Securing Water for Development in West Bank and Gaza

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Please cite the work as follows: World Bank. 2018. “Securing Water for Development in West Bank and Gaza.” World Bank, Washington, DC.

Cover design: Jean Franz, Franz & Company, Inc.

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Abbreviations

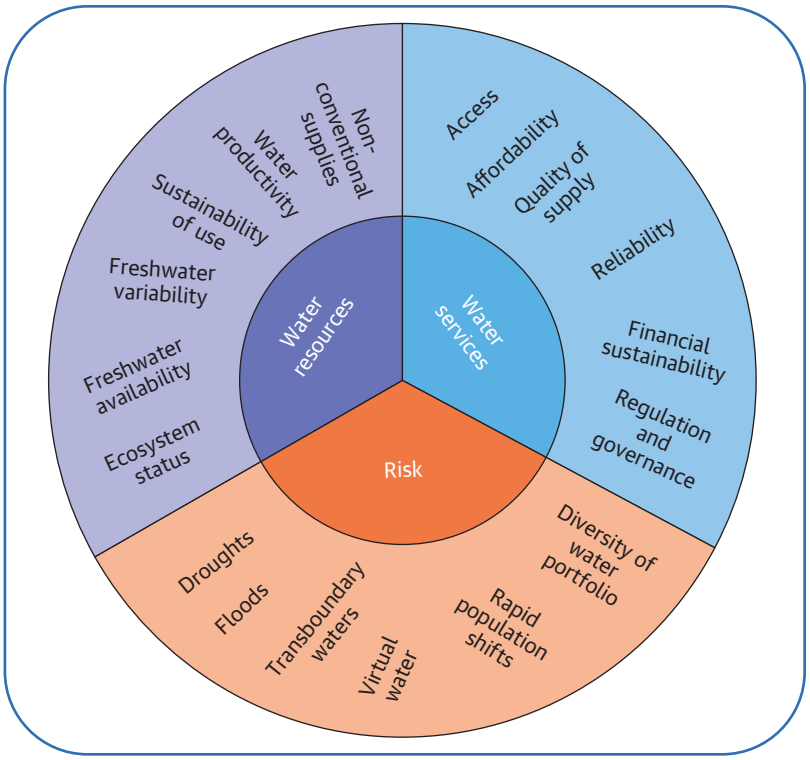
CMWU	Coastal Municipalities Water Utility
DESCO	District Electricity Company
DMA	district metering area
EU	European Union
IEC	Israeli Electricity Corporation
IsDB	Islamic Development Bank
IWII	is aligned with incentives
JSC	Joint Service Council
JWU	Jerusalem Water Undertaking
KF	Kuwait Fund
lcd	liters per capita per day
LGU	local government unit
m^3	million cubic meter
MoF	Ministry of Finance
MoLG	Ministry of Local Government
NGO	nongovernmental organization
NRW	nonrevenue water
NWC	National Water Company
O&M	operation and maintenance
PA	Palestinian Authority
PWA	Palestinian Water Authority
RO	reverse osmosis
SDP	Strategic Development Plan
SP	service provider
STLV	short-term low-volume
USAID	U.S. Agency for International Development
VC	Village Council
WBWD	West Bank Water Department
WHO	World Health Organization
WSRC	Water Sector Regulatory Council
WSSA	Water Supply and Sanitation Authority
WWTP	wastewater treatment plant

Introduction

West Bank and Gaza is a water-scarce lower-middle-income territory with a relatively water-dependent economy and is vulnerable within its geopolitical setting. The components of water security in West Bank and Gaza are marginalized and weak. Thus, assuring water security is a priority. Water security requires adequate water resources that are well managed, including management of risks and water service providers (SPs) that provide sustainable, efficient, and equitable services. Figure 1 illustrates the elements of water security in relation to the Palestinian context.

FIGURE 1. Elements of Water Security

- **Renewable water resources** are not available in adequate quantity and quality to meet the needs.
- **Risks:** water resources are mostly out of the palestinian sphere of control.
- **Water services** must provide equitable, sustainable, and affordable access and quality of supply through viable, regulated institutions, which is not the case for all uses.



What Is the Current Water Supply and Wastewater Situation in Palestine?

