## National Water and Wastewater Policy and Strategy for Palestine

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## Acronyms

Acronym	Definition
BWSSA	Bethlehem Water Supply and Sewerage Authority
CA	Coordination Authority
CMWU	Coastal Municipality Water Utility
EQA	Environmental Quality Authority
EU	European Union
GCDP	Gaza Central Desalination Plant
GDP	Gross Domestic Product
ILS	Israeli shekel
INCR	Initial National Communication Report
IWRM	Integrated water resources management
JSC	Joint Service Council
JWC	Joint Water Committee
JWU	Jerusalem Water Undertaking
LGU	Local Government Unit
MAR	Managed aquifer recharge
МСМ	Million Cubic Meters
MDG	Millennium Development Goals
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoF	Ministry of Finance
MoFA	Ministry of Foreign Affairs
МоН	Ministry of Health
MoLG	Ministry of Local Governments
MoNE	Ministry of National Economy
MoSD	Ministry of Social Development
MoWA	Ministry of Women Affairs
NAP	National Adaptation Plan
NDC	Nationally Determined Contributions
NGO	Non-governmental organization
NRW	Non-revenue water
NWC	National Water Company
0&M	Operation and Maintenance
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
PA	Palestinian Authority
PCBS	Palestinian Central Bureau of Statistics
PENRA	Palestinian Energy and Natural Resources Authority

Acronym	Definition
PPP	Public-Private Partnerships
PSI	Palestinian Standard Institute
PWA	Palestinian Water Authority
RWU	Regional Water Utility
SDGs	Sustainable Development Goals
SG	Strategic Goals
SGDP	Southern Gaza Seawater Desalination Plant
SP	Service Provider
SRF	Strategic Results Framework
STLV	Short term, low volume (desalination plant)
TDS	Total Dissolved Solids
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	The United Nations International Children's Emergency Fund
UNRWA	The United Nations Relief and Works Agency for Palestine
VC	Village Council
WASH	Water and Sanitation-Hygiene Group
WB	World Bank
WBWD	West Bank Water Department
WHO	World Health Organization
WSRC	Water Sector Regulatory Council
WSS	Water Supply and Sanitation
WUA	Water User's Association
WWTP	Wastewater treatment plants

## Summary

Updating the Water Sector Policy and Strategy for Palestine Years 2022 – 2042 was instrumental in gathering and updating all water information data, acting as a policy document reflecting the national vision towards water and its uses and as a strategy representing the respective future vision of all stakeholders. It is essentially a reflection of the goals, objectives and approaches towards:

- Reaching a balance between the **supply and demand** through proper management by assessing uses of existing resources and those developed for future supplies, both vital for the continued economic growth of the country and the prosperity of all residents of Palestine. It calls for the efficient management of water in all sectoral uses including domestic, industrial and irrigation uses while targeting the preservation of existing resources (reducing over-abstraction of groundwater and incorporating aquifer recharge), desalinating in Gaza and the Jordan Valley, managing purchased water, water harvesting at all levels, capturing cross-boundary flows of untreated wastewater and exploring the use of treated wastewater in agriculture after committing towards proper treatment.
- Building on existing **policy and policy statements** as a general framework while incorporating new considerations relevant to contemporary challenges, such as climate change, gender and youth inclusivity, the necessity for a cross-sectoral approach, and the sustainability of ecosystems.
- Recognizing that the need for effective management and protection of Palestinian water resources in line with **Integrated Water Resources Management (IWRM)** is a critical function of the water sector. The national strategy recognizes this, and its goals reflect the need for holistic and integrated strategies that address supplies, uses, and improvements on the part of all elements of society from water utilities and bulk suppliers to business leaders and households.
- Realizing that **Irrigated agriculture** will continue to be one of the largest water users. Hence the responsibilities arise to reduce water losses in irrigation water infrastructure, increase the productivity of irrigation water, and expand the use of non-conventional water.
- Achieving **cost recovery** commitments for PWA and its water utilities creates independence resulting in better service provision leading to better willingness to pay from users, willingness to charge by politicians, and willingness to provide additional support by development partners.
- Establishing effective sector governance as a fundamental necessity for sustainable sector management and lasting water security. This includes the amalgamation of individual utilities like Regional Water Utilities and the development of the National Water Company to deal with bulk supplies as well as the enhancement of the role of the Water Regulator.
- Highlighting the need to reduce **energy consumption** in the water sector through efficiency measures is essential and so is the need to increase the share of renewable energies in current supplies. The need for an Energy Management System at all sector facilities is needed whereas regulations are tailored specifically for the water sector needs of power and enhancing joint and harmonized planning between water and energy sectors.
- Showing that competent collection and timely dissemination of quality data and information for decision-making are necessary to improve water sector performance. Embedding quality assurance activities in data collection and data entry functions to ensure a better quality of data. Knowledge of water solutions and developments globally, accompanied by new and expanded collaboration with the private sector and academia can also further drive and scale innovation.
- Indicating that mitigation and adaptation measures must be considered by water resources managers to adapt to the effects of **climate change** that have already occurred or are unavoidable. Palestine

needs to address the impact of climate change on its social, economic, and environmental development. Adaptation measures must ensure institutional response capacity, community education, and awareness of the risk.

• Emphasizing that a proper framework is needed for **implementing the strategy** by specifying roles, responsibilities, and timelines for key actions.

#### **Policy statements**

The updated policy retains the essential elements of the 2013 framework and incorporates new considerations to face new challenges, setting 15 policy principles as follows:

- Sustainable management of water resources (see II.1.1 page 35), acknowledges water as a finite, vulnerable and public good for which a sustainable resource development and protection must be developed.
- Integrated water resources management (see II.1.2 page 35), 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" (see II.1.3 page 35), is the approach to future development plans to ensure equity in water resources use.
- Water rights (see II.1.4 page 36), 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 (see II.1.5 page 36), states the inclusive rights to access water and sanitation services for all.
- Financial sustainability of water Service Providers (see II.1.6 page 36), establishes that water is not free and its tariff is regulated by the government, encouraging the shift from groundwater to treated waste water reuse in agriculture.
- Governance and Management (see II.1.7 page 36), 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 (see II.1.8 page 37), invokes the polluterpayer principle and the definition of norms for safe disposal of water.
- Quality standards for Water Supply and Wastewater Reuse in Palestine (see II.1.9 page 37) fully considers wastewater as an alternative resource for which standards and specifications must be developed to optimise the different uses of water.
- Gender and Youth issues in the water sector (see II.1.10 page 37), recognises the key role played by women an youth in the management of water and the need for inclusion.
- Climate change impact on water resources (see II.1.11 page 37), states that the policy will contribute to the Palestinian climate change adaptation measures.
- Enhancing rainwater harvesting (see II.1.12 page 38), sets rainwater as a strategic additional resource, collected at 3 levels (on-site, district and central).
- Supporting Private Sector Participation in the Water Sector (see II.1.13 page 38), recognises the benefit of private sector participation in the sector.

- Scientific Research and Knowledge (see II.1.14 page 38), advocates for partnering with universities for innovation.
- Capacity Building (see II.1.15 page 38), emphases the crucial role of building the capacity of the sector actors, in terms of training, institutional development, resource allocation, knowledge transfer, monitoring and evaluation.

Section	Content	Page
II.2.1 Sustainable management of water resources	Permits for abstraction, control of abstraction rates, aquifer protection, water quality control, non-conventional water resources, introduction of desalination, national database for decision-making and planning, community involvement, Water User Association, public awareness-raising	39
II.2.2 Integrated water resources management and nexus "water-energy - food security"	Water as a public property of the Palestinian people, priority of domestic and residential purposes and definition of allocations (by a national committee) based on economic benefit, fairness and equity between users and regions, national authority for abstraction permits, arbitration, cost-efficiency in agriculture, sewerage and drainage separation, water-energy-food security nexus	40
II.2.3 Trans-boundary water issues	Full rights of Palestinians to shared water resources, cooperation with regional partners for optimum utilisation and data sharing, reuse within the national territory, exportation of treated wastewater	41
II.2.4 Access to water and wastewater services	Right to access affordable water of required quality for the purpose of use, priority to domestic demand and economic/social/environmental value, focus on marginalised areas	41
II.2.5 Financial sustainability of water and wastewater utilities	Financial viability from abstraction to treatment, full cost recovery (O&M, replacement and investment), regulations on revenue collection and illegal connections, financial objectives for each type of provider, subsidies, tariff wastewater to cover O&M (+ part of capital cost) and according to effluent quality, pro-poor tariffs and review mechanisms considering ability to pay, demand-driven approach for service provision, cross-subsidy mechanisms and progressive tariffs, earmarking of water revenues to improve water and sanitation services, support to energy efficiency (including renewable energies), promotion of reuse treated wastewater for irrigation	42
II.2.6 Governance and management	Regulation of the entire sector from water resource to disposal and reuse, separation of regulatory functions from operation, involvement of the private sector and formal water user associations, gender consideration in programmes and projects, target funding at efficient performances, incentives for reduction of NRW, water demand management (through tariffs and awareness-raising), financially and technically sound master planning to meet long-term strategic objectives, sound governance to mobilise funding, regulation and enforcement, integrity and transparency, establish NWC as an asset managing entity, establish Regional Water Utilities	43

These principles translate into 109 policy statements gathered in 13 sections:

Section	Content	Page
II.2.7 Protecting the environment from pollution by wastewater	Improvement of on-site sanitation, manage wastewater to reduce health and environmental risks, separate stormwater from sewerage to enable rainwater harvesting, treat wastewater to allow for a productive reuse, target agriculture for reuse in combination with fresh water, considering nutrients in wastewater to avoid overuse of nutrients, monitor heavy metals and salinity, encourage modern and efficient irrigation, sound contractual arrangements for commercialisation of wastewater, raise public awareness about wastewater and reuse.	44
II.2.8 Quality standards for water and wastewater sector in Palestine	Develop national standards on drinking water based on the most up-to-date knowledge and priorities, establish standards for industrial wastewater discharge and agricultural reuse, on-site sanitation, effluents of treatment plants and monitor compliance with regulations.	45
II.2.9 Gender and Youth in the water sector	Reflect the prominent role of women in the governance of the sector, promote their participation in service provision, decision-making positions, set guidelines to promote women as sector professionals, encourage the involvement of youth.	46
II.2.10 Climate change impact on water resources	Mainstream climate change into national strategies and policies, monitor climate change impact on water resources, limit the carbon's footprint (and water footprint) of the water sector, renewable energy, promote compliance of the sector to climate change legislation, integrate disaster risk reduction and raise awareness	46
II.2.11 Enhancing rainwater harvesting	Promote rainwater harvesting to balance the rising demand, use stormwater infiltration to recharge aquifers, subsidy mechanism to encourage domestic rainwater harvesting, separate stormwater from wastewater, build dams.	47
II.2.12 Supporting Private Participation in the water sector	Establish a enabling environment to encourage private investment in the sector, safeguard interest of users, favour competition for innovation and modern technologies.	47
II.2.13 Enhancing the applied research in the water sector	Providing scholarships to master and doctoral students, foster partnerships with Palestinian universities and utilities, promote applied research in strategic projects, encourage water operators to keep pace with technological advancements,	47

#### Baseline

The vision in this policy document is developed taking **year 2022 as a baseline**. The main characteristics of the water sector situation in 2022 are detailed in Part III Baseline (2022), page 49.

The **Palestinian population** is experiencing rapid growth, with an annual growth rate projected at 2.38% for 2017–2026, significantly increasing water demand. By 2022, the population density in the West Bank reached 613 persons/km<sup>2</sup>, while the Gaza Strip exhibited an extreme density of 6,608 persons/km<sup>2</sup>.

The **GDP** per capita displayed steady growth from 2007 to 2013 but stagnated between 2013 and 2021 due to political instability and the COVID-19 pandemic. Despite these challenges, the economy benefits from a literate and educated population, strong financial and trade ties with the Palestinian diaspora, and potential opportunities for economic collaboration with neighbouring countries. However, international assistance remains critical for investment in the water sector, as unresolved political agreements continue to hinder progress.

In terms of **health and environment**, child mortality rates in the West Bank have declined due to improvements in water quality and sanitation. However, in the Gaza Strip, severe sanitary challenges persist, driven by high population density, Israeli restrictions, and significant nitrate pollution in the coastal aquifer caused by untreated sewage and agricultural fertilizer use, posing major health risks

Palestine's available water resources include surface water, groundwater, desalinated water, treated wastewater, and purchased water. However, these resources face significant challenges.

Surface water in Palestine is critically limited. Key sources include:

- Jordan River: Historically, the river's flow into the Dead Sea was approximately 1,250 MCM/year. Over the past six decades, this volume has plummeted to 40–100 MCM/year.
- West Bank Wadis: These have an estimated annual flow of 102 MCM/year, though only 2.3 MCM/year is harvested through ponds and small dams.
- Wadi Gaza: Originating upstream in Israel, this wadi has an annual average flow of 20 MCM/year, most of which is trapped before reaching the Gaza Strip.

**Groundwater** is the primary source of water for Palestinians, with most of the supply derived from wells and springs.

- In the West Bank, renewable groundwater resources range between 578–814 MCM/year across three main aquifers: the Western (318–430 MCM/year), North-Eastern (135–187 MCM/year), and Eastern (125–197 MCM/year). Over-extraction and climate change have reduced spring discharge to an average of 25 MCM/year. Rising chloride and nitrate levels, especially in areas like Jericho, Tulkarm, and Qalqilya, have compromised water quality.
- In the Gaza Strip, the coastal aquifer is over-extracted, with an annual abstraction of 190 MCM, far exceeding the natural recharge rate of 55–60 MCM/year. This has resulted in aquifer depletion, seawater intrusion, and increasing salinity. Approximately 97% of groundwater samples exceed WHO limits for chloride.

**Desalination** of seawater is at inception stage:

In the **West Bank**, the Palestinian Water Authority (PWA) is exploring short-term opportunities to desalinate brackish groundwater and long-term projects, such as developing the Fashka spring, to improve water quality.

In the **Gaza Strip**, three major desalination plants operate, with capacities ranging from 2.2 to 3.5 MCM/year. Over 100 small-scale plants produce an additional 2–3 MCM/year. A large-scale Gaza Central Desalination Plant (GCDP) is planned, with an initial capacity of 55 MCM/year, expandable to 110 MCM/year by 2042.

Treated wastewater is already part of the available water resources:

- In the **West Bank**, 10 MCM of treated wastewater was produced in 2022, of which 20% (2.3 MCM) was reused for irrigation. The remaining untreated wastewater poses significant environmental risks.
- In the **Gaza Strip**, treated wastewater is reused for artificial aquifer recharge (17.3 MCM/year) and irrigation (7.1 MCM/year).

Water supply in Palestine significantly relies on **purchased water**. Palestine purchases water from Israel's Mekorot water system:

- In the **West Bank**, purchased water volumes doubled from 52.6 MCM in 2012 to 83.8 MCM in 2022.
- In the Gaza Strip, purchased volumes increased from 4 MCM in 2012 to 18.5 MCM in 2022.

Key water resource risks include:

- 1. **Groundwater Depletion**: Over-abstraction threatens sustainability in the West Bank and Gaza.
- 2. Seawater Intrusion: The coastal aquifer in Gaza suffers from significant seawater encroachment.
- 3. **Nitrate Pollution**: Contamination is widespread, particularly in Gaza and agricultural areas of the West Bank.
- 4. **Climate Change**: Reduced rainfall and increased variability exacerbate water scarcity, necessitating coordinated adaptation efforts.

In terms of **wastewater services**, according to the 2019–2020 Palestinian Central Bureau of Statistics (PCBS) census, 98.8% of Palestinian households use improved sanitation facilities, including piped sewer systems, septic tanks, and pit latrines. Connectivity is slightly higher in Gaza (99.5%) than in the West Bank (98.3%).

- In the **West Bank**, 54% of the population is connected to sewer systems, and 19 wastewater treatment plants handle 10 MCM annually, of which 2.3 MCM is reused for agriculture.
- In the **Gaza Strip**, 83.5% of the population is connected to sewer systems. Five treatment plants handle 50.6 MCM annually, with 17.3 MCM reused for aquifer recharge and 7.1 MCM for irrigation.

Israel deducts ~100 million ILS annually from Palestinian Authority tax revenues for wastewater treatment without established mechanisms or clear verification.

In terms of **institutional framework**, the governance of Palestine's water sector has evolved through key legislative and institutional milestones, including the establishment of the PWA in 1996 and the enactment of Water Law No. (3) of 2002 and Decree No. (14) of 2014.

Key institutions include:

- Palestinian Water Authority (PWA): Oversees policy, planning, and resource allocation.
- Water Sector Regulatory Council (WSRC): An independent body regulating tariffs, service quality, and licensing.
- National Water Company (NWC): Replaces the West Bank Water Department (WBWD) for bulk water supply management.
- **Regional Water Utilities (RWUs)**: Serve 15.6% of the population, aiming to consolidate local providers for efficiency.
- Water Users Associations (WUAs): Legally recognized groups managing local irrigation water distribution, maintenance, and allocation.

#### Demand for Water and Wastewater Services

The strategy document presents a comprehensive strategy for addressing the **demand for water and wastewater services** within the context of the Palestinian territories, spanning long-term, mid-term, and short-term perspectives (see Part IV Demand for Water and Wastewater Services, page 78).

The **long-term perspective** (after 2042) emphasizes the establishment of a fully independent Palestinian state, highlighting critical implications such as the restoration of water rights, negotiation of transboundary water rights, access to irrigable land, enhanced autonomy in water management removal of equipment import restriction and replacement of the Joint Water Committee (JWC) by cooperative mechanisms. It aims to significantly improve access to water resources, service quality, and wastewater management while fostering economic development through agriculture and industry.

The **medium-term implementation plan** (2030-2042) outlines necessary, systematically addressing immediate infrastructural needs and long-term strategic objectives.

The **short-term plan** (2023-2030) responds to existing constraints under Israeli military occupation, focusing on feasible investments and coping strategies to enhance water resource management amidst limited availability, through the mobilization of alternative water resources (desalination, rainwater harvesting, treated wastewater reuse) and optimization of water use (non-revenue water reduction, irrigation efficiency improvement, drought-resistant crops).

**Aims of the Strategy:** the strategy aims to improve water and sanitation services for Palestinian citizens over the next 20 years. Key objectives include securing water quantity, maximizing irrigation availability, ensuring reliable access to quality water, reducing regional inequalities, improving water quality, enhancing sanitation systems, increasing service reliability, sustainable water resource management, protecting water resources, ensuring financial sustainability, maximizing irrigation benefits, and providing reliable water service to industry.

**Sector Performance Indicators:** To evaluate progress and impact, the strategy is underpinned by a set of quantitative objectives for monitoring progress and estimating required investments. The focus is on customer-centric performance indicators to align with Palestinian population needs.

**Sector Strategic Objectives:** The Palestinian Water Authority (PWA) has outlined five strategic goals (SG) for the water sector, focusing on integrated management of water resources, quality service provision, sanitation improvement, institutional capacity building, and financial sustainability. These SG are supported by 24 specific performance indicators tailored for the unique challenges of the Gaza Strip and the West Bank to ensure effective monitoring and achievement of objectives during the period 2022-2042.

**Population growth:** The water sector strategy is based on the population hypothesis published by the Palestinian Central Bureau of Statistics (PCBS) for the period 2017-2026, extending the projection to 2042.

**Demand for urban water supply:** This expansion will result in greater demand for urban water, with a water production target of roughly 1.5 times greater by 2042 to cater to domestic and industrial requirements. The national water strategy targets 120 liters/capita/day (lcd) as a domestic water supply and 9% of domestic demand as an industrial supply for the West Bank and 6% in Gaza as of 2042.

To better manage water resources, the intervention aims to decrease the amount of Non-Revenue Water (NRW) from its current level (i.e., 40%) to 26% in West Bank and 28% in Gaza by 2042. This will be carried out by investing in distribution networks, metering, and billing infrastructure. The strategy does support sustainable water use in which treated wastewater is used for irrigation and water supply diversifies to provide a stable supply for a burgeoning area.

Considering the population growth, the planned NRW reduction and the 120 lcd target, **the yearly demand** for urban water would rise in twenty years from 154 MCM (million cubic meter) to 283 MCM in West Bank and from 121 MCM to 242 MCM in Gaza.

In terms of **demand for irrigation water**, agriculture is a cornerstone of the Palestinian economy, ensuring food security and empowering communities to manage their natural resources. Despite its importance,

the sector faces significant challenges, particularly in water management. With only 14% of agricultural land irrigated, primarily relying on groundwater, and limited surface water availability, Palestine's agricultural development is hindered.

The estimated annual agricultural water usage is around 171 MCM, with substantial potential for enhancing productivity through the use of treated wastewater.

To address these challenges, it is essential to improve water management practices, enhance the use of treated wastewater, and develop a robust institutional framework to promote sustainable agriculture. This requires concerted efforts from governmental bodies, local communities, and international partners to build resilient agricultural systems and optimize water use for sustainable development.

**Irrigated and irrigable land:** A significant portion of Palestine's agricultural land is utilized for farming, with 90% located in the West Bank. Rainfed agriculture covers 77%, while irrigated agriculture is mainly in Gaza, Jordan Valley, and some other regions in West Bank. The Ministry of Agriculture (MoA) estimates more than 360,000 dunums of land could be irrigated, with challenges in meeting water demand.

**Water demand for irrigation:** Agricultural water demand varies seasonally, peaking in hot, dry summers and decreasing in winter. This contrasts with water availability, highest in winter and lowest in summer, creating irrigation challenges. Storing treated wastewater poses difficulties due to seasonal demand mismatches. Implementing storage infrastructure like dams aids in managing water supplies for agriculture, enhancing resource sustainability. Efficient water utilization and strategic land planning can optimize existing resources in Gaza and West Bank, fostering agricultural development and resilience.

Palestinian Water Rights will enable an ambitious irrigation program in the West Bank, while Gaza faces constraints due to salinity issues, necessitating exploration of alternative water sources like desalinated water and treated wastewater reuse.

Considering the availability of irrigable land, the salinity issue in Gaza and MoA development program, the yearly demand for irrigation water would rise in twenty years from 78 MCM to 142 MCM in West Bank and from 96 MCM to 78 MCM in Gaza.

**Nexus of Water, Food, and Energy:** In Palestine, the interconnection of water, food, and energy is underscored by the reuse of treated wastewater as a strategic resource. This approach involves collaboration between ministries to address environmental threats, health risks, and energy generation possibilities. Efforts are focused on sustainable development through groundwater regulation, stormwater harvesting, water reuse systems, and seawater desalination to meet increasing water demands while ensuring long-term viability and resilience in the region.

#### Sustainable development of water resources

The water resource management strategy in Palestine (see Part V Sustainable Development of Water Resources, page 95) is predominantly oriented towards the controlled and sustainable use of natural resources, mainly groundwater, desalinated water, purchased water as well as surface water and rainwater. The strategy aims at ensuring long-term viability and resilience in the face of growing demand.

For **groundwater resource**, short and mid-term strategies focus on rights to access these resources. While negotiations regarding Palestinian water rights must be conducted with Israel and other riparian states, water utilization allocations for Palestinians are currently governed by the Oslo II Agreement, which is based on inadequate figures (water abstractions as of 1995).

Given this constraint, **short-term actions** focusing on groundwater management must be undertaken:

1. Review of Oslo Agreements (article 40 in particular)

- 2. Reassessment of Palestinian involvement in JWC meetings (balanced with Israel)
- 3. International third-party involvement (international observer)
- 4. Engagement with media and international community
- 5. Promotion of a national water management approach on Palestinian territory
- 6. Response to water infrastructure demolitions (repair, compensation and reconstruction)
- 7. Monitoring of water violations in area C of the West Bank (documenting violations and seeking for compensation)
- 8. Challenging the Israeli permit regime in area C.

The **long-term strategy** for water resources will be anchored in a peace process agreement involving all parties sharing these vital resources, specifically focusing on:

- Jordan River Surface Water Resources
- Groundwater Resources

Given the uncertainties surrounding the outcomes of the negotiations, the strategy will rely on hypotheses of the resources likely to be available to Palestinians, and is subject to a revision, particularly in relation to water allocations and necessary investments.

The strategy will consider alignment with the **Arab Strategy for Water Security**, which successful execution will bolster Palestinian water rights in the context of transboundary shared water resources.

In the meantime, additional wells should be considered in the short, mid-term and long-term strategy (although in the short term, the construction of new wells remains contingent upon negotiation with Israeli authorities via the JWC):

- In the **western aquifer** (the most productive one, could provide an additional 12.5 MCM/y by 2030, and 15 MCM by 2042) with new wells from the northern to the southern regions.
- In the **north-eastern aquifer** (vital resource for the Nablus, Jenin, and portions of the Tubas Governorates), which could provide an additional 12 MCM/y by 2030 and 17.5 MCM by 2042.
- In the **eastern aquifer** (currently facing depletion in certain areas) where new wells must be carefully sited to avoid interference with existing wells (additional yield is expected at 13.5 MCM by 2030 with an increase of 8.5 MCM/y by 2042). The long-term strategy for easter aquifer considers additional resources from the 38 Israeli wells that are expected to be eventually transferred and the development of AI Fashka Spring Groups on the slopes of the Dead Sea (Bethlehem and Hebron governorates), for future desalination (40 MCM/y for domestic use) and irrigation in Jericho (20 MCM/y).
- In the coastal aquifer (which is significantly overexploited), where reduction of abstraction for domestic use cannot take place in the short term (2024-2030), but use of treated wastewater is expected to help reducing abstraction for agricultural purposes and contribute to aquifer recharge. In the mid-term (2031-2042), PWA will focus on optimizing existing groundwater resources while exploring alternative water sources such as desalination and rainwater harvesting to gradually restrict abstraction to 90-100 MCM/y. In the long term, the strategy in Gaza is to significantly reduce groundwater abstraction to 96 MCM per year by 2042 through enhanced water conservation measures, increased use of treated wastewater and development of desalination facilities.

In terms of **treated wastewater and reuse**, the strategy encompasses a comprehensive development plan for wastewater collection systems, including sewerage and cesspit sludge collection, alongside the construction of new wastewater treatment plants, in alignment with the National Policy directives. This will require collaboration of various stakeholders for production (high-performance treatment plants, coordinated transportation, aquifer recharge, encouragement for industrial and agricultural use, with guidelines for safe crops).

**Desalinated water** is also considered in the short- and long-term strategy.

In **Gaza**, the PWA has developed an investment program aimed at enhancing the production of desalinated water, as it is identified as the principal additional water resource for this area close to the seashore. The PWA has proposed a regional desalination project for Gaza (GCDP), with an initial capacity of 55 MCM per year. However, this project remains on hold due to funding limitations and the prevailing political situation, with production tentatively scheduled to commence in 2031.

In the interim, a Short-Term Low Volume (STLV) strategy is being implemented in Gaza, utilizing mediumsized desalination plants to render brackish water In Gaza usable to meet emergency water supply needs and enhance drinking water availability.

While in the **West Bank**, addressing salinity concerns is crucial for preserving agricultural productivity and groundwater quality. Collaborative efforts and advancements in technology will be essential to optimize the utilization of brackish water resources.

**Purchased water** currently provides a significant part of the water supply of Palestinians, but the PWA strategic vision is to prioritize reliance on local water resources to reduce the dependence on purchased water (from the Mekorot connection points).

In the **West Bank**, in alignment with this strategy, it is anticipated that once Palestinians regain full control over land and water resources, the reliance on purchased water will decrease, with groundwater abstraction becoming the primary source for meeting domestic water needs.

However, to address the decline in water quality in Gaza caused by the over-exploitation of groundwater resources, the PWA has adopted a strategy to augment the quantity of water purchased from Mekorot for this territory.

Similarly, in the **short-term** (until Palestinians can reclaim their water rights) the strategy acknowledges the need to purchase additional water in Jenin, Hebron and Bethlehem governorates. PWA will undertake a series of negotiations with the Israelis through JWC (increasing purchased water volumes, at an acceptable price, drilling new wells, reducing connection points to improve pressure management and reduce NRW, reallocation of volumes to the southern West Bank and Gaza)

In the mid and long-term strategy, along the strategy to prioritize local water resources, the procurement of water will continue to be a viable option until full rights to groundwater and surface water are secured. This dual approach will ensure water availability while working towards greater autonomy in water resource management.

**Surface water resources** in Palestine are severely limited: most wadis in Gaza have been entirely depleted while in the West Bank, the access to the main surface water (the Jordan River) is denied to Palestinians.

However, there are significant stormwater runoffs and baseflows from large springs in several Wadis throughout the West Bank. The potential for surface water utilization remains largely untapped. Strategically, it is essential to focus on the management of major wadis, which flow either westward toward the Mediterranean or eastward into the Jordan Valley and the Dead Sea. By enhancing the management of these water resources, stakeholders can promote sustainable agricultural practices, improve water availability, and contribute to the overall resilience of the region's water supply.

**Stormwater harvesting**, as an alternative resource, faces political, geographical, and hydrogeological constraints in Palestine. Addressing these constraints requires meticulous planning, active stakeholder engagement, and effective coordination among all relevant parties. It is essential that dam projects in the West Bank are grounded in comprehensive technical assessments, environmental sustainability, and social inclusivity to promote sustainable and equitable management of water resources in the region.

The first strategic orientation is to **build dams in major wadis**, to serve both for rainwater collection and **storage of treated wastewater**. This combined storage will allow to improve the quality of treated wastewater and broaden its use. Table 19 page 113 lists the 15 main dam projects that can be implemented in three phases (five years, ten years and long-term projects).

The second strategic orientation is to develop on-site rainwater harvesting, at building or land plot level. This orientation will be implemented through the development and promotion of affordable designs, education and training, incentives and support, with a framework for monitoring and evaluation (including quality assessment to inform future improvements) as well as adaptations to building, agricultural and planning regulations to facilitate rainwater harvesting.

The **reuse of treated wastewater** for irrigation, industrial purposes and Manages Aquifer Recharge (MAR) is an important addition to the water balance in the State of Palestine.

Treated wastewater can potentially be sold or traded with Israel where irrigation and industries may not fully absorb the available treated wastewater.

To enhance regulatory frameworks, EQA, PSI, MoA, and PWA will work together to update and enforce all regulations related to Environmental Limit Values (standards and guidelines) for treated wastewater reuse and managed aquifer recharge, including the required specifications for various crops.

The **strategic orientation for reuse** is based on making available every cubic meter of treated wastewater to irrigation, industrial use or managed aquifer recharge, and enhance the efficiency of treated wastewater in agriculture. This will require an excellent coordination and cooperation among the various stakeholders (MoA, PWA, EQA, Municipalities, WUAs, WWTP operators).

**Managed Aquifer Recharge** will be of particular use to reverse, or at least mitigate, saline intrusion. The national strategy advocates for the artificial recharge of the coastal aquifer in **Gaza**, using treated wastewater. This approach allows for the subsequent exploitation of the aquifer in proximity to the recharge area, particularly for the irrigation of high-value crops, such as vegetables

PWA is apprehensive about artificial aquifer recharge in the West Bank, that may ultimately benefit downstream Israeli wells or raise geopolitical tensions regarding the potential contamination of groundwater extracted downstream from shared aquifers.

Three preliminary sites have been identified as suitable for MAR:

- 9. Faria Basin (Al Nasaryah in Nablus Governorate and Al Jeftlic in Jericho Governorate)
- 10. Al Auja Site (in Jericho Governorate)
- 11. Lower Wadi Al Qilt Drainage System in Jericho Governorate.

The strategy aims to put in place an **Integrated Water Resource Management**, based on water resource monitoring (by PWA), delineation of protection zones and rehabilitation programs, improvement of water allocation among communities and individuals, clustering water service zones (based on access to water resources).

The strategic objectives are:

- 12. Reducing inequalities between clusters
- 13. Reducing inequalities within communities
- 14. Enhancing technical and financial performance
- 15. Prioritizing local resources

Figure 14, page 122, displays the geographic distribution of the identified water clusters.

The strategy also includes the **reduction of transboundary wastewater flow from the West Bank** as these waters are mixed (treated and untreated) and considered as untreated by Israeli WWTP operators, which results in PA incurring increasing treatment costs.

The strategies to address this issue are:

- 16. Improving treatment capacity in the West Bank
- 17. Establishing Transparent Billing Procedures
- 18. Promoting Water Reuse
- 19. Strengthening Regulatory Frameworks
- 20. Infrastructure for Water Transfer
- 21. Trading treated Wastewater

Transboundary wastewater and reuse are interconnected: the more wastewater is reused in the Palestinian territory, the less treatment becomes a transboundary issue.

#### Water and wastewater service improvement

In terms of **service improvement**, the strategy covers water for domestic and industrial use, water for irrigation, the improvement of water supply and that of wastewater services, with distinct strategic modalities for the West Bank and in Gaza (see Part VI Water and Wastewater Services Improvement, page 125).

Water for domestic and industrial use: In the West Bank, the primary sources of water for domestic and industrial use are the sustainable abstraction of groundwater resources and the purchase of water from Mekorot.

The strategies for the short term (by 2030) and medium term (by 2042) are structured around a greater dependence on groundwater abstraction by drilling new wells and retrofitting existing ones, while ensuring the sustainable management of aquifers is maintained. It is also foreseen that purchases from Mekorot will be increased to achieve the required balance between supply and demand. As for springs, the contribution is expected to be marginal as the source is not reliable in quantity and timeliness. Quantitatively, these supplies meeting the current demand at 150 MCM/yr become 200 MCM/yr in 2030 and nearly 280 MCM/yr in 2042, with groundwater component being nearly 60 MCM/yr, is 80 MCM/yr to 130 MCM/yr in years 2030 and 2042, respectively.

In Gaza, the primary water resources for domestic and industrial supply are the sustainable abstraction of groundwater and the desalination of seawater.

The short-term (by 2030) and medium-term (by 2042) strategies are founded on the basis of (a) increasing the current supply of 125 MCM/yr to nearly 230 MCM/yr by 2042 by enhancing water production through desalination currently at 20 MCM/yr, becoming 30 MCM/yr by 2030 and 170 MCM/yr in 2042, (b)

moderate reliance on water purchases capped at nearly 20 MCM/yr throughout the panning horizon, (c) reduction of groundwater production to counter seawater intrusion caused by over abstraction and (d) applying artificial recharge technologies with treated wastewater, yet seeing a net decrease in groundwater abstractions from the current 90 MCM/yr to nearly 45 MCM/yr by 2042.

