WWTPs that will soon be operational do not include a specific approach to these issues. In the case of the Hebron's WWTP, which should be operational in the course of 2025, technical studies predict an average moisture content of 70% at the treatment outlet. In order to anticipate this issue, the WWTP Department of Hebron Municipality proposed to install a burning unit for sludge disposal. The incinerator would incorporate activated carbon filtration to capture and neutralize harmful emissions. However, the financial feasibility and environmental impact of this approach requires further study that haven't been planned yet.

Faced with this situation and in accordance with the regulations, the SPs have no other option than to evacuate sewage sludge to landfill. There are 4 landfill sites in the WB and no authorization have been allowed yet for the construction of new dumpsites despite an increasing need. Installation of new dumpsites in the WB is a challenge due to small available space and political disputes. Figure 27 describes all currently used and future planned landfills⁴⁸.

Zahrat Al-Finjan landfill, in Jenin governorate, is one of the most important landfill of the country and is in operation since 2007. Initially designed with four cells totalling a capacity of 3.5 million cubic meters, the landfill has since expanded to accommodate five cells, now holding 5.5 million tons, exceeding its capacity.

⁴⁸ Source: Research Article – “Multicriteria Evaluation-GIS Integration Framework for Landfill Site Selection in Limited Space Regions: A Case Study in the West Bank” - Ayah H. Helal - Department of Urban Planning Engineering, Faculty of Engineering, An-Najah National University, Nablus, State of Palestine - 2022

According to a research paper from Ayah H. Helal from the Department of Urban Planning Engineering, at An-Najah National University in 2022, “Zahrat Al-Finjan landfill has an area of about 240 dunom in Jenin Governorate. It was designed to fit two governorates (Jenin and Tubas) only, however, it is now used for 6 governorates (Jenin, Tubas, Tulkarem, Nablus, Qalqilia and Ramallah, and Al-Bireh).”

Initially intended to receive solid waste at a rate of 300 tons per day, it currently processes 1200-1400 tons daily, according to an environmental and social audit that has been conducted by the Municipal Development and Lending Fund (MDLF) in 2024 in order to assess the situation. As a result, the design capacity has exceeded and the demand is constantly growing (Figure 28).



Figure 28: Evolution of the quantity of waste deposited at the Zahrat Al Fenjan sanitary landfill⁴⁹

As a result and according to stakeholders met during the field mission, the Jenin Joint Service Council (JSC), operating the Zahrat Al-Fenjan sanitary landfill, do not allow anymore sludge disposal due to technical issues caused by overloading. Yet waste and sludge continue to be transferred there by most SPs.

Municipalities and WUs are concerned about the environmental and health risks associated with this situation, especially because the aquifer is shallow in the region. According to the manager of Jenin West WU, untreated wastewater and liquid sludge are beginning to pollute the groundwater resource.

As most WWTPs are not equipped with the technology needed to meet current standards for treated sludge, the ban on Zahrat Al-Fenjan landfill for sludge disposal has further restricted the leeway of SPs, which now adapt their practices according to the authorizations granted by the Jenin Joint Service Council (JSC) operating the landfill, as shown in table below:

⁴⁹ Source: Environmental and social audit conducted by MDLF.