Palestinian territories face significant and growing shortfalls in the water supply available for domestic use. The World Health Organization (WHO) considers 100 liters per capita per day (lcd) as the benchmark minimum for domestic consumption to achieve full health and hygiene benefits while the Palestinian Water Authority (PWA) has set a target of 120-150 lcd for its population.[1] In contrast, available water resources (supplied minus the nonrevenue water [NRW], as shown in Table 1) for domestic consumption in West Bank is only 62 lcd,[2]

TABLE 1. Domestic Water Supply and Demand (Does Not Include Irrigation)[a]

Water supply					Wastewater				
	West Bank		Gaza Strip			West Bank		Gaza Strip	
	MCM/year					MCM/year			
	2016	2030	2016	2030		2016	2030	2016	2030
Supply requirement (Domestic demand) in 2030[b]	**152**	**209**	**100**	**135**	**Domestic demand in 2030[f]**		**167**		**106**
Groundwater/natural resources[c]	48	48	84	30	Existing plants	9.5		60	
Desalination[d]	0	0	6	6	Treated in Israel	21.4		0	
Mekorot purchase	69	69	10	20	On-site treatment	64.6		20	
Water harvesting	0	0	0	0					
Subtotal	**117**	**117**	**100**	**56**	**Subtotal**	**95.5**		**80**	
NRW[e]	51		38						
Total supply (supply-NRW)	**66**		**62**						
Supply gap	**80**	**92**	**38**	**79**	**Treatment gap**		**72**		**26**
Possible options for filling the supply gap					**Possible options for filling treatment gap**				
Central desalination plant		0		55	Improved PWA treatment[g]		32		26
Additional small desalination		0		13	Improved on-site[h]		40		0
Additional Mekorot purchase		52		0	Treatment in Israel		0		0
Groundwater[i]		10		0					
Water harvesting		1		0					
Losses reduction		29		11					
Total		**92**		**79**	**Total**		**72**		**26**

Note: MCM = million cubic meter; NRW = nonrevenue water; PWA = Palestinian Water Authority.

a. The source of the data for 2016 is the PWA (PWA water table 2016) and assumption for 2030 if final negotiation with Israel is not pursued.

b. Assume population of 1.9 million and 2.8 million in Gaza and 2.9 million and 4.4 million in West Bank and 100 lcd for 2016 and 2030, respectively.

c. Actual in 2016 for West Bank and Gaza and sustainable yield in Gaza and no change in West Bank for 2030.

d. Desalination—none in West Bank and in Gaza, from small desalination units

e. NRW in West Bank is 44 percent in 2017 (for bulk is 15 percent and domestic 29 percent) and estimated at 30 percent (8 percent bulk and 22 percent domestic) for 2030 to fulfil the gap. In Gaza, it is 38 percent in 2016 and estimated at 30 percent in 2030 to fulfil the gap.

f. Volume of wastewater is estimated at 80 percent of water demand.

g. Assumed new plants plus increasing efficiency of existing plants.

h. At household and by small private sector for cleaning and maintenance.

i. The assumption is continuation of the status quo and Palestinians will get additional water from the aquifers of 10 m^3 only.

while in Gaza it is 89 lcd. With the West Bank and Gaza population of approximately 4.8 million growing at an average annual rate of 2.8 percent,[3] the domestic supply gap is projected to be about 92 and 79 million cubic meters, respectively, in 2030 unless supply and service options are expanded. Data for water and wastewater supply and demand are presented in Table 1. The 2030 projections are based on the listed assumptions as noted.[4]