**Water for Irrigation:** In the **West Bank**, the primary water resources for irrigation include the sustainable abstraction of groundwater resources (springs and wells) and the reuse of treated wastewater. Additionally, rainwater harvesting will be increasingly recognized as a vital resource, with the construction of dams for the storage of stormwater and treated wastewater during the winter months.

The current demand for agriculture water at 78 MCM/yr is expected to increase to nearly 100 MCM/yr in the short-term (by 2030) and to 116 MCM/yr in the medium-term (by 2042). Strategies are structured around (a) the Management of Groundwater Use by Implementing a modest reduction in groundwater abstraction for irrigation purposes involving reallocating the use of certain agricultural wells to domestic supply, (b) the expansion of treated wastewater reuse achieving a significant increase in the reuse from 2 MCM/year to 29 MCM/year over the next two decades., and (c) the contribution of rainwater harvesting towards irrigation. Dams constructed for winter storage of treated wastewater will also capture stormwater, with a planned increase from the current 2 MCM/yr to reach over 20 MCM/year in the next two decades. The strategic objectives, however, call for optimization of water resource management for irrigation by ensuring sustainable agricultural practices and enhancing overall water availability in the West Bank.

In Gaza, the primary water resources for irrigation consist of groundwater and the reuse of treated wastewater. While rainwater harvesting is acknowledged as an additional resource, its development is limited by the availability of suitable dam sites.

The short-term (by 2030) and medium-term (by 2042) strategies considered are both structured around:

- 22. the enhancement of treated wastewater reuse and expansion of its reuse through the construction and extension of WWTPs,
- 23. the application of aquifer recharge by implementing and extending infiltration infrastructures to facilitate the process which will not only provide the tertiary treatment necessary to meet quality standards for various crops but will also help containing and reversing seawater intrusion in the coastal aquifer as well,
- 24. requiring the reduction of groundwater abstraction gradually from the current 88 MCM/yr to 51 MCM/yr in 2042 while increasing the current treated wastewater reuse from the current 7 MCM/yr to 27 MCM/yr in 2030 to 50 MCM/yr in 2042.

**Domestic water service improvement:** This national water sector strategy encompasses more than merely quantitative enhancements; it also seeks to elevate the quality of services provided to consumers, particularly in the areas of water pressure and continuity of service as well as water quality.

In Gaza, priority is given to water quality where the supplied water is highly saline with excessive levels of chloride and nitrates, rendering it non-compliant with the WHO drinking water standards. Consequently, many households rely on private desalination suppliers for drinking water, raising concerns about accessibility and affordability.

Addressing the salinity issue and improving the quality of the public water supply is critical for ensuring safe drinking water for all residents in Gaza. The Government has initiated an ambitious program aimed at producing freshwater through seawater desalination processes, specifically reverse osmosis. This method yields water with minimal salt and nitrate content, thereby improving quality. To optimize the

supply of this desalinated water and address the possible lack of minerals, this water will be blended with a precisely calculated proportion of water extracted from the coastal aquifer. This strategy will enhance the total volume of water available while ensuring compliance with WHO standards, ultimately benefiting a greater number of users in the region.

The strategic objectives for the water service operators are:

- to define and implement a comprehensive water testing program and publicly disclose the water quality indicators (average annual levels of nitrate and chloride
- achieve a compliance to WHO standards regarding salinity and nitrate by a rate of 50% of the water supplied in Gaza in 2030, climbing to 80% by 2042.

In the **West Bank**, the issue is the intermittent water supply with only a limited number of users benefiting from continuous water access (designated as 24/7). Many residents receive water only once or twice a week, or in some cases, as infrequently as once every two months.

To improve the quality of service to users, the Government will implement a comprehensive series of institutional and technical measures by 2042. The aim is to enhance the operational efficiency of water service providers and ensure a more equitable distribution of available water resources.

The Strategy thus calls for:

- 25. organizing water distribution around clusters of municipalities, ensuring that each cluster is provided with a sufficient supply of safe water, with a target of at least 75 lcd,
- 26. establishing a National Water Company (NWC) to optimize bulk water supply within each cluster and facilitate necessary inter-cluster water transfers, thereby addressing regional disparities, (d) constructing regional reservoirs to effectively manage pressure within the distribution networks, ensuring consistent supply and improved service delivery,
- 27. extensively supporting all water service providers, particularly the RWUs, to reduce NRW. This support will include subsidies for the installation of prepaid water meters, acquisition of essential equipment, and engagement of specialists for leak detection.

These strategic initiatives aim to transform the water supply landscape in the West Bank, moving towards a more reliable and equitable system that meets the needs of all residents. The objectives are then:

- to ensure by 2030 that 90% of customers receive water on a weekly basis and achieve provision of water at least every other day for 75% of customers
- while ensuring, by 2042, that 100% of customers receive water on a weekly basis and that 90% of users have access to water at least every other day.

For Wastewater Service Improvement, the national sanitation strategy establishes:

- 28. specific targets for sewer networks to efficiently collect wastewater from as many users as possible (this effectiveness being monitored by the percentage of the population connected to a sewer system),
- 29. a priority on constructing wastewater treatment plants to treat the wastewater to suitable standards for removing primary pollutants (such as organic matter, nitrogen, and phosphorus) and targeting the reuse potential of the output of these plants,
- 30. a strategic use of trucks to collect wastewater from households not connected to the networks.

In Gaza, a sewer network already serves all major towns. The strategic objective is to extend sanitation services to the remaining small localities that are not yet connected and to promote connections among all households. While existing WWTPs in Gaza are capable of effectively treating the majority of wastewater, the national strategy encompasses plans for the construction of additional wastewater treatment facilities as well as extension and enhancement of existing plants. Additionally, several WWTPs will be equipped with tertiary treatment systems to improve the quality of effluents, to make them suitable for agricultural use, industrial applications, and managed aquifer recharge.

Strategic actions include:

- enhancement and extension of existing WWTPs to accommodate forecasted wastewater flow,
- improvement of the collection ratio (households being connected to the sewer system) to 90% by 2030 and 98% by 2042. This requires sustainable financial viability of the services, thus integration of solar energy solutions wherever feasible, as the treatment process is energy intensive.

In the **West Bank**, the level of sewage collection is significantly lower than in Gaza. Many medium-sized localities lack sewer systems, while many households remain unconnected where sewers do exist. This situation arises from several constraints that are unique to this region, such as rugged terrain, dispersed housing and fragmentation of the West Bank into areas A, B, and C, thus complicating project planning and implementation. The challenge is further compounded by the need for a sanitation strategy in the West Bank to prioritize the reuse of all collected and treated wastewater within its borders. This focus is essential to avoid incurring additional treatment costs across the border, by achieving 50% reduction in transboundary wastewater by 2030 and 80% by 2042 through the construction of wastewater treatment facilities and the reuse of treated wastewater in agriculture and industry, where feasible. This also calls for financial sustainability, decentralized treatment options and the use of solar energy.

#### Strategy implementation, monitoring and evaluation

The national strategy acknowledges the significant challenges facing the water sector in Palestine (see Part VII Strategy Implementation, Monitoring and Evaluation, page 135), which include:

- insufficient resources to meet the increasing demand,
- barriers of Israeli occupation to access and control over water resources,
- financial imbalances in service providers accounts.

These challenges, in addition to cross-cutting issues such as engagement of youth and PWA commitment to activities related to climate change threats; all lead to the need for a detailed and specific framework to monitor and evaluate the effective implementation of the national strategy for the water sector.

The successful execution of this strategy hinges on the successful implementation of two critical institutional reforms established by 2014 Water Act:

- Establishing Independent water and sanitation service providers (Regional Water Utilities RWUs) operating independently from municipalities, to enhance technical and financial performance
- Developing an autonomous bulk water supply company (National Water Company NWC) which will focus on the efficient management of limited water resources, free from political interferences.

The **structural reform process towards RWUs** is based on the establishment of 4 RWUs (3 in the West Bank and 1 in Gaza) by 2030, through aggregation of individual utilities (nearly 300 in 2018) according to a specific plan. The process involves transferring water and wastewater services from providers at Local Government and Village Council levels to a larger utility at regional level. This shift will improve governance

by assigning service responsibility to fewer, larger utilities operating on a commercial basis and reporting to the PWA. The reform aims to enhance efficiency and leverage economies of scale.

In Gaza, the reform will involve transforming Coastal Municipality Water Utility (currently a Joint Service Council established under the 1997 Local Authorities Law) into the Gaza RWU. The process of consolidating Gaza's 25 municipal service providers into the CMWU has already begun, although progress has been slower than expected.

The main key strategic indicator by 2030 is to have separate accounting systems, new tariffs covering O&M costs and autonomous management of HR for 50 % of the service providers supplying more than 500 m<sup>3</sup>/day (those 122 largest service providers cover 93 % of all users in the country). The target rate for 2042 is to reach 100%.

The structural reform process towards the **National Water Company (NWC)** relies on the establishment of the NWC (as mandated by the 2014 Water Act) which is currently in progress. The NWC will function as a public entity fully owned by the State of Palestine, in alignment with the Water Law (Article 37, Section 1). The board of directors has been appointed by the cabinet of ministers, and the company received formal registration in 2022.

The key indicator for 2030 is to have a fully operational NWC:

- 31. taking over the responsibility of water purchases,
- 32. managing resource wells,
- 33. operating Gaza desalination plants,
- 34. planning water harvesting projects such as dams,
- 35. utilizing treated wastewater,
- 36. integrating all staff required for bulk supply into a unified organizational structure,
- 37. maintaining the balance of operating accounts (effective billing and transparent subsidy framework as needed),
- 38. properly recording and tracking assets of all kinds.

Among the **cross-cutting issues**, the **communication and outreach** component will implement a National Communication Strategy, aimed at fostering behaviour and policy changes within the water sector. This strategy seeks to support an integrated and systematic communication effort that addresses the country's pressing natural resource challenges. It includes mobilizing the youth to be actively engaged in water conservation policies. Palestinian institutions can harness their energy, creativity, and commitment to fostering sustainable water management practices. Effective community engagement can significantly reduce territorial and institutional fragmentation within the water sector, leading to more efficient, cost-effective, and sustainable water supply and sanitation services.

Another cross-cutting issue relates to the **mitigation of climate change impact.** The climate change represents a pervasive challenge that exceeds national borders and sectors, particularly in contexts such as Palestine. In the water sector, PWA has collaborated with the EQA to draft an NDC action plan for 2022-2032. This plan delineates key performance indicators designed to monitor the implementation of NDC actions, along with cross-cutting priorities. The action plan focuses on three principal areas:

- 39. water treatment and conservation,
- 40. water source infrastructure,

41. improvement of water networks infrastructure.

This strategic framework underscores the necessity for collaborative efforts and international support to enhance Palestine's resilience to climate change while ensuring sustainable water resource management. Specific targets include:

- reducing non-revenue water by 15%,
- drain and collect 5% of rainwater in priority urban areas by 2032.

To oversee this national strategic approach, a Palestinian National Climate Change Committee has been established, chaired by EQA. This committee includes PWA and other relevant authorities, each with defined roles and responsibilities for monitoring progress and ensuring effective implementation.

#### Monitoring the Strategy implementation

To effectively monitor progress in the implementation of the strategy, the Government requires reliable and objective performance indicators. Consequently, the PWA has been tasked with developing a procedure for the regular production of these indicators, adhering to the principles of the SRF focused on measuring the performance of key stakeholders in the water sector (such as PWA, WSRC, NWC, RWUs) and facilitating resource mobilization to achieve strategic objectives while also incorporating relevant aspects of the SDG indicators which are primarily derived from data collected by the PCBS through censuses and in-depth household surveys.

To support the achievement of SDG targets, the sector will enhance the availability and accessibility of disaggregated data by income, gender, age, and other factors. Ensuring the quality and coverage of this data is essential. The basic data, to be used to establish most of the indicators, are produced by the service providers (RWUs and municipalities): number of customers, number of prepaid meters, volume of water distributed, WSRC plays a pivotal role in overseeing and regulating water-related activities within Palestine, particularly in data collection across the sector addressing:

- Regulatory compliance monitoring,
- Performance monitoring,
- Policy development and planning,
- Research and analysis,
- Data dissemination and reporting.

Overall, the WSRC's role in data collection is essential for effective regulation, management, and governance of water resources and services. By collecting, analyzing, and disseminating relevant data, the WSRC supports sustainable water management practices and enhances access to safe and reliable water for all.

#### Strategic Goals (SG) in the Strategic Results Framework (SRF)

The SRF for the water and sanitation sector is organized around five strategic objectives, each aligned with the three primary thrusts of the national policy agenda. This structured approach ensures that the sector's goals are integrated with broader national priorities, facilitating coordinated efforts to enhance water resource management and sanitation services in Palestine. The data collected for each of the strategic goals below is collected on a four-year basis, with 2022 as the baseline reference. A KPI and its value is identified for each of the four years.

	National Policy: providing basic needs for population groups
SG1	Improving the quality and reliability of water supply service and ensuring fair supply; (a) amount of water produced annually from wells and springs, (b) desalinated, harvested or (c) from treated wastewater (MCM/year)
	National Policy: ensuring the sustainability of the environment
SG2	Sustainable development of water sources; (a) amount of water available at customer tap (litre/ individual/ day), (b) percentage of samples that achieve all Palestinian Standards, (c) weighted average for nitrates and chlorides in Gaza (ppm), and (d) the rate of non-revenue water (NRW) = leakages, illegal connections, poor metering
SG3	Improving the sanitation service provision and reducing its environmental impact; (a) wastewater collection, treatment and reuse, (b) percentage of houses connected to sewage systems, (c) percentage of the amount of wastewater treated inside Palestine, (d) percentage of treated sewage that corresponds to the Palestinian specifications for WWTPs, (e) percentage of treated wastewater reused for irrigation or managed aquifer recharge, and (f) area of irrigated agricultural land from treated wastewater (donum) separately for Gaza and the West Bank
	National Policy: efficiency and effectiveness of public finance management
SG4	Developing and building water sector institutions to establish the foundations of good governance in an integrated legal and institutional environment; (a) total number of established RWU, (b) number of water service providers, (c) number of acting bylaws and (d) progress in establishing the National Water Company
SG5	<b>Ensuring the financial sustainability of water facilities and providers;</b> (a) number of domestic customers managed by autonomous service providers (x 1000), (b) collection efficiency: the collection rate of water bills, and (c) percentage of domestic connections equipped with prepaid meters

Reference is made here to Sustainable Development Goal **SDG 6** pertaining to **clean water and sanitation**, an indicator agreed upon internationally. Palestine has adopted an SDG framework to measure progress in various development areas using standardized indicators. PWA, being responsible for water and sanitation, will collaborate with sector entities to establish specific targets and indicators aligned with SDG 6. These targets will be tailored to reflect the current Palestinian water context and integrated into monitoring and evaluation mechanisms across relevant institutions.

## **Document Structure Overview**

The Updated Water Sector Policy and Strategy for Palestine is structured into seven key sections. These interdependent sections provide a comprehensive approach to managing water resources and meeting the growing needs of the population and the water sector pressing needs and issues:

**Part I. Background, page 28**, provides the rationale behind the updating of the water sector policy and strategy, vision statement and the specific objectives of the Water Policy, including a specific disclaimer regarding the applicability of the strategy to Gaza on the short term after the Israeli war on Gaza. Purpose statement and references, establishing the foundational framework for the subsequent sections.

**Part II. Policy, page 34**, defines the policy principles, and objectives that guide the sustainable management of water resources, allocation, and protection of water resources in Palestine. Policy statements, sustainable management, transboundary water resources, and financial sustainability. The policy focuses on promoting equitable access to water, integrated water resources, safeguarding environmental resources, and ensuring the resilience of the water sector in Palestine.

**Part III. Baseline (2022), page 49**, thoroughly assesses of the current state of the water sector as of 2022 is presented in this section. It includes a review of existing water resources, infrastructure, service levels, and key performance indicators, providing a clear baseline for future planning and development.

**Part IV. Demand for Water and Wastewater Services, page 78**, analyses demand and supply projections for water and wastewater services, considering factors such as population growth, industrial development, and climate change. The demand analysis informs the planning and scaling of future infrastructure and service delivery. Available water resources, conventional and in conventional water resources.

**Part V. Sustainable Development of Water Resources, page 95**, focuses on the long-term sustainability of water resources, and outlines strategies for resource conservation, integrated water management, and climate resilience. It highlights the need for innovative and efficient practices to ensure that water resources are available for future generations.

**Part VI. Water and Wastewater Services Improvement, page 125**, identifies areas for enhancing the quality, reliability, and accessibility of water and wastewater services. It outlines specific measures for improving infrastructure and implementing policy reforms to ensure efficient and equitable service delivery. In addition to the priority for dealing with the transboundary wastewater and reuse.

**Part VII. Strategy Implementation, Monitoring and Evaluation, page 135**, provides a detailed implementation framework for the strategy, specifying roles, responsibilities, and timelines for key actions. It establishes a system for ongoing monitoring and evaluation, SRF monitoring and performance evaluation mechanism, using clear key performance indicators (KPIs) to track progress and make necessary adjustments to ensure the successful achievement of the strategy's objectives, adhering to the principles of the **SRF** while also incorporating relevant aspects of the **SDGs**.

Each section of the strategy builds on the previous one, providing a cohesive and comprehensive approach to addressing the challenges and opportunities in Palestine's water sector. The strategy aims to achieve sustainable water management, improve service delivery, and safeguard water resources for current and future generations

# Part I. Background

# I.1 The rationale behind the Water Sector Policy and Strategy updating

In 2012 and 2013, the Palestinian Water Authority (PWA) conducted a comprehensive consultation involving all stakeholders within the water sector to develop a sector policy paper and a 20-year development strategy (2012-2032). These foundational documents received approval from the Council of Ministers and have since guided all subsequent programs implemented in Palestine, remaining key references to this day.

The necessity of reviewing these documents at this juncture arises from the understanding that a 20-year development strategy, regardless of its initial robustness, must be periodically reassessed to reflect evolving economic, sociopolitical, and technological landscapes, regulatory frameworks, and stakeholder engagement dynamics.

While the core principles of the Water Policy have remained largely unchanged, due to the consistency of the country's primary political orientations, the sectoral policy document presented herein retains the essential elements of the 2013 framework while incorporating new considerations relevant to contemporary challenges, such as climate change, gender and youth inclusivity, the necessity for a cross-sectoral approach, and the sustainability of ecosystems.

Furthermore, the updated strategy constitutes a detailed revision of the prior plan developed a decade ago, addressing significant developments, including:

- A 50% increase in population over the past ten years, coupled with a socio-economic and political landscape that exerts additional pressure on relatively static water resources.
- The escalating effects of climate change on these critical resources.
- Notable changes in the institutional environment, particularly in relation to the water law and its implementation regulations, which foster the establishment of more efficient public service operators.

The newly formulated 20-year strategy document (2023-2042) integrates these developments and articulates new objectives, accompanied by a series of indicators designed to facilitate comparative analysis with the preceding strategy

## **I.2** Vision statements

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.

## **I.3** Specific Objectives of the National Water Policy

The overall goal for the policy is to guide the achievement of sustainable management, development and use of water resources in Palestine and to provide a framework that is dynamic, innovative and effective.

The water policy aims to provide direction to all agencies working within the water sector for achieving the following specified objectives:

- To address issues related to development of surface water and groundwater and management of these resources in an efficient and equitable manner.
- To ensure the availability of water to all elements of society including the poor and the underprivileged and consider the needs of women and youth.
- To emphasis water rights and sovereignty.
- To accelerate the development of sustainable water and wastewater systems.
- To develop knowledge and capacity building that would enable the design of future water resources management plans with economic efficiency, gender equity, and social justice.
- To improve institutional arrangements for Integrated Water Resources Management (IWRM) and insure financial sustainability of services providers.
- To protect water resources, ecosystem, catchment areas and networks and promote effective programs for water conservation and protection.
- To include research, implementation of scientific and technology innovation in the provision of water services to sustain ecosystems.
- Developing wastewater services and reuse of treated wastewater.

## **I.4** Alignment with the national vision

### I.4.1 Responsibilities

Responsibilities for implementing the measures proposed in this policy document will be shared between various stakeholders, including:

- Office of the Prime Minister
- Palestinian Water Authority (PWA)
- Water Sector Regulatory Council (WSRC)
- National Water Company (NWC)
- Ministry of Finance (MoF)
- Ministry of Agriculture (MoA)
- Ministry of National Economy (MoNE)
- Environmental Quality Authority (EQA)
- Ministry of Local Government (MoLG)
- Ministry of Health (MoH)
- Negotiations Affairs Department

- Ministry of Foreign Affairs (MoFA)
- Ministry of Women Affairs (MoWA)
- Ministry of Social Development (MoSD)
- Ministry of Education (MoE)
- Palestinian Energy and Natural Resources Authority (PENRA)
- Water service providers and their representative association

The policy and strategy title are referred to as the National Water and Wastewater Policy and Strategy. This document has been developed under the auspices of the PWA, with the involvement of all major stakeholders of the water sector in the Palestinian Territories.

## I.4.2 Purpose statement

The National Water Policy provides the orientations to organize the protection, conservation, sustainable management and development of water resources and for the provision, improvement and sustainable management and provision of water supply and wastewater services and related standards in Palestine. The policy aims to:

- 42. Reinforce the Palestinian Authority's approach to sustainable water resources management by ensuring that all arms of government work together in the pursuit of shared water resources management goals; and
- 43. Establish a framework for the coordinated development, regulation and financial sustainability of water supply and wastewater services to ensure concerted efforts towards improved water systems management, rehabilitation and maintenance.

The National Water Policy will also act as a platform for ensuring close collaboration and cooperation among all water-related agencies and stakeholders at the national, governorate, municipal and local communities' levels. As such, the National Water Policy should be treated as a living document to accommodate changes that will further strengthen the national framework and reflect water and wastewater governance at all levels.

## I.4.3 Previous Reference

- 1. The National Water Policy and Strategy (2023-2042) is in line with the National Water Policy for Palestine (2012),
- 2. The National Water and Wastewater Policy and Strategy for Palestine (2013-2032),
- 3. The Water Law (2014) and the relevant by-laws,
- 4. The strategic water resources and transmission plan (2014),
- 5. The Strategies for Sustainable Financing of the Water Sector (2014),
- 6. The Capacity Development Policy and Strategy of the Water Sector (2016),
- 7. The Non-Revenue Water strategy, the water safety plan (2017) and,
- 8. The Roadmap for the creation of Regional Water Utilities in the frame of the Water Sector Reform in Palestine (2018).

## I.5 Impact of the current war in Gaza Strip on the Water Sector Updated Strategy

The ongoing Israeli Aggression / War on Gaza Strip has exacerbated the challenges that were already critical within the water sector. The original water sector strategy, which had been updated prior to the eruption of hostilities, outlined a roadmap for addressing longstanding issues related to water supply, water resources (conventional and non-conventional), wastewater, sanitation, and infrastructure resilience. However, the current escalation and destruction has necessitated a shift in priorities, particularly concerning the urgent need for the rehabilitation of essential water infrastructure.

**In the short term**, the immediate focus has shifted to the restoration of damaged infrastructure, with particular attention to the repair and reconstruction of key water and sanitation systems. The continuous restrictions on the movement of goods into Gaza, which predate the conflict, have significantly hindered efforts to enhance infrastructure capacity and provide uninterrupted access to essential services. These restrictions have been further intensified by the ongoing conflict, severely impeding the import of critical materials and equipment required for rebuilding and maintenance activities.

The following areas of the water sector have been particularly impacted:

- 9. **Bulk Water Supply Systems:** Water supply system infrastructure, which play a crucial role in providing potable water to Gaza's population, have sustained extensive damage, undermining the region's capacity to meet current and future water demands. This disruption severely affects the supply of safe drinking water, which is already a scarce resource in Gaza.
- 10. Water Conveyance and Distribution Pipelines: The destruction of both main and secondary water pipelines, including those serving household connections, has significantly hindered the distribution of potable water.
- 11. Sewage Networks and Wastewater Treatment Plants: The damage to sewage infrastructure has had severe implications for public health. The destruction of wastewater treatment plants and sewage networks has resulted in increased contamination of groundwater sources, heightening the risk of waterborne diseases and posing a serious threat to public health.

The urgency of addressing the challenges confronting Gaza's water sector has been further underscored by the updated strategy's emphasis on infrastructure rehabilitation, which must now account for the additional setbacks caused by the ongoing war and extensive destruction. The restoration of essential water and sanitation services has become an **immediate priority**, not only to meet the urgent needs of Gaza's population but also to ensure the long-term sustainability and resilience of the region's water systems.

Given the scale of the damage and the complexity of the current situation, a coordinated, multidimensional approach is critical. This approach must combine both humanitarian aid for immediate relief and long-term infrastructure development to mitigate the lasting impacts of the war. The strategic response should focus on restoring essential water services while simultaneously laying the foundation for a more resilient and adaptive water sector. In light of these unprecedented challenges, it is essential that the water sector strategy for Gaza be revisited and revised based on the findings of a comprehensive damage assessment conducted once hostilities cease. The revised strategy should prioritize urgent reconstruction efforts for the initial 5-7 years, considering the extent of the damage and the evolving needs of the population. This updated strategy will be crucial in guiding both short-term recovery efforts and long-term planning, ensuring that Gaza's water systems can not only recover but also adapt to future challenges, enhancing their resilience and sustainability

## **Part II. Policy**

## **II.1** Policy principles

#### **II.1.1** Sustainable management of water resources

- Water is a public good with economic, social and environmental value
- Fresh water is a finite and vulnerable resource, essential for sustaining life, development and the environment.
- Water supply must be based on the sustainable development of all water resources (conventional and non-conventional, shared and endogenous).
- Water resources development must be based on systematic data collection and evaluation of all water resources as well as balancing between water availability and water needs for all sectors.
- All water resources must be protected from pollution and overexploitation.

### II.1.2 Integrated water resources management

- Environmental goals must be achieved through rationalization of water use and protection of all water sources from pollution.
- Water is part of larger ecological systems. Realizing the importance and shortage of fresh water, it must be treated as an essential element for sustaining all life forms.
- Water resources must be managed in an integrated manner, taking the needs and viewpoints of all existing and potential users and the long-term sustainability of these resources into account.
- Just, equitable, and sustainable allocation to all legitimate users will be best ensured by the State.
- Agricultural, industrial, and other development and investments must be aligned to the water resource quantity and quality available or to be developed.
- Water is a key factor of agriculture in Palestine and for this reason Agricultural land use must be considered in water resources management., with consideration to Food security needs and the increase in population
- Treated wastewater effluent is considered as an unconventional water resource and is added to the water budget due to high demand in water
- TWW water is considered an important option to be used in irrigation and industrial use in accordance with Palestinian standards and specifications.

## II.1.3 Nexus "water-energy-food security"

- NEXUS approach will be adopted at higher political level.
- Future development and plans will consider mainstreaming NEXUS approach to ensure the sustainable and equity of natural resource management and distribution where applicable

## II.1.4 Water rights

• The Palestinians will pursue their interests in connection with obtaining full Palestinian water rights, including right-of-access, right-of-control and right-of-use to all water resources shared with other countries, in line with international law.

### II.1.5 Access to water and wastewater services

- Water has a unique value for human survival and health. Each citizen has the right to sufficient and affordable water of the required quality for the purpose of use.
- Each citizen has the right to hygienic sanitation services.
- The needs and interests of all vulnerable groups (marginalized, poor, restricted access, disabled, women and women headed, etc.) are considered.

## II.1.6 Financial sustainability of water Service Providers

- As water has an economic, social and environmental value in all its competing uses, water services are not free.
- The tariff for water, in its various uses (domestic water, irrigation, industry, tourism, etc.) is regulated by the Government.
- The Government supports the financial viability of Service Providers through a sound tariff policy and subsidy mechanisms and support to Non-Revenue Water (NRW) reduction strategies.
- The Government supports the national strategy for the reuse of treated wastewater in agriculture and industrial use through financial support.
- Tariff for TWW may be subsidized to support users shift from groundwater (where applicable).

## II.1.7 Governance and Management

- All water resources are considered as a public property.
- Water resources development and management will be based on a participatory approach, involving all stakeholders (users, planners and policymakers) at all levels.
- The responsibilities for water resources governance, being a regulatory function, and water services management, being an operational function, will be separated institutionally. The role of an independent regulator cannot be over emphasized.
- The Government will create and enable conditions for a proper governance to achieve the required change in behaviour of water resource users and key institutions.
## **II.1.8** Protecting the environment from pollution by wastewater

- Water polluters will be required to rehabilitate or pay for the environmental damage they cause in accordance with the regulation.
- Safe disposal of wastewater necessitates treatment to eliminate biological, chemical and physical hazards.

## **II.1.9** Quality standards for Water Supply and Wastewater Reuse in Palestine

- Depending on their quality, different water resources can be used for different purposes (domestic, agricultural, industrial, recreational, environmental...). Water quality standards for these different uses must be clearly defined and respected.
- Treated wastewater effluent is considered an alternative water resource and is added to the water budget in accordance with the Palestinian Standards and Specifications.
- Specific quality standards are needed to ensure that this alternative water resource can be well developed and optimally used.
- An increasing share of irrigation water will come from treated water instead of groundwater (where feasible and applicable).

## **II.1.10** Gender and Youth issues in the water sector

- Women and Youth play a critical role in the proper management of water of their families and communities.
- Involvement of youth and building their capacities in water-related subjects is essential for the development of future leaders in the water sector and in developing innovative solutions for sustainable water management.
- Youth and Gender inclusion must be considered in the rules governing the sector and water and sanitation operators, considering gender and youth needs and priorities in water programs and projects.

#### **II.1.11** Climate change impact on water resources

- Climate change has a significant impact on water resources in Palestine. This factor needs to be carefully considered in the development of the water and sanitation sector strategy.
- The Water Sector Policy and Strategy-2042 will contribute to the climate change adaptation measures included in the Palestinian Authority's Nationally Determined Contributions (NDCs) and the National Adaptation Plan (NAP).

## II.1.12 Enhancing rainwater harvesting

- Every drop of water count, and rainwater harvesting will be adopted as a strategic option for providing additional water resources, so that rainwater is reclaimed rather than drained out of the country, to alleviate the stress on groundwater resources and to leave no one behind.
- Stormwater will be harvested on three levels, on-site harvesting, district harvesting and finally in central infrastructure.
- Stormwater harvesting will be regulated by the government to avoid any harm to downstream beneficiaries.

## **II.1.13** Supporting Private Sector Participation in the Water Sector

• The private sector has demonstrated its resilience in the difficult context of the occupation. Increased private sector participation in the water and sanitation sector will strengthen and diversify the service offer, to the benefit of customers.

## II.1.14 Scientific Research and Knowledge

- PWA advocates for the adoption of novel and innovative ideas, supporting their implementation at both small and large scales. By incorporating these ideas into the practices of service providers, PWA ensures their continued sustainability.
- PWA prioritizes the formation of partnerships with universities and research canters to address the challenges confronting the Palestinian water sector, leveraging relevant scientific principles
- PWA will translate science toward implementation to foster development and sustainability within the local communities and end users.

## II.1.15 Capacity Building

- To achieve long-term sustainability and effectiveness in water management, it is imperative to prioritize capacity building as a core component of the water strategy. This involves strengthening the skills, knowledge, and capabilities of individuals and organizations involved in water governance, management, and service delivery.
- By prioritizing capacity building, the policy aims to empower individuals and institutions, enhance water management practices, and ultimately contribute to the sustainable development and resilience of water resources.

The policy will focus on:

- 1. **Training and Education:** Developing and implementing comprehensive training programs and educational initiatives for water sector professionals, local authorities, and community stakeholders to ensure they possess the necessary expertise and competencies.
- 2. **Institutional Development:** Supporting the enhancement of institutional structures and processes to improve efficiency, accountability, and effectiveness in water management. This includes fostering collaboration and knowledge-sharing among institutions at local, regional, and national levels.

- 3. **Resource Allocation:** Ensuring the allocation of adequate resources, including financial, technical, and human resources, for capacity-building activities. This entails securing funding, providing technical support, and facilitating access to necessary tools and infrastructure.
- 4. **Knowledge Transfer:** Promoting the exchange of best practices, experiences, and technical knowledge between various stakeholders, including international experts, local practitioners, and academic institutions.
- 5. **Monitoring and Evaluation:** Establishing robust mechanisms for monitoring and evaluating the impact of capacity-building initiatives to ensure continuous improvement and adaptation to emerging challenges and needs

# **II.2 Policy statements**

## **II.2.1** Sustainable management of water resources

- 1. Regulate the use of water resources through the administration of permits for water abstraction that specify the types of uses that need to be regulated as well as the abstraction fees to be charged to sustain the economic development for all water users.
- 2. Ensure that the abstraction rate from water resources is sustainable unless specifically sanctioned by the Government, where there is no alternative source for meeting basic needs.
- 3. Prioritize the prevention of groundwater pollution (including non-point source pollution by fertilizers and pesticides) and ensure the protection of aquifers and in the meantime, improve the quality of fresh water in water bodies that have been degraded by human activities.
- 4. Undertake to continuously control the quality of water resources, identify pollution sources and polluters, prevent pollutions and enforce the polluter pays principle.
- 5. Develop additional quantities of water from non-conventional water resources without infringing upon Palestinian Water Rights.
- 6. Educate and train towards the inevitable introduction of all sources of nonconventional water supply.
- 7. Support the regular collection of all hydrological and other water-related data in a centralized data base and to make this information available to the public, for to (a) enhance the decision-making process, (b) ensure the efficient management of water in Palestine, (c) ensure the optimal planning of irrigation by MoA and relevant stakeholders, and (d) to document priority investments in the sector.
- 8. Encourage community (including women and youth) involvement in the various stages of water resource development projects, including public awareness and training campaigns, to create an environment for effective management and ensure an

educated public understands their roles and responsibilities in the effective management of water resources.

- 9. Promote water user's associations (WUA) as formal entities entitled to negotiate and manage shared water rights on behalf of their members.
- 10. Raise public awareness on water and wastewater issues and increase participation in water sector management, involving the people in the process of public participation processes and developing their understanding of their rights and role.