SPs	WWTP	Planned sludge disposal method	Actual sludge disposal method
Nablus municipality	Nablus west WWTP	Drying pits, and dewatered sludge to produce biogas to heat the digester and use the methane gas for electric generators	Drying pits for sewage sludge are inadequate in terms of volume and not efficient in winter. Even with drying pits, sludge cannot reach less than 50% moisture. Resulting sludge from digester are transported to Zahret Al-Fenjan. As Zahret Al-Fenjan sanitary landfill is saturated, sludge are transported there when possible or discharged into wadi
Ramallah municipality	Al-Tireh WWTP / Al-Rehan WWTP	Zahrat Al-Fenjan sanitary landfill	Mixed with solid waste and transported to Zahret Al-Fenjan sanitary landfill
Hebron municipality	Hebron WWTP (planned)	Dewatered sludge to produce biogas to heat the digester and use the methane gas for electric generators. Resulted sludge after digester to be burned or evacuated into Al Menya sanitary landfill	NA - WWTP not yet operating
Al Bireh municipality	Al Bireh WWTP	Zahrat Al-Fenjan sanitary landfill	Mixed with solid waste and transported to Zahret Al-Fenjan sanitary landfill
Tubas WU	Tayaseer WWTP	Zahrat Al-Fenjan sanitary landfill	Discharged into wadi as Zahret Al-Fenjan sanitary landfill is overloaded and do not allow sludge disposal
West Jenin WU	Anin WWTP	Zahrat Al-Fenjan sanitary landfill	Evacuated to Zahret Al-Fenjan sanitary landill as the WU is dealing with a low volume of sludge and has a good relationship with Jenin JSC
Jenin municipality	Jenin WWTP	Biosolids accumulate at the bottom of the sedimentation ponds. Sludge evacuation planned every 5 years.	Aeration pumps have stopped working. Sludge are accumulating in the ponds and deteriorating treated wastewater quality. No evacuation of sludge during, at least, the last 7 years.

Table 29: Planned and actual sludge disposal practices by SPs

In order to find solutions to this major problem, main SPs are asking for new standards adapted to the obstacles encountered on the ground and which would make it possible to reduce the requirements concerning the maximum moisture percentage in sludge in order to compost it or reuse it as a fertilizer. According to Nablus Municipality, discussions have been held in order to review the regulation regarding sewage sludge and a specific technical committee has met in order to discuss these issues between main SP and institutional stakeholders including PWA, the Ministry of Health, the Ministry of Agriculture or PSI.

The minutes of the discussions held during the meetings of this technical committee and the resulting conclusions have not been shared. According to the GIZ, which attended the discussions, the stakeholders were unable to reach an agreement. While the SPs were calling for a revision of the regulations in order to lower the dry matter rate for classifying sludge as class A to 50%, the Ministry of Health and the Ministry of Agriculture did not wish to revise the standards beyond a minimum dry matter rate of 85%. In view of the issues mentioned above, this reduction would not bring about a change in dynamics and offer new opportunities to SPs with regard to the disposal or reuse of treated sludge.

H.3.3 Specific case of Jericho and pilot projects regarding sludge disposal and reuse

The Jericho Municipality was presented by sectorial central institutions, as an exemplary water and wastewater service provider, with which other SP can benefit from a certain number of positive lessons learned; particularly on the financial level and the structuration of local reuse sector. It therefore seemed relevant to look at sludge management at the level of this service provider, integrated into the diagnostic as a specific case study.

The wastewater project in Jericho began in 2012 with a total cost of 30 million USD, funded by JICA (Japanese International Cooperation Agency). The project aimed to establish a wastewater treatment plant with a capacity of 6,600 cubic meters per day under normal conditions, and up to 9,800 m³/day at maximum capacity. This project included the establishment of a sanitation department in 2014, which involved institutional building and development for the water and wastewater department.

According to Jericho municipality's executive manager, the capacity-building processes that helped the municipality enhance its services were the trainings received in various areas, including financial, administrative, and technical aspects (operation and maintenance for both the network and the station).

Jericho WWTP is operating since 2014 and is using a secondary treatment with activated sludge and chlorine disinfection.



Figure 29: Aerial image of the Jericho WWTP and land allocated for sludge disposal

Regarding the sludge management case in Jericho, the WWTP currently handles sludge on-site using drying beds. This approach is effective due to the region's hot climate and the availability of large areas of empty land within the WWTP premises allocated by the municipality for sludge storage after drying. As a result, there has been no need to transport sludge outside the facility until now.

According to the Jericho WWTP manager, it would be important to anticipate the transportation of sludge to Jericho landfill but, for now, treated sludge has not been evacuated after drying due to the high transportation costs. Although this solution allows the SP to manage treated sludge at a lower cost and with a limited impact on the environment, the municipality of Jericho is aware that this is a temporary system that cannot be sustainable in the medium to long term with the accumulation of sludge.