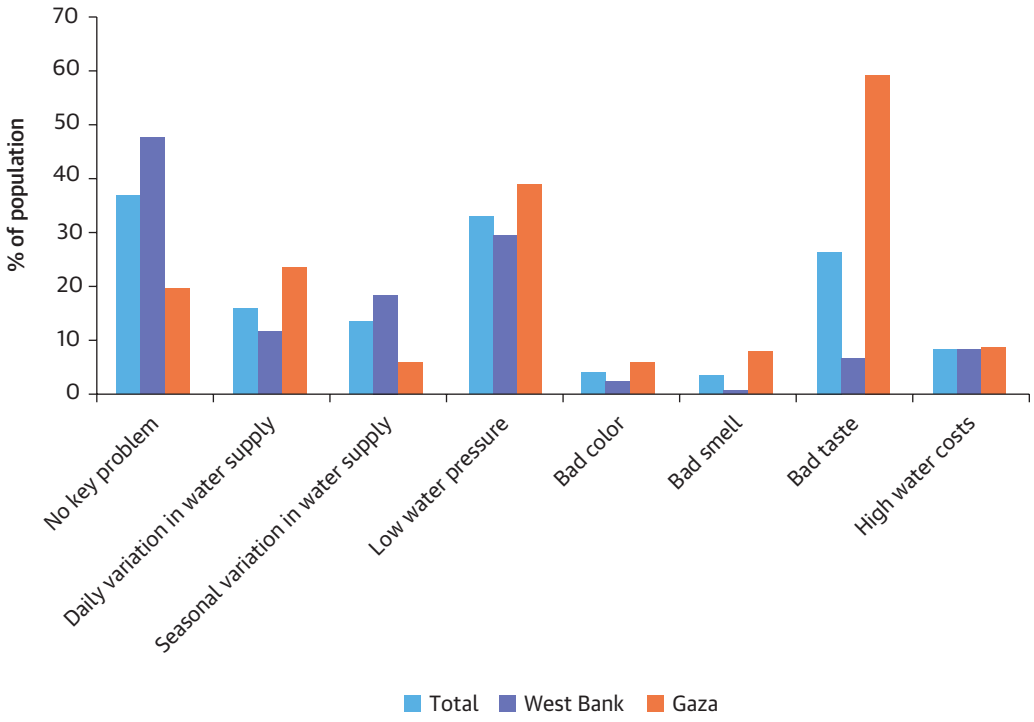
The water supply in the Palestinian Territories is determined largely through negotiated agreements with Israel for groundwater abstraction (internal resources) and imports of additional supply. Development of Palestinian water resources is bound by Article 40 of the 1995 Israeli-Palestinian Interim Agreement on The West Bank and The Gaza Strip (Oslo II Accord).[5] The Article, which was developed for the interim period of five years, is framed on three important assumptions. First, that Palestinian domestic water needs in the West Bank are at 70-80 m^3 per year in addition to the existing uses at the time of signing the agreement, 118 m^3 per year. Second, that interim water development must be managed through a coordinated Palestinian-Israeli process and mechanism. Third, that topics of "common interest" (of which the Palestinians consider water to be one) would be further delineated under the Permanent Status Negotiations (ongoing slowly with obstacles). The additional resources were to be extracted from previously unused sources in the eastern basin of the Mountain Aquifer.[6] Until the development, Israel was to immediately begin supplying the Palestinians with approximately 25 m^3 of water a year.

Water quality is undrinkable in Gaza. Because of increased demand, groundwater is being abstracted from the coastal natural aquifer at almost three times the sustainable abstraction rate, thereby causing seawater intrusion. Sea water intrusion and sewage pollution made the resource largely nonpotable. Only 4 percent of the 180 m^3 abstracted per year meets drinking water quality standards. Part of the problem is that the population has responded to water scarcity by expanding the drilling of private wells, which the PWA has been unable to regulate. Most of the 260 municipal wells have chloride concentration of 500-1,500 mg/L, while along the coastline the concentration of chloride exceeds 2,000 mg/L and nitrate levels above standards set by the WHO, and their water is unfit for human consumption.[7] As a result, 97 percent of the population rely on informal and unregulated private water tankers and small-scale informal desalination plants for drinking water. Water provided through networked systems by formal providers is used for other domestic purposes. Groundwater quality is generally acceptable in West Bank, with localized concentrations of chlorides and nitrates.[8]

In the Local Government Performance Assessment survey of 2016, about 60 percent of the surveyed population in Gaza saw problems in the water quality pertaining to color, smell, and taste, whereas in West Bank more of their concern was related to quality of service (48 percent) and discontinuity (19 percent) and water pressure (30 percent) of water supply (see figure 2).

Years of overexploitation and sewage infiltration into the aquifer have resulted in pollution of 95 percent of groundwater resources in Gaza, with high proportions of nitrates and chlorides, well above international guidelines for potable water resources. (PWA Water Supply report 2015).

FIGURE 2. Key Reported Problems among Population with Piped Water in 2016



Source: Local Government Performance Assessment 2016.
Note: Means are constructed only for those respondents who report connection to a public pipe. Households were allowed to report up to three problems.

TABLE 2. Water Allocation According to Oslo Agreement and Utilization in 2016 by the Palestinian Authority (PA) and 2011 by Israel

Use	Oslo agreement (m^3)				Utilization 2011 (Israel) and 2016 (PA) (m^3)			
	WAB	NEAB	EAB	Total	WAB	NEAB	EAB	Total
Israel	340	103	40	483	411	103	150[a]	664
Palestinian Authority	22	42	54	118	38.7	21.7	53.0	113.4
Additional Quantity for Palestinian Development	–	–	78	78	–	–	0	0
Base in total	362	145	172	–	–	–	–	–

Note: There are no available data for 2016 from Israel. – = not available; EAB = East Aquifer Basin; m^3 = million cubic meter; NEAB = North East Aquifer Basin; WAB = Western Aquifer Basin.
a. This includes 100 m^3 from the Dead Sea springs, which Israel prevents Palestinians from developing.