## II.2.2 Integrated water resources management and nexus "water-energy food security"

- 11. Define all water resources available in Palestine as the common property of the Palestinian People. No individual or organization can claim water resources for private property. The right-of-use of these resources is regulated by the relevant national authority.
- 12. Define the priorities for allocating available water resources to the different types of users, e.g. domestic, agricultural, environmental, industrial, recreational, touristic, etc. and ensure that absolute priority is accorded to domestic and residential purposes over all other uses.
- 13. Allocate water rights for economic benefit (agriculture, industry, tourism, etc.) between different users based on the economic benefits to Palestine (in terms of revenue, job creation and food security) and in agreement with national development plans.
- 14. Have a national committee in place to set and review the water rights allocation at national level (defining the allocation principles and quantities designated to each activity).
- 15. Ensure that the allocation of limited water supplies within each specific user type is fair and equitable and that distribution among the regions is fair; where necessary, transfers will be organized from basin to basin and region to region, under the responsibility of the bulk supply utility.
- 16. Allocate water abstraction rights through a dedicated national authority; these rights will be limited in volume, limited in time and will be allocated for well-specified purposes; to this end, all well drilling, water production and supply will be allowed only by permit or license.
- 17. Organize the settlement by arbitration, and, if necessary, though the courts, of any disputes that may arise from the allocation of water rights.
- 18. Exclude that economic development, even inadvertently, would imply unsustainable water use, or irreversible environmental damage; the regard for resources and the environment will lay the premises for economic solutions.

- 19. Ensure that, water consumption in the agricultural sector adjusts to ensure better productivity and cost-efficiency (choice of cultivars, use of marginal-quality water and more widespread use of improved irrigation technology).aligned with agriculture policies and strategies
- 20. Consider the separation of sewerage and storm water drainage, whenever feasible, in a cost-effective manner.
- 21. Protect the environment and safeguard health through the integrated management of water resources.
- 22. Encourage the nexus "water-energy-food security" in strategic projects, especially treatment and desalination plants, with the aim of protecting the environment and achieving financial sustainability for water sector operators.

## **II.2.3** Trans-boundary water issues

It is the National Water Policy of Palestine to:

- 23. Ensure the full water rights of Palestinians to shared water resources and conduct all required procedures with other parties to attain this right.
- 24. Cooperate with regional partners to promote and secure the optimum utilization of shared water resources, and to collect and share relevant information and data.
- 25. Promote, were expedient, an equitable distribution of available bulk water supplies in Palestine.
- 26. Reuse treated wastewater preferably within the national territory, wherever technically feasible.
- 27. Where expedient, consider the trans-boundary export of treated wastewater from Palestine in return for the trans-boundary import of fresh water over and above the agreed allocated quantities from shared resources.

#### **II.2.4** Access to water and wastewater services

- 28. Pursue the right of each citizen to affordable, reliable, equitable and sufficient water (when available) of the required quality for the purpose of use.
- 29. Give priority to the provision of water in adequate quantity and quality to meet domestic demand. Allocation of water to meet other demands (irrigation, livestock, industrial) will take into consideration the economic, social and environment value of water.

- 30. Focus particularly on improving water and wastewater services provided to marginalized areas (suffering from poor service), including rural areas, remote villages, refugee camps and area C communities.
- 31. Adopt and apply all measures that ensure the fair distribution of water resources among all citizens including the poor and marginalized.

## **II.2.5** Financial sustainability of water and wastewater utilities

- 32. Ensure that the abstraction, transmission and distribution of water, together with wastewater collection and treatment, is financially sustainable and that providers of these services can demonstrate their financial reliability as regards the full cost recovery of operation, maintenance, capital investment and capital replacement costs.
- 33. Define and enforce clear regulations for revenue collection by utilities (including customer debts), as collecting these debts is key to ensuring the financial viability / sustainability of water and wastewater utilities.
- 34. Define and enforce regulations to deal with illegal connections to water systems and sewers.
- 35. Ensure that the services' proposed financing and funding requirements reflect the approved financial objectives and cost profiles of each service provider and that, where these tariffs do not provide full cost recovery, all sources of funding required to meet this gap are clearly identified and secured.
- 36. Set wastewater charges, connection fees, sewerage taxes and treatment fees to cover at least the operation and maintenance costs and part of the capital cost. The ultimate aim is for full cost recovery.
- 37. Apply different wastewater charges for different geographical areas, as a function of use and effluent quality.
- 38. Assess the citizens' ability to pay for water and wastewater services and ensure that this assessment forms part of tariff reviews and includes issues related to the poor and disadvantaged sections of the community.
- 39. Implement fair and progressive tariff systems with a view to facilitating access to the service by the poor and vulnerable groups and to ensuring cost recovery by utilities.
- 40. Ensure that service providers classify their water users (domestic use, industrial use, commercial use, tourism use...) and charge it accordingly.
- 41. Support water operators in the design and implementation of sound technical and financial practices, aiming to secure financial sustainability.

- 42. Design service provision through demand driven approaches in which users are fully involved and contribute to the cost of facilities and services to promote ownership and sustainability.
- 43. Continue to provide subsidies to NWC to enable it to carry out its public service missions, including the supply of bulk water to deprived communities.
- 44. Encourage cross-subsidization within each water utility service area, through the scaling of water tariffs, thereby ensuring a basic minimum consumption at reduced rates and larger consumptions at increased rates.
- 45. Implement and enforce efficient mechanisms regulate tariff adjustment in due time.
- 46. Ensure that water revenues (charges, fees, permits and tariffs) are used as a priority for improving water and sanitation services.
- 47. Support service providers in the water sector when adopting energy efficient technology to reduce high energy cost.
- 48. Encourage the re-use of treated effluent for irrigation and some of industrial process on a commercial basis.
- 49. Introduce energy efficiency schemes in all operations including the use of renewable energy where such applications are viable.

#### II.2.6 Governance and management

- 50. Regulate the water resources, water supply and wastewater collection, treatment and disposal issues, separating the institutional, regulatory functions from those of service delivery.
- 51. Task the regulated public organizations with the provision of water supply services, and of wastewater systems.
- 52. Encourage the involvement of the private sector in the funding, implementation, operation and maintenance of water supply and wastewater systems to improve efficiency and the performance of water sector and the transfer of technological expertise.
- 53. Encourage the involvement of formal water users' associations to ensure optimal management of shared water resources (including wells, springs and treated wastewater) used for economic purposes (irrigation, industry, tourism).
- 54. Ensure the adequate involvement of all stakeholders (from a gender perspective) in water and wastewater programs & projects, to support sustainability in water resources management.
- 55. Prioritize the optimal use of water resources, including the allocation of public funds, by encouraging efficient performances.

- 56. Encourage and incentivize water service providers to reduce the quantity of nonrevenue water in order to increase the availability of scarce resources to customers and improve their operational efficiency to progressively meet national targets.
- 57. Develop water demand management strategies, including suitable tariff mechanisms and public awareness-raising.
- 58. Stipulate that the organizations responsible for the water sector produce financially and technically sound plans to meet national long-term strategic objectives and regional (within Palestine) infrastructure master planning requirements, as well as the short-term investment requirements of the water sector.
- 59. Ensure that the governance arrangements help mobilize water finance and allocate financial resources in an efficient, transparent and timely manner.
- 60. Ensure that sound water management regulatory mechanisms are effectively implemented and enforced in pursuit of public interest.
- 61. Mainstream integrity and transparency practices across water policies, water institutions and water governance frameworks.
- 62. Ensure that NWC is well established to manage, upgrade and develop any assets received from the Authority to guarantee smooth commercial relations with customers, and provides all means necessary for the development of activities and infrastructure works related to the supply of bulk water supply.
- 63. PWA shall establish, in coordination and cooperation with the relevant competent authorities, and in line with the public interest Regional Water Utilities for the provision of water and wastewater services within its specified administrative and geographical scope.

## **II.2.7** Protecting the environment from pollution by wastewater

- 64. Pursue the right of each citizen to have access to suitable sanitation facilities (sewerage or on-site sanitation), to collect and dispose of wastewater in a hygienic manner.
- 65. Promote the improvement of on-site sanitation facilities where applicable.
- 66. Remedy health risks associated with wastewater production and prevent environmental pollution from wastewater.
- 67. Prohibit roof- and storm-water connection to public sewers. Collection of stormwaters shall be done separately and will be the subject of water harvesting.
- 68. Treat all produced wastewater to a quality suitable for safe and productive reuse, in line with national standards, and support the distribution and productive reuse of treated wastewater.

- 69. Give high priority to agricultural reuse of treated effluent, including through blending of treated wastewater with fresh water to improve quality where possible. Crops to be irrigated by the treated effluent or blend thereof with freshwater resources shall be selected to suit the irrigation water, soil type and chemistry, and the economics of the reuse operations.
- 70. Determine crop nutrient requirements taking into consideration the prevailing effluent quality. Overuse of nutrients shall be avoided. Farmers shall be encouraged to determine the rate of water application needed for different crops, taking into consideration the value of nutrients in the treated water and other parameters.
- 71. Monitor accumulation of heavy metals and salinity and implement mitigating strategies where relevant.
- 72. Encourage farmers to use modern and efficient irrigation technologies. Protection of on-farm workers and of crops against pollution with wastewater shall be ensured.
- 73. Improve treated wastewater reuse through sound contractual arrangements between the producers and the users.
- 74. Work with relevant authorities and institutions on public awareness with focus on the importance of wastewater treatment and re-use, and the risk of health and environmental impacts of raw sewage discharge into the environment.

#### **II.2.8** Quality standards for water and wastewater sector in Palestine

- 75. Work with relevant stakeholders in the water and wastewater sector to develop, update and enforce national standards on drinking water quality based on the most up-to-date knowledge of potential hazards, national priorities, economics, and availability of water supplies, as well as health and other environmental implications.
- 76. Work with relevant stakeholders to establish and enforce national standards for regulating industrial wastewater discharge into sewers.
- 77. Work with relevant stakeholders to establish and enforce national standards for wastewater reuse in agriculture and suitable crops for this reuse.
- 78. Work with relevant stakeholders to establish and enforce national standards for discharging wastewater into natural water courses (wadis, rivers, sea).
- 79. Work with relevant stakeholders to establish and enforce national regulations for onsite sanitation, as it is a potential source of pollution.
- 80. Coordinate with relevant stakeholders (wastewater collection and treatment service providers) to set trade effluent standards that will allow wastewater treatment plants to comply with the regulation for use of treated wastewater in agriculture and sludge use and disposal standards.

81. Monitor wastewater service providers performances regarding effluent and require these to comply with the relevant regulation.

## **II.2.9** Gender and Youth in the water sector

It is the National Water Policy of Palestine to:

- 82. Reflect in the governance rules of the sector the prominent role of women in the management of domestic water.
- 83. Promote women's capabilities and enhancing women's participation in water and wastewater services provision.
- 84. Develop and activate the role of women through access to decision-making positions in water sector regulatory institutions and utilities.
- 85. Put in place affirmative action's guidelines to enhance the recruitment, training and advancement of women as water sector professionals and facilitate women's access to information regarding training opportunities, jobs, technological development in water sector.
- 86. Plan and encourage the involvement of youth in the water sector who constitute a significant portion of the population at large and build their capacities as they represent the resource for future leaders in the sector.

#### **II.2.10** Climate change impact on water resources

- 87. Develop a mechanism to make sure that climate change is mainstreamed into national strategies and policies.
- 88. Monitor potential impacts of the climate change on water resources (aquifer depletion, spring discharge rate change, sea water intrusion...).
- 89. Consider climate change impact and adaptation measures during the development of any sector strategies, master plans and long-term investments.
- 90. Limit the water sector's carbon footprint and reduce the water footprint through the most efficient use of water and the increasing introduction of renewable energy sources.
- 91. Adopt renewable energy use in all new development projects when applicable.
- 92. Promote sector compliance to climate change legislation and the NDCs while mainstreaming climate consideration in all aspects of water and wastewater sector planning and decision making.
- 93. Integrate disaster risk reduction to protect water sector investments and public safety.

94. Raise awareness of climate change issues and impact on water and the ecosystems.

## **II.2.11** Enhancing rainwater harvesting

It is the National Water Policy of Palestine to:

- 95. Implement measures to develop efficient water harvesting in general, to counter the rising demand with the limited conventional water resources.
- 96. Increase storm water infiltration at upper elevations to recharge the aquifers, especially in the Palestinian well field zones.
- 97. Encourage, regulate and strengthen the capacity of households, farmers and other entities to utilize rainwater harvesting systems at the land plot scale, including through suitable subsidy mechanisms.
- 98. Collect stormwater separately from wastewater, aiming to facilitate reuse, stormwater harvesting and aquifer recharge.
- 99. Build dams that will help to collect and store stormwater for their ultimate use for domestic supply and agriculture.
- 100. Build dams that will help to collect and store stormwater and treated wastewater for their ultimate use for agriculture and industrial use in accordance with the applicable standards.

## **II.2.12** Supporting Private Participation in the water sector

It is the National Water Policy of Palestine to:

- 101. Encourage private operators to invest in water and sanitation facilities, ensuring a stable legal framework and respect for the rules of law and contracts.
- 102. Promote the participation of private operators in the management of water and sanitation services, in a transparent manner to safeguard the interests of users.
- 103. Favour the competitive tendering of private operators, whenever possible, to encourage the introduction of innovation and cost cutting solutions.
- 104. Partner with the private sector in the introduction of rapidly advancing modern technologies applied in the water industry.

## **II.2.13** Enhancing the applied research in the water sector

It is the National Water Policy of Palestine to:

105. Actively encourage and support researchers and enthusiasts by providing scholarships to master and doctoral students in order to develop modern technologies in the water and sanitation sectors.

- 106. Utilize modern technological methods in scientific research to enhance practical applications and to promote applied research during the implementation of strategic projects.
- 107. Foster partnerships between Palestinian universities, utilities and local governments to support development and dissemination of innovation and implementation of research outcomes.
- 108. Encourage water operators to keep pace with technological advancements, embracing academic youth and opening avenues for scientific innovation and creativity.
- 109. Keep pace with technological advancements, embracing academic youth and opening avenues for scientific innovation and creativity.

# Part III. Baseline (2022)

## **III.1 General**

## III.1.1 Population

The Palestinian population has grown rapidly over the last forty years and, in 2017, the Palestinian Central Bureau of Statistics (PCBS) estimated that growth for the 2017/2026 period will be 2.38% per year, stimulating a rise in the demand for water. Figure 1 below, shows the population growth 1997 – 2025 for Palestinian territories.<sup>1</sup>



Figure 1: PCBS population estimations and projection for the Palestinian territories 1997-2025

## III.1.2 National economy and GDP

Gross Domestic Product (GDP) per capita grew vigorously between 2007 and 2013. The previous national strategy for the water sector was drawn up in 2013 in a favourable economic context, with good prospects for economic growth and public investment.

<sup>&</sup>lt;sup>1</sup> Source: https://www.pcbs.gov.ps/statisticsIndicatorsTables.aspx?lang=en&table\_id=676



Figure 2: GDP per capita evolution

However, between 2013 and 2021, GDP per capita grew very little. It has even fallen significantly in 2020, because of the impact of Covid pandemic on the decline in international trade, the global economy and remittances from the diaspora. Figure 2 above, shows GDP evolution (1994-2021)<sup>2</sup>.

In 2021, GDP per capita returned to a level equivalent to that of 2019 and it can reasonably be supposed that GDP/capita will continue to expand during the 2023-2042 period due to the country's main economic strengths (a literate and educated population, a dynamic Diaspora maintaining commercial and financial links with their homeland, potential development of exchanges with neighbouring countries, etc.).

Nevertheless, a considerable factor in the investment capacity in the water sector has been and remains international assistance and support, which could change and slow the growth in the future in the absence of progress in the implementation of a long-term agreement with Israel, based on the Two-State solution.

## III.1.3 Health and environment

Environmental conditions are difficult in Palestine as a result of the very high population density: by 2022, the population density was 613 persons/km<sup>2</sup> in the West Bank and 6,608 persons/km<sup>2</sup> in the Gaza Strip.

An important achievement of the health sector in Palestine is the serious drop in child mortality<sup>3</sup> due to the improving water quality and sanitation services (figure 3, page 52).

<sup>&</sup>lt;sup>2</sup> Data source: World Bank national accounts data, and OECD National Accounts data files. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=PS

<sup>&</sup>lt;sup>3</sup> Data source: UNICEF - https://www.theglobaleconomy.com/Palestine/infant\_mortality/





However, sanitary conditions are worse in the Gaza Strip, where the very high population density, combined with the Israeli-imposed embargo, makes development of good sanitation services more difficult.

Water quality monitoring in Gaza has revealed very high nitrate pollution in coastal aquifers. High nitrate levels are primarily caused by the infiltration of sewage into water resources, as well as by over application of N-Fertilizers.

# **III.2** Water Resources<sup>4</sup> in Palestine

#### III.2.1 Surface water resources

Water resources in Palestine are critically constrained, particularly with regard to surface water. In the West Bank, the only permanent source of surface water is the Jordan River, from which Palestinians are systematically denied access. Additionally, the seasonal stormwater that discharges into wadis is limited, while the Gaza Strip has effectively lost all its surface water resources due to the depletion of Gaza Wadi, exacerbated by upstream water extraction practices in Israel. Most wadis flow intermittently, primarily during flash floods that occur in response to thunderstorms, making the collection and utilization of this water particularly challenging due to the complex geological and geographical characteristics of the valleys.

The construction of large storage dams is further complicated by the limited availability of flat plains and the predominance of karstic limestone substratum in many regions. The Jordan River, a vital resource, is heavily utilized by Israel for both irrigation and domestic water supply. However, since 1967, Palestinians have been systematically denied access to this essential resource. As a transboundary resource shared among Jordan, Syria, Lebanon, Israel, and Palestine, the Jordan River necessitates a strategic approach that prioritizes integrated resource management. Establishing a sustainable long-term strategy will require a comprehensive basin-wide agreement among all relevant stakeholders to ensure equitable and sustainable use of this critical water resource.

<sup>&</sup>lt;sup>4</sup> Water Resources according to the Water Law: All water resources located within the territorial and maritime boundary of the State of Palestine, whether conventional (surface or ground waters) or non- conventional.

However, the following facts should be considered:

Jordan River. It mainly consists of two parts: the upper part that's flows from the river headwaters into Lake Tiberias (also known as the Sea of Galilee), while the Lower Part is the continuation of flow from Lake Tiberias to the Dead Sea. Historically, the quantity of water flowing into the Jordan River and discharging into the Dead Sea is estimated 1,250 MCM/y. This amount decreased dramatically during the past six decades and is presently no more than 40 to 100 MCM/y. This huge reduction in flow is mainly due to diversion by Israel of more than 500 MCM/y through the National Israel Water Carrier that extends south to the Negev, in addition to the construction of many dams upstream. Furthermore, the Jordan River is threatened by the discharge of large quantities of untreated wastewater from Israeli settlements located along south of Lake Tiberias.

**West Bank Wadis.** The West Bank wadis are classified into eastern wadis (toward the Jordan Valley and the Dead Sea) and western wadis (towards the Mediterranean) by the direction of flow. The long-term average annual flow of flood water through wadis in the West Bank was estimated about 165 MCM/y in 2003. The Water Harvesting Master Plan in The West Bank (2023), updated this figure. The net natural flow varies from 0.1% to 6.9% from wadi to wadi in the West Bank, while total potential at the catchment's outlet is nearly 102 MCM. This number is concluded after accounting for transmission losses, which are significantly high as verified by earlier studies. Currently, about 2.3 MCM/y is being harvested through several agricultural ponds and small-scale dams in Al Auja Area, Bani Naiem, Beit Al Roush and Arrabah.

**Wadi Gaza.** It originates at the eastern upstream where Israel is trapping the natural flow. This action dries the wadi in the downstream, except in very wet years, where surface water allowed to flow to avoid dams' failures. The annual average flow of this wadi is about 20 MCM/y outside the political border of the Gaza Strip.

## III.2.2 Groundwater Resources

Palestine is mostly reliant on groundwater where the majority of Palestinian water supply comes from this source either by wells and/or springs. The total long-term average renewable groundwater resources have been estimated as 578-814 MCM/year in the West Bank and around 55-60 MCM/year in the Gaza Strip as shown in the below table1.

Aquifer Basin	Area within Palestine (km <sup>2</sup> )	Long – term Average Recharge (Mm³/year) <sup>6</sup>		
Western Aquifer	1,767	318-430		
North – eastern Aquifer	981	135-187		
Eastern Aquifer	2,896	125-197		
West Bank Total	5,644	578-814		
Gaza Coastal Aquifer	365	55-60		

#### Table 1: Aquifer Recharge in the West Bank and Gaza<sup>5</sup>

<sup>&</sup>lt;sup>5</sup> Recharge estimates for the main aquifers: Source: PWA, 2012. Status Report of Water Resources in Occupied Palestinian Territory for 2011, Long term average recharge from rainfall (freshwater) is estimated around 24.5 MCM.

<sup>&</sup>lt;sup>6</sup> Long term Average recharge estimates based on previous studies and models, and these estimates require to be updated to incorporate all recent developments and changes.

## III.2.3 Groundwater resources in West Bank

#### a) Aquifers

The total renewable groundwater resources in West Bank have been estimated in the range 578 - 814 MCM/year in the West Bank (see Table 1, page 53). They are contained in deep (karstic) limestone and dolomite aquifers. These aquifers are commonly divided into three main aquifers basins (Western, Eastern and North-eastern).

#### b) Springs discharge

Generally, the yearly water flow of the different springs in the West Bank varies from year to another based on the rainfall. In figure 4 below, for the springs which are monitored by the PWA have been grouped in 3 classes: (a) for domestic/industrial use only, (b) for irrigation only and (c) mixed use.

Spring discharges varies significantly from year to year, this is due to the fact that it is highly dependent on recharge from rainfall which varies spatially and temporally. Figure 4 below shows the variations in spring discharge, it is shown that the trend is declining also as a result of climate change and wells abstractions. for better management of springs and for issues to achieve sustainable planning it was agreed to consider the average total quantities of spring discharge of 25 MCM, including 7.5 MCM for domestic purposes.



#### Figure 4: West Bank Springs yearly discharge<sup>7</sup>

#### c) Long-term trends in spring discharge

In terms of long-term trends, the cumulative flow of all West Bank springs appears to have decreased over the last 20 years. It is tempting to link this trend decline to the increase in water abstraction and climate change impacts, which causes a drop in the level of the aquifers. This would represent a major risk for the West Bank's water supply and would justify more in-depth studies.

<sup>&</sup>lt;sup>7</sup> Data source: PWA 2022 – monitored 126 main springs in West Bank

#### d) Water abstraction from wells in West Bank

In the West Bank, the three main groundwater basins are Eastern, Western and North-East basins. The total ground water pumped through the different water wells increased from 64.3 MCM in year 2012 to 109 MCM in 2022.

#### e) Groundwater quality

Groundwater quality in West Bank is assessed through water quality monitoring for different sources used for domestic supply purposes. Results revealed that the main chemical parameters (chloride, and nitrate) are up to World Health Organization (WHO) and below to the Palestinian Guidelines.

Only about 14-18% of tested water samples are exceeding the WHO limit for chloride. Most of the collected samples where in Jericho area where chloride is more than 500 mg/l in most of the wells, reflecting salt leaching process since the yielding zone is relatively shallow.

Nitrate content is increasing for some wells that are located close to agriculture or wadis carrying wastewater or close to urban areas. This trend is particularly noticeable in the Tulkarm and Qalqilya regions as a result of intensive agriculture and urban development. It is more sensitive for shallow aquifers than for deep aquifers.

Regarding biological parameters (Faecal and Total coliform at the sources), more than 96% of the samples are free from pollution. Chlorination is recommended to service providers, in agreement with the water safety plans.

To further support development initiatives, PWA collaborates with local university research centres to analyse micro-pollutants, including trace metals, pharmaceutical residues, and pesticides. Ongoing monitoring of these parameters is essential for improving water safety plans and ensuring the sustainability of groundwater resources in the West Bank.

## III.2.4 Groundwater resources in Gaza

#### a) Aquifers

In Gaza, groundwater resources are primarily found in a shallow sandy aquifer that extends eastward into Israel and southward into Egypt. The region is home to over 2,390 water wells, of which 290 are designated for domestic supply, as reported by PWA in 2022. The remaining wells are utilized for agricultural purposes and penetrate the aquifer to depths ranging from 20 to 60 meters below the surface.

However, the coastal aquifer is under significant stress due to abstraction rates that far exceed natural recharge levels from all users, including Israelis, Egyptians, and Palestinians. As a result, the aquifer is experiencing depletion and is increasingly affected by seawater intrusion, which further exacerbates the decline in groundwater levels. This intrusion, coupled with exposure to various pollutants, has led to groundwater quality that falls substantially below WHO standards.

According to PWA data for 2022, the total estimated quantity of abstracted water from the aquifer is approximately 190 MCM per year. This over-extraction not only threatens the sustainability of the aquifer but also poses serious risks to public health and agricultural viability in the region.

## III.2.5 Desalinated sea water in Gaza

Gaza currently operates three principal desalination plants, established under the supervision of PWA, along with several medium-sized desalination units managed by the Coastal Municipalities Water Utility (CMWU):

- 1. **Deir El Balah Desalination Plant:** This facility has undergone three phases of construction, ultimately achieving a capacity of 2.2 MCM/y. The desalinated water produced is directly injected into the existing water distribution network.
- 2. North Gaza Seawater Desalination Plant: Designed to serve the western side of Gaza City, this plant became operational in August 2019 with a capacity of 3.5 MCM/y. The desalinated water is pumped directly into the water networks of Gaza City, benefiting approximately 250,000 residents.
- 3. Southern Gaza Seawater Desalination Plant (SGDP): Located at the future site of the Gaza Central Desalination Plant (GCDP), the SGDP represents the PWA's "short-term low volume" (STLV) strategy, which involves constructing smaller desalination plants until funding for the regional facility is secured. The initial phase of SGDP has a capacity of 2.2 MCM/y, with water distributed nearly equally to the western sides of Rafah and Khan Younis. This phase was funded by the European Union (EU) through The United Nations International Children's Emergency Fund (UNICEF), and a second phase commenced last year, aiming to expand capacity to 7 MCM/y.

GCDP is planned with an initial capacity of 55 MCM/y, with plans to expand to 110 MCM/y by 2042. The desalinated water from these facilities will be mixed with extracted groundwater and distributed to consumers through the existing distribution systems.

It is important to note that the introduction of additional desalinated seawater is expected to significantly impact water tariffs. Therefore, enhancing the efficiency of the distribution system will be crucial to cover the operational and maintenance costs associated with these new facilities

## III.2.6 Desalinated Brackish Groundwater

#### a) Private Desalination Plants in Gaza

In Gaza, the proliferation of private desalination plants is a response to the inadequate water quality available through the existing network. There are over one hundred small reverse osmosis plants distributed throughout the Gaza Strip, which produce fresh water from brackish groundwater sources. Each of these plants has a capacity ranging from 20 to 40 cubic meters per day, collectively estimated to supply between 2 to 3 MCM/y for drinking water needs. This water is primarily distributed to residents via tanker trucks.

#### b) Desalination Initiatives in the West Bank

In the West Bank, PWA is exploring short-term opportunities for the desalination of brackish groundwater. Additionally, there is a potential for long-term project aimed at developing the Fashka spring, which is known for its brackish water resources. These initiatives are part of a broader strategy to enhance water quality and ensure sustainable water supply solutions for the region.

#### Figure 5: Desalination plants location in the Gaza Strip



#### III.2.7 Treated Wastewater

#### a) West Bank

In the West Bank, treated wastewater represents a highly promising resource for irrigation and managed aquifer recharge (MAR). Until 2020, there were few initiatives focused on wastewater reuse, primarily small-scale community projects such as those in Anza, Kharas, and Al Arrub. However, several new reuse projects are currently being implemented or developed in areas including Jericho, North-West Nablus, Tayaseer, and Auja.

In the Jericho region, for instance, farmers are successfully using treated wastewater to irrigate palm trees, as their farms are located in close proximity to wastewater treatment plants (WWTPs). This proximity minimizes infrastructure costs associated with distributing treated wastewater, and because palm trees require year-round irrigation, no winter storage is necessary.

As of 2022, a total of 10 MCM of treated wastewater was produced in the West Bank, with 2.3 MCM, or 20%, being reused for irrigation purposes. The remainder is discharged into the natural environment, indicating significant potential for expansion in wastewater reuse initiatives.

## b) Gaza Strip

In the Gaza Strip, several reuse projects have already been implemented:

- A small-scale reuse project initiated in 2013 around Sheikh Ejleen WWTP has successfully delivered 2,000 (m<sup>3</sup>/d) of partially treated wastewater to irrigate 500 donums.
- Another small-scale reuse project launched in 2017 in Mawasi, located on the western side of Khan Younis, has delivered 3,000 m<sup>3</sup>/d to irrigate 600 donums.
- Two additional small-scale projects around Rafah WWTP are operational, each with a capacity of 3,600 m<sup>3</sup>/d. The first project irrigates 165 donums, while the second irrigates 200 donums.
- A large-scale reuse ongoing project is near the North Gaza WWTP, designed to utilize 40,000 m<sup>3</sup>/d of recovered water for the irrigation of 15,000 donums, to be implemented in two phases.
- Currently, the total flow of recovered treated wastewater in Gaza stands at 17.3 MCM utilized for artificial recharge in addition to 7.1 MCM for direct reuse. While this represents a significant potential resource, further development is necessary to address important issues, including water tariffs for farmers and sanitary considerations regarding the use of treated wastewater for various crops.

## III.2.8 Purchased Water

#### a) West Bank

The West Bank Water Department (WBWD) is tasked with overseeing the bulk water supply in the West Bank. The WBWD procures water from Mekorot, the Israeli water company, which significantly addresses the water needs of the West Bank and provides a limited supply to the Gaza Strip. Additionally, the WBWD acquires water from the Gihon Company to serve parts of the central West Bank, including East Jerusalem and Bethlehem.

Currently, there are approximately 175 connection points between the WBWD and Mekorot's water systems. PWA is actively engaged in efforts to streamline these connections, with the goal of consolidating supply into fewer main connection points. Over the past decade, the volume of water purchased has seen considerable growth, doubling from approximately 52.6 MCM in 2012 to 83.8 MCM in 2022.

To enhance the management of bulk water distribution among service providers and ensure fair allocation and metered consumption, the PWA is implementing a strategy to improve the physical capacity of the WBWD's water network. This will involve reducing the number of connection points as part of its broader water supply strategy and Master Plan, which is currently under development. These initiatives are aimed at optimizing water distribution efficiency and preparing for increased future water quantities from Mekorot and local sources.

#### b) Gaza Strip

In the Gaza Strip, PWA also procures a limited volume of water from Mekorot, with three established connection points linking Mekorot to the Palestinian water system. The quantity of purchased water from Mekorot has risen significantly, increasing from 4 MCM in 2012 to 18.5 MCM in 2022.

Overall, the trend in water purchases from Mekorot has shown marked growth in both the West Bank and the Gaza Strip in recent years. The accompanying figure 6, page 59, illustrates the quantities purchased

from 2010 to 2022, highlighting this growing dependence on external water sources. This significant increase in water procurement reflects the ongoing challenges in local water availability and the necessity of sourcing additional supplies to meet demand.





## III.2.9 Water Resources at Risk

#### a) Groundwater depletion

Groundwater abstraction in the region, particularly by Israeli users, has surpassed the thresholds established in the Oslo Agreement, leading to significant depletion of various sub-aquifers. This issue is especially pronounced in the southern portion of the Eastern Aquifer, where unrestricted abstraction by Israeli wells adversely affects adjacent Palestinian wells and springs. Additionally, persistent drought conditions have further hampered aquifer recharge, resulting in drawdown levels exceeding 70 meters in certain areas of southern West Bank. This situation poses a substantial threat to the integrity of the groundwater system in this region.

The coastal aquifer in Gaza is also experiencing depletion due to an imbalance between total water abstraction and its renewable capacity. Consequently, groundwater levels have fallen below sea level, exacerbating the risk of long-term sustainability for this vital resource.

#### b) Sea Water Intrusion

The depletion of the coastal aquifer has led to two significant negative consequences:

- 1. **Seawater Intrusion:** The declining water levels have facilitated the encroachment of seawater into large portions of the inland coastal aquifer.
- 2. Upward Leakage of Saline Water: The depletion has also caused saline water from deeper geological formations to migrate upwards.

<sup>&</sup>lt;sup>8</sup> Data source: PWA

As a result of these factors, groundwater salinity has risen dramatically, often exceeding acceptable limits. Approximately 97% of the pumped water in the Gaza Strip surpasses the WHO drinking water guideline of 250 mg/l for chloride concentration, with measurements typically ranging between 200 and 1,000 mg/l, and continuing to increase in tandem with aquifer depletion. This deterioration of water quality poses serious implications for public health and agricultural viability in the region (figure 7)<sup>9</sup>.



#### Figure 7: Chloride spatial distribution (2012-2016-2020)

#### c) Eastern aquifer Salinization in the Jordan Valley

Regarding Recent assessments of water quality in the Eastern Aquifer of the Jordan Valley have revealed a concerning trend: a gradual increase in groundwater salinity levels from west to east. This pattern, as illustrated in Figure (8), highlights the escalating chloride concentrations across the region. Several factors contribute to this phenomenon. A primary concern is the insufficient groundwater recharge to the basin, which is compounded by excessive groundwater extraction. This imbalance not only diminishes the aquifer's natural replenishment but also leads to the mobilization of saline water.

Moreover, the continuous dissolution of salt deposits from the Lisan Formation, which is interspersed with Quaternary deposits, significantly contributes to the rising salinity levels. As these salt deposits dissolve, they release additional salts into the groundwater, further deteriorating water quality and posing risks to both agricultural and domestic water uses in the region.

The Lisan Formation<sup>10</sup> which is a geological formation plays a crucial role in shaping the hydrological behaviour of the aquifer, significantly affecting both water quality and availability.

<sup>&</sup>lt;sup>9</sup> Data source: PWA – Gaza PMU

<sup>&</sup>lt;sup>10</sup> Lisan Formation: spans a significant portion of the Jordan Valley, is predominantly composed of marl, clay, and gypsum salts, along with interspersed layers of mixed materials such as clay and small gravel

Understanding these geological influences is essential for effective water resource management in the region. Implementing strategies that account for the unique properties of the Lisan Formation will be vital in addressing the challenges of groundwater depletion and salinization in the Jordan Valley.





figure 8 above illustrates the intricate spatial dynamics of chloride concentration within the shallow aquifer of Jericho, showcasing a significant gradient in salinity levels. Notably, there is a gradual increase in chloride concentration as one moves from the western to the eastern regions of the aquifer, this is due to the fact that the thickness of the shallow aquifer decreasing towards east, so the contact with the Lisan formation increased.