Supported by JICA's technical assistance, Jericho's WWTP teams have explored potential reuse options through studies and pilots projects. Between 2014 and 2015, Jericho Municipality implemented a pilot plant at the WWTP for experimental reuse of the treated wastewater and sewage sludge. The pilot plant had four comparative experimental fields of drinking water, treated wastewater, animal sludge, and sewage sludge to examine the treated wastewater influence.

In the early stage of the pilot plant, the sewage dry sludge and soil were tested and comparatively analysed by the sludge standard for use in agriculture. The results showed both sewage sludge and soil meet the standard for heavy metal concentrations in sludge for agricultural use.

Jericho municipality then hold participatory meetings with related organizations and stakeholders (including the Ministry of Agriculture, Agriculture Cooperatives Association, Environmental Quality Authority (under the Ministry of Environment), Ubaidyeh Municipality, JICA, and An-Najah National University) to share the results and conducted a questionnaire survey with the participators in order to collect their perception of sewage sludge agricultural reuse.

2. Perception of Sewage Sludge Reuse		
2-1	You know dry sewage sludge can be used for fertilizer of agricultural products.	Yes: 10 (6) No: 1 (0)
2-2	You agree with reuse of the dry sewage sludge.	Yes: 9 (6) No: 2 (1)
2-3	In case of "No" on 2-2, rejection reasons? (multiple answers allowed)	• Unclear whether heavy metal contents meet the standard: 1 (1) • Dirty and/or hygienic care: 2 (1)
2-4	In case the sludge meets the reuse standard, you use it as fertilizer.	Yes: 9 (5) No: 1 (1)
2-5	When the sludge is sold, you buy/use it.	Yes: 6 (3) No: 4 (3)

(): stakeholder's answer except the Jericho municipality staff

Figure 30: Results from the survey led by JICA regarding perception of sewage sludge reuse

However despite that work and encouraging results regarding stakeholders perception of reusing treated sludge, it's unclear why this pilot project was not continued in order to achieve the objective of reusing 10% of treated sludge for agricultural purposes. According to Jericho WWTP's manager, "these efforts have been unsuccessful due to restrictions from the relevant ministries, which still do not permit sludge reuse in agriculture or open lands".

Other studies have been published in Palestine concerning pilot initiatives for the reuse of sludge. A recent study carried out by the International Water Observatory (Oleau) in 2023: "Application of dried sludge on agricultural land in Ramallah: agronomic relevance of using sludge from the Ramallah WWTP (Al-Tireh)", analyses the conditions required for safe use adapted to the needs of the crops, and proposes actions in order to implement pilot reuse initiatives.

This study is part of a project funded by the Toulouse Metropole aiming to provide project management assistance for the construction of a solar drying unit for urban wastewater sludge for the city of Ramallah. The study concludes that the installation of a solar greenhouse applied to Ramallah's sludge would facilitate treated sludge volume reduction (by a factor >3) and elimination or reuse by producing a sludge that complies with technical instruction n°59-2015.

This project, if the results are positive, monitored and shared with the various stakeholders in the sector, could serve as an example and a success story which could have a positive ripple effect on wastewater treatment across Palestine, where development is currently hindered by the lack of a sludge recovery process and limited options for landfill disposal.

However, discussions with the SPs and the example given above for Jericho show that these pilot projects do not lead to concrete solutions without in-depth monitoring by the competent authorities and joint discussions to arrive at solutions on a larger scale. The study carried out by OIEau tends to converge towards this analysis indicating that "the use of dried sewage in agriculture has been tested in various contexts in Palestine, demonstrating an improvement in the growth of the plants tested: citrus fruits, dates,

alfalfa, ornamental plants, etc. Despite this demonstration, it has never been authorized or carried out on the entire sludge production of a sewage treatment plant.”

H.3.4 Social acceptance of treated sludge reuse

According to the interviews conducted, social acceptance by local farmers and Palestinian population of treated sludge’s reuse for agriculture is also a major obstacle to the development of pilot initiatives that could enable solutions to be envisaged on a larger scale.