Palestinians are increasingly reliant on bulk water purchases from Israel. As indicated in the Oslo Agreement in 1995, the Palestinian demand for the interim 5 years period was 118 m^3 per year to be extracted from previously unused sources in the eastern basin of the Mountain Aquifer. Due to the political climate and technical problems, the plan was not pursued and the Palestinians become dependent on purchasing water from Israel rather than extracting from the aquifer. The Palestinians purchased about 79 m^3 in 2016 and agreed under the Red-Dead Sea conveyance project to get another 32 m^3, with a demand for an additional 34 m^3. If these deals are agreed and implemented, the Palestinians will purchase about 145 m^3 from Mekorot

TABLE 3. Available Bulk Water Supply and Possible Future Sources

Domestic use	Local wells (m^3)			Mekorot (m^3)		
	Available	Vision	Desalination	Available	Agreed additional (Red-Dead Sea deal)	Vision
West Bank Demand	48	+10	–	69	+22	34
Gaza demand	84	–54	68	10	+10	–
Total		**102**			**145**	
Grand total				**247**		
	41 percent			**59 percent**		

Note: – = not available; m^3 = million cubic meter.

(Israeli bulk water supply company). Due to the aquifer depletion and deterioration in Gaza, the plan is to reduce the extraction to 30 m^3 per year and improve desalinated water systems.

The PWA is not able to pay Mekorot for the bulk water it purchases and is accumulating debt to Israel. In West Bank, every bulk water purchase from Mekorot puts the PWA in further arrears to Israel because of the lack of cost recovery at the service-provider level. Israel deducts this amount from the taxes it collects on behalf of the PA. The total arrears in 2017 stand at about US$335 million. In 2016, the Israeli Minister of Finance deducted US$94 million from clearance revenues due to the PA for unpaid Mekorot water bills (net lending) and for wastewater treatment. In 2017, the amount deducted increased by 10 percent—in contrast to the unpaid power deductions that decreased by 7.5 percent. In Gaza, imports from Mekorot are increasing, now about 10 m^3, and expected to double.

Options for desalination of seawater have not been fully exploited. Given the condition of the aquifer in Gaza, desalination is critical. In addition to small-scale options, there is the European Union (EU)-funded short-term low-volume (STLV) seawater desalination plant with a capacity of 6,000 m^3/day (2.2 m^3 per year). Small desalination units are operational in the West Bank only on a limited scale from the eastern aquifer. Following the Comparative Study of Options for an Additional Supply of Water for the Gaza Strip (CSO-G)—July 2011, a rolling program of interventions was produced, which recommended the enhancement of the level of water imports from Israel, the introduction of STLV desalination of seawater to respond to the medium-term needs and to build a centralized seawater desalination plant (55 m^3/year) and reduce the abstraction of the groundwater to protect the aquifer. Two STLVs were developed (6,000 m^3/day funded by EU and 2,600 m^3/day funded by Italy). In the meantime, extensions of those two plants to 20,000 and 6,000 m^3/day are ongoing, funded by EU and U.S. Agency for International Development (USAID), respectively. In addition, a third plant of 10,000 m^3/day capacity is under construction and funded by Kuwait Fund (KF) under the Islamic Development Bank (IsDB). But the two existing plants were not fully operational due to energy shortages, and another one to be financed by the IsDB is being developed. On March 20, 2018, an international conference for financial pledging for the central desalination plant and its associated works was able to secure about EUR 456 million, with about 20 percent financing gap.

Water Service Delivery in the Palestinian Territories

The establishment of the National Water Company (NWC) is part of the key institutional reforms in the sector, but this reform has not yet started. There are some significant attempts at institutional strengthening and rationalization but still in the early stages. The PWA has a branch in Gaza, but its effectiveness has been constrained by a parallel PWA set up in Gaza by the de facto Hamas administration. Bulk water provision in West Bank is the responsibility of the West Bank Water Department (WBWD). The WBWD manages wells and purchases bulk water from Israel (Mekorot) which it sells to SPs, and it operates some wells owned by the PWA. The 2014 Water Law provides for the establishment of a NWC that would be the bulk provider for both West Bank and Gaza. In March 2017, the PWA drafted a road map (National Water Company Draft Action Plan) for establishing the NWC from the WBWD, but no decision has yet been taken to implement the road map.