This distribution pattern serves as a critical indicator of underlying issues such as excessive groundwater extraction and inadequate recharge, compounded by geological factors associated with the Lisan Formation.

#### d) Nitrate Pollution of Groundwater Resources

#### • Gaza Strip

Gaza Strip faces significant challenges related to groundwater pollution, particularly from nitrates. With a densely populated urban area, the region discharges substantial amounts of pollutants per square kilometre, including organic matter and nitrogen compounds. Although over 85.8% of the urban population is connected to a wastewater collection system, many residents still rely on cesspits or septic tanks for the disposal of raw wastewater. This practice poses a considerable risk to groundwater quality, as wastewater can seep through the highly permeable unsaturated sandy zones.

Nitrate contamination of groundwater is pervasive in the Gaza Strip, with a majority of domestic wells exceeding the WHO's recommended limit of 50 mg/l for drinking water. Currently, approximately 70% of

the aquifer area is contaminated by elevated nitrate levels, and this percentage continues to rise, particularly under urbanized regions.

While the development of sewerage systems and large WWTPs has made strides in mitigating nitrate pollution, challenges remain. As of the end of 2020, three regional WWTPs were operational, resulting in improved spatial distribution of nitrate concentrations in the northeastern area from 2012 to 2020. However, conditions have worsened in the southern parts of the Gaza aquifer, particularly in Khan Younis and Rafah, highlighting the need for ongoing efforts to manage wastewater effectively and protect groundwater resources.





figure 9 above<sup>11</sup> provides a comprehensive overview of the evolving levels of nitrate contamination in groundwater across the Gaza Strip over time. The data reveals critical trends in nitrate concentrations, with notable improvements in the north-eastern regions attributed to the successful implementation of new wastewater treatment plants. These advancements signify a positive step toward enhancing water quality and reducing pollution. In contrast, however, the figure also underscores deteriorating conditions in the southern areas, particularly Khan Younis and Rafah, where nitrate levels continue to rise.

A comprehensive analysis of these trends is essential for evaluating the efficacy of existing pollution mitigation strategies. Furthermore, this assessment will be instrumental in guiding future water management initiatives within the region.

• West Bank

Although population density is lower in the West Bank compared to Gaza, several factors contribute to rising nitrate contamination levels in certain areas, particularly Tulkarm and Qalqilya. Poor sanitation facilities, the uncontrolled use of chemical fertilizers in agriculture, the impact of Israeli wastewater settlements, and the vulnerability of karstic aquifers are all contributing to this issue. As a result, there is an urgent need for mitigation measures and protective plans.

<sup>&</sup>lt;sup>11</sup> Data source: PWA – Gaza PMU

Recent analyses reveal that chemical parameters, specifically chloride, nitrate, and potassium, are slightly above the upper limits set by WHO and Palestinian guidelines. Nevertheless, most water resources tested show concentrations below 250 mg/l for chloride, 50 mg/l for nitrate, and 10 mg/l for potassium. Approximately 14-18% of the samples exceed the WHO limits for these parameters.

The observed increase in nitrate levels in certain wells, particularly those near agricultural areas, wadis carrying wastewater, and domestic zones, can be attributed to the relatively shallow yielding zones of these wells compared to deeper aquifers. Chloride concentrations in the supplied water for both domestic and agricultural uses typically remain below the WHO limit of 250 mg/l. However, wells in the Jericho area often exceed 500 mg/l, indicating a process of salinization due to leaching from the shallow yielding zones.

In Qalqilya and Tulkarm, the incremental rise in nitrate and potassium levels is primarily linked to agricultural activities and the discharge of treated and untreated wastewater into nearby wadis. Addressing these issues is critical for safeguarding water quality and ensuring the sustainability of groundwater resources in the region.

## e) Climate Change Impact on Water Resources

Climate change is anticipated to have significant effects on rainwater resources in Palestine, primarily characterized by decreased overall rainfall and altered precipitation patterns. While specific projections may differ, climate change models commonly indicate the following potential impacts:

- **Decreased Annual Rainfall:** There is a strong likelihood that annual rainfall in the Mediterranean region, including Palestine, will decline due to climate change. This reduction could lead to water scarcity, especially during dry seasons, compounding existing challenges related to water availability. Concurrently, rising temperatures are expected to increase agricultural water demands.
- Increased Seasonal Variability: Changes in precipitation patterns may result in heightened variability, with more frequent intense rainfall events leading to increased flood risks, as well as prolonged dry spells. This variability presents significant challenges for effective rainwater harvesting and management practices.
- Impacts on Agricultural Water Needs: Alterations in rainfall patterns will profoundly affect agricultural practices in Palestine. Variations in water availability and the timing of precipitation can disrupt planting and harvesting schedules, reduce crop yields, and necessitate adjustments in irrigation strategies to maintain productivity.

Addressing these climate change impacts will be essential for ensuring sustainable water resource management and agricultural resilience in Palestine.

## f) Response to Climate Change

The State of Palestine has demonstrated a strong commitment to addressing climate change by submitting its Initial National Communication Report (INCR) to the United Nations Framework Convention on Climate Change (UNFCCC) on November 11, 2016. This report highlights Palestine's intent to engage actively in global efforts to combat climate change. Furthermore, Palestine developed its National Adaptation Plan (NAP) in alignment with UNFCCC guidelines, becoming the sixth party to submit its NAP shortly after joining the UNFCCC. This prompt action underscores the critical importance of climate change within Palestine's national agenda.

Although Palestine contributes negligibly to global greenhouse gas emissions—accounting for less than 0.01% of total emissions—it remains highly vulnerable to climate change due to its geographical location in the Mediterranean region, which is particularly susceptible to climate-related impacts. As a result, Palestine's primary focus is on adaptation strategies to mitigate the adverse effects of climate change on sustainable development.

In parallel, Palestine has elevated its greenhouse gas mitigation ambitions beyond the targets established in its First NDC in 2017, reaffirming its commitment to climate leadership. The key objective is to reduce climate vulnerabilities by enhancing adaptive capacities, thereby bolstering the climate resilience of both national development processes and local communities.

Collaboration among key stakeholders and national partners across various sectors has been instrumental in formulating climate adaptation and mitigation goals. These collective efforts aim to strengthen national institutions, ensuring the effective implementation of Updated NDCs, thereby driving sustainable development and securing prosperity for future generations.

However, achieving these ambitious climate adaptation and mitigation objectives is contingent upon international support. Without adequate resources (including finance, technology, and capacity-building assistance) Palestine's climate action plans may encounter significant challenges. The State of Palestine actively seeks international partnerships to bolster its NDC initiatives while continuing to pursue sovereignty, freedom, and independence.

Since the formulation of its First NDCs in 2017, Palestine has made substantial progress in climate action planning. The updated NDC report of 2021 introduced 14 investment-ready implementation action plans targeting six of the twelve most vulnerable sectors identified in the NAP: agriculture, energy, health, transport, waste, and water. These new conditional actions are designed to be gender-responsive, time-bound, and measurable, reflecting Palestine's heightened ambitions in its Updated NDCs.

# **III.3** Wastewater Services Organization, Coverage and Quality

## III.3.1 Household level of sanitation equipment

The Millennium Development Goals (MDG) Joint Monitoring Program, led by WHO and UNICEF, categorizes households based on their sanitation facilities into three distinct groups:

- Households using flush toilets, which are considered the highest standard of sanitation service.
- Households using non-flush toilets, such as latrines.
- Households without access to toilets.

According to PCBS census conducted in 2019-2020, an overwhelming majority of Palestinian households utilize improved sanitation facilities, including piped sewer systems, septic tanks, and pit latrines. Specifically, 98.8% of households have access to these improved sanitation solutions. This figure is slightly higher in the Gaza Strip, where 99.5% of households report using improved sanitation facilities, compared to 98.3% in the West Bank (see Table 2, below).

This high level of coverage indicates significant progress in sanitation services across Palestinian territories, highlighting the importance of continued investment in wastewater management to maintain and enhance public health outcomes.

	Type of Sanitation facility used by household					cility,		oved	р		
	Impi	mproved Sanitation Facility			Unimproved Sanitation Facility			no fa		mpre	seho
	F	-lush / P	our flush	to:			50	on (r field	Total	Percentage using i sanitatior	Number of hou members
	Piped Sewer System	Septic Tank	Pit latrine	Do not know	Open drain	Other	DK / Missing	Open defecati bush,			
Total	58.5	11.8	28.0	0.4	1.0	0.1	0.1	0.0	100	98.8	47,219
Region											
West Bank	39.9	17.6	40.0	0.7	1.4	0.0	0.2	0.1	100	98.3	28,052
Gaza Strip	85.8	3.4	10.3	0.0	0.4	0.1	0.0	0.0	100	99.5	19,167
Area											
Urban	63.9	10.4	24.3	0.5	0.7	0.1	0.1	0.0	100	99.1	36,434
Rural	10.1	25.6	60.8	0.4	2.6	0.0	0.2	0.3	100	96.9	6,942
Camps	95.5	0.7	2.9	0.2	0.5	0.0	0.1	0.0	100	99.4	3,843

 Table 2: Distribution of population (%) according to type of sanitation facility, Palestine, 2019-202012

## III.3.2 Sewerage

#### a) Localities with sewers

According to data from PWA, approximately 37% of the Palestinian population lives in non-sewered localities. This situation is more pronounced in the West Bank, where about 60% of residents are affected, compared to only 4% in the Gaza Strip. Those residing in these areas rely on on-site sanitation systems such as septic tanks, cesspits, and pit latrines to meet their sanitation needs.

This dependence on inadequate sanitation infrastructure presents significant public health and environmental challenges. Poorly maintained systems can lead to the contamination of groundwater and surrounding soil, increasing the risk of waterborne diseases and negatively impacting overall community health.

<sup>&</sup>lt;sup>12</sup> Source: PCBS- Palestine in figures 2020

#### b) Population connected to sewers

According to figures from 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).

Table 3 below provides an overview of the population served and not served by wastewater collection systems by locality type in Palestine. In the West Bank, the percentage of the population connected to sewer systems varies considerably.

These variations underscore the challenges and inequalities in wastewater management across the region, highlighting the need for targeted interventions to improve infrastructure and ensure equitable access to sanitation services for all communities.

## c) Connection rate varies with the type of locality

The percentage of population connected to sewage networks varies also according to the type of locality (urban, rural or refugee camps) as shown in Table 3 below.

	Wastewater Disposal Method					
Region and Locality Type	Others Tight Cesspit		Porous Cesspit	Wastewater Network		
Palestine	0.8	13.5	31.8	53.9		
Urban	0.8	11.1	28.1	60		
Rural	1.2	29.3	61.5	8		
Camps	0	2.6	4.2	93.2		
West Bank	1.2	17.1	43.3	38.4		
Urban	1.3	13.5	39.4	45.8		
Rural	1.2	29.3	61.9	7.6		
Camps	0	5.1	8.7	86.2		
Gaza	0	6.7	9.8	83.5		
Urban	0	7.1	10	82.9		
Rural	0	29.5	55.9	14.6		
Camps	0	0.9	0.9	98.2		

#### Table 3: Population served and unserved by locality type in Palestine (2015)<sup>13</sup>

According to the PCBS, in urban areas, the population connected to wastewater networks is 45.8% in the West Bank, compared to a significantly higher rate of 82.9% in the Gaza Strip.

<sup>&</sup>lt;sup>13</sup> Source : PCBS 2015, https://www.pcbs.gov.ps/Portals/\_Rainbow/Documents/HHE%202015%20e%203.htm

The United Nations Relief and Works Agency for Palestine Refugees (UNRWA) has played a pivotal role in constructing wastewater networks in the majority of refugee camps in both the West Bank and Gaza Strip. As a result, approximately 86.2% of the population in West Bank refugee camps is connected to these networks, while the connection rate in Gaza Strip refugee camps is even higher at 98.2%.

In contrast, the rural population in the West Bank, which constitutes 28.5% of the total population, faces substantial challenges with wastewater management. Less than 8% of the rural population in the West Bank is connected to wastewater networks, whereas this figure is somewhat higher at 14.6% in the Gaza Strip. In these rural areas, the predominant sanitation option remains the porous cesspit, highlighting the need for improved infrastructure and sanitation solutions to enhance public health and environmental conditions

## III.3.3 Wastewater Treatment Plants

## a) Wastewater collection, treatment and disposal

In 2022, Palestine had an estimated population of approximately 5.5 million inhabitants, with drinking water supply reaching around 256 MCM/y, including industrial demand. Notably, about 85% of this water is returned as wastewater.

**In the West Bank**, the total water consumption is approximately 90.8 MCM, which generates 77.2 MCM wastewater. Considering 38.4% of the population served by sewerage network, the total volume of collected wastewater is estimated at 29.6 MCM. These figures highlight significant challenges in water management and wastewater treatment in the region, emphasizing the need for improved infrastructure and sustainable practices to optimize water resources and enhance sanitation services.

There are more than 19 treatment plants operating in the West Bank, with an annually treated quantity of 10 MCM. Of this amount, approximately 2.3 MCM is reused for agricultural purposes, while the remaining volume is disposed of into wadis, where it mixes with raw sewage. Additionally, 17.3 MCM of treated wastewater crosses the Green Line, reaching the Israeli side.

**In Gaza**, the total water consumption is approximately 71 MCM, which generates 58.5 MCM wastewater. Considering 90% of the population being served by sewerage network, the total volume of collected wastewater is estimated at 52.6 MCM. These figures underscore the relatively high connection rate to sewage services in Gaza compared to other areas, but they also highlight the ongoing need for effective wastewater treatment solutions to protect public health and the environment.

There are five treatment plants, with annual treated quantities amounting to about 50.6 MCM. Of this, around 17.3 MCM is utilized for artificial recharge and 7.1 for irrigation.

## III.3.4 Management Arrangement for Sewers and WWTPs

#### a) In West Bank

Municipalities in the West Bank are primarily responsible for the following tasks related to wastewater management:

• Investing in new sewer systems or extensions, with support from the PWA.

- Maintaining existing sewer systems, including cleaning services.
- Connecting households to the sewer network.

Larger municipalities and utilities, such as the Jerusalem Water Undertaking (JWU), Water Supply & Sewerage Authority (WSSA), and municipalities in Nablus, Hebron, Ramallah, Jenin, Al Bireh, Tulkarm, Jericho, Qalqilya, and Salfit, are the main operators responsible for the operation, maintenance, and expansion of sewerage services.

## b) In Gaza Strip

In the Gaza Strip, the main water operator, CMWU, along with municipal departments, oversees sewerage services and WWTPs. Their responsibilities include:

- Connecting households to the sewer network.
- Operating and maintaining sewers and wastewater treatment plants.
- Managing investments, with support from the PWA.

Sewerage fees are collected by the CMWU and municipalities, typically included in the same billing statement as water services. This integrated billing approach helps streamline revenue collection for wastewater management

## III.3.5 Transboundary Wastewater

Israeli authorities have been deducting substantial amounts from Palestinian tax revenues monthly, citing the treatment of wastewater on their side. This deduction process operates without any formal agreement, verification mechanism, or agreed-upon measurement procedures, making it a unilateral action by the Israeli authorities.

These deductions began over 13 years ago; however, invoices from the Israeli side were not received until 2018. The invoices provided are often lump sums lacking detailed breakdowns, are frequently inaccurate or exaggerated, and are issued exclusively in Hebrew. Some estimates suggest that the quantities of wastewater crossing the borders exceed the amount consumed by Palestinian citizens, particularly in areas affected by wastewater from Israeli settlements, such as Ramallah, Bethlehem, and Hebron.

PWA estimated that (17-19) 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 period from July 2020 to June 2021. During the same period, Israeli authorities deducted 64.4 million ILS, claiming this amount was for the costs associated with transboundary wastewater treatment.

Additionally, 16 Israeli wastewater treatment operators invoiced the PWA for 35 million ILS during the same timeframe, 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. The link between these invoices and the flows of transboundary wastewater is often unclear, leaving the PWA with limited capacity to contest these payments, as the amounts are directly deducted from the total tax revenues intended for PA.

Overall, Israeli operators charged the PWA nearly 100 million ILS during the last fiscal year. Of this, 64.4 million ILS was directly related to transboundary wastewater volumes, while 35 million ILS was charged as a lump sum. The PWA estimates that this deduction translates to a treatment cost of approximately 10 ILS per cubic meter, which includes significant expenses for infrastructure development. Concerns have been

raised about the justification for these high costs, particularly as the unit cost of treatment continues to rise annually without clear rationale or supporting evidence. It is noteworthy that Israel benefits from the treated wastewater for agricultural purposes, despite Palestinians bearing the associated costs.

Moreover, these deductions occur from PA tax revenues collected by Israel on behalf of the PA, lacking any legal justification or agreement with the PA. There are also no joint committees or clear mechanisms in place for either party to verify the quantities of treated wastewater or the deducted amounts, exacerbating the ongoing financial strain and operational challenges faced by the PA.

## III.3.6 Treated Wastewater Reuse

The Palestinian Water Authority in cooperation with ministry of agriculture started reuse projects in Both West Bank and Gaza Strip. Currently 2.3 MCM of treated wastewater in the West Bank is used for irrigation purposes. In the Gaza Strip, 17.3 MCM of treated wastewater is recharged to the aquifer aiming to be recovered for irrigation.

Currently, there are two ongoing projects in the Gaza Strip aimed at enhancing irrigation capacity. The first project, located in the northern region, is designed to irrigate 1,500 hectares, while the second project in the southern region aims to irrigate 1,000 hectares. Both projects are expected to become operational by 2024, contributing significantly to agricultural productivity and water management in the area. These initiatives reflect ongoing efforts to address water scarcity and improve agricultural sustainability in the Gaza Strip.

PWA is committed to reducing the volumes of wastewater that cross the Green Line, as this incurs significant costs and poses logistical challenges. To address this issue, the PWA has developed a strategic approach comprising the following options:

- 1. Local Treatment and Reuse: The primary and most effective strategy involves the local treatment and reuse of wastewater. This method not only reduces the amount of wastewater crossing borders but also promotes the sustainability of water resources within the region.
- 2. Alternative Conveyance: In cases where local treatment and reuse are impractical—such as in areas without irrigable land or industrial activities—the PWA will consider alternative options. These may include the transportation of raw or treated wastewater to other regions within the West Bank where it can be utilized effectively.
- 3. **Transboundary Arrangements:** Where feasible, the PWA may explore opportunities for exporting treated wastewater across borders. This approach could involve reciprocal arrangements, allowing for the transboundary import of fresh water in excess of previously agreed allocations from shared resources.

These strategic options aim to enhance wastewater management in the West Bank, reduce costs associated with cross-border waste, and improve overall water resource sustainability in the region.

## III.3.7 On-site Sanitation

#### a) Type of frequently utilized on-site facilities

In areas not connected to the sewer network, wastewater is discharged into on-site sanitation systems (septic tanks, percolating cesspits) or/and in wadis.

In areas not connected to the sewer network, wastewater is typically managed through various on-site sanitation systems. The most commonly utilized facilities include:

- Septic Tanks: These are underground chambers that treat wastewater through a combination of settling and anaerobic digestion. Septic tanks separate solids from liquids and allow the treated effluent to percolate into the surrounding soil.
- **Percolating Cesspits:** These are similar to septic tanks but primarily serve as storage systems for wastewater. They allow liquids to seep into the ground while solids accumulate over time. Regular maintenance and emptying are necessary to prevent overflow and contamination.
- **Discharge into Wadis:** In some cases, untreated wastewater is discharged directly into wadis (dry riverbeds), which can pose significant environmental and public health risks. This practice often leads to groundwater contamination and negatively impacts local ecosystems.

## b) WWTPs' sludge removal and treatment

Sludge, a byproduct of the treated wastewater process generated in TWWPs, consists of both organic and inorganic components. The volume of sludge produced is substantial, particularly in central treatment plants utilizing activated sludge technology, which is the most commonly employed method in Palestine. This results in significant quantities of sludge being collected and often disposed of in landfills, creating serious environmental challenges.

According to the PWA data from 2014, the estimated average sludge production is approximately 37 grams of dry sludge per capita per day, translating to about 1.92 litres of wet sludge per capita per day. The volume of generated sludge varies depending on the treatment technology used; activated sludge technology produces a considerably larger amount of sludge compared to other methods.

Currently, the specifications of generated sludge in Palestine do not meet the Palestinian standards for sludge reuse and disposal (No. 898) and the mandatory technical instructions (No. 59/2015). Consequently, the use of untreated sludge in agricultural activities as a soil amendment is prohibited until it undergoes treatment that complies with these standards.

To utilize sludge in the agricultural sector or for other potential applications, proper treatment is essential to meet the required Palestinian sludge use standards. The decision on the appropriate treatment method and disposal strategy depends on several factors, including applicable legislation, treatment costs, and considerations of capital, transportation, and operational expenses. Effective management of sludge is crucial for mitigating environmental impacts and promoting sustainable practices in wastewater treatment and agricultural use

## c) Cesspit sludge removal and treatment

In regions lacking connections to the sewer network, wastewater is typically discharged into percolating pits known as cesspits. The contents of these cesspits are removed by vacuum tankers, which often discharge the sludge in open areas, valleys, sewage networks, or designated dump sites.

Current WWTPs have not been specifically designed to treat sludge collected from septic tanks; however, some facilities do accept deliveries from vacuum trucks. Most of these vacuum trucks are operated by small private companies, which adds a layer of complexity to the management and treatment of cesspit sludge.

The indiscriminate dumping of cesspit contents poses significant environmental risks, including groundwater contamination and public health concerns. To address these issues effectively, there is a need for the development of a comprehensive strategy that includes proper treatment facilities tailored for cesspit sludge, as well as regulations governing the disposal practices of vacuum tanker operators.

Implementing standardized procedures for the collection and treatment of cesspit sludge will not only enhance environmental protection but also improve public health outcomes in areas reliant on these systems. Establishing partnerships with private operators and investing in appropriate infrastructure will be essential in managing this critical aspect of wastewater management in non-sewered localities.

# **III.4 The Institutional Framework**

The evolution and restructuring of Palestine's water sector have been profoundly shaped by a series of laws, decisions, and directives throughout its history. Key milestones include the establishment of the PWA in 1996, which marked a significant step in the governance of water resources. This foundational law set the stage for subsequent regulatory frameworks, water laws, and amendments that have been enacted up to 2022.

Over the years, these legislative measures have aimed to enhance water management practices, ensure sustainable usage, and address the challenges posed by both local and regional water scarcity. The PWA has played a central role in formulating policies and implementing strategies that reflect the evolving needs of the population while navigating complex geopolitical dynamics.

As the sector continues to develop, ongoing legal reforms and regulatory decisions will be crucial in addressing emerging challenges and optimizing the management of water resources in Palestine. These efforts are essential for promoting equitable access to water, improving infrastructure, and ensuring the sustainability of water resources for future generations.

- Law No. (2) of 1996 establishing the Palestinian Water Authority: This pioneering law, enacted in 1996 by Yasser Arafat, marked a crucial step in the management and regulation of water resources within Palestine. The law created the PWA, emphasizing efficient and sustainable water management. It promoted collaboration among local administrations, stakeholders, and relevant parties.
- 2. Water Law No. (3) of 2002: Enacted in 2002, this law continued the trajectory set by its predecessor, focusing on comprehensive water resource management. Yasser Arafat's leadership ensured the establishment of the PWA as the central regulatory body. The law's objectives encompassed development, quality preservation, public ownership acknowledgment, regulatory framework establishment, and licensing implementation.
- 3. Decree No. (14) for the year 2014 Relating to the Water Law: This comprehensive decree, introduced restructuring the water and wastewater sector governance. The law separated policy and regulatory functions, establishing bodies like the WSRC and the NWC.
- 4. **Cabinet Resolution No. (1) of 2013 AD regarding the Water Tariff System:** this resolution established tariff system for water and sanitation services. Objectives include full cost recovery, affordability for low-income households, and water conservation.
- 5. **Council of Ministers' Decision Number (4) for the Year 2018:** This decision, from 2018, cantered on sustainable irrigation water use at the local level. Its detailed procedures for WUAs, emphasizing sustainability, defined roles, transparency, and structured dissolution procedures.
- 6. Decree Law No. (18) of 2019/Amending Decree Law No. (14) of 2014: This amendment focusing on monitoring the NWC and ensuring financial sustainability. Findings stress adherence to standards, financial resources, and regulatory reforms.

- 7. **Cabinet Resolution No. (8) of 2020:** A licensing system for drilling and rehabilitating wells, extracting groundwater, and contracting for drilling wells, this resolution, stands as a pivotal framework governing well-related activities in Palestine. Originating from the office of the Prime Minister, it establishes a comprehensive licensing system, emphasizing the critical need for regulation and control. The resolution underscores public ownership of groundwater and advocates for environmental considerations.
- 8. Cabinet Resolution No. (16/18/81/M.M. (1) of 2020 AD: the formal registration and establishment of the National Water Company, focuses on the formal registration and establishment of the NWC as a government entity within the water sector, aligning with the recommendations of the Water Sector Reform Committee. The primary objectives include the official registration of the company, setting its initial capital at \$2 million, forming the Board of Directors with representatives from relevant ministries and water specialists, and authorizing the appointment of a general manager. Although the resolution doesn't specify a timeframe, it became effective on 11/02/2020 AD.
- 9. Unified Tariff System for Water and Sanitation No. (4) of 2021 AD: this amendment aims for a standardized pricing framework. Key findings stress unified pricing, financial sustainability, and adherence to standards.
- 10. Instructions No. (2) of 2021 AD Unified tariff for water and sanitation: This instructive document, published on 8/02/2021, is a cornerstone in the realm of water and sanitation services in Palestine. It meticulously outlines regulations to ensure efficient service provision, emphasizing the need for a unified tariff system.
- 11. Regulations for establishing and licensing regional water utilities No. 17 of 2021: This regulation, sets the stage for the establishment and licensing of regional water utilities. It outlines roles, responsibilities, and financial aspects, emphasizing sustainability and efficiency.

## III.4.1 Overall Water Sector Governance

PWA has been entrusted with the mandate to oversee water resource management through Law No. 2 of 1996, which was further reinforced by amendments in Law No. 3 of 2002. These laws empower the PWA to execute national water policies, supervise and monitor water projects, and facilitate coordination among stakeholders involved in water management. Subsequently, the issuance of Water Law No. 14 in 2014 ushered in a new phase for the governance and management of water and wastewater services, aimed at enhancing service delivery.

This 2014 Water Law established a comprehensive institutional framework for the water sector, emphasizing the separation of regulatory, planning, and operational functions. It delineated the roles and relationships among various water sector institutions as follows:

- **PWA's Responsibilities:** The PWA is tasked with the overall management and regulation of water resources, policy formulation, water allocation, quality protection, and project development.
- **Commercialization of Water Supply:** The law facilitates the commercialization of water supply through the creation of a NWC, which involves restructuring the WBWD.
- **Performance Monitoring:** An independent WSRC has been mandated to monitor the performance of water service providers (SP's), ensuring its legal and budgetary independence from the PWA.
- **Regional Water Utilities:** The law necessitates the establishment of regional water utilities (RWU) for the delivery of water and wastewater services, legally and financially independent, which requires the consolidation of existing service providers into regional entities.
In addition to the PWA, other ministries and agencies have specific responsibilities:

- Ministry of Agriculture (MoA): Focused on irrigation and the promotion of farmers' associations.
- Environmental Quality Authority (EQA): Responsible for setting environmental regulations, including standards for treated wastewater discharge into natural watercourses.
- Palestinian Standards Institute (PSI): Tasked with standardizing regulations for water facilities, sewerage, on-site sanitation, and carbon and water footprints.
- Ministry of Local Government (MoLG): Implements and supports Joint Service Councils (JSCs) and local governmental units (LGUs) while coordinating water and wastewater projects with the PWA.

**Under the original 1996 Law,** the PWA performed a range of functions encompassing political, strategic, regulatory, and operational roles. However, this combination of responsibilities led to challenges in crisis management, adversely affecting the PWA's ability to deliver its mandated services effectively.

To address these challenges, a comprehensive water sector reform was initiated over the past decade, culminating in the 2014 water law. This reform clearly delineated the institutional organization of the water sector in Palestine:

- The PWA retained its ministerial functions concerning policy and strategy.
- A new regulatory body, the Water Sector Regulatory Council (WSRC), was established to oversee regulatory functions.
- The existing bulk water supplier, WBWD, is to be transformed into NWC serving both the West Bank and Gaza Strip.
- Municipal water departments will be consolidated into RWUs.
- WUA's are to be formed to sustainably manage irrigation water supply at the local level.

These reforms aim to enhance the governance and management of water resources in Palestine, ensuring sustainable access and improved services for all stakeholders

# III.4.2 Palestinian Water Authority (PWA)

Palestine water Authority essential functions include the following<sup>14</sup>:

- Prepare and implement effective policy
- Develop and enforce pragmatic legislation
- Produce and continually update strategic, technical (master) and investment plans
- Prepare and implement a series of focused communication strategies and programs
- Allocate water abstraction rights
- Regulate the right of use of the resources
- Resolve conflicts between service providers

<sup>&</sup>lt;sup>14</sup> Article 8 of New Water Law 2014

- Facilitate an Integrated Water Resource Management program
- Maintain effective and successful relations with the international donor community
- Support community involvement in the water management mechanisms
- Enhance research and capacity development.

# III.4.3 Water Sector Regulatory Council (WSRC)

An independent Regulatory Council has been established with the following essential functions<sup>15</sup>:

- Develop and implement an economic regulation model and regulate the establishment of prices and tariffs
- Issue licenses for water operators
- Regulate public service obligations, and the quality of service provided
- Implement benchmarking among water service providers, through the collection and comparison of performance indicators
- Develop programmes for performance incentives and penalties

# III.4.4 West Bank Water Department / National Water Company

## a) Bulk water supply in West Bank

The management of bulk water distribution in the West Bank presents significant challenges due to the limited availability of water resources and their uneven distribution across the region. Areas with high population density, such as the governorates of Hebron and Bethlehem, experience particularly acute water deficits.

To address these challenges, the government has established a dedicated entity for the integrated management of water resources in the West Bank which is the **West Bank Water Department (WBWD)**. The WBWD is responsible for overseeing water purchases from Israeli water systems and operating PWA wells throughout the West Bank. The department transports this water to various localities, selling it at regulated tariffs.

Despite its critical role, the WBWD has faced considerable difficulties over the past two decades, resulting in poor financial performance. A significant factor contributing to this situation is the high rate of Non-Revenue Water (NRW) largely due to technical issues and commercial losses, including late or partial payments from municipalities. As a result, billing and collection rates remain below acceptable levels, and the WBWD is burdened with substantial debt.

To improve this situation, the government is in the process of establishing a National Water Company (NWC), which will operate as a state-owned public shareholding entity, wholly owned by the State. The NWC is designed to obtain a service provision license and will be subject to oversight and regulation by

<sup>&</sup>lt;sup>15</sup> Article 24 of New Water Law 2014

the Water Sector Regulatory Council (WSRC). It will operate efficiently to fulfill the following primary responsibilities as outlined in Article 39 of the Water Law 2014:

- Water Production and Treatment: The NWC will produce, treat, or organize the treatment of water from wells and other sources, including desalination, in accordance with the licenses issued under the relevant laws and regulations.
- **Bulk Water Distribution:** The company will distribute all available water in bulk to service providers and private users, adhering to the licenses obtained and the official water tariffs in effect.
- Infrastructure Management: The NWC will drill, operate, and maintain wells, transmission pipelines, facilities, and associated pumping stations and equipment.
- Water Procurement: The NWC will purchase water from other sources, subject to the approval of the relevant authority.

The decree establishing the NWC has been formally adopted and published, with its Board and Managing Director appointed. Capital formation is currently underway, alongside efforts to transfer the resources of the WBWD, including staff, facilities, and equipment, to the new entity.

The challenge of addressing the accumulated debts owed by municipalities to the **WBWD** is under active discussion, as part of the broader strategy to ensure the successful establishment and operation of the National Water Company discussions.

# III.4.5 Water and Sewerage Service Providers and RWUs

To enhance customer service, bulk water suppliers do not engage directly with end users; instead, they sell water to local service providers. Currently, there are over 300 such providers primarily operating at the municipal level. To improve efficiency and achieve economies of scale, the sector strategy promotes the aggregation of these service providers into larger entities capable of delivering water and sanitation services (WSS) across multiple localities. The overarching goal is to establish regional utilities that encompass concession areas covering one or more governorates.

Regional water utilities are formed through collaboration among service providers, supported by the MoLG and the PWA, in accordance with the RWU Bylaw (2021). These utilities function as independent entities, complete with their own boards of directors, staff, internal regulations, and budgets.

Under Article 47 of the Water Law 2014, RWUs are entrusted with the following primary functions and responsibilities:

- **Maintenance and Operation:** Ensure the upkeep, operation, and expansion of existing water service infrastructure in accordance with licensing requirements and capital investment programs.
- Water Supply: Provide water to all customers within their designated service areas.
- Wastewater Services: Offer comprehensive wastewater services, including the collection, removal, and treatment of wastewater.

As of 2021, four regional water utilities are operational within the Palestinian territories, collectively serving over 15% of the customer base. This framework aims to enhance the effectiveness and sustainability of water and wastewater services throughout the region, ultimately improving service delivery and resource management.

2022	Population serviced	Water connections	Volume of water (MCM/year)
Jerusalem Water Undertaking	404,058	78,316	19.9
BWSSA	176,052	14,519	6.8
CMWU Rafah	220,244	20,956	10.7
NW Jenin WU	60,000	12,115	2.5
Total managed by water utilities	860,354	125,906	40.1
As a percentage of Palestinian territories	15.6%		23.6%
Palestinian Territories	5,500,000	N. A	158.00

## Table 4: Population serviced by autonomous water utilities<sup>16</sup>

# III.4.6 Water Users Association (WUA)

The WUA is a legally recognized entity formed by local stakeholders (primarily farmers) to oversee the distribution and efficient utilization of irrigation water within a designated area. These associations are regulated by **the Council of Ministers' Decision No. (4) for the Year 2018** in Palestine.

The WUA's primary mandate is to ensure the sustainable management of water resources, in compliance with national policies and regulations. In Palestine, WUAs operate under the Council of Ministers' Decision Number (4) for the Year 2018, which provides a comprehensive framework for their establishment, governance, and operational procedures. The regulation covers key elements such as membership criteria, financial management, operational duties, and dissolution procedures.