While implementing the pilot project at Jericho’s WWTP in 2015, JICA assesses that “the reuse of sewage sludge is eschewed due to the fact that it is derived from human waste”. According to other research studies and the data collected from different SPs, main barriers to sludge’s reuse acceptance are psychological and social concerns, potential health risks, and religious beliefs.

“Social acceptance of the use of sludges is another stumbling block, and regulation will have to be accompanied by public awareness campaigns”.

A study realized in 2017⁵⁰ targeted two farming communities located in Jenin and Nablus districts in the West Bank selected a sample of more than 100 farmers who were surveyed through structured and open-ended questions. The results revealed that, overall, farmers hold positive views on the land application of sludge. A majority support the idea of using sludge once a planned wastewater treatment plant is built and becomes operational. Additionally, most farmers favor using sludge to fertilize fruit trees rather than growing vegetables or other plants in greenhouses. Many also demonstrate a solid understanding of the properties of sludge, as well as its advantages and disadvantages for agricultural use. The findings further suggest that “more farmers would accept the land application of treated sewage sludge if consumers are willing to purchase products fertilized with sludge, if the sludge meets public health standards, and if it is available at an affordable cost.

This study shows that awareness campaigns must be organized on a wider scale and target more than just farmers, to facilitate the purchase of products that would have been grown using treated sludge. It seems necessary to define who is responsible for carrying out such campaigns, which are not very common and which none of the WUs encountered as part of this diagnosis has yet implemented in its service area.

The implementation of pilot projects concerning the reuse of sludges should systematically include a prior socio-economic analysis of demand and social acceptance. These studies should make it possible to determine the areas in which farmers’ reluctance is least significant and where these projects would have a real impact and the best chance of success.

In parallel, the implementation of pilot projects concerning the reuse of treated sludge should be systematically accompanied by awareness campaigns aimed at the population, particularly farmers and those living in agricultural areas, according to several service provider. Following the successful approach in Jericho regarding the reuse of treated wastewater, which was based on raising community awareness about the benefits of reusing treated water and sludge by targeting groups that will make a difference, pilot projects, promoting their success, and targeting farmers or influential people in the community will have a rapid impact in convincing people and overcoming psychological barriers and community concerns

H.3.5 Central level institutions’ position regarding the reuse of sludge is still unclear

On one hand all relevant institutions at central level (PWA, MoA, EQA, MoH) understand that sludge management represents a critical issue for WWTP operators.

⁵⁰ “Farmers’ attitude toward treated sludge use in the villages of West Bank, Palestine” - Md. M. Rashid & Mary G. Kattou’a & Issam A. Al-Khatib & Chikashi Sato - 2017

But on the other hand, if they all agree that something has to be done, each institution maintains a position of principle and may seem to prefer the actual status quo rather than to take a risk (regarding the pollution of agricultural land and natural resources, or the risk to human health).

By acting like this, the institutions somehow play a fool game. Their position is perfectly understandable in theory but is then in contradiction with their behavior. They are aware about the illegal dumping of untreated sludge in the wadis by WWTP operators; they know that this practice raises the risk at its maximum in terms of environmental and human possible impact; but they do not take action. Certainly because they know that operators have no choice and are not given a legal alternative.

When considering the emergency to take action, institutions seem to move slowly:

- Until now there is no specific strategy concerning sludge management.
- Successful pilot initiatives (in Jericho for instance) are not further developed and upscaled, or even shared with other service providers & WWTP operators.
- The opportunities offered by existing standards seem not to be fully explored. Surprisingly, all SPs and institutions met during the assessment only referred to the objective to reach class A sludge. Yet the possibility seems not to have been investigated to reach class B sludge, that offers more accessible standards (up to 50% moisture, remaining presence of fecal coliforms up to 2 million UFC/gram of sludge) and to reuse this sludge for soil amendment instead of soil fertilization.