The 2014 Water Law was designed to clarify accountabilities and establish autonomous utilities but implementation has been slow due to an incomplete legal structure, lack of financing, and lack of clarity of rules and responsibilities at the local level. Previous water laws and strategies have also called for the establishment of regional utilities, but there has been no progress. Most SPs are still governed under the 1997 MoLG Law (Ministry of Local Government), which assigns the water services to the local government units (LGUs). Where the PWA sees water services as a free-standing activity that can be provided in partnership with the private sector, the MoLG sees water services as part of the local government's allocated responsibilities. LGUs also often see revenues from water sales as a means to cover their deficits on the provision of other services. In the interim, the lack of clarity will continue regarding accountabilities among the central agencies (PWA and MoLG) and the accountabilities of SPs upward and at the local level. Different interpretations of the 2014 Water Law by stakeholders both at the national and local levels suggest that the stakeholder consultation process has not yet resulted in full buy-in by the MoLG and LGUs, which increases the risk for implementation of the law and its supporting strategies. The ambiguity in the rules will continue until the establishment of draft utilities by law is approved.

Regulatory capacity is being developed but faces sustainable challenges. The Water Sector Regulatory Council (WSRC) was established under the 2014 Water Law as an independent legal entity that reports directly to the Palestinian Cabinet of Ministers. The WSRC is responsible for overall monitoring and regulation of all matters related to the operation of water and sanitation SPs. These responsibilities include approving tariffs, licensing and regulating SPs, and protecting consumers. The WSRC also collects valuable data by SP and has initiated a benchmarking process. It publishes a summary of these data in an annual report. When the NWC is established, the WSRC will set a unified price for all bulk supply to SPs. However, most of these statutory functions have not yet been legally transferred to the WSRC, including the approval of the licensing bylaw which would give the WSRC the eligibility to collect

fees for its financial sustainability from licensed SPs. Since neither the PWA nor the WSRC has technical or administrative control over LGUs, there is a governance gap in the sector. The MoLG exercises administrative supervision of LGUs, but water service delivery is loosely supervised.

Water supply is fragmented across a large number of SPs. There are different local government institutional entities that provide water services in West Bank and Gaza.

1. In West Bank, about 17 percent of the population is served by two autonomous "utilities," formally established under their own statute and reporting to a board of the LGUs that own them. The Jerusalem Water Undertaking (JWU) provides water services to part of East Jerusalem and surrounding communities and too much of Ramallah and Al Bireh governorate. The Water Supply and Sanitation Authority (WSSA) provides water services to some communities in the Bethlehem area.
2. The rest of the West Bank population and all Gaza households are serviced by providers under the aegis of the MoLG. Larger towns have municipal water departments, which provide water and/or sanitation services (76 in West Bank and 25 in Gaza).
3. In West Bank, a number of smaller municipalities and villages have joined together to form Joint Service Councils (JSCs) (13 to date), which provide water and/or wastewater services.
4. Some 162 Village Councils (VCs) also deliver water and wastewater services. There are moves to begin with aggregation of smaller SPs and to encourage SPs to strengthen transparency, accountability, and financial autonomy.
5. The Coastal Municipalities Water Utility (CMWU) is the Gaza SP under the MoLG in Gaza, as it is established as a JSC. Support to almost all Gaza municipalities is given by the CMWU to maintain and upgrade their water and wastewater systems without real responsibility on operation and maintenance (O&M), revenue collection, and tariff implementation except in Rafah. In practice, the CMWU serves also as a project management unit that is implementing some donor projects.

Gaza relies on unregulated private sector services. There is a lack of clarity of roles and responsibilities among the PWA, CMWU, and the municipalities, which makes it difficult to advance infrastructure projects, especially with external funding. By the end of 2018, the PWA plans to submit to the Cabinet a regulation for the establishment of regional water utilities which can reenergize the model. Network water provided through municipal providers or the CMWU is chlorinated but not suitable for drinking and is used mainly for cleaning and gardening. Almost 97 percent of the drinking water consumed in Gaza is supplied through small-scale independent providers—estimated to have increased from 20 in 2010 to 100 in 2016. In Gaza City, the municipality retains sole responsibility for water supply.

Private businesses are running several reverse osmosis (RO) plants and a fleet of trucks. Some private businesses comprise only trucks and purchase bulk desalinated water from the RO plants. Public bodies, nongovernmental organizations (NGOs), educational institutions,

and aid agencies are also running RO plants. In 2015, 154 RO plants were reported in Gaza with no proper monitoring on water quality as the WSRC data report poor quality with respect to coliform[9] and nitrates. A PWA/WASH Partners/GIZ study found that although most plants are monitored (59 percent by the Ministry of Health), "nearly half the RO plants produce contaminated water (total coliform)." Tankers and storage tanks in supermarkets and domestic dwellings are rarely properly cleaned. Around 68 percent of the plants are not licensed and 40 percent use