## a) Establishment and Affiliation

WUAs are created under the jurisdiction of the **MoA** and operate in coordination with the **PWA**. The decision outlines the process for establishing a WUA, which requires at least 10 farmers owning not less than 50 donums of land, and details the submission of a formal application to the MoA and PWA.

# b) Role and Responsibilities

The primary goal of a WUA is to ensure the sustainable management of irrigation water at the local level, maximizing the efficient use of available water resources. Their key responsibilities include:

- 1. **Irrigation Management:** Planning and managing water distribution for agricultural use, ensuring equitable and efficient water allocation.
- 2. Infrastructure Maintenance: Overseeing the operation and maintenance of the irrigation and drainage systems.
- 3. Water Resource Allocation: Acquiring water from licensed sources and redistributing it among members.
- 4. **Dispute Resolution:** Settling disputes related to water sharing among members.

<sup>&</sup>lt;sup>16</sup> Data source: WSRC 2021

- 5. **Financial Oversight:** Setting water prices, collecting fees, and managing the association's finances transparently.
- 6. **Training and Awareness:** Educating farmers on modern irrigation techniques and water conservation methods.
- 7. **Sustainability Practices:** Promoting sustainable agricultural practices and the efficient use of water resources.

**WUAs** play a vital role in optimizing water use, maintaining irrigation infrastructure, and resolving disputes, contributing to the sustainable and equitable management of water resources in agricultural communities.

# Part IV. Demand for Water and Wastewater Services

# **IV.1** Long-term, Mid-term, and short-term Perspectives

# IV.1.1 The long-term perspective

The long-term strategy for the water and wastewater sector is envisioned to support the establishment of a fully independent Palestinian State. This strategic outlook encompasses several critical implications:

- **Restoration of Water Rights**: The Palestinian people will regain full rights and access to natural water resources within the boundaries established prior to 1967, including East Jerusalem. This access encompasses surface water from the Jordan River Basin and groundwater sources in the West Bank and Gaza Strip, significantly enhancing the volume of available water. Such improvements will facilitate enhanced water services for domestic consumers and foster the development of water-dependent economic activities, notably in agriculture and industry.
- Negotiation of Trans-boundary Water Rights: The Palestinians will successfully engage in negotiations with neighboring countries to secure their water rights concerning trans-boundary water resources, including the Jordan River, Gaza Wadi, and associated groundwater.
- Access to Irrigable Land: The Palestinian populace will regain full access to cultivable land, particularly in the Jordan Valley, which holds substantial potential for profitable irrigated agriculture.
- Autonomy in Water Management: The Palestinian administration, at both central and local levels, will be empowered to plan and implement necessary water and wastewater infrastructure, including wells, storage tanks, networks, wastewater treatment facilities, and water harvesting systems, in alignment with their strategic objectives.
- **Removal of Equipment Import Restrictions**: The importation of hydraulic equipment will no longer face restrictions, facilitating the development of essential infrastructure.
- **Transition from Joint Water Committee (JWC)**: The JWC will be dissolved, replaced by cooperative mechanisms aimed at ensuring the sustainable management of trans-boundary water resources, grounded in recognized water rights between Palestine and its neighboring states.
- **Demographic Growth**: A significant increase in population is anticipated, driven by both natural demographic expansion and the repatriation of refugees.

This comprehensive long-term strategy aims to improve both the quantity and quality of water services offered to citizens, while concurrently fostering economic development through irrigation and industrial initiatives. It is based on the following principles:

- **Recognition of Palestinian Water Rights**: Emphasizing the importance of Palestinian water rights in trans-boundary water resources, including groundwater and rivers shared with neighboring countries (Jordan, Syria, Lebanon, Israel, and Egypt).
- **Optimal Resource Utilization**: Focusing on the effective use of all available water resources from environmental, economic, and social perspectives, thereby addressing health, revenue, and employment concerns.
- Sustainable Resource Management: Committing to the sustainable management and use of these vital water resources to ensure long-term viability and ecological integrity

# IV.1.2 Long-term strategic objectives (2042)

The national strategy for the water and wastewater sector is predicated on the establishment of the State of Palestine, with the objective of achieving full water rights for Palestinians. This goal will require the elimination of existing restrictions on water usage, thereby facilitating several essential enhancements:

- Service Improvement
- : There will be significant advancements in the services provided to customers, encompassing increased service hours, improved water pressure, and enhanced water quality.
- Expansion of Service Coverage: The strategy will aim to extend water supply services to localities currently lacking connection to the network, ensuring equitable access to potable water across the region.
- Enhanced Wastewater Management: Improvements will be made in wastewater services, incorporating comprehensive solutions for collection, treatment, disposal, and reuse. Additionally, large-scale water harvesting projects will be initiated to augment water availability.

In the absence of a conclusive agreement with Israel regarding the final status of the Palestinian territories, the feasibility of implementing these long-term strategic objectives will be severely compromised. Such a scenario could precipitate a significant deterioration of the water situation in the Palestinian territories, potentially necessitating the designation of these areas as water disaster zones. This underscores the critical importance of achieving a sustainable and cooperative resolution to the ongoing water management challenges

# IV.1.3 Implementation plan (2030-2042)

The medium-term implementation plan is constructed to align with the strategic objectives outlined by the PA for the year 2042. This plan delineates the necessary water resources and investments that must be mobilized between 2030 and 2042 to realize these strategic goals. The implementation strategy consists of two distinct phases, each employing different methodologies:

- 1. **Short-Term Implementation Plan (2023-2030):** This phase focuses on investments that have already been planned, for which the requisite financial resources have either been secured or are highly likely to be obtained. It prioritizes immediate actions to enhance the water and wastewater infrastructure
- Medium-Term Implementation Plan (2030-2042): This phase is centered on the strategic objectives for 2042, identifying the investments required to meet these goals. It will incorporate analyses of future resource needs, investment gaps, and potential funding sources to ensure that the PA can achieve its long-term water management vision

By integrating both the short-term and medium-term approaches, the implementation plan aims to ensure a cohesive and sustainable development pathway for water resources management in Palestine, ultimately contributing to the achievement of the PA's long-term vision for 2042.

# IV.1.4 Short term implementation plan (2023-2030)

In the current context, PWA and local service providers encounter numerous constraints due to the Israeli military occupation. These challenges include restricted access to land and water resources, significant delays in importing essential equipment, and obstacles in obtaining permits for construction projects, particularly in Area C.

Given these constraints, the short-term implementation plan focuses on investments and water resource management actions that can be realistically completed within the existing political framework. The plan recognizes the necessity to adapt to the current circumstances and will be revisited and updated once these constraints are alleviated. Should the Palestinian people gain full rights to their water resources or achieve liberation and control over land and water, the plan will be modified to align with the long-term strategic vision.

Under the prevailing situation, the availability of new water resources to meet the growing demands of Palestinian citizens, farmers, and industries is limited. Consequently, the Palestinian Government will invest in a range of coping strategies, which include:

- NRW Reduction Programs: Initiatives aimed at minimizing water loss in distribution systems.
- Drilling New Wells and Rehabilitation of Existing Wells: Expanding and improving groundwater extraction capabilities.
- Water Conservation and Harvesting: Implementing practices that optimize water use and enhance collection during rainfall.
- **Desalination of Brackish Springs and Wells**: Exploring options to convert saline water into usable freshwater.
- **Treated Wastewater Reuse for Irrigation**: Enhancing the application of treated wastewater in agriculture to conserve freshwater resources.
- Improving Irrigation Efficiency: Adopting advanced irrigation techniques to maximize crop yield while minimizing water use.
- Evolving Crop Patterns: Adjusting agricultural practices to favor drought-resistant crops and optimize water consumption.

# **IV.2** Synthesis of strategic objectives

# IV.2.1 Aims of the Strategy

The overarching aim of this strategy is to enhance the water and sanitation services provided to Palestinian citizens over the next 20 years. The development of this strategy has been guided by criteria that prioritize both customer perspectives and the sustainability of natural water resources, alongside the operational viability of water service providers. The key objectives of the strategy include:

- 1. **Increasing and Securing Water Quantity**: Ensuring a reliable and adequate supply of water delivered to customers.
- 2. Maximizing Irrigation Availability: Enhancing the volume of water allocated for agricultural purposes to support food security and economic development.

- 3. **Providing Reliable Access to Quality Water**: Ensuring that all citizens have dependable access to highquality water sources at affordable tariffs, with particular attention to gender and economically disadvantaged groups.
- 4. **Reducing Regional Inequalities**: Addressing disparities in water service provision among different regions and localities.
- 5. **Improving Water Quality**: Enhancing the quality of water supplied to customers to meet health and safety standards.
- 6. **Enhancing Sanitation Systems**: Protecting natural water resources from pollution and excessive depletion through improved sanitation practices.
- 7. **Increasing Service Reliability and Quality**: Ensuring that water services are consistently delivered with high reliability and quality.
- 8. **Sustainable Water Resource Management**: Adopting environmentally sustainable practices in the management of water resources.
- 9. **Protecting Water Resources**: Implementing measures to safeguard water resources against degradation and over-exploitation.
- 10. **Ensuring Financial Sustainability**: Establishing a financial framework that supports the long-term viability of water service operators.
- 11. Maximizing Irrigation Benefits: Enhancing the contributions of irrigation to crop yields, job creation, and revenue generation.
- 12. **Facilitating Industrial Development**: Creating an enabling environment for industrial growth through reliable water service provision

# IV.2.2 Sector performance indicators

To evaluate progress and impact, the strategy is underpinned by a set of quantitative objectives that reflect anticipated improvements in water and wastewater services. These objectives will facilitate:

- Monitoring Progress: Assessing advancements in the implementation of the strategy over the next two decades.
- Estimating Investment Needs: Determining the level of financial investment required to achieve strategic goals.

The selected objectives and corresponding performance indicators are designed to provide a comprehensive perspective on the water sector from the customer's viewpoint (output-based), rather than solely from the planner's perspective (input-based). This customer-centric approach ensures that the strategy remains aligned with the needs and expectations of the Palestinian population.

# IV.2.3 Sector Strategic objectives

PWA has established five strategic goals (SG) for the water sector, aimed at fostering comprehensive improvements and sustainability. These goals are as follows:

- SG1 Integrated management, governance and sustainable development of water sources in terms of quality and quantity
- SG2 Improving the quality and reliability of water supply service and ensuring fair supply
- SG3 Improving the sanitation service provision, wastewater treatment, reuse and reducing its environmental impact

- SG4 strengthening and building capacities of water sector institutions to establish the foundations of good governance in an integrated legal and institutional environment in response to gender and youth participation.
- SG5 Ensuring the financial sustainability of water facilities and service providers

## Table 5: Strategic objective 1

National policy: ensuring the sustainability of the environment							
Strategic Objective N° 1: Integrated management and sustainable development of water							
	resources in terms of quality and q	uantity	<b>D</b> "	•			
Results	Indicator		Baseline	Stra	tegy		
			2022	2030	2042		
	Amount of water produced annually from	West Bank	147,9	173,0	214,0		
	wells and springs (MCM/year)	Gaza	189,4	165,0	95,0		
	Amount of desalinated water available	West Bank	0,0	0,0	0,0		
	annually (MCM/year)	Gaza	7,5	45,0	164,0		
	Amount of water purchased annually from	West Bank	83,8	124,0	145,0		
la successive de successión de la	Mekorot (MCM/year)	Gaza	18,5	20,0	20,0		
increasing the amount of water made available	Amount of water produced from water harvesting facilities (MCM/year)	West Bank	2,3	11,0	21,0		
		Gaza	0,0	0,0	0,0		
		West Bank	2,3	10,0	29,0		
	Amount of treated wastewater made available	Gaza direct	7,1	20,8	26,8		
	ior Palesunian larmers (MCM/year)	Gaza artificial recharge	17,3	22,1	47,0		
Protecting water sources from pollution	ting water sources ollutionThe existence of a monitoring system applied to various water sources in quantity, quality (ratio of controlled sources)			79%	91%		

These strategic objectives are linked to specific performance indicators, which will be monitored by the relevant authorities over the next 20 years (refer to Part VII Strategy Implementation, Monitoring and Evaluation, page 135). Each performance indicator has been tailored for the Gaza Strip and the West Bank, considering the unique challenges and conditions of each region (see Table 6: Strategic objective 2, page 84). This targeted approach will ensure effective tracking of progress and accountability in achieving the strategic goals outlined for the water sector.

## Table 6: Strategic objective 2

National policy: providing basic needs for population groups Strategic Objective N° 2: Improving the quality and reliability of water supply service and							
Results	Indicator		Baseline	Strategy			
				2030	2042		
Increase the amount of water	Amount of water available at customer tap	West Bank	85	97	120		
provided to beneficiaries	(litre/individual/day)	Gaza Strip	87	88	120		
	Percentage of samples that achieve all	West Bank	98%	98%	98%		
Good and sustainable supply	Palestinian standards	Gaza	32%	48%	72%		
reliable sources of water	Weighted average for nitrate (ppm)	Gaza	127	111	36		
	Weighted average for chloride (ppm)	Gaza	1014	899	288		
Improving and developing	The rate of non-revenue water (NRW) =	West Bank	40%	37%	26%		
distribution systems	metering	Gaza Strip	41%	37%	28%		

## Table 7: Strategic objective 317

National policy: ensuring the sustainability of the environment Strategic Goal N° 3: Improving the sanitation service provision and reducing its environmental impact						
Baseline Strategy						
Results Indicator				2030	2042	
	Percentage of houses connected to sewage syst	61%	69%	81%		
Raising the efficiency of sewage systems from collection, transportation and treatment	Percentage of the amount of wastewater treated inside the Palestinian territories		42%	58%	82%	
	Percentage of treated sewage that correspondent palestinian specifications for WWTPs	82%	87%	94%		
Increasing the area of irrigated land from treated water sources	Percentage of treated wastewater reused for irrigation or managed aquifer recharge		23%	47%	83%	
	Area of irrigated agricultural land from treated	West Bank	2,000	8,000	25,000	
	wastewater (dunum)	Gaza	10,000	31,000	40,000	

<sup>&</sup>lt;sup>17</sup> According to MoA plans.

### Table 8: Strategic objective 4

National policy: efficiency and effectiveness of public finance management Strategic Objective N° 4: Developing and building water sector institutions to establish the foundations of good governance in an integrated legal and institutional environment

Populto	Indicator	Baseline	Stra	tegy
Results	Indicator	2022	2030	2042
Water Sector Institutions' Reform: structuring the	Establishment of RWUs	0	4	10
	Total number of established RWU		6	16
various water sector institutions in harmony with	Number of water service providers	324	160	16
the new Palestinian Water	Number of acting bylaws	6	12	15
Law	Progress in establishing the National Water Company	0,15	1	1

#### Table 9: Strategic objective 5

National policy: efficiency and effectiveness of public finance management Strategic Objective N° 5: Ensuring the financial sustainability of water facilities and providers						
Poculte	Indicator	Baseline	Stra	tegy		
nesuns	Indicator	2022	2030	2042		
Promoting financial autonomy for water facilities and water providers	Number of domestic customers managed by autonomous service providers (x 1000)	142	182	222		
Raising the efficiency of	Collection efficiency: the collection rate of water bills	61%	69%	81%		
collection and reducing the ratio of public debt	Percentage of domestic connections equiped with prepaid meters	29%	45%	69%		

# **IV.3 Demand and Supply Projections**

# IV.3.1 Population growth

## a) Observed growth rate

According to the latest population census<sup>18</sup>, PCBS calculated an average annual population growth rate of 2.69% per year for the period from 1997 to 2017.

## b) Demographic Trends for the Strategy

PCBS has also published population projections by governorate for the period 2017-2026. These projections indicate that while the growth rate is expected to remain high in the coming years, a slight

<sup>&</sup>lt;sup>18</sup> PCBS. The Palestine Population and Housing Census - December 2017.

slowdown is anticipated. This change is attributed to evolving factors such as advancements in education and shifts in family structures, similar to trends observed in other Mediterranean countries. This demographic context is crucial for planning and implementing effective water and sanitation strategies to meet the needs of a growing population.

The water sector strategy is based on the same growth assumption, extending the projection published by the PCBS to 2042.

PCBS Population growth projections (extended up to 2042)						
	Baseline	Strategic Objectives				
Region	2022	2026 2030 2034 2038 2042				
West Bank	3,188,387	3,257,524	3,785,985	4,126,174	4,497,381	4,902,474
Gaza	2,166,269	2,411,790	2,694,752	3,092,013	3,452,068	3,749,670
Palestine	5,354,656	5,669,314	6,480,737	7,218,187	7,949,449	8,652,144

 Table 10: Population growth hypothesis for the Water Strategy

# IV.3.2 Demand for urban water supply

With water shortages in many localities, one of the most relevant water service parameters is the quantity of water made available to each citizen expressed in litres per capita per day. In 2022, the water service providers in Palestine supply each person with an average of 87 l/c/d in Gaza, 85 l/c/d in the West Bank Keep in mind that the supplied quantities are too much below the average numbers due to the shortage of available water supply, for example Hebron and Bethlehem Governorates.

These two figures are not just for domestic consumption. They also include water consumption by administrative and social services (schools, hospitals, mosques, etc.), commercial water supply and almost all industrial water supply, as these customers are connected to the same distribution networks as domestic customers.

The strategy is designed to enhance customer satisfaction by ensuring access to a reliable, permanent source of high-quality tap water at an affordable price. This initiative is expected to lead to an increase in domestic water consumption. However, this growth will be tempered by several factors, including customers' affordability and their willingness to pay for the service. Additionally, consumer support for national policies aimed at minimizing water losses from limited resources will play a crucial role in shaping water consumption patterns.

The strategy has been developed with the objective of providing 120 l/c/d for domestic purposes in Gaza Strip and West Bank by 2042.

Furthermore, should the Palestinian people attain their rights to water resources and achieve full control over land and water, the strategy will be revisited and updated to reflect the availability of additional resources for utilization.

In addition to the demand for domestic water, the strategy considers the demand for industrial water to reach 9% for West Bank and 6% for Gaza of the domestic water demand by 2042.

The strategy establishes the total volume of urban water (comprising both domestic and industrial use) that service providers are required to deliver to users. This volume is calculated by multiplying the projected population by the targeted per capita water supply. This approach ensures that water provision aligns with population growth and consumption needs, facilitating effective planning and resource management. **This calls for this volume to more than double over the next 20 years**, to keep pace with population growth (+60%) and improve the quality and reliability of the water service.

Demand for Urban Water Supply at customer tap (Domestic & Industrial)				
Urban Water Needs at	Baseline	Strategic Objectives		
customer tap (MCM)	2022	2030	2042	
West Bank	92	127	209	
Gaza Strip	71	91	174	
Palestine	163	218	383	

Table 11: Demand for urban water supply (domestic + industrial)<sup>19</sup>

Portion of the water produced by service providers is lost during storage, treatment, transportation, and distribution. This loss is quantified as NRW, which encompasses various factors, including physical losses during treatment, leakage in the distribution network, illegal water tapping, and commercial losses.

As of now, the average rate of NRW in Palestine is approximately 57 l/c/d, representing 40% of the water supplied for domestic, commercial, and industrial purposes in the West Bank. In Gaza, the NRW rate stands at about 60 l/c/d, equivalent to 41% of the water supplied. These figures account for NRW in both the bulk supply and distribution systems.

Importantly, the NRW rates in Palestine are lower than the global average of 77 l/c/d. This notable achievement can be attributed to significant efforts made by operators in recent decades, including the replacement of outdated meters and the renewal of aging pipes. These initiatives have collectively contributed to more efficient water management practices within the region.

The Palestinian national strategy for the next 20 years aims to achieve a reduction in the NRW rate to an average of 26% in West Bank and 28% in Gaza. Attaining this ambitious target will necessitate substantial investments in enhancing distribution networks, as well as upgrading metering and billing systems. This initiative is deemed a high priority, particularly given the constrained availability of water resources in the region, further complicated by the challenges associated with the Israeli occupation.

By focusing on the reduction of NRW, the strategy seeks to optimize the efficient utilization of available water resources. This approach will not only improve overall service delivery but also enhance access to water for Palestinian communities. Ultimately, these efforts will contribute to a better quality of life and greater sustainability of water resources in the region.

<sup>&</sup>lt;sup>19</sup> Source: PWA

Non-Revenue Strategic Objectives					
Baseline Strategic Objectives					
Non-Revenue Water%	2022	2030	2042		
West Bank	40%	37%	26%		
Gaza Strip	41%	37%	28%		

## Table 12: Strategic objectives for NRW

## a) Projected demand for domestic water

The projected demand for domestic water in Palestine highlights the need for significant increases in water production over the next 20 years.

The formula (P=D/(1-NRW)) underscores the relationship between water demand (D), Non-Revenue Water (NRW), and the total volume of water operators must produce (P).

## Key Points:

- 1. **Doubling of Water Production:** The strategy anticipates that the total volume of water required will nearly double, despite efforts to reduce NRW by 2042.
- 2. **Water Sources:** Water will be sourced from various resources, including groundwater, purchased, desalination, rainwater harvesting, and reuse, ensuring a diversified approach to meeting demand.
- 3. **Industrial Water Use:** With limited natural water resources, the strategy promotes the use of treated wastewater for industrial purposes where feasible. This approach minimizes competition for groundwater between domestic and industrial users.
- 4. **Regulatory Framework:** The Water Law (2014) and the Water Supply Unified Tariff Bylaw (2021) establish frameworks for tailored tariffs for different user types, including industrial, commercial, and tourism sectors.
- 5. **Urban Water Demand:** The **strategy consolidates both domestic and industrial** water needs under urban water demand, facilitating a comprehensive view of the required production needs.

## b) Consideration of Water Demand for Industry

Natural water resources in Palestine are limited. To limit this risk, the national strategy emphasises integrated and sustainable management of water resources, which are treated as a collective asset administered by the State. In this respect, the Palestinian national strategy aims to avoid any competition between different users for access to groundwater resources.

Industrial users are therefore encouraged to use treated water where applicable. Otherwise, industry will be supplied with water by the water service providers licensed in their area.

The water needs of industry are therefore considered in this strategy document within the urban water demand category. The tables (13,14) here below summarize the demand for urban water supply (domestic and industrial demand in the West Bank), and the relevant production needs. This strategic approach aims to balance the water needs of all sectors while ensuring the sustainability of Palestine's limited water resources.

Demand for Urban Water Supply				
	Baseline	Strategic C	Objectives	
Year	2022	2030	2042	
Consumption @HH (l/c/d)	85	97	120	
Industrial Demand (%)	3.5%	5.7%	9%	
NRW (%)	40%	37%	26%	
Domestic Demand @Source (I/c/d)	144	152.5	166	
Industrial Demand @Source (I/c/d)	3	5.5	11	
Total Demand @Source (I/c/d)	147	158	177	
Total Demand @ Source (MCM)	154	196	283	

#### Table 13: Demand for urban water supply at source (West Bank)

#### Table 14: Demand for urban water supply at source (Gaza)

Demand for Urban Water Supply				
	Baseline	Strategic O	bjectives	
Year	2022	2030	2042	
Consumption @HH (l/c/d)	87	88	120	
Industrial Demand (%)	3.5%	4.5%	6%	
NRW (%)	41%	37%	28%	
Domestic Demand @Source (I/c/d)	147.5	146	253	
Industrial Demand @Source (I/c/d)	3	4	7	
Total Demand @Source (I/c/d)	152	146	176	
Total Demand @ Source (MCM)	121	143	242	

# **IV.4 Demand for Irrigation Water**

Agriculture is a cornerstone of the Palestinian economy, providing food security and empowering communities to manage their natural resources. The strategic framework for agricultural development in Palestine emphasizes "Resilient Agriculture and Sustainable Development," highlighting the government's commitment to this vital sector.

## **Key Points:**

1. Agricultural Importance: Agriculture is recognized as one of the most important productive sectors in Palestine, playing a crucial role in economic stability and cultural identity.

- 2. **Primary Water Source:** Groundwater serves as the primary water source for irrigation, particularly due to limited surface water availability and restrictions on developing water infrastructure.
- 3. **Irrigated Land:** Currently, only 14% of agricultural land in the West Bank is irrigated, reflecting the significant constraints imposed by the occupation and limited resources.
- 4. **Annual Water Usage:** The estimated annual agricultural water usage from agricultural wells is around 171 MCM, with approximately 51 MCM utilized in the West Bank and the remaining in the Gaza Strip. Furthermore, around 18 MCM are utilized from springs in the West Bank, 2.3 MCM from the Harvested Water.
- 5. **Treated Wastewater Potential:** There is substantial potential for enhancing agricultural productivity through the use of treated wastewater, currently 7.1 MCM utilized from treated wastewater in Gaza and 2.3 MCM in the West Bank.

This opportunity remains largely untapped properly due to several challenges:

- **Developing Irrigation Scheme:** Despite the efficient current irrigation practices, there is a need for continuous development to ensure efficient water use.
- Lack of Institutional Framework: There is a need for a robust institutional framework to manage and promote the use of treated wastewater.
- **Insufficient Monitoring and Management:** Limited capacity and financial support for monitoring and managing irrigation water resources hinders effective utilization.

To support agricultural development and ensure food security, it is essential to improve water management practices, enhance the use of treated wastewater, and address the challenges facing irrigation in Palestine. This will require concerted efforts from governmental bodies, local communities, and international partners to build resilient agricultural systems and optimize water use for sustainable development.

# IV.4.1 Irrigated and Irrigable land

Agriculture is a critical component of the Palestinian economy, with a significant portion of land dedicated to farming practices.

## **Key Statistics:**

- 1. **Total Agricultural Land**: Approximately 1.2 million dunums of land are utilized for agriculture in Palestine, with 90% located in the West Bank.
- 2. Rainfed vs. Irrigated Agriculture:
  - a. Rainfed Agriculture: Dominates, covering around 77% of total agricultural land.
  - b. Irrigated Agriculture: Occupies the remaining area, primarily concentrated in:
    - i) The Gaza Strip
    - ii) The Jordan Valley
    - iii) Semi-coastal regions of the West Bank
- 3. Irrigable Land:
  - a. MoA estimates that there are approximately **368,855 dunums** of irrigable land in Palestine.
  - b. Distribution:
    - i) West Bank: 352,058 dunums (approximately 95.4%)
    - ii) Gaza Strip: 16,797 dunums (approximately 4.6%)
- 4. Current Irrigated Area:
  - a. Total Irrigated: 289,177 dunums

- i) West Bank: 189,405 dunums (approximately 65.6%)
- ii) Gaza Strip: 99,772 dunums (approximately 34.4%)

## Water Demand for Irrigation:

• To effectively irrigate all available irrigable land at a rate of **750–900 m<sup>3</sup> per dunum per year**, approximately **493–592 million m<sup>3</sup>** of water would be required annually.

## **Challenges:**

- **Sustainable Limits**: This demand significantly exceeds the sustainable limits of available natural resources. The focus for determining irrigation water demand must include:
  - The area that is effectively irrigated
  - Sustainable management of water resources

The balance between irrigation needs and sustainable water resource management is crucial for the future of agriculture in Palestine. Effective strategies are needed to optimize water use, enhance irrigation practices, and ensure that agricultural development aligns with sustainable water resource management goals.

Table 15 below is a summary for irrigated and irrigable land in Palestine

Governorate	Irrigated Area – Dunum	Irrigable land- Dunum	Total -Dunum
Jenin	47,373	80,335	127,708
Tubas & Northern Valleys	40,854	34,280	75,134
Tulkarm	15,924	67,521	83,445
Nablus	10,565	10,986	21,551
Qalqilya	8,214	36,864	45,078
Salfit	502	44,935	45,437
Ramallah & Al-Bireh	2,210	11,144	13,353
Jericho & Al- Aghwar	50,232	2,548	52,780
Jerusalem	478	1,018	1,496
Bethlehem	3,039	8,479	11,518
Hebron	10,012	53,947	63,959
West Bank	189,405	352,058	541,462
Gaza	99,772	16,797	116,569
Total	289,177	368,855	658,081

<sup>&</sup>lt;sup>20</sup> Census 2021: Irrigable Land

# IV.4.2 Water Demand

Agricultural water demand fluctuates in response to weather conditions, exhibiting a distinct seasonal pattern that peaks during the hot, dry summers and reaches its lowest levels in winter. In contrast, water availability corresponds with these seasonal trends, being highest in winter and lowest in summer. This discrepancy creates heightened irrigation needs during the driest months, intensifying pressure on already limited resources.

Additionally, the substantial seasonal variations in irrigation water demand present challenges for the effective utilization of treated wastewater. WWTPs generate a consistent flow of treated water throughout the year, including in winter months when irrigation demand is low. This mismatch between supply and demand complicates the integration of treated wastewater into agricultural practices.

To address these challenges, the implementation of storage facilities (ex. dams) is increasingly recognized as a strategic solution for ensuring reliable water supplies for agricultural irrigation. Such infrastructure facilitates improved planning of annual cropping strategies, mitigates peak flows during wet periods, and maintains lower flows during dry spells. This approach not only enhances water resource management but also supports the sustainability of agricultural practices in the region.

**In Gaza**, the sector strategy is to utilize this water for artificial groundwater recharge. However, this option presents greater complexities in the West Bank.

# **IV.4.3** Irrigated land and projected demand for irrigation

Actual (and future) irrigated land is evaluated by cross-referencing the water used (and available) for irrigation figures with water needs per dunum.

If the current political situation (military occupation) persists, it is considered that the amount of water available for irrigation will be severely constrained. From a strategic perspective, certain agricultural wells situated within residential zones will be repurposed for domestic water supply. Concurrently, the availability of treated wastewater for irrigation purposes is expected to increase, in alignment with the National Water Policy.

But, despite the challenges of Israeli occupation affecting Palestinian access to water resources, strategic initiatives can significantly enhance agricultural development and expand irrigated areas. In the West Bank, focusing on efficient water utilization and strategic land planning can optimize the benefits of existing resources. In the Gaza Strip, tackling the issue of groundwater over-extraction is essential for sustainability. Furthermore, promoting ecological agriculture can diversify farming practices, ensuring long-term resilience and adaptability in both regions.

MoA aims to enhance the efficiency of agricultural resource use to boost the profitability of farms and improve food security, while ensuring the sustainability of water resources.

This involves developing the necessary infrastructure to promote sustainable water productivity and consumption practices. Key initiatives will focus on raising awareness about the importance of water conservation, introducing and promoting alternative technologies for optimal water management, and enhancing both waters use efficiency and overall productivity. These strategic measures will contribute to building a more resilient agricultural sector in Palestine.

Once Palestine attains its water rights from transboundary water resources (Jordan River; Western aquifer Basin in the West Bank; Eastern Aquifer Basin; North-Eastern aquifer Basin in the West Bank; and Coastal aquifer in the Gaza Strip), the additional amounts of water made available upon the attainment of Palestinian Water Rights will enable Palestine to develop an ambitious irrigation program in the West Bank. The agricultural demand projections are calculated and summarized in Table 16 below.

Agricultural Demand (MCM)	Baseline	Strategy	
	2022	2030	2042
West Bank	78	112	124
Gaza	95	88	78

Table	16:	Aaricultural	demand	projection.	ΜΟΑ
i ubic	40.	Agriculturur	acmana	projection,	mon

The availability of water for irrigation in Gaza will remain constrained due to salinity issues arising from the intrusion of seawater into the coastal aquifer. Consequently, there is a pressing need to explore alternative water resources, such as desalinated water and treated wastewater, to address the impending shortage of freshwater. Ensuring sufficient agricultural output in the future will necessitate an expansion of horizontal agriculture, which will, in turn, lead to an increase in agricultural water demands.

Within the State of Palestine:

- the groundwater resources available for irrigation will decrease in Gaza, because of aquifer invasion by seawater
- the resources available for irrigation will increase in the West Bank, as Palestinians will attain their water rights in the Jordan River and shared aquifers, and also the reuse of TW, water harvesting projects.
- PWA and MoA will plan and support reuse of treated wastewater, harvested water for agriculture where feasible, including the construction of facilities to store and transport this water; the water resource for irrigation will be further detailed in Part V, page 95.

# IV.4.4 Nexus of Water, Food and Energy

The reuse of treated wastewater exemplifies the significance of an integrated nexus approach and the necessary inter-ministerial collaboration it entails.

Treated wastewater must be evaluated from multiple perspectives:

- 1. **Environmental Threat:** The discharge of pathogens into surface waters and the resultant eutrophication due to nitrogen and phosphorus release pose significant environmental risks.
- 2. **Health Risk:** There exists a potential threat to the health of agricultural workers and consumers of plant products cultivated with treated wastewater.
- 3. Water Resource: Treated wastewater represents a viable resource for restricted agricultural practices, particularly in contexts where irrigation water is scarce.
- 4. **Energy Generation:** WWTPs can serve as energy sources, generating energy that can be utilized for operational purposes, including treatment and pumping activities.

5. **Environmental Resource:** The strategic use of treated wastewater can help sustain summer lowwater flows in rivers, reduce groundwater extraction, and facilitate managed aquifer recharge.

These interconnections are being explored through collaborative working groups established between the MoA and the PWA, which have initiated pilot reuse projects such as NGEST. Additionally, partnerships between the PWA and the MoH aim to establish standards for WWTP effluents.

Planning for wastewater treatment facilities must address two critical energy-related considerations:

- 1. Location Proximity: The site of the treatment plant should be strategically chosen to minimize transmission costs and losses by being close to energy sources.
- 2. Long-term Planning: Securing energy sources is often a protracted process; therefore, wastewater services should be planned with a horizon of 7-10 years.

It is advisable to establish a permanent mechanism, such as a national dedicated committee, to facilitate effective coordination among pertinent stakeholders. This committee would be responsible for overseeing the planning, management, and development of projects, thereby ensuring that the nexus approach is incorporated from the earliest stages of project conception.

# Part V. Sustainable Development of Water Resources

In Palestine, the availability of water resources to meet urban and agricultural demands is severely limited, a situation that is expected to deteriorate further with the anticipated population growth and increasing water demand (refer to Part III Baseline (2022), page 49). The primary water resource is groundwater (see section III.2 Water Resources in Palestine, page 52). To ensure the sustainable utilization of this resource, PWA has implemented a strategy aimed at regulating groundwater abstraction (refer to V.1 Groundwater Resources Management, below).

The key strategic objectives include securing Palestinian water rights, promoting the reuse of treated wastewater, and enhancing water harvesting as supplementary irrigation resources (see section V.5.3 Storm Water Harvesting National Strategy, page 111 and V.6.3 Strategic Orientations for Reuse, page 116). In Gaza, the strategic focus is on seawater desalination (see section V.3.4 Desalination of brackish Water in Gaza, page 104) and the development of water reuse systems, which can serve as alternatives to irrigation wells or facilitate the artificial recharge of the coastal aquifer.