H.3.6 Conclusions et recommendations

Despite numerous studies, research projects and regional experiments, Palestine is struggling to find a suitable solution for sludge management. The study from COSTEA regarding wastewater reuse in agriculture and published in 2022, indicates that “service providers are suffering from the lack of good practices of sludge management, all practices and projects related to the sludge management are either on pilot level, or individual research projects, without practical solution”. Only Nablus municipality is using dewatered sludge to produce biogas to heat the digester and use the methane gas for electric generators. But later the resulting sludge is transported at high costs to landfills in Jenin area.

“Sludge could be seen as a resource and potential source of income, not only as a waste and a cost for service providers”.

According to Ramallah municipality, it costs on average 130 NIS to transfer 1 ton of waste to Zahrat Al-Fenjan dumpsite. Ramallah municipality is sending about 150 tons/day of waste to the landfill which represents a daily cost of 19.500 NIS.

The costs associated with sludge management and the absence of a permanent solution for sludge disposal or

reclamation regulated by the national authorities means that each operator has to find temporary or permanent solutions.

According to the manager of the Union of Palestinian Water Service Providers (UoPWSP) sludges should not be considered as a waste and disposed of in landfill but rather considered as a resource that can be used for different purposes and generate income for the SPs, helping them to consolidate their financial model and make them more autonomous.

The data collected as part of this assessment shows that sludge management is a crucial issue facing the sector. The growing demand for connection to the wastewater network, the development of the service and the ever-increasing volumes treated at existing WWTPs each year are all factors that require quick and appropriate decision-making to meet the challenges of the territory.

Introduce regulatory flexibility and performance-based incentives

- Bring together the sector stakeholders to reach a realistic compromise on the applicable regulations, without creating additional health and environmental risks. Instead of a rigid moisture requirement, encourage a performance-based regulatory approach where compliance is measured not only by moisture content but by other key safety indicators such as pathogen reduction and metal content.
- Work on the development of environmental standards governing sludge deposits and strengthen the indicators for monitoring sludge by the WSRC.

- Provide incentives for SPs that demonstrate innovative sludge reuse solutions beyond dumping.
- Strengthen EQA's involvement to develop a pragmatic regulatory framework, planning and to provide heavy guidance to SPs in sludge management

Anticipate operational obstacles to sludge management ahead of wastewater and reuse projects

- Integrate the issue of on-site treated sludge disposal into sector development projects and new WWTP construction projects, ensuring possibilities for extensions to store sludge and limit transport costs.
- Plan the integration of energy installations to facilitate sludge drying and limit operational costs at existing WWTPs (such as in Nablus) and in new WWTP projects.
- Strengthen the capacities of service providers and technical operators with regard to the energy efficiency and reduction of the operating costs necessary for sludge drying.

Strengthen social acceptance and raise awareness about pilots successful projects

- Continue the implementation of pilot projects concerning the reuse of treated sludge in areas where social acceptance is rather favorable in order to encourage success stories and to give impetus on a regional or national scale.
- Launch awareness campaigns and trainings on the topic of extension services provided by the MoA to improve social acceptance and facilitate the implementation of pilot projects at the local level, and view regulation as a means of raising farmers' awareness of these practices rather than as a hindrance.

Establish regional sludge drying facilities

- Instead of requiring each WWTP to achieve 10% moisture independently, create regional drying facilities using cost-effective solar and thermal drying techniques, shared across multiple service providers, reducing transportation costs and investments costs.
- Encourage Public-Private Partnerships (PPPs) to operate these hubs, reducing operational and investment burdens on WWTPs.
- Promote investment in solar drying beds, which can passively reduce moisture content without high operational costs.

Develop a Market-Based Approach for Sludge Reuse

- Introduce sludge valorization incentives by creating market linkages with potential buyers, such as:
- Soil amendment industries (integrating sludge with compost).
- Bioenergy production (converting sludge to biochar or biogas on large scale).

I. ANNEXES

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Annex 2	List of documents collected and used
Annex 3	List of interviews conducted during assessment phase
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Annex 5	Quality criteria for reclaimed TWW (extract of PS 742-2015)
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Annex 11	Parameters for the characterization of industrial wastewater
Annex 12	Procedure for controlling and sampling industrial wastewater
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All annexes can be found in this on-line folder: [Annexes](#)



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