The water resource management strategy in Palestine is predominantly oriented towards the controlled and sustainable use of natural resources, ensuring long-term viability and resilience in the face of growing demand.

# V.1 Groundwater Resources Management

# V.1.1 Short and Mid - term strategy

## a) Rights to access groundwater resources

Negotiations regarding Palestinian water rights will be conducted with Israel and other riparian states in accordance with international law. In the interim, water utilization allocations for Palestinians are governed by the Oslo II Agreement.

The Oslo II Agreement primarily reflects water abstractions as of 1995, with limited allowances for population growth. Initially designed to regulate water allocations during a five-year interim period, this agreement has now extended for over 30 years, rendering its figures inadequate to meet current Palestinian needs. Despite the urgent necessity to revise these allocations in response to demographic changes and other socio-economic factors, the Oslo II Agreement continues to be referenced in discussions within JWC.

Given the constraints and restrictions on the development of additional water resources, a series of shortterm actions must be undertaken. These actions focus on investments in water resource management and development that are feasible within the current political context.

## Political actions to be considered:

- 1. **Review of the Oslo Agreements**: Examine Article 40 of the Oslo Agreements and the agreed allocations, while applying political pressure regarding basin exchanges and the development of additional water resources.
- 2. **Reassessment of Palestinian Involvement in JWC Meetings**: Reevaluate the effectiveness of Palestinian participation in the JWC under a management regime that disproportionately benefits Israel and enables its unlawful claims over Palestinian water resources.

- 3. **International Third-Party Involvement**: Advocate for the inclusion of an international observer in JWC meetings to ensure transparency and accountability regarding all projects discussed.
- 4. Engagement with Media and International Community: Mobilize media outlets, international stakeholders, donors, and relevant NGOs to publicly condemn Israeli actions and restrictions within the JWC and Coordination Authority (CA).
- 5. **Promotion of a National Water Management Approach**: Foster a cohesive national strategy for water planning and management that safeguards Palestine's territorial integrity.
- 6. **Response to Water Infrastructure Demolitions**: Implement initiatives for the repair, compensation, and reconstruction of demolished water infrastructure, accompanied by advocacy campaigns.
- 7. **Monitoring of Water Violations in Area C**: Systematically document violations pertaining to water access in Area C, including seeking compensation from Israeli authorities for these infringements.
- 8. **Challenging the Israeli Permit Regime**: Impose actions to challenge the Israeli permit regime in Area C of the West Bank, which has prevented communities from accessing sustainable sources of water and thus increasing their vulnerability to forced displacement

## **Additional Considerations:**

- Under the Oslo II Interim Agreement, Israel is obligated to supply an additional 5 MCM/year to Gaza, while Palestinians are permitted to develop an additional 78 MCM/year in the West Bank relative to their 1995 water usage.
- The source for this additional 78 MCM/year should be the Eastern Aquifer Basin or another mutually agreed-upon resource within the West Bank.
- Notably, the Oslo II Interim Agreement does not address abstraction rights concerning the Coastal Aquifer in the Gaza Strip, nor does it specify abstraction rates for either Israelis or Palestinians in 1995; it merely stipulates that both parties should maintain existing utilization levels.

# V.1.2 Long term strategy - State of Palestine

The long-term strategy for the State of Palestine regarding water resources will be anchored in a peace process agreement involving all parties sharing these vital resources, specifically focusing on:

- Jordan River Surface Water Resources
- Groundwater Resources

Negotiations will be conducted in accordance with international law and Palestinian water rights legislation. Given the uncertainties surrounding the outcomes of these negotiations, the strategy will rely on a general assessment of the resources likely to be available to Palestinians without specifying definitive figures. The final agreement regarding water resources will serve as a reference for PWA to modify its strategic approach, particularly in relation to water allocations and necessary investments. It is essential to acknowledge that should Palestinians achieve their water rights and gain full control over land and water; the strategy will undergo significant revisions aligned with the vision of a sovereign Palestinian state.

It is essential to acknowledge that should Palestinians achieve their water rights and gain full control over land and water; the strategy will undergo significant revisions aligned with the vision of a sovereign Palestinian state.

The Palestinians will actively pursue their interests in securing water rights, which encompass fair access, control, and use of all shared water resources with neighbouring countries, in alignment with the principles of international law. Concurrently, efforts will be made to develop additional quantities of water from non-conventional sources, ensuring that these actions do not infringe upon established Palestinian water rights.

## a) Political and Legal Framework

The ongoing denial of Palestinian water rights during the occupation has resulted in a disproportionate and inequitable allocation of existing water resources. Until a final agreement on water rights and allocations is achieved (an issue that exceeds the mandate of the PWA) it is imperative to implement a comprehensive management strategy at both political and legal levels. This strategy will encompass all elements of the water resource supply and demand chain.

The proposed strategy will evaluate Palestinian alternatives for managing competing demands and explore opportunities for regional cooperative management. Key components will include frameworks for cooperative management of shared water resources to ensure sustainable allocations of adequate quality, thereby supporting the immediate water needs of the Palestinian population.

## b) Arab Strategy for Water Security

The strategy will consider alignment with the **Arab Strategy for Water Security**, which encapsulates a joint Arab approach to sustainable development in the context of water resources. This long-term program aims to address anticipated challenges in water resource development and management within the Arab region, characterized by scarcity, uneven geographic distribution, and increasing competition for utilization. Notably, the Arab Strategy emphasizes the protection of Arab water rights in Palestine and promotes cooperation among Arab states for the management of shared resources, while adhering to commitments under the Millennium Development Goals.

It is important to highlight that Israeli actions have exacerbated the depletion of water resources without regard for the Arab water rights in the occupied territories, including the Golan Heights, the Jordan River, and Palestine itself.

To ensure the successful implementation of this strategy, all concerned Arab nations will collaborate under the auspices of the **Arab Ministerial Water Council**, which will coordinate efforts alongside the League of Arab States Secretariat.

Ultimately, the successful execution of the Arab Water Security Strategy will bolster Palestinian water rights in the context of transboundary shared water resources.

The successful execution of the **Arab Strategy** for Water Security will bolster Palestinian water rights in the context of transboundary shared water resources

## c) Additional Wells

Additional sources of water by new wells from the three groundwater aquifers (basins) should be considered in the short, medium and long-term Strategy. In the short term, the development of new wells remains contingent upon negotiations with Israeli authorities via the JWC, given the current occupation and associated restrictions.

## d) Western Aquifer

The Western Aquifer is recognized as the most productive water resource, benefiting from a recharge area that captures the majority of regional rainfall. The current abstraction rate of 41.2 MCM is anticipated to be increased. To facilitate this growth, it is imperative to drill new wells throughout the basin, extending from the northern to the southern regions, with the aim of mobilizing an additional 12.5 MCM annually by 2030 and 15 MCM annually by the end of 2042.

## e) North-eastern Aquifer

The North-eastern Aquifer is a vital resource for the Nablus, Jenin, and portions of the Tubas Governorates. Presently, the extraction rate stands at 35.5 MCM per year. PWA is committed to enhancing the development of this aquifer, with objectives to increase yield by an additional 12 MCM annually by 2030 and 17.5 MCM annually by 2042

## f) Eastern Aquifer

The Eastern Aquifer is currently facing challenges related to water table depletion in certain zones, particularly in the southern areas. Consequently, the siting of additional wells must be approached with caution to prevent interference with existing extraction points. The current utilization from groundwater wells is approximately 32.4 MCM. The PWA is actively pursuing the development of an additional 13.5 MCM by 2030, followed by an increase of 8.5 MCM by 2042.

## • Long-Term Strategy for the Eastern Aquifer

**In the long-term strategy**, PWA anticipates that the existing 38 Israeli wells, which currently extract over 40 MCM annually from the Eastern Aquifer, will ultimately be transferred to its jurisdiction. This transfer is essential for consolidating water resource management and ensuring sustainable oversight of the aquifer's utilization.

## • Development of Al Fashka Spring Groups

Al Fashka spring groups represent another significant potential water resource. Located on the slopes of the Dead Sea within the Bethlehem and Hebron governorates, these brackish springs have an annual average discharge of 80 MCM. However, many of these springs are too brackish for direct domestic water supply and have not been utilized to their full capacity.

The long-term strategy aims to capitalize on this resource due to the following considerations:

- The proximity of the springs to the Hebron and Bethlehem governorates, where numerous localities are experiencing water shortages.
- Their close location to irrigable land in the Jordan Valley.

PWA plans to develop this resource through various programs:

- 1. **Desalination Plant:** Establishing a desalination facility with a production capacity of 40 MCM per year to provide potable water.
- 2. Irrigation Schemes: Utilizing 20 MCM per year of the brackish water for irrigation in Jericho, specifically from springs with total dissolved solids (TDS) levels below 2 g/l. An evaluation will be conducted to assess the feasibility of mixing this brackish water with treated wastewater and/or harvested rainwater to optimize resource use.

## g) Coastal Aquifer – Management Strategy

The Coastal Aquifer has faced significant overexploitation in recent decades. In the Gaza Strip, groundwater abstraction has reached 189.4 MCM annually, while the long-term average natural recharge from rainfall over the past 42 years is estimated at approximately 55-60 MCM per year. Consequently, the water level of the aquifer has declined by more than 15 meters over the last four decades. Furthermore, as a coastal aquifer, it has begun to experience the intrusion of brackish and saline water, compromising the quality of the freshwater supply.

In light of these challenges, the long-term strategy aims to reduce total groundwater abstraction in the Gaza Strip to 96 MCM per year by 2042. However, during the short-term strategy period, achieving a significant reduction in groundwater abstraction will be challenging due to limited additional water resources, including desalination and purchased water, compounded by financial constraints.

• Expected Groundwater Utilization in the Coastal Aquifer:

## Short-Term (2024-2030)

- During the short-term period, groundwater utilization is expected to face significant challenges. With
  the increasing population and limited additional water resources, total groundwater abstraction for
  domestic water supply is projected to rise from approximately 89 MCM in 2022 to around 105 MCM
  per year by 2030.
- Despite the overall increase in groundwater extraction, efforts will be made to decrease abstraction for agricultural purposes. Groundwater use for irrigation is anticipated to decline from 100.4 MCM per year to about 67.2 MCM per year due to the implementation of treated wastewater initiatives. Additionally, approximately 22 MCM per year of treated wastewater is expected to be recharged into the groundwater system, contributing to resource sustainability.

## Mid-Term (2031-2042)

- In the mid-term, groundwater utilization strategies will begin to stabilize as initiatives to enhance water resource management are implemented. PWA will focus on optimizing existing groundwater resources while exploring alternative water sources such as desalination and rainwater harvesting.
- By this period, total groundwater abstraction is projected to gradually decrease, with efforts aimed at reducing dependence on groundwater for domestic and agricultural uses. The anticipated abstraction rate may range between 90-100 MCM per year, reflecting ongoing conservation efforts and improved efficiency in water usage. Additionally, increasing volumes of treated wastewater are expected to be recharged into the groundwater system.

The total groundwater abstraction is projected to gradually decrease, with efforts aimed at reducing dependence on groundwater for domestic and agricultural uses reflecting the ongoing conservation efforts and improved efficiency in water usage.

## Long-Term Perspective (2042 and beyond)

- The long-term strategy for Gaza aims to significantly reduce groundwater abstraction to 96 MCM per year by 2042. This goal is driven by a comprehensive approach to sustainable water management, including
  - Enhanced water conservation practices.
  - Increased utilization of treated wastewater for agricultural irrigation is projected to replace a significant portion of groundwater use.
  - Development of desalination facilities to provide alternative water sources.
- By the end of this period, it is expected that groundwater levels will stabilize, and the quality of water resources will improve, mitigating issues related to salinity and over-extraction. The successful implementation of these strategies will be crucial for ensuring the long-term sustainability of groundwater resources in Palestine.

Region	Aquifer Basins	Long Term average Recharge (MCM/year)	Actual utilization (MCM/year) Year 2022	Short term strategy (2023-2030) (MCM/year)	Med-term strategy (2031-2042) (MCM/year)
West Bank	Western	318-420	41.2	+ 12.5	+ 15
	Eastern	125-197	32.4	+ 13.5	+ 8.5
	N-E	135-197	35.5	+ 12	+ 17.5
	Total		109.1	147.1	187.1
Gaza Strip	Coastal	55-60	190 (89 for domestic 100.4 for agriculture)	105 for Domestic 67.2for Agricultural - <b>22</b> for aquifer recharge (Treated WW)	45 for Domestic 51 for Agricultural - <b>47</b> for aquifer recharge (treated WW)

Table 17: Expected groundwater utilization in Palestine, Short-, Mid- and Long-Term Perspectives

# V.2 Treated Wastewater and Reuse

The strategy encompasses a comprehensive development plan for wastewater collection systems, including sewerage and cesspit sludge collection, alongside the construction of new wastewater treatment plants, in alignment with the National Policy directives.

The establishment of efficient wastewater treatment facilities will yield an additional water resource that can be allocated for agricultural irrigation and industrial applications, where applicable. However, the

implementation of this allocation process will be complex and will necessitate the cooperation of various stakeholders. The foundational principles for this allocation are as follows:

- High-Performance Treatment: Wastewater will be processed in advanced treatment plants to produce "reuse quality water" suitable for irrigation, artificial recharge, and certain industrial activities.
- Coordination for Transportation: PWA, NWC and the MoA will collaborate to ensure the effective transportation of treated wastewater to designated irrigation areas.
- Encouragement for Agricultural Use: The MoA will develop mechanisms to incentivize farmers to utilize treated wastewater for agricultural purposes. The allocation process will be organized through WUAs in coordination with relevant authorities.
- Industrial Applications: The PWA and the MoNE will work together to facilitate the use of treated wastewater in various industrial activities where feasible and applicable.
- Aquifer Recharge: In regions where, treated wastewater cannot be reused in agriculture, effluent from WWTPs may be employed for aquifer recharge or transferred to other areas for reuse, in accordance with Palestinian standards and feasibility assessments.
- Infiltration Facilities: Ongoing studies are being conducted on several infiltration facilities in the Gaza Strip. The strategy aims to maximize the benefits derived from these facilities as a core component of the PWA's Integrated Water Resources Management (IWRM) approach.
- Crop Guidelines: The MoA will define a limited list of crops approved for irrigation with treated wastewater, ensuring safety and efficient irrigation practices. All relevant constraints and guidelines will be considered, as detailed in section V.6.3 Strategic Orientations for Reuse, page 116.

# V.3 Desalinated Water

# V.3.1 Current Situation in the Gaza Strip

Freshwater supply through desalination is currently provided by small to medium-scale seawater desalination plants.

# V.3.2 Increasing Water Production Capacity in Gaza Strip

The PWA has developed an investment program aimed at enhancing the production of desalinated water in Gaza. This program is grounded in several key assumptions:

- **Excessive Abstraction:** The current abstraction rate from the coastal aquifer is unsustainable and has resulted in seawater intrusion. Reducing this rate is essential to restore the aquifer's capacity.
- **Reliability of Mekorot Supply:** Additional water from the Mekorot water company is deemed unreliable due to political constraints imposed by the Israeli government. While it may be considered a short- to medium-term option, it cannot be relied upon as a major water source for the Gaza Strip.
- **Primary Resource:** Seawater desalination is identified as the principal potential additional water resource for Gaza.

 Impact on Wastewater Salinity: The introduction of desalinated water is expected to decrease the salinity of treated wastewater, facilitating the development of additional capacities for reuse and managed aquifer recharge.

#### V.3.3 **Desalination of Seawater**

The Gaza Strip's proximity to the Mediterranean Sea provides a nearly limitless source of seawater that can be utilized for freshwater production, similar to practices in other Mediterranean countries. The technologies for seawater desalination are well-established, and there are numerous reliable manufacturers available to supply equipment.

## a) Constraints

Several constraints impede the construction of large desalination plants in a low-income and blockaded area like Gaza:

- Funding Availability: Securing adequate funding is a significant challenge.
- Equipment Costs: The high cost of necessary equipment poses a barrier to development.
- Operational Expenses: The running costs of desalination plants, including energy consumption and equipment maintenance, are considerable.
- Power Supply: The need for reliable power generation or import is critical.
- Israeli Restrictions: Access to materials and equipment is limited due to Israeli regulations.
- Investment Risks: Attracting investors is difficult due to the ongoing conflict and the risks associated with potential targeting of installations, as evidenced by previous attacks on the Gaza power station.

## b) Planned Developments

The PWA has proposed a regional desalination project for Gaza (GCDP), with an initial capacity of 55 MCM per year. However, this project remains on hold due to funding limitations and the prevailing political situation, with production tentatively scheduled to commence in 2031.

In the interim, a Short-Term Low Volume (STLV) strategy is being implemented in Gaza, utilizing mediumsized desalination plants located at Deir El Balah, the South desalination plant, and the North desalination plant.

Production under the STLV strategy is expected to increase steadily until 2031, when the GCDP (first phase) will provide a substantial seawater desalination capacity to address the demand gap and alleviate further deterioration of groundwater resources.

The following Table 18 outlines the planned seawater desalination capacities for the Gaza Strip, considering the increasing water demand and the necessity to protect the coastal aquifer.

Tuble 18. Required descrimation cupacities in Guzu Strip				
	Baseline	eline Strategy		
Desalinated Water Capacity (MCM)	2022	2030	2042	
Gaza Strip	7.5	45.4	164	

Table 18: Red	quired desaling	ation capacit	ies in Gaza Stri	р
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In summary:

- **Current Plants**: Medium-sized desalination plants in Deir El Balah, North, and South are operational, addressing immediate supply needs.
- **Future Capacity**: The GCDP planned for 2031 will provide a significant capacity increase, crucial for meeting growing demand and protecting the coastal aquifer from further degradation.

This strategic approach aims to ensure a sustainable and reliable freshwater supply for the Gaza Strip while preserving the integrity of the coastal aquifer

## V.3.4 Desalination of brackish Water in Gaza

In the south-eastern portion of the Coastal Aquifer, brackish water (with salinity levels ranging from 3 to 5 g/L) is available. However, this water is unsuitable for domestic consumption or agricultural irrigation. It can be desalinated for emergency purposes, offering a limited-capacity solution at a lower cost and with reduced power consumption compared to seawater desalination. Currently, the capacity of STLV desalination facilities for brackish water is estimated at 2 to 3 MCM per year, intended for drinking water supply for the residents of Gaza. The desalinated water is distributed via tanker trucks.

# V.3.5 Desalination of brackish Water in West Bank

In the West Bank, the overall quality of groundwater remains relatively good; however, concerns regarding salinization have emerged, particularly in the Jordan Valley region, notably around Jericho. This salinity issue is underscored by the increasing salinity levels observed in water samples from various wells, with salinity rising significantly in an eastward direction.

- For instance, the Nwiemeh and Jaib wells, which were previously considered unsuitable for domestic use due to their high salinity, illustrate this concerning trend. Additionally, agricultural wells are experiencing heightened salinization, which has necessitated a shift among farmers towards the cultivation of more salt-tolerant crops, such as palm trees, or the exploration of alternative water sources to maintain agricultural viability.
- In the West Bank, the development of water resources, particularly from the Fashka Springs in the Jordan Valley, faces significant challenges due to political obstacles imposed by the Israeli occupying administration, as well as technical and funding limitations.
- In the short and medium term, efforts will concentrate on harnessing brackish water resources from wells through methods such as desalination or blending with freshwater. Additionally, initiatives focused on water harvesting and wastewater treatment will be prioritized to render these resources suitable for agricultural use.
- Looking ahead, the long-term strategy aims to extract approximately 3 MCM/year from these sources by establishing a desalination plant dedicated to urban water supply. This strategic framework is intended to enhance water security and promote sustainable development in the region.

Desalination of the brackish water In Gaza serves to meet emergency water supply needs and enhance drinking water availability.

While in the West Bank, addressing salinity concerns is crucial for preserving agricultural productivity and groundwater quality.

Collaborative efforts and advancements in technology will be essential to optimize the utilization of brackish water resources.

# V.4 Purchased Water

# V.4.1 Purchased water in West Bank

In alignment with the PWA strategic vision, **the preference for domestic water supply is primarily directed towards local resources, specifically groundwater and desalinated water**. However, when these local sources prove insufficient to meet demand 75 l/c/d, the option of purchasing water becomes necessary. This water is procured from Mekorot connection points and their associated systems.

In alignment with the PWA strategic vision, the preference for domestic water supply is primarily directed towards local resources, specifically groundwater and desalinated water

In 2022, purchased water amounted to over 83.8 MCM/y, as reported by the PWA. These imports partially mitigate the restrictions imposed by the Israeli government on the construction of new wells. Over recent years, the volume of purchased water has been on the rise, a trend that is expected to continue in response to population growth and increasing demand for water.

Ultimately, it is anticipated that once Palestinians regain full control over land and water resources, the reliance on purchased water will decrease, with groundwater abstraction becoming the primary source for meeting domestic water needs.

# V.4.2 Purchased Water in Gaza

To address the decline in water quality caused by the over-exploitation of groundwater resources, the PWA has adopted a strategy to augment the quantity of water purchased from Mekorot. In 2022, the volume of purchased water was approximately 18 MCM/y. This amount is anticipated to increase to 20 MCM/y by 2025 and will be maintained at this level until the end of the strategic planning period, unless additional water sources become available to the system.

# V.4.3 Short Term Strategy

Several governorates in Palestine, including Jenin, Hebron, and Bethlehem, are experiencing significant water deficits. To improve water supply in these regions, the strategy acknowledges the need to purchase additional water quantities from Mekorot until Palestinians can reclaim their water rights.

In the short term, PWA will undertake a series of negotiations with the Israelis through JWC, focusing on the following objectives:

- Securing Additional Quantities: Extensive negotiations will be initiated to obtain additional water through the drilling of New Wells, thereby reducing dependency on purchased water where feasible.
- **Reducing Connection Points:** Efforts will be directed toward negotiating a reduction in the number of connection points to enhance pressure management and decrease NRW.
- Increasing Purchased Water Volumes: Negotiations will also aim to raise the total amount of water purchased from Mekorot (where required) at an acceptable price.
- **Reviewing Water Supply Points:** Discussions will encompass revising the distribution of water supply, particularly by increasing the volume piped into the southern West Bank, where alternative resources are limited in the short term, as well as to the Gaza Strip.

# V.4.4 Mid and Long-Term Vision

The primary objective of the Palestinian strategy is to prioritize reliance on local water resources. However, purchasing water will remain a viable option until Palestinians fully secure their rights to both groundwater and surface water resources. This dual approach will ensure water availability while working towards greater autonomy in water resource management.

The primary objective of the Palestinian Water Sector Strategy is to prioritize local water resource utilization. However, the procurement of water will continue to be a viable option until full rights to groundwater and surface water are secured.

# V.5 Surface water resources and Rainwater Harvesting

# V.5.1 Surface Water Resources

Surface water resources in Palestine are severely limited. In the West Bank, the only permanent surface water source is the Jordan River, from which Palestinians denied access and utilization of this important resource. Additionally, while seasonal stormwater does flow into various wadis, these flows are irregular and unreliable. In the Gaza Strip, surface water resources have been entirely depleted, primarily due to excessive water extraction from the main watercourse, known as Gaza Wadi, resulting from upstream practices in Israel. Most wadis in the region experience flow for only a few weeks each year, typically during flash floods triggered by thunderstorms.

# V.5.2 Current level of surface water use

Due to restricted access to surface water resources, Palestinians currently utilize these sources to a very limited extent. Traditionally, small farmers in Palestine rely on springs or shallow wells to construct **small storage pools** and reservoirs near their irrigated fields, often located directly adjacent to the springs. However, these small structures primarily function as short-term intermediate storage and are not designed for seasonal or multi-annual storage, unlike dams.

Despite the presence of significant **stormwater runoff and baseflows** from large springs in several Wadis throughout the West Bank, the potential for surface water utilization remains largely untapped. Currently, there are three existing small rock fill dams and one pond in the West Bank with storage capacities exceeding 50,000 m<sup>3</sup>. The following provides information on these existing structures:

- Auja Dam: Located in Auja Village, Jericho, the dam has a design storage volume of 40,000 m<sup>3</sup> according to a study by a Jordanian team. However, reports from the Ministry of Agriculture indicate that the actual storage volume is approximately 700,000 m<sup>3</sup>.
- The Bani Naim Dam: Located in Bani Naim and possesses a designated storage volume of 180,000 cubic meters
- The Beit Arroush Dam: Located in Dura, Hebron, with a designated storage volume of 180,000 cubic meters.
- The Arrabeh Pond: Which is located in Arrabeh, Jenin, and has a storage capacity of 80,000 cubic meters. This pond irrigates over 2,000 dunums of highly fertile agricultural land.



## Figure 10: Auja Dam

#### Figure 11: Bani Naim Dam



Figure 12: Arrabeh Pond



## a) Jordan River

The Jordan River is the main surface water resource in Palestine. Its catchment area is shared among 5 riparian countries (Palestine, Jordan, Syria, Lebanon and Israel). The historical total average flow is estimated to be 1,400 MCM/year (PWA. 2012c). The Jordan River is extensively utilized by Israel for irrigation and domestic water supply. However, since 1967, the Palestinians have been denied access to this crucial resource. The Jordan River is a trans-boundary resource and in order to establish a sustainable long-term strategy, it is essential to prioritize the integrated management of this resource and reach a comprehensive basin-wide agreement among all involved parties.
#### b) West Bank Catchment Area

The West Bank encompasses 73 delineated sub-basins, of which 33 are major sub-basins that direct water toward the Mediterranean Sea, the Dead Sea, and the Jordan River. The accompanying figure 13, page 110 provides a visual representation of the boundaries and identifiers of each basin within the West Bank.

Strategically, it is essential to focus on the management of major wadis, which flow either westward toward the Mediterranean or eastward into the Jordan Valley and the Dead Sea. PWA monitors some of these wadis, and the estimated total water resources are as follows (reference: Water Harvesting Master Plan, Baseline Report 2023):

- Wadis flowing westward to the Mediterranean Sea: 16 wadis with an average total runoff of 47.6 MCM/y.
- Wadis flowing eastward to the Jordan Valley: 9 wadis with an average total runoff of 27.7 MCM/y.
- Wadis flowing eastward to the Dead Sea: 8 wadis with an average total runoff of 21.5 MCM/y.

By enhancing the management of these water resources, stakeholders can promote sustainable agricultural practices, improve water availability, and contribute to the overall resilience of the region's water supply.

The West Bank is characterized by a network of river basins that play a vital role in its hydrology. Each basin is assigned a unique identifier and delineated boundary to facilitate effective management and planning. Below is an overview of the river basin identifiers and their respective boundaries within the West Bank:



Figure 13: River Basin Identifiers and Boundaries in the West Bank

Recognizing the identifiers and boundaries of river basins in the West Bank is vital for effective water resource management and regional planning. This understanding enables targeted interventions to mitigate water scarcity, enhance irrigation practices, and boost agricultural productivity, thus promoting the sustainability of the region's water resources

### V.5.3 Storm Water Harvesting National Strategy

#### a) Country Specific Constraints for Rainwater Harvesting

The development of rainwater harvesting infrastructure in Palestine encounters several constraints, which can be categorized into political, geographical, and hydrogeological factors:

- 1. **Political Constraints:** The majority of runoff occurs in the West Bank, a region characterized by complex political dynamics and governance structures. The construction of water management facilities, such as dams, necessitates collaboration among various stakeholders. These political intricacies can impede the effective planning and execution of dam projects.
- 2. **Geographical Constraints:** The topography of the West Bank poses significant challenges for the construction of dams. The area is marked by rugged terrain, steep slopes, and narrow valleys, making it difficult to identify suitable sites for large-scale dams capable of adequate water storage while delivering economic benefits. Additionally, efforts to minimize environmental and social impacts further complicate site selection.
- 3. **Hydrogeological Constraints:** The predominant bedrock in the West Bank consists mainly of limestone, which exhibits high permeability. This geological characteristic allows water to infiltrate rapidly, thereby limiting the storage capacity of dams and potentially jeopardizing their structural integrity. As a result, the hydrogeological conditions significantly influence the cost of dam construction, often necessitating partial or complete lining of reservoirs.

Addressing the rainwater harvesting constraints in Palestine requires meticulous planning, active stakeholder engagement, and effective coordination among all relevant parties. It is essential that dam projects in the West Bank are grounded in comprehensive technical assessments, environmental sustainability, and social inclusivity to promote sustainable and equitable management of water resources in the region.

#### b) Strategic orientation 1: Building Dams in Major wadis

#### **Objectives of the National Strategy for Stormwater Harvesting**

The national strategy aims to optimize the storage of runoff water in dams, facilitating sustainable water harvesting. This initiative is vital for addressing the anticipated variability linked to climate change, enhancing resilience to external shocks, and enabling the integration of treated wastewater for improved reuse.

The proposed dams will fulfill two primary objectives:

- 1. **Collection of Rainwater:** The dams will capture rainwater from surrounding catchment areas, thereby increasing overall water resource availability.
- 2. **Storage of Treated Wastewater:** The infrastructure will facilitate the storage of treated wastewater during winter months, when irrigation demand is low. This strategic storage will maximize water availability for future use.

By combining stormwater and treated wastewater, and storing it for several months during winter, this strategy will generate a water resource of higher quality than that produced solely by wastewater treatment plants. This improvement in water quality will broaden the types of crops eligible for irrigation, enhancing agricultural productivity and sustainability in the region.

#### c) Implementation Plan for Water Harvesting Priority Projects

A comprehensive implementation plan has been formulated, prioritizing key projects based on their urgency and feasibility:

- Phase 1 (Short-term): This initial phase concentrates on the execution of the 'Top 5' most promising projects within a five-year timeframe. These projects have been selected due to their immediate impact and overall viability.
- Phase 2 (Mid-term): The second phase encompasses the 'Top 10' promising projects, with a target realization period of ten years. This phase will leverage insights and lessons learned from the execution of Phase 1.
- **Phase 3 (Long-term):** The final phase includes the remaining 'Top 15' projects, which are typically characterized by lower priority or higher uncertainty, often stemming from insufficient data.

A detailed summary of the potentials dam sites including priorities, location, annual water potential, intended purposes in the short, medium and long term provided in Table 19 below.

This strategic orientation emphasizes the construction of dams in major wadis as a crucial component of sustainable water resource management. By enhancing water quality and availability, the strategy aims to support agricultural productivity and resilience in the face of climate variability.

Priority	Rank	Location	Basin Name	Dam Name	Political Area	Water Potential (Annual) (hm³)	Max. Storage Volume (MCM)	Wastewater Contribution	Purpose	Net Irrigation Area (dunum)
TOP - 5	0	East	Wadi Faria - Malaqi	Al Faria Dam	В	5,72	3.06	Nablus East WWTP	Irrigation	8,576
	1	South	Wadi EL Khaleel	Beit Amra Dam	B/A	14,67	8.6	Hebron WWTP + South Hebron C1	Irrigation	22,001
	2	West	AdDilb	Saffa Dam/ Kharbatha	С	2,69	1.97	Ein Jariot WWTP	Irrigation	4,039
	3	West	Wadi Massin	Balaa Illar Dam	А	2,24	3.98	-	Irrigation	3,367
	4	West	Wadi Abu Nar	Iraq an Nataf Dam	C/B	1,15	2.94	Option: Pumping from Jenin WWTP will be studied	Irrigation	1,730
	5	East	Upper Qilt	Aqabat Jabr Dam	С	2,74	3.95	-	Irrigation	4,110
	6	South	Wadi Shunaiq	Al Samou Dam	В	0,38	1.37	-	Irrigation	567
TOP - 10	7	North	Wadi Jamus	AL Yamoun Dam	С	0,40	0.86	Al Yamoun TP	Irrigation	595
	8	West	Wadi Sarida	Kufr AL Dik Dam	B/A	4,67	7.14	Salfit WWTP + NE Ramallah WWTP	Ecological- Irrigation	7,012
	9	West	Wadi Qana	Kufur Thulth Dam	С	0,56	3.31	Kufr Thulth proposed WWTP to be studied	Irrigation	840
	10	East	Wadi Nueima	Nueima Dam	А	1,43	2.26	Taybeh-Rammun WWTP	Irrigation	2,148
TOP - 15	11	East	Wadi Malih	Upper Malih Dam	С	1,71	1.74	Tayser WWTP	Irrigation	2,560
	12	East	Wadi Al Ahmar	Al Ahmar Dam	С	0,35	1.48	-	Irrigation	530
	13	West	Wadi Attin	Kur Dam	В	0,79	1.96	-	Irrigation	1,191
	14	East	Wadi Al Ghar	Taamreh Dam (Bani Naem)	B/A	1,86	3.34	Sa'ir Arrub WWTP	Ecological- Irrigation	2,792
	15	East	Wadi Nar	Wadi Nar Dam	С	1,82	3.25	Zaatara WWTP to be studied	Irrigation	2,740

 Table 19: Estimated Available Water Resources from Various Wadis in the West Bank<sup>21</sup>

<sup>&</sup>lt;sup>21</sup> Data source: PWA- Water Harvesting Master Plan

#### d) Strategic orientation 2: Rainwater Harvesting at the Land Plot Scale

The national short-term strategy (2023-2030) aims to maximize the volumes of rainwater harvesting. In this regards PWA encourages the construction of small-scale infrastructures to harvest rainwater either on the scale of a building or individual plot of land.

Land plot-level rainwater harvesting presents a significant opportunity for sustainable water management through private investment by building and landowners. This strategic orientation focuses on effectively capturing and utilizing rainwater, fostering resilience, and enhancing water availability across agricultural, domestic, and ecological contexts.

#### **Objectives:**

- 1. **Enhancing Water Security:** By collecting rainwater at the plot level, landowners can reduce dependence on external water sources and improve resilience to drought conditions.
- 2. **Promoting Sustainable Agriculture:** Utilizing harvested rainwater can support irrigation practices, thereby increasing crop yields and contributing to food security.
- 3. **Reducing Runoff and Erosion:** Implementing rainwater harvesting systems can help mitigate surface runoff and soil erosion, promoting better land management and preserving soil health.
- 4. **Encouraging Community Engagement:** Involving local communities in the design and implementation of rainwater harvesting systems fosters a sense of ownership and encourages sustainable practices.

#### e) Implementation Strategies:

- 1. **Design and Infrastructure:** Develop and promote affordable, efficient rainwater harvesting systems tailored to local conditions, including cisterns, barrels, and infiltration trenches.
- 2. **Education and Training:** Conduct workshops and training sessions to educate landowners and farmers on the benefits of rainwater harvesting and best practices for system implementation.
- 3. **Incentives and Support:** Provide financial incentives, grants, or subsidies to encourage the adoption of rainwater harvesting technologies among landowners.
- 4. **Monitoring and Evaluation:** Establish a framework for monitoring the effectiveness of rainwater harvesting systems, including water quality and quantity assessments, to inform future improvements.
- 5. **Integration with Other Water Management Practices:** Encourage the combination of rainwater harvesting with other sustainable practices, such as greywater reuse and soil moisture conservation techniques, to maximize water efficiency.

#### f) Role of Stakeholders

Local initiatives from building owners and farmers are crucial for the success of this strategy. The PWA, MoLG and municipalities will actively support these initiatives by:

- Promoting appropriate water collection techniques based on regional characteristics.
- Integrating water and soil conservation practices into academic curricula for relevant professionals.
- Adapting building, agricultural, and urban planning regulations to facilitate rainwater harvesting.

By prioritizing rainwater harvesting at the land plot scale, the strategy aims at enhancing local water resilience, support sustainable agricultural practices, and empower communities to effectively manage their water resources and response to emergency situations.

## V.6 Reuse of Treated Wastewater for Irrigation, Industrial and Managed Aquifer Recharge

#### V.6.1 Rationale for reuse of treated wastewater

The National Water Policy states that "Treated wastewater effluent is considered an alternative water resource and is added to the water balance in accordance with the Palestinian Standards and Specification; it is the National Policy of Palestine treat all produced wastewater to a quality suitable for safe and productive reuse, in line with national standards, and support the distribution and productive reuse of treated wastewater".

Treated wastewater can also play a crucial role in MAR, particularly relevant in the Gaza Strip, where groundwater is threatened by saline intrusion. In this context, recharging the aquifer with low-salinity water represents a highly effective long-term strategy for safeguarding this vital resource. To this end, PWA has initiated two projects in Gaza aimed at recharging the coastal aquifer through large infiltration basins.

However, implementing aquifer recharge with treated wastewater in the West Bank presents challenges, as the region's karstic aquifers are particularly sensitive to fecal contamination.

#### a) Additional Applications

Beyond aquifer recharge, treated wastewater can be utilized for industrial purposes and potentially sold or swapped with Israel. Although industries in the West Bank that require significant quantities of process or cooling water are limited (primarily concentrated in the stone-cutting sector in the Hebron region) they may not fully absorb the available treated wastewater.

Consequently, it is preferred to utilize treated wastewater for irrigation within Palestine to enhance food security and reduce reliance on food imports. In instances where not all treated wastewater can be utilized domestically, the sale or exchange of this resource could be considered.

Additionally, it is essential to explore the possibility of trans-boundary agreements for the export of treated wastewater from Palestine in exchange for the import of fresh water beyond the allocated shares from shared resources.

#### V.6.2 Wastewater Reuse Regulation and Support

The reuse of wastewater for irrigation is governed by Instructions No. 34 of 2012, which outlines requirements for four classes of water (A-D). Properly treated wastewater meets the standards for Class A. The regulation explicitly prohibits the use of treated wastewater for:

• Watering livestock

- Cultivating vegetables
- Direct groundwater recharge
- Aquaculture

PWA in collaboration with the MoA, will establish mechanisms to support farmers in the restricted use of treated wastewater for agricultural purposes, considering economic viability.

To enhance regulatory frameworks, EQA, PSI, MoA, and PWA will work together to update and enforce all regulations related to Environmental Limit Values (standards and guidelines) for treated wastewater reuse and managed aquifer recharge, including the required specifications for various crops.

#### a) Additional Regulatory Developments

Further regulations will be developed to address:

- Investment in treated wastewater carriers, including ownership definitions, implementation rules, and funding arrangements
- Management and governance of treated wastewater storage, conveyance, and distribution
- Regulations and bylaws govern the treated wastewater transfer to the new dams' locations, mixing with storm water and quality requirements for reuse.
- Regulations and by-laws to manage treated wastewater reuse for agricultural, industrial and recreational purposes
- Institutional and legal frameworks for Public-Private Partnerships (PPP)
- Mechanisms for setting tariffs on treated wastewater

These initiatives aim to establish a robust framework for the sustainable reuse of treated wastewater, thereby optimizing water resources and supporting agricultural and industrial development in Palestine.

#### V.6.3 Strategic Orientations for Reuse

The national reuse strategy encompasses two main components:

- 1. **Water Component:** The objective of this component is to ensure that every cubic meter of treated wastewater is made available for irrigation, industrial use, or managed aquifer recharge.
- 2. Agricultural Component: This component aims to enhance the productivity of treated wastewater. The goal is to ensure that every cubic meter of treated wastewater utilized for irrigation is used with maximum efficiency, thereby optimizing the return on each cubic meter applied.

The success of the national strategy hinges on excellent coordination between these two components (Water and Agricultural Components), necessitating close consultation, coordination and cooperation among the various stakeholders involved in implementation, including the **MoA**, **PWA**, **EQA**, **Municipalities**, **WUAs**, and **WWTP operators**.

#### a) Water component

The aim of this component is to make every cubic of treated wastewater available for irrigation, industry or artificial recharge. This has many implications and inevitably involves building expensive facilities:

- The reuse strategy involves building a system for transporting treated water to the irrigable lands (storage facilities, piping and pumping infrastructure); consequently, any new treatment plant project will have to include a comprehensive reuse scheme. The reuse strategy involves building a distribution network to distribute the water among the farmers; this part of the work, managed by the WUA in coordination with MoA and PWA, may involve a financial contribution from the beneficiaries.
- Part of the treated wastewater is produced in winter (outside the irrigation season); in Gaza, it is
  possible to use it for artificial groundwater recharge; on the other hand, in the West Bank, there are
  fewer opportunities for artificial recharge; It is therefore essential to store treated wastewater during
  the winter, by building a reservoir; any new treatment plant project should at least include a feasibility
  study for one or more reservoirs, with a capacity adapted to the water production of the WWTP during
  the winter. Based on the Water Harvesting Master Plan (PWA, 2023) part of the treated wastewater
  shall be transferred to the new dams to be mixed and reused later.
- Some of the treated wastewater is generated in regions where water resources surpass agricultural demands, such as in the Tulkarm area. Consequently, it becomes essential to transport the treated wastewater to regions experiencing deficits. In this context, it is imperative that the treatment plant project incorporates, at a minimum, a feasibility study of one or more transmission systems to the deficit areas or the potential sale or swapping of treated wastewater, or exploring additional opportunities for reusing treated wastewater in the industrial sector or for managed aquifer recharge, where feasible and in accordance with established national standards)
- In case the treated wastewater shall be used for the MAR wastewater will be treated in high performance treatment plants (Tertiary treatment is crucial for applications that require high-quality effluent, such as irrigation, industrial use, or discharge into sensitive ecosystems).

#### b) Agricultural Component

The objective of this component is to actively involve farmers from the design phase of any new WWTP. Such engagement may lead to necessary modifications to the project, enhancing the overall success of the reuse operation. Previous experience indicates that the participation of Palestinian farmers in a reuse program is not guaranteed; therefore, their involvement in the planning and design stages is essential.

To facilitate this engagement, activities to promote reuse among farmers will be managed by the MoA in collaboration with WUAs. These initiatives will include:

- An extensive and **transparent awareness campaign** will be conducted prior to the implementation of any project. This campaign will provide critical data regarding water quantities, water quality, approved crops, irrigable surface areas, and operation and maintenance costs. The use of mass media will be explored as a tool to effectively communicate the benefits and importance of water reuse schemes.
- Proactive measures will be taken **to promote and increase the number of WUAs**. This will involve simplifying registration procedures, recognizing pre-existing associations of irrigators without imposing mandatory transformations, and allowing flexibility in their internal organizational structures.
- Public funding will be allocated to cover all or part of the investments required for the treated wastewater distribution network. However, it is important to note that the national strategy does not

include provisions for subsidizing the operational costs of the irrigation network, which will remain solely the responsibility of the beneficiaries, organized through their respective WUAs.

• Treated wastewater will be provided to farmers at no charge, with the operating costs of the WWTP funded by the entities that generated the wastewater, in accordance with the **Polluter-Pays Principle**.

From a strategic perspective, these coordinated efforts will ensure that farmers are effectively engaged in the reuse of treated wastewater, leading to improved agricultural productivity and sustainable water resource management in the region.

## V.7 Managed Aquifer Recharge (MAR)

MAR enhances natural groundwater recharge processes by promoting infiltration at strategically selected locations. This intervention is especially critical in regions facing over-exploitation of aquifers. Utilizing water that would otherwise be lost (such as floodwaters and overflow from dams) can significantly improve groundwater levels. This method offers notable advantages over surface water storage, as underground storage minimizes evaporation losses, particularly in arid and semi-arid climates like Palestine.

#### V.7.1 Techniques for MAR

Various techniques for artificial groundwater recharge include:

- **Direct Infiltration:** This method involves constructing collection reservoirs, terraces, ditches, check dams, or canals to promote surface infiltration.
- Infiltration or Injection Wells: While effective, this approach requires careful attention to water quality, especially when wells reach saturated zones, as current regulations prohibit direct injection into these areas.

The design of artificial groundwater recharge systems should take into considerations the following factors:

- Soil and Geological Suitability: The permeability of surface soils is essential for effective recharge., geological formations and structures are important in defining the suitable technique and the quality of infiltrated water
- Aquifer Storage Capacity: The availability of storage within the aquifer must be assessed.
- **Closed Basins:** Ensuring that recharged water is effectively utilized within the same the targeted hydrological boundaries is crucial.
- Legal and Regulatory Factors: legal and institutional arrangements can significantly impact the success of MAR initiatives.

However, political and environmental pollution are considered main challenges facing the artificial recharge

#### Water Sector Strategy

To reverse, or at least mitigate, saline intrusion, the national sectoral strategy advocates for the artificial recharge of the coastal aquifer using treated wastewater. This approach allows for the subsequent exploitation of the aquifer in proximity to the recharge area, particularly for the irrigation of high-value crops, such as vegetables

#### a) Gaza

The coastal aquifer in Gaza has been overexploited for several decades, leading to a decline in the piezometric surface and the intrusion of saline water. The artificial recharge is important to recover the yield capacity of the aquifer and enhance the quality of groundwater

#### b) West Bank

Artificial recharge presents a potential strategy for enhancing groundwater resources; however, its implementation necessitates stringent quality control measures. The geopolitical context complicates this approach, as there are concerns regarding the potential contamination of groundwater extracted downstream from shared aquifers. PWA is apprehensive that water recharged artificially in Palestinian aquifers may ultimately benefit downstream Israeli wells.

The Palestinian experience with MAR in the West Bank has been limited primarily to the use of infiltration wells in the Sanour Plain. Here, accumulated surface runoff is directed into infiltration wells, facilitating the movement of water into the unsaturated zone above the local aquifer. This method has successfully improved groundwater potential and elevated water levels in surrounding wells.

Artificial recharge is recognized as a viable solution for augmenting aquifer storage, particularly in the context of depleted shallow aquifers in the West Bank, where water quality is deteriorating. Implementing this strategy aligns with the Palestinian objective of optimizing access to additional groundwater resources.

However, one significant limitation to artificial recharge in the region stems from the geological characteristics and groundwater flow regimes. The dominant formations of highly fractured karstified limestone and dolomite, dating from the Upper Cretaceous to Tertiary periods, present challenges. The conduit systems within the upper and lower Mountain Aquifer systems render the introduction of diverse water types particularly risky, as these aquifers serve as strategic regional drinking water sources. Any contamination could severely impact the availability of potable water in the West Bank.

#### c) Potential Locations for Artificial Recharge

A water harvesting master plan has identified three preliminary sites suitable for artificial recharge within the Eastern Basin, targeting local shallow aquifer systems:

- 1. Faria Basin:
  - a. Al Nasaryah in Nablus Governorate
  - b. Al Jeftlic in Jericho Governorate
- 2. Al Auja Site in Jericho Governorate
- 3. Lower Wadi Al Qilt Drainage System in Jericho Governorate

In these proposed sites, groundwater is extensively used for agricultural purposes, with demand rapidly increasing due to intensive practices, particularly the cultivation of over 300,000 palm date trees, significantly raising water demand.

**MAR** is a crucial strategy for enhancing groundwater resources in Gaza while it is an optional solution in the West Bank. By addressing the challenges and identifying suitable locations for recharge, this initiative can play a vital role in sustainable water management, particularly in regions facing over-exploitation and water scarcity.

## V.8 Integrated Water Resources Management

#### V.8.1 Water resources monitoring

In light of the significant water shortages in Palestine, primarily attributed to the Israeli occupation, the effective monitoring of water resources is of paramount importance. PWA is tasked with the collection, analysis, and dissemination of data pertaining to water resources, encompassing groundwater levels, water quality, stormwater flow, and related quality metrics.

This critical information is made available through periodic reports, such as the "Status Report of Water Resources in Palestine – 2021" (PWA, 2021). Furthermore, there exists an urgent need to enhance the monitoring of both the quantity and quality of influent and effluent from wastewater systems to ensure sustainable water management and safeguard public health

#### V.8.2 Delineation of Protection Zones and Rehabilitation Programs

The majority of Palestinian sources of drinking water are vulnerable to pollution, necessitating the formulation of measures to ensure reliable protection in both current and future contexts. Consequently, the establishment of effective protection zones, grounded in detailed assessments of all major water resources, is essential, with particular emphasis on key springs. This initiative should be accompanied by rehabilitation programs for existing wells and springs, implemented in collaboration with relevant stakeholders.

#### V.8.3 Enhancing Water Allocation Among Communities and Individuals

The updated national water strategy transcends the mere establishment of average indicators for coverage, service levels, and water quality. Its objective is to minimize disparities among all Palestinian citizens and regions. To achieve this goal, the national strategy outlines the implementation of actions at three distinct levels:

- 1. **Inter-Regional:** Facilitating the transfer of bulk water between regions to address and mitigate existing inequalities.
- 2. Inter-Community: Promoting the interconnection of water systems managed by various operators, along with effective reallocation management.
- 3. **Inter-Customer:** continuous development of tariff policies designed to enhance access to water services for economically disadvantaged individuals.

This comprehensive approach aims to ensure equitable water distribution and improve overall service delivery across all communities.

#### V.8.4 Clustering Water Service Zones Based on Access to Water Resources

The 2013 National Water Sector Strategy evaluated the volume of water available in each governorate and aimed to reduce inequalities among administrative regions, as reflected in per capita water supply metrics. However, this methodology encountered challenges, as customers were organized into administrative units that did not correspond with the actual structure of water supply systems. As a result, disparities in access to water resources persisted within individual governorates, with certain communities lacking the requisite infrastructure for effective water redistribution, thereby exacerbating inequalities among users.

To resolve these challenges, the future water sector strategy will adopt a functional approach rather than an administrative one. It will establish 13 clusters defined by the availability of accessible water resources. Each cluster will comprise communities dependent on the same water sources, including wells, springs, desalination plants, and connections to the Mekorot water network. The Gaza Strip will be designated as a single cluster, while the West Bank will be organized into 12 distinct clusters (refer to figure 14, page 122).

This strategic clustering initiative aims to enhance the management and equitable distribution of water resources, thereby fostering improved access for all communities.

#### **Strategy Objectives**

- 1. **Reducing Inequalities Between Clusters:** Ensure that each cluster receives a minimum provision of 75 l/c/d of drinking water.
- Reducing Inequalities Within Communities: Develop infrastructure to facilitate the redistribution of water within each cluster, including the installation of booster stations, regional reservoirs, and main water supply lines.
- 3. Enhancing Technical and Financial Performance: Improve technical efficiency by reducing NRW and enhance financial performance through optimized pressure management, thereby lowering operating costs across each cluster.
- 4. **Prioritizing Local Resources:** Promote the utilization of local resources for domestic water services, thereby ensuring sustainability and fostering self-sufficiency.

This strategy outlined for water resources monitoring, protection, allocation, and clustering represent a holistic approach to addressing the pressing water challenges in Palestine. By prioritizing equitable access and sustainable management, these initiatives can contribute to resilience and improve the overall water situation for all Palestinian citizens





## V.9 Strategy to Reduce Transboundary Wastewater Flow from the West Bank

This section addresses the critical issue of wastewater management related to the flow of treated, mixed, and untreated wastewater through wadis into Israel. Israeli WWTP operators classify this water as untreated, which results in the PA incurring treatment costs. Notably, these costs have risen significantly over the past five years.

Israeli authorities routinely deduct substantial amounts from Palestinian tax revenues on a monthly basis, justifying these deductions as necessary for wastewater treatment conducted within Israel.

PWA has established a strategic priority for the next two decades: maximizing the reuse of treated wastewater for agricultural and industrial applications, as well as managed aquifer recharge where feasible and applicable.

This strategic overview emphasizes the necessity for comprehensive collaboration and transparency in wastewater management.

#### Key strategies should include:

- 1. Enhancing Wastewater Treatment Capacity: Investing in the construction and upgrading of WWTPs in the West Bank to ensure a higher volume of wastewater is treated prior to crossing into Israeli territory.
- 2. Establishing Transparent Billing Procedures: Negotiating for clear and detailed invoicing practices that ensure accurate billing for wastewater treatment, including itemized breakdowns in accessible languages for all stakeholders.
- 3. **Promoting Water Reuse**: Expanding initiatives for the reuse of treated wastewater for agricultural and industrial purposes, thereby reducing dependency on freshwater resources.
- 4. **Strengthening Regulatory Frameworks:** Developing joint regulatory frameworks to manage transboundary wastewater flows effectively, ensuring compliance with mutually agreed-upon standards.
- 5. Infrastructure for Water Transfer: If the demand for treated wastewater in the area is lower than the volume produced, include necessary infrastructure in the project to transfer the excess water to areas with unmet needs. This includes the installation of pipes and booster stations to facilitate efficient water distribution.
- 6. **Swapping of treated Wastewater:** Where expedient, consider the trans-boundary export of treated wastewater in return for the trans-boundary import of fresh water over and above the agreed allocated quantities.

#### V.9.1 The Interconnected Issues of Transboundary Wastewater and Reuse

In the West Bank, the interconnected issues of transboundary wastewater and its reuse present significant challenges. Wastewater from major urban centers, whether treated or untreated, crosses the border if not utilized within the region, resulting in considerable financial burdens for the PA. The Israeli government imposes charges for the treatment of this wastewater without acknowledging the treatment already conducted on the Palestinian side of the Green Line. This process lacks reliable verification and measurement mechanisms, leading to direct deductions from Palestinian tax revenues, from the perspective of the PA, it is crucial not only to treat wastewater but also to achieve comprehensive reuse and valorization within the West Bank. The primary demand for treated wastewater is in agricultural

irrigation, as industrial applications do not sufficiently utilize the available volume. However, several significant constraints impede effective agricultural reuse:

- **Restrictions on Crops:** The MoA has defined a list of crops permissible for irrigation with treated wastewater according to Palestinian Specifications No. 742/2015. This list excludes vegetables, which are profitable in certain areas, resulting in a lack of demand for treated wastewater.
- Social Acceptance for Treated Wastewater reuse in Agriculture: Public acceptance of treated wastewater reuse is essential for advancing sustainable water management in the face of increasing water scarcity. To foster this acceptance, key strategies include educating the public about treatment processes and safety standards to build trust, engaging communities in decision-making to incorporate local values, showcasing successful case studies to demonstrate efficacy, and highlighting socio-economic benefits such as cost savings and environmental impacts. By prioritizing these approaches, stakeholders can effectively enhance public support for treated wastewater reuse initiatives.
- **Sufficient Local Resources:** In some regions, such as Tulkarm and Qalqilya, current water resources are abundant and inexpensive, further diminishing the demand for treated wastewater.
- Seasonal Demand: The irrigation season runs from April to October, while WWTPs produce treated water year-round. Therefore, effective storage solutions are required during the autumn and winter months to manage this surplus.

The PWA's strategic approach aims to mitigate the financial and operational burdens associated with transboundary wastewater flow while enhancing the sustainable management of water resources in the West Bank. By prioritizing the reuse of treated wastewater, improving treatment infrastructure, and establishing transparent processes, PWA seeks to foster a more equitable and efficient water management framework.

Taking these constraints into account, the sector strategy for wastewater treatment in the West Bank comprises several interrelated components:

- 1. **Enhancing WWTP Capacity**: Construct and/or expand WWTPs to ensure the capacity to treat all wastewater collected in the West Bank within the medium term.
- 2. Integrated Design for Reuse: Establish a framework for reusing treated wastewater from the design stage of each WWTP, ensuring that treatment and reuse components are implemented concurrently.
- 3. **Storage Solutions:** Construct a dam with adequate capacity to store treated wastewater during the winter months, facilitating effective management of water resources.
- 4. Infrastructure for Water Transfer: If local irrigation water demand is lower than the volume of treated wastewater produced, incorporate the necessary infrastructure to transfer excess water to areas with unmet irrigation needs. This includes installing pipes and booster stations to ensure efficient distribution.

# Part VI. Water and Wastewater Services Improvement

## VI.1 Water Resources Mobilization for Domestic and Industrial Supply

#### VI.1.1 West Bank

#### **Strategic objectives**

In the West Bank, the primary sources of water for domestic and industrial use are the sustainable abstraction of groundwater resources and the purchase of water from Mekorot.

The strategies for the short term (by 2030) and medium term (by 2042) are structured around the following objectives:

- **Groundwater Abstraction**: Achieve a substantial increase in groundwater abstraction by establishing new wells and retrofitting existing ones, while ensuring the sustainable management of aquifers is maintained.
- Water Purchases: Implement a measured increase in water purchases from Mekorot to enhance overall supply and meet demand.
- **Spring Contribution**: Acknowledge that springs will provide only a marginal contribution to water supply, as this source lacks the reliability necessary to secure consistent domestic water availability.

These objectives aim to create a balanced and sustainable water management strategy that addresses current and future water needs in the West Bank.



Figure 15: West Bank – Water resources for domestic and industrial supply

#### VI.1.2 Gaza

#### **Strategic objectives**

In Gaza, the primary water resources for domestic and industrial supply are the sustainable abstraction of groundwater and the desalination of seawater. The short-term (by 2030) and medium-term (by 2042) strategies are founded on the following objectives:

- **Enhanced Water Production**: Achieve a significant increase in water production through seawater desalination to meet growing demand.
- **Moderate Water Purchases**: Implement a very moderate increase in water purchases from Mekorot to supplement local supplies.
- **Managed Groundwater Reduction**: Gradually reduce groundwater abstraction from the coastal aquifer to mitigate the progression of saltwater intrusion. This reduction will be phased, aligning with the commissioning of alternative resources, such as new desalination plants.
- Artificial Aquifer Recharge: Facilitate the artificial recharge of the coastal aquifer using treated wastewater to elevate the piezometric surface and further reduce saltwater intrusion.



*Figure 16: Gaza – Water resources for domestic and industrial supply* 

## **VI.2** Water Resource Mobilization for Irrigation

#### VI.2.1 West Bank

#### **Strategic objectives**

In the West Bank, the Primary water resources for irrigation include the sustainable abstraction of groundwater resources (springs and wells) and the reuse of treated wastewater. Additionally, rainwater harvesting will be increasingly recognized as a vital resource, with the construction of dams for the storage of stormwater and treated wastewater during the winter months.

The short-term (by 2030) and medium-term (by 2042) strategies are structured around the following objectives:

- 1. **Managed Groundwater Use**: Implement a modest reduction in groundwater abstraction for irrigation purposes. This shift will involve reallocating the use of certain agricultural wells to domestic supply.
- 2. Expansion of Treated Wastewater Reuse: Achieve a significant increase in the reuse of treated wastewater, rising from 2 MCM/year to 29 MCM/year over the next two decades.
- 3. Enhancement of Rainwater Harvesting: Increase the contribution of rainwater harvesting to irrigation. Dams constructed for winter storage of treated wastewater will also capture stormwater, with a planned increase to reach 21 MCM/year over the next two decades

These strategic objectives aim to optimize water resource management for irrigation, ensuring sustainable agricultural practices and enhancing overall water availability in the West Bank.

Water resources for	Baseline	Target		
irrigation (MCM/year)	2022	2030	2042	
wells and springs	82,4	88,5	74,6	
rainwater harvesting (dams)	2,3	11,0	21,0	
treated wastewater reuse	2,3	10,0	29,0	
Total	87,0	109,5	124,6	

#### Table 20: West Bank – Water resources for irrigation

#### VI.2.2 Gaza

#### **Strategic objectives**

**In Gaza**, the primary water resources for irrigation consist of the sustainable abstraction of groundwater (from wells) and the reuse of treated wastewater. While rainwater harvesting is acknowledged as an additional resource, its development is limited by the availability of suitable dam sites. The short-term (by 2030) and medium-term (by 2042) strategies are structured around the following objectives:

- **Enhancement of Treated Wastewater Reuse**: Expand the potential for treated wastewater reuse through the construction and extension of WWTPs, thereby increasing the availability of this critical resource for irrigation.
- **Managed Aquifer Recharge**: Implement and extend infiltration infrastructure to facilitate the reuse of treated wastewater. This approach will not only provide the tertiary treatment necessary to meet quality standards for various crops but will also help to contain and reverse seawater intrusion in the coastal aquifer.
- **Reduction of Groundwater Abstraction Rates**: Gradually decrease the rate of groundwater abstraction to protect the coastal aquifer from depletion and mitigate the impacts of seawater intrusion. This objective is essential for ensuring the long-term sustainability of groundwater resources.

These strategic objectives aim to optimize water resource management for irrigation in Gaza, enhancing agricultural resilience while safeguarding vital water sources.

	Baseline	Target		
Agricultural demand	2022	2030	2042	
Agricultural demand	95	88	78	
Treated wastewater reuse	7.1	21	27	
Groundwater (wells & springs)	88	67	51	

Table 21: Gaza – Water resources for irrigation

#### VI.3 Domestic water service improvement

#### VI.3.1 Improving service quality

Part VI, page 125, was dedicated to the mobilization of supplementary water resources to secure urban water distribution. The national water sector strategy encompasses more than merely quantitative enhancements; it also seeks to elevate the quality of services provided to consumers, particularly in the following areas:

- Water pressure and continuity of service
- Water quality

#### VI.3.2 Gaza: priority to water quality

The primary issue with the current water distribution system in Gaza is the high salinity of the water supply. A significant number of users receive water that contains excessive levels of chloride and nitrates, rendering it non-compliant with the WHO drinking water standards. Consequently, many households rely on alternative sources of drinking water, primarily desalinated water provided by private suppliers. This dependence on private desalination raises concerns about accessibility, affordability, and the overall sustainability of water resources in the region. Addressing the salinity issue and improving the quality of the public water supply is critical for ensuring safe drinking water for all residents in Gaza

It is imperative to address the salinity issue and enhance the quality of the public water supply to ensure safe drinking water for all residents of Gaza. In response to this pressing challenge, the Government has initiated an ambitious program aimed at producing freshwater through seawater desalination processes, specifically reverse osmosis. This method yields water with minimal salt and nitrate content, thereby improving quality.

To optimize the distribution of this desalinated water, it will not be directly injected into the existing distribution network, as such an approach is inadvisable due to the insufficient mineralization of desalinated water. Instead, the desalinated water will be blended with a precisely calculated proportion of water extracted from the coastal aquifer. This strategy will enhance the total volume of water available while ensuring compliance with WHO standards, ultimately benefiting a greater number of users in the region.

#### Strategic objectives

#### Short-Term (by 2030)

*Ensure that all water service operators conduct comprehensive testing of water quality and publicly disclose the average annual levels of nitrate and chloride.* 

Achieve a compliance rate of 50% for the water distributed in Gaza with respect to WHO standards regarding salinity and nitrate contents.

#### Medium-Term (by 2042)

Attain an 80% compliance rate for the water distributed in Gaza with WHO standards concerning salinity and nitrate levels.

#### VI.3.3 West Bank: Towards Continuous Water Supply (24/7)

The principal challenge facing the water distribution system in the West Bank is its intermittent supply, with only a limited number of users benefiting from continuous water access (designated as 24/7). Many residents receive water only once or twice a week, or in some cases, as infrequently as once every two months.

To improve the quality of service to users, the Government will implement a comprehensive series of institutional and technical measures through 2042. The aim is to enhance the operational efficiency of water service providers and ensure a more equitable distribution of available water resources:

• Establish a Cluster-Based Distribution System: Organize water distribution around clusters of municipalities, ensuring that each cluster is provided with a sufficient supply of safe water, with a target of at least 75 l/c/d.

- Enhance the National Water Company (NWC): Develop the NWC by gradually increasing its resources to optimize bulk water supply within each cluster and facilitate necessary inter-cluster water transfers, thereby addressing regional disparities.
- **Construct Regional Reservoirs:** Build regional reservoirs to effectively manage pressure within the distribution networks, ensuring consistent supply and improved service delivery.
- **Support Water Service Providers:** Provide extensive support to all water service providers, particularly the RWUs, to reduce NRW. This support will include subsidies for the installation of prepaid water meters, acquisition of essential equipment, and engagement of specialists for leak detection.

#### Strategic objectives

#### Short-Term (by 2030)

Ensure that 90% of customers receive water on a weekly basis

Achieve a provision of water at least every other day for 75% of customers.

Medium-Term (by 2042)

Ensure that 100% of customers receive water on a weekly basis.

*Ensure that 90% of users have access to water at least every other day.* 

These strategic initiatives aim to transform the water supply landscape in the West Bank, moving towards a more reliable and equitable system that meets the needs of all residents.

## VI.4 Wastewater Service Improvement

#### VI.4.1 A Strategic approach to sanitation

A modern sanitation system comprises several interconnected components, each significantly impacting the overall performance of the system. The national sanitation strategy establishes specific targets for each of these components:

- Sewer Network: This component is designed to collect wastewater from the maximum number of users, contingent upon factors such as size, capacity (diameter, gradient, lifting pumps), and infrastructure efficiency. Its effectiveness is assessed by the percentage of the population residing in areas equipped with sewer systems.
- Household Connections: The process of connecting households to the sewer system requires explicit consent from residents, who may also need to install pumps to facilitate wastewater lifting. The effectiveness of this component is measured by the ratio of households that are actually connected to those eligible for connection.
- Wastewater Treatment Plants (WWTPs): These facilities are responsible for treating wastewater to a
  quality suitable for discharge into the natural environment, agricultural land, industrial applications, or
  groundwater recharge systems. Effectiveness is evaluated based on the proportion of collected
  wastewater that is treated and the efficiency of the plants in removing primary pollutants such as
  organic matter, nitrogen, and phosphorus.

• Collection and Treatment of Non-Connected Households: The strategy also addresses the collection and treatment of effluent from households not connected to the sewer system. This involves ensuring that such effluent is collected via trucks and treated at WWTPs. Effectiveness in this area is measured by the percentage of sludge collected and subsequently treated

#### VI.4.2 Gaza

The Gaza Strip currently possesses a sewer network that serves all major towns. The strategic objective is to extend sanitation services to the remaining small localities that are not yet connected and to promote connections among all households.

While the existing WWTPs in Gaza are capable of effectively treating the majority of wastewater, projected increases in water consumption will exceed their current treatment capacities. In response, the national strategy encompasses plans for the construction of additional wastewater treatment facilities extension and enhancement of existing plants. Additionally, several WWTPs will be equipped with tertiary treatment systems to produce effluent of higher quality, suitable for agricultural use, industrial applications, and managed aquifer recharge.

#### Strategic objectives

Short-Term (by 2030)

**Enhance Treatment Capacity**: Upgrade the treatment capacity of existing WWTPs to accommodate forecasted wastewater flow.

**Expand Sewage Collection Services**: Extend sewage collection services to ensure that 90% of households are connected to the sewer system.

**Ensure Financial Sustainability**: Establish mechanisms to ensure the financial sustainability of WWTPs and the broader sanitation system.

**Promote Renewable Energy**: Integrate solar energy solutions wherever feasible to support operational efficiency and sustainability

#### Medium-Term (by 2042)

*Further Expand Sewage Collection Services*: Achieve an expansion of sewage collection services to connect 98% of households.

**Continued Upgrade of Treatment Capacity**: Further enhance the treatment capacity of existing WWTPs to meet the projected increase in wastewater flow.

*Sustain Financial Viability*: Maintain and improve financial sustainability for WWTPs and the overall sanitation system.

**Advance Solar Energy Utilization**: Continue to adapt and expand the use of solar energy in sanitation operations wherever feasible.

#### VI.4.3 West Bank

The level of sewage collection in the West Bank is significantly lower than in Gaza. Many medium-sized localities lack sewer systems altogether, and in areas where sewers do exist, numerous households remain unconnected. This situation arises from several specific constraints unique to this region:

- **Rugged Terrain:** The challenging topography of the West Bank hinders the construction of extensive sewerage networks, making infrastructure development more complex and costlier.
- **Dispersed Housing:** A substantial proportion of housing is dispersed, necessitating heavy investments in infrastructure, including longer pipe runs and lifting pumps, to establish effective sewage systems.
- **Fragmentation of Zones:** The division of the West Bank into Areas A, B, and C complicates the planning and implementation of sewerage networks, as different governance structures and regulatory environments affect development efforts.

The challenge is further compounded by the need for the sanitation strategy in the West Bank to prioritize the reuse of all collected and treated wastewater within its borders. This focus is essential to avoid incurring additional treatment costs across the border, thereby enhancing the sustainability and efficiency of wastewater management in the region.

#### **Strategic Objectives**

#### Short-Term Objectives (By 2030)

**Reduce Transboundary Wastewater:** 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.

**Expand Sewage Collection Services:** Increase sewage collection services to connect over 45% of households, thereby enhancing access to sanitation.

**Decentralized Treatment Solutions:** Supply and install small to medium-scale decentralized treatment plants that serve individual communities or neighborhoods, promoting localized wastewater management.

*Financial Sustainability:* Ensure the financial sustainability of WWTPs and the broader sanitation system, implementing strategies for efficient operation and maintenance.

**Solar Energy Adaptation:** Incorporate solar energy solutions in wastewater treatment processes wherever feasible to promote renewable energy use and reduce operational costs.

#### Medium-Term Objectives (By 2042)

*Further Reduce Transboundary Wastewater*: Achieve an 80% reduction in transboundary wastewater through the continued expansion of wastewater treatment facilities and increased reuse in agricultural applications.

**Expand Sewage Collection Services**: Enhance sewage collection services to connect over 65% of households, significantly improving sanitation coverage.

**Ensure Financial Sustainability**: Maintain and enhance the financial sustainability of WWTPs and the overall sanitation system, ensuring long-term viability and service delivery.

**Continued Solar Energy Adaptation**: Further adapt solar energy technologies in wastewater treatment processes, maximizing the use of renewable resources and reducing reliance on conventional energy sources

# Part VII. Strategy Implementation, Monitoring and Evaluation

The national strategy outlined in the preceding chapters will guide the activities of the key stakeholders in the water sector, particularly the activity of PWA, MoA and WSRC.

The successful execution of this strategy hinges on the successful implementation of two critical institutional reforms established by 2014 Water Act:

- Establishment of Independent Water and Sanitation Service Providers (RWUs): These entities will operate independently from municipalities, with the objective of enhancing both technical and financial performance in the water sector.
- **Development of an Autonomous Bulk Water Supply Company (NWC):** This organization will focus on the efficient management of limited water resources, free from political interference

The national strategy acknowledges the significant challenges facing the water sector in Palestine, including:

- Limited Water Resources: Insufficient resources to meet the increasing demand for water.
- Israeli Occupation Constraints: Barriers to access and control over water resources.
- Climate Change Threats: The impacts of climate change on water availability and management.
- Financial Imbalances: Many service providers are experiencing financial difficulties, which may necessitate tariff increases.

## **VII.1 Cross-Cutting Themes**

#### VII.1.1 Youth Engagement

• The national water strategy aims to actively involve youth in water conservation initiatives, recognizing their role as future custodians of water resources. Institutions such as the PWA, relevant ministries, universities, youth NGOs, and funding agencies are committed to supporting this strategy through various initiatives.

#### VII.1.2 Climate Change Considerations

- Climate change significantly affects water management in Palestine, impacting supply, flood response, and drought mitigation. Rising temperatures and extreme weather disrupt hydrological cycles.
- In the water sector PWA has collaborated with EQA to draft an NDC action plan for 2022-2032, focusing on six vulnerable sectors: agriculture, energy, health, transport, waste, and water. These plans include specific activities, SMART targets, and policy recommendations and incorporating key performance indicators to track progress on priority activities.

#### VII.1.3 Monitoring and Evaluation Framework

The concluding chapter delineates the indicators selected by the PWA for monitoring and evaluating the effective implementation of the national strategy for the water sector. These indicators will serve as

benchmarks for assessing progress, identifying areas for improvement, and ensuring accountability among stakeholders.

## **VII.2 Generalization of Regional Water Utilities (RWUs)**

#### VII.2.1 Institutional process

Currently, over 300 small and local water SPs operate at the level of LGUs and VCs. These providers are responsible for delivering safe and affordable water to more than 3.2 million people in the West Bank and 2.3 million in Gaza. However, PWA lacks both technical and administrative control over these LGUs, leading to governance gaps in the sector. Although MoLG has administrative oversight of the LGUs, water service delivery is not systematically supervised. Consequently, the operational and financial performance of these providers remains unsustainable, limiting their ability to offer reliable services to the population

To address these challenges and improve governance and efficiency within the water sector, water supply and wastewater services will be provided by RWUs as part of the water sector reform. The creation of RWUs is mandated by Chapter 8 of the 2014 Water Law, which calls for the consolidation of existing water providers at the LGU level into regional utilities to ensure more sustainable service delivery (figure 17).



The Roadmap study outlined, developed in 2018, the gradual establishment of RWUs, recommending a reduction in the number of service providers from nearly 300 in 2018 to four RWUs by 2032—three in the West Bank and one in Gaza. The process involves transferring water and wastewater services from LGUand VC-level providers to RWUs. This shift will improve governance by assigning service responsibility to fewer, larger utilities operating on a commercial basis and reporting to the PWA. The reform aims to enhance efficiency and leverage economies of scale. In Gaza, the reform will involve transforming CMWU—currently a JSC established under the 1997 Local Authorities Law—into the Gaza RWU. The process of consolidating Gaza's 25 municipal SPs into the CMWU has already begun, although progress has been slower than expected<sup>22</sup> (figure 18, page 138).

<sup>&</sup>lt;sup>22</sup> Source: Roadmap for the creation of RWU - FCG report to PWA, 2018

#### Figure 18: Proposed reorganization of the water service providers in the West Bank



Despite delays in implementation, an important milestone was achieved with the adoption of Bylaw 2021/17, which provides the legal framework for creating RWUs. This framework clarifies the roles of the PWA, MoLG, and municipalities, allowing them to move forward with establishing RWUs. In July 2021, the Tubas RWU was formally established, marking a significant step in the reform process.

#### VII.2.2 Objectives of this strategy

The Water Law (2014) and the by-law (2021) encourage operation using best commercial practices within a regulated water market and financially sustainable. More business-like approaches to water resources management will save water and reduce governmental cost subsidies. Water utilities must run based on commercial basis with a focus on customer service, providing a quality product that is properly valued and paid for by customers. The high losses within the water distribution systems must be reduced and quickly brought in line with international best practices. It must be stressed that better commercial practices require providing a better product to consumers. A partnership between consumers and SPs (Utilities) must be establish where consumers can expect to receive improved service and utilities can expect to receive an adequate tariff for that service.

Benefits from adoption of business-like procedures include:

- Reducing manpower requirements per unit of water delivered.
- Increasing revenue through efficient billing, collection, and customer service.
- Lowering operating costs, potentially mitigating the need for tariff increases.
- Incorporating technology to improve operational efficiency, reduce water losses, and lower costs.
- Innovative demand management strategies, thereby increasing water supply, such as rebate programs for retrofitting low water use fixtures
- Establishing tariffs that fully cover operation and maintenance (O&M) costs.

#### VII.2.3 Towards autonomy of service providers

#### a) Autonomy versus aggregation

The establishment of RWUs, as foreseen in the 2014 Water Law (art. 45-47), implies two important developments:

- Autonomy: Water service providers will become more independent from municipalities, reducing political interference and ensuring professional service delivery.
- Aggregation: Smaller water operators will merge into larger entities to pool resources, improve technical and financial performance, and benefit from economies of scale.

These two processes, though related, are distinct:

- JSCs and their transformation: Several LGUs have formed JSCs, combining technical services to achieve economies of scale. However, JSCs do not guarantee autonomy from municipal officials, necessitating their transformation into fully independent RWUs.
- Municipality-based water services transitioning to RWUs: In some cases, a large municipality (e.g., Jerusalem Water Undertaking - JWU) will first transform its water service into a utility. This modern utility can then encourage neighbouring municipalities to join the RWU, offering improved services. Similar pathways may be relevant for Nablus, Jenin, Hebron, Ramallah and Al-Bireh (JWU), or Bethlehem BWWSA.





Therefore, a clear distinction should be made in the development of the strategy between (1) increased autonomy of the operators and (2) the aggregation of several operators into a larger entity.

## b) The different areas in which service providers must achieve a high level of autonomy

Currently, over 95% of water service providers in Palestine operate as departments within municipalities or VCs, with no autonomy over financial, technical, or human resource management. Their revenues are integrated with municipal accounting, and water-related costs are not separated.

The short-term strategy is to organize the autonomy of technical services, as this is a prerequisite for their integration into future RWUs. Autonomy will be pursued in the following areas:

- Accounting: the strategic objective is for the main water service providers to establish separate accounts from other municipal services to ensure financial transparency and accurately identify water-related costs and expenditures.
- **Tariffs and subsidies:** the strategic objective are for each water service provider must set tariffs that cover all O&M costs in the short term. To achieve this, operators will prepare detailed operating accounts as a solid basis for tariff adjustments. These accounts are also necessary to track any subsidies received and to prevent water revenues from being used to finance non-water municipal services (ring-fencing)
- Assets: Most water service providers currently lack full legal autonomy, with infrastructure and equipment owned by municipalities. Inventories and valuations of these assets, including facilities and equipment, must be conducted, with depreciation properly accounted for. This operation is a precondition for creating independent utilities and can be undertaken before RWU establishment.
- Human Resources: As most of water service providers are often embedded within municipal services, they lack control over staff management (e.g., salaries and career development). The strategic objective calls for the creation of autonomous water departments responsible for water and sanitation services. The director of each department will manage recruitment, dismissals, training, career progression, salaries, and bonuses, reporting to the municipality in accordance with Bylaw 2021/17.

On the short term, it is expected that Jenin East RWU and the Coastal RWU will be established.

Key indicators for the strategy					
<b>Short-term (2022-2030</b> ): the short-term strategy put efforts on the 122 largest Service Providers, i.e. those supplying more than 500 $m^3$ /day, serving 93% of all customers in the country					
Accounting -50% of the 122 large SPs have separate accounting data base and books					
Tariff and subsidies - 50% of the large SPs have an updated tariff approved by the cabinet that safeguard SP financial viability in accordance the new tariff by law 2022					
Assets - 50% of the large SPs have an asset register					
Human resources - 50% of the large SPs have an autonomous human resources management system					
Medium-term (2030-2042): the medium-term strategy extent the move to all water operators					
Accounting - 100% of the large SPs + 25% of other SPs have separate accounting data base and books					
Tariff and subsidies - 100% of the large SPs + 25% of other SPs have un updated tariff approved by the cabinet that safeguard SP financial viability					
Assets - 100% + 40% of other SPs of the large SPs have an asset register					
Human resources - 100% of the large SPs have an autonomous human resources management system					

## VII.3 Towards the National Water Company (NWC)

The establishment of the NWC, as mandated by the 2014 Water Act, is currently in progress. The NWC will function as a public entity fully owned by the State of Palestine, in alignment with Water Law (Article 37, Section 1). The board of directors has been appointed by the cabinet of ministers, and the company received formal registration from the MoNE on September 13, 2022.

### VII.3.1 Staff Integration Strategy

The WBWD currently employs personnel under diverse employment statuses, resulting in significant challenges related to effective human resource management. To address these challenges and foster a sense of belonging among employees, the NWC will integrate all personnel into a single organization, implementing a unified pay scale to promote equity and cohesiveness within the workforce.

#### VII.3.2 Bill Recovery Framework

The existing bulk water supply operator, WBWD, has accrued 1.5 billion NIS in outstanding claims against municipalities. The NWC Board of Directors has made a strategic decision not to transfer these historical debts to the new company.

A primary objective will be the establishment of a transparent and efficient mechanism for the collection of bills from municipalities and other SPs. Additionally, if the NWC is required to sell water at rates lower than its production costs, the Palestinian Authority will compensate for the deficit through a formal

subsidy. This arrangement will be clearly defined in a contractual agreement between the PA and the NWC, ensuring financial sustainability and operational efficiency.

#### Key performance indicators for the NWC:

**1. Implementation Timeline:** *The NWC will be fully operational during the short-term phase of the strategy, spanning from 2023 to 2030.* 

**2. Scope of Operations:** The company will assume responsibility for all bulk supply activities throughout the West Bank and Gaza Strip, which will encompass:

- Water purchases
- Management of WBWD wells
- Operation of Gaza desalination plants
- Water harvesting from dams
- Utilization of treated wastewater

**3. Staff Integration:** The NWC will incorporate all personnel required for bulk supply activities into a unified organizational structure, featuring a standardized pay scale.

**4. Financial Sustainability:** *The company will maintain a balanced operating account, achieved through:* 

- Effective billing collection mechanisms from municipalities
- A transparent subsidy framework, ensuring reimbursement from the PA when selling prices fall below production costs

**5.** Infrastructure Registration: All bulk water infrastructure, including pipes, tanks, boosters, wells, and associated facilities, will be identified and formally registered.

## VII.4 Communication and Civil Society Engagement to Support Strategy Implementation

#### VII.4.1 Youth mobilization

The national water strategy prioritizes the engagement of youth in water conservation initiatives, recognizing their vital role as future stewards of water resources. Key institutions, including the PWA, relevant ministries, universities, youth NGOs, and funding agencies, are committed to supporting this strategy through several strategic initiatives:

- Education and Awareness: Integrating topics related to water conservation, groundwater protection, and environmental stewardship into educational curricula to foster awareness among students about the significance of water resources and the necessity for conservation.
- Youth Representation: Ensuring the inclusion of youth representatives in decision-making processes related to water governance and within institutions such as the (WUAs) and the boards of (RWUs). The Youth Forum will provide insights on water conservation policies and actively participate in stakeholder meetings.

- Youth-led Initiatives: Encouraging and supporting youth-led projects that focus on water conservation, while providing platforms and resources for young individuals to develop and implement their own initiatives aimed at raising awareness and promoting community involvement.
- **Collaboration and Partnerships**: Fostering partnerships among youth organizations, RWUs, NGOs, and the PWA to collaborate on water conservation initiatives, research projects, and community outreach programs.
- **Technology and Innovation**: Developing mobile applications, online platforms, and social media campaigns to disseminate information, raise awareness, and inspire behavioral changes regarding water conservation.
- **Recognition and Awards**: Establishing recognition programs and awards to celebrate the achievements of young individuals or youth-led organizations in the field of water conservation and water pressing issues research.
- **Capacity Building**: Involving youth in water-related programs and enhancing their capacities is essential for nurturing future leaders in the water sector and for developing innovative solutions for sustainable water management.

By active engagement of the youth in the water conservation policies, Palestinian institutions can harness their energy, creativity, and commitment to fostering sustainable water management practices

#### VII.4.2 Public Engagement Strategy

Public engagement is a fundamental principle of effective governance, crucial for inclusive decisionmaking in the water sector. Citizens have the inherent right to participate in discussions concerning public issues that significantly affect their lives, the development of the economy, and the management of environmental resources. With increasing complexities due to population growth, urban expansion, and freshwater contamination risks, robust public participation is essential.

Village and city councils serve as key platforms for collaborative decision-making. The objective of public participation is to involve individuals affected by specific decisions, ensuring their contributions meaningfully influence policy outcomes.

As Palestine's population grows and resource pressures mount, the water sector must adapt, requiring difficult political decisions. Stakeholders (including governmental custodians, service providers, and consumers) must prioritize conservation and efficiency. Effective communication and strategic social marketing are vital for linking transformative decisions to the communities impacted.

The implementation of a National Communication Strategy aimed at fostering behavioural and policy changes within the water sector provides a strategic framework for Palestine. This strategy seeks to support an integrated and systematic communication effort that addresses the country's pressing natural resource challenges.

Currently, stakeholder involvement in the decision-making processes and the formulation of laws and regulations within Palestine, particularly in the water sector, remains inadequate. Enhancing public participation is crucial for effective planning and governance. The principle of public engagement is interrelated with other governance values, such as transparency and democracy.

The limited engagement of stakeholders in decision-making mechanisms often results from individual initiatives by public sector leaders or donor-driven projects that require public involvement as a condition for planning and monitoring. Nonetheless, legal provisions exist that mandate public participation in specific contexts.

Effective community engagement can significantly reduce territorial and institutional fragmentation within the water sector, leading to more efficient, cost-effective, and sustainable water supply and sanitation services.

To achieve meaningful public participation in water and sanitation services, a comprehensive approach is essential. This approach should promote a shift in public attitudes, facilitate information sharing and consultation, enhance monitoring and evaluation practices, and improve transparency and accountability. The overarching goal is to unify diverse stakeholders under an integrated communication strategy, thereby fostering collective advancements across the water sector in Palestine.

## **VII.5 Climate Change Implications for the Strategy Implementation**

The climate change represents a pervasive challenge that exceeds national borders and sectors, particularly in contexts such as Palestine. Climate change exerts a profound influence on all facets of water management, encompassing supply, flood and drought mitigation. The effects of rising temperatures, decreasing precipitation, and extreme weather events (including heat waves, floods, and droughts) pose significant risks to the hydrological cycle and the sustainable management of water resources.

In response to these challenges, EQA has assumed a leadership role in the development NDC implementation plans for the next decade, culminating in 2032. These plans address six of the twelve sectors identified as most vulnerable in the National Adaptation Plan (NAP): agriculture, energy, health, transport, waste, and water. Each plan is structured around specific activities, SMART targets, comprehensive cost assessments, institutional arrangements, and policy recommendations.

In the water sector PWA has collaborated with the EQA to draft an NDC action plan for 2022-2032. This plan delineates key performance indicators designed to monitor the implementation of NDC actions, along with cross-cutting priorities.

#### The action plan focuses on three principal areas:

- 1. Water Treatment and Conservation: This component outlines a series of initiatives aimed at achieving the conditional NDC, contingent upon securing international funding. The strategies include:
  - a. Enhancing the use of additional and alternative water resources for non-domestic purposes in both the West Bank and Gaza Strip. The plan seeks to improve water availability through the treatment and reuse of wastewater and the harvesting of rainwater. Specific targets include:
    - i) By 2030, reusing 70% of treated wastewater from large-scale treatment facilities in the West Bank and Gaza.
    - ii) Harvesting 7 MCM of rainwater in the West Bank by 2032.
- 2. Water Source Infrastructure: The Water Resources plan aims to bolster the availability of water sources essential for the successful implementation of Palestine's NDC. Key actions include the
rehabilitation of vital water sources such as wells, canals, and springs, with the realization of these initiatives dependent on securing international funding.

- Improvement of Water Networks Infrastructure: The plan encompasses strategies aimed at fulfilling specific NDC actions derived from Palestine's NAP, also contingent upon international funding. Key initiatives include:
  - a. Implementing measures to mitigate leakage from distribution systems.
  - b. Developing and enhancing stormwater management and drainage infrastructure.

To achieve these objectives, the plan outlines six strategic activities, each designed to meet specific targets aligned with the NDC actions:

- Reduce non-revenue water by 15% by 2032.
- Drain and collect 5% of rainwater in priority urban areas by 2032.

This strategic framework underscores the necessity for collaborative efforts and international support to enhance Palestine's resilience to climate change while ensuring sustainable water resource management.

PWA has committed to enhancing water resilience and climate planning. This commitment involves integrating climate change considerations into the updated water sector strategy and policy, prioritizing renewable energy in all infrastructure and reuse projects, and focusing on the reduction of carbon emissions. Additionally, the treatment of wastewater and sludge aims to improve ecosystem health.

It is essential for water resource managers to incorporate both mitigation and adaptation measures to address the impacts of climate change that have already occurred or are deemed unavoidable. This proactive approach will facilitate the development of resilient water systems capable of withstanding the challenges posed by a changing climate.

## VII.5.1 Importance of Climate Resilience

Developing resilience to climate change is paramount, as it impacts every facet of Palestine's national water strategy. **Climate change threatens the integrity of water resources and challenges sector capacity, staff, systems, efficiency, and infrastructure**. Therefore, while not always explicitly stated, climate change considerations are integral to all strategic areas, with a focus on adaptation and mitigation.

### Water Supply and Demand Balance

- Optimize the management and infrastructure of bulk water systems to enable flexible reallocation among regions and users.
- Base groundwater extraction and development on reliable hydrological data to effectively monitor climate-induced changes.

### IWRM and Environmental Protection

- Enhance surface water storage capacity through improvements to existing facilities and the construction of new ones, adapting to higher temperatures and reduced rainfall.
- Strengthen management of shared groundwater basins by incorporating climate data to promote cooperation across geopolitical boundaries.

### Irrigated Agriculture

• Collaborate closely with the Ministry of Agriculture to align irrigation policies and allocations with the realities of climate impacts on water availability.

## **Utilities Management**

• Enhance the efficiency of network operations and maintenance to ensure continuous supply and minimize water losses, integrating climate-resilient planning.

## Efficiency and Renewable Energy

- Improve energy efficiency in all water sector operations to reduce costs and mitigate climate change impacts.
- Optimize pumping practices by maintaining systems and scheduling operations to avoid peak energy demand.
- Expand the use of renewable energy across water operations to further reduce costs and mitigate climate change.

## **Governance and Institutional Development**

- Integrate climate data and progress in climate-related policies into sector reporting.
- Ensure climate change impacts inform planning and management throughout government coordination.
- Maintain updated capital investment planning to address infrastructure needs and secure climate financing for resilient water, sanitation, and hygiene (WASH) systems.
- Invest in staff training to enhance capacities in project management, climate change, and financial sustainability, ensuring a focus on lasting water security.

### **Financial Sustainability**

Palestine's water scarcity and geopolitical vulnerabilities necessitate a shift from traditional sector-specific approaches to a more interconnected water management strategy. This requires inclusive governance and innovative solutions to address anticipated impacts effectively.

Given limited financial resources for new projects and declining freshwater availability, large-scale initiatives such as desalination and wastewater treatment are crucial to meet growing demands. However, their implementation must prioritize financial sustainability, ensuring the sector can adapt to climate impacts.

To achieve financial sustainability and improve resource management, the following imperatives are essential:

Continuously track financial allocations for climate change adaptation and mitigation, optimizing investments to meet adaptation commitments.

Create an effective enabling environment to attract new investments in climate resilience projects, as outlined in NAPs.

# VII.5.2 Strategic Approach to Climate Change Adaptation

Climate change adaptation is a dynamic process necessitating regular evaluation and updates, given the rapid changes in climatic conditions. Effective management of climate risks relies on comprehensive knowledge to forecast impacts and enhance adaptive capacity.

Successful implementation of this strategy and its climate-related provisions demands a multifaceted approach, including:

- Methodologies and Policies: Employing appropriate methodologies and establishing robust policies.
- Funding: Ensuring sufficient financial resources are allocated.
- Awareness and Political Will: Fostering strong awareness and political commitment to climate initiatives.
- Institutional Frameworks: Developing effective institutional frameworks to support adaptation efforts.
- Data Management: Implementing comprehensive data collection and management systems.
- Local Capacity Building: Enhancing local capacities to respond to climate challenges.

To oversee this national strategic approach, a Palestinian National Climate Change Committee has been established, chaired by EQA. This committee includes PWA and other relevant authorities, each with defined roles and responsibilities for monitoring progress and ensuring effective implementation.

# **VII.6 Monitoring the strategy implementation**

To effectively monitor progress in the implementation of the strategy, the Government requires reliable and objective performance indicators. Consequently, the PWA has been tasked with developing a procedure for the regular production of these indicators, adhering to the principles of the **SRF** while also incorporating relevant aspects of the **SDGs**.

## VII.6.1 Strategic Results Framework (SRF) principles

In Palestine, the primary mechanism for monitoring and evaluating the effectiveness of public policies is SRF. This framework serves to integrate the programs executed by various public entities into a cohesive conceptual framework, allowing for the measurement of progress through objectively verifiable indicators. The SRF encompasses all areas of public action, including health, education, agriculture, and water, with a specific focus on the water sector in this context

The PWA is charged with the implementation of the SRF in the water sector. To fulfil this responsibility, it systematically collects data from key stakeholders involved in water and sanitation, including the NWC, WSRC, MoA, PCBS, and various PWA departments. This collaborative data collection approach is essential for ensuring comprehensive monitoring and effective evaluation of the strategy's implementation.

## VII.6.2 SRF Monitoring and Evaluation Mechanisms

The Strategic Results Framework (SRF) features three reporting time frames:

## a) Long-Term Reporting (20 Years)

Aligning with the sector strategy, this period defines around thirty specific objectives, measured by verifiable indicators. Each objective includes target values for 2042 and estimated annual progress, incorporating available data for intermediate milestones (e.g., operational dates for projects like the STLV in Gaza).

## b) Medium-Term Reporting (5-6 Years)

Medium-term evaluations occur every three years, adjusting indicators based on actual conditions. The PWA collects data from key institutions (PWA, NWC, WSRC, PCBS, MoA) to produce reports, such as "Strategic Results Framework for the Water and Wastewater Sector for 2017-2022 and Updated Strategy (2021-2023)."

## c) Short-Term Reporting (Quarterly and Annual)

Short-term reporting monitors project progress overseen by each ministry. The PWA issues quarterly updates in the "Quarterly Report Related to the Strategic Results Framework and Operational Plans," detailing project status by strategic objectives. Additionally, an annual report summarizes achievements and indicator progress from the previous year.

These mechanisms ensure effective monitoring and evaluation of the strategy's implementation in Palestine's water sector.

## VII.6.3 Comparison between SDG and SRF indicators

The indicators defined for SRF monitoring differ from those used for SDG monitoring, reflecting their distinct objectives:

- SRF Indicators: Focused on measuring the performance of key stakeholders in the water sector (such as PWA, WSRC, NWC, RWUs) and facilitating resource mobilization to achieve strategic objectives.
- **SDG Indicators:** Aim to assess the country's progress towards SDG targets and enable comparisons with other nations.

SDG indicators are primarily derived from data collected by the PCBS through census and in-depth household surveys. This method offers several advantages:

- 1. PCBS is an independent entity, minimizing the risk of biased reporting.
- 2. The data sources utilized by PCBS differ from those used by PWA, allowing for effective cross-verification.

Given these differences, it is essential not to standardize SDG and SRF indicators. Instead, combining their results can enhance the analysis of progress and challenges within Palestine's water sector.

# VII.6.4 Sustainable Development Goals (SDG) SDG 6 – Clean Water and Sanitation

Palestine has adopted an SDG framework to measure progress in various development areas using standardized indicators. PWA responsible for water and sanitation, will collaborate with sector entities to

establish specific targets and indicators aligned with SDG 6. These targets will be tailored to reflect the current Palestinian water context and integrated into monitoring and evaluation mechanisms across relevant institutions.

Indicators from the SDG strategy, detailed on the PCBS website, vary in relevance to SRF:

- **Relevant Indicators:** Some SDG indicators, such as the percentage of users with access to safe drinking water and sanitation coverage, align closely with PWA metrics.
- Irrelevant Indicators: Certain indicators, like the percentage of open defecation, do not pertain to the Palestinian context.
- **Complementary Indicators:** Additional SDG indicators, particularly related to IWRM, may enhance the SRF.

PWA plans to incorporate additional indicators into the SRF that PCBS cannot address, such as the amount of water- and sanitation-related official development assistance (ODA) included in a government-coordinated spending plan.

To support the achievement of SDG targets, the sector will enhance the availability and accessibility of disaggregated data by income, gender, age, and other factors. Ensuring the quality and coverage of this data is essential to avoid leaving no one behind.

# VII.6.5 Strategic goals in the Strategic Results Framework

The SRF for the water and sanitation sector is organized around five strategic objectives, each aligned with the three primary thrusts of the national policy agenda. This structured approach ensures that the sector's goals are integrated with broader national priorities, facilitating coordinated efforts to enhance water resource management and sanitation services in Palestine

National Policy: Providing Basic Needs for Population groups						
SG1	Improving the quality and reliability of water supply service and ensuring fair supply					
National Policy: Ensuring the sustainability of the environment						
SG2	Sustainable development of water sources					
SG3	Improving the sanitation service provision and reducing its environmental impact wastewater collection, treatment and reuse)					
	National Policy: efficiency and effectiveness of public finance management					
SG4	Developing and building water sector institutions to establish the foundations of goods governance in an integrated legal and institutional environment					
SG5	Ensuring the financial sustainability of water facilities and providers					

# VII.6.6 SRF indicators

## a) Type of indicators

- **Results Indicators:** To effectively assess progress in implementing the national strategy, PWA emphasizes results indicators over means indicators:
- **Domestic Water Supply:** While the volume of water produced is a measurable figure, the critical metric is the actual volume available to each user, expressed in litre per capita per day (I/c/d).
- **Network Maintenance:** Instead of merely calculating total expenditures on repairs, the more relevant metric is the rate of NRW loss.
- **Context-Specific Indicators:** Indicators must reflect Palestine's unique circumstances:
- For instance, the percentage of people practicing open defecation, a key SDG sanitation indicator, is not applicable in Palestine where most households have toilet access. In contrast, the percentage of treated wastewater that is reused serves as a relevant indicator, demonstrating efforts to:
  - Increase water volumes available for agricultural use, reducing reliance on groundwater.
  - Minimize cross-border flows of treated or untreated wastewater.
- Indicators of Institutional Change: The indicator framework extends beyond water volumes and household connectivity, incorporating measures of institutional development:
- A significant reform in the sector is the establishment of independent service providers, such a RWUs. The key indicator for this reform is not simply the number of RWUs, but the percentage of customers served by an RWU rather than a municipal service, reflecting the effectiveness of the reform.

## **b)** Producing indicators

The basic data, to be used to establish most of the indicators, are produced by the service providers (RWUs and municipalities): number of customers, number of prepaid meters, volume of water distributed, quality of water distributed, volume of wastewater collected, volume of wastewater treated, etc.

### Role of the WSRC:

The WSRC plays a pivotal role in overseeing and regulating water-related activities within Palestine, particularly in data collection across the sector:

- 1. **Regulatory Compliance Monitoring:** The WSRC ensures adherence to water regulations set by government authorities, collecting data from utilities to verify compliance with water quality standards and conservation measures.
- 2. **Performance Monitoring:** The council gathers performance data on water utilities and infrastructure, including metrics related to water quality, quantity, and service reliability, which are crucial for evaluating the sector's overall effectiveness.
- 3. **Policy Development and Planning:** The WSRC compiles data to inform the formulation of water policies, regulations, and long-term planning. This includes data on water availability, demand projections, infrastructure requirements, and environmental considerations.
- 4. **Research and Analysis:** The council conducts or commissions research to understand water-related challenges and trends, addressing issues such as water scarcity, pollution, climate change impacts, and technological advancements.

5. **Data Dissemination and Reporting:** The WSRC is responsible for disseminating water-related data to the public, policymakers, and stakeholders through reports and datasets, enhancing transparency and informed decision-making.

Overall, the WSRC's role in data collection is essential for effective regulation, management, and governance of water resources and services. By collecting, analyzing, and disseminating relevant data, the WSRC supports sustainable water management practices and enhances access to safe and reliable water for all.

All collected data is systematically analyzed and compiled by the PWA, which is responsible for producing the sector's SRF indicators. The PWA also incorporates highly reliable external data sources, including the PCBS for demographic data and household survey results, as well as the MOH for assessments of water quality.

National policy: ensuring the sustainability of the environment											
Strategic Objective No	<sup>9</sup> 1: Integrated management a	and sustainable o	developr	nent c	of wate	r reso	urces	in			
terms of quality and quantity											
Results	Indicator		Baseline		Strate	gic obje	ectives				
incourto	Indicator	2022	2026	2030	2034	2038	2042				
	Amount of water produced annually	West Bank	147,9	160,0	173,0	180,0	195,0	214,0			
	from wells and springs (MCM/year)	Gaza	189,4	190,0	165,0	160,0	120,0	95,0			
	Amount of desalinated water	West Bank	0,0	0,0	0,0	0,0	0,0	0,0			
	available annually	Gaza	7,5	14,0	45,0	69,0	110,0	164,0			
	Amount of water purchased annually from Mekorot	West Bank	83,8	101,0	124,0	128,0	145,0	145,0			
Increasing the amount of		Gaza	18,5	20,0	20,0	20,0	20,0	20,0			
water made available for all	Amount of water produced from water harvesting facilities	West Bank	2,3	5,0	11,0	13,0	17,0	21,0			
purposes		Gaza	0,0	0,0	0,0	0,0	0,0	0,0			
	Amount of treated wastewater made available for Palestinian farmers	West Bank	2,3	5,0	10,0	13,0	17,0	29,0			
		Gaza direct reuse	7,1	9,0	20,8	23,0	23,0	26,8			
		Gaza artificial recharge	17,3	21,0	22,1	30,0	38,0	47,0			
Protecting water sources from pollution	The existence of a monitoring syste various water sources in quantity, q controlled sources)	71%	75%	79%	83%	87%	91%				

#### Table 23: SRF indicators - n° 1

Table 24: SRF Indicators - n° 2

### National Policy: Providing Basic needs for population groups

### Strategic Goal N2: Improving the quality and reliability of water supply service and ensuring equitable supply

			Baseline	Strategy						
Results Indicator		2022	2026	2030	2034	2038	2042			
Increase the amount of water	Amount of water available at	West Bank	88	95	102.5	112	121.5	131		

provided to beneficiaries (domestic + Industrial)	customer tab (litre/ individual/ day)	Gaza	90	91.5	92	103	115	127
Good and	Percentage of samples that	West Bank	98%	98%	98%	98%	98%	98%
susply of vater to all standard vertices from reliable for nitrat water to all standard vertices of water Weighter for chlor	Palestinian Standards	Gaza	32%	40%	48%	56%	64%	72%
	Weighted average for nitrate (ppm)	Gaza	127	110	111	94	55	36
	Weighted average for chloride (ppm)	Gaza	1014	887	899	761	446	288
Improving and developing the efficiency of	The rate of non – revenue water (NRW) = leakages,	West Bank	40%	37%	37%	32%	29%	26%
water distribution systems	water illegal connections, stribution poor metering systems	Gaza	41%	39%	37%	34%	31%	28%

### Table 25: SRF indicators - n° 3

National Policy: Ensuring the sustainability of the environment Strategic Goal 3: Improving the sanitation service provision and reducing its environment impact										
Results			Baseline	Strategy						
	Indicator		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 the amount of wastewater treated inside Palestine		42%	50%	58%	66%	74%	82%		
	Percentage of treated sewage that corresponds to the Palestinian specifications for WWTPs		82%	84%	87%	89%	92%	94%		
Increasing the area of irrigated land	Percentage of treated wastewater reused for irrigation or managed aquifer recharge		23%	65%	47%	59%	71%	83%		
from treated water sources	Area of irrigated agricultural land	West Bank	2,000	5,500	8,000	15,000	20,000	25,000		

from treated							
wastewater (donum)	Gaza	10,000	14,000	31,000	34,500	34,500	40,000
(uonum)							

#### Table 26: SRF indicators - n° 4

## National Policy: Efficiency and effectiveness of public finance management

Strategic Goal N4: 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

		Baseline	Strategy						
Results	Indicator	Baseline         Strategy           2022         2026         2030         2034            0         2         4         6		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 RWU	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 27: SRF indicators - n° 5

National policy: efficiency and effectiveness of public finance management											
Strategic Objective N° 5: Ensuring the financial sustainability of water facilities and providers											
Poculte	Indicator	Baseline	Strategic objectives								
Results	Indicator	2022	2026	2030	2034	2038	2042				
Promoting financial autonomy for water facilities and water providers	Number of domestic customers managed by autonomous service providers (x 1000)	142	162	182	196	210	222				
Raising the efficiency of	Collection efficiency: the collection rate of water bills	61%	65%	69%	73%	77%	81%				
ratio of public debt	Percentage of domestic connections equiped with prepaid meters	29%	37%	45%	53%	61%	69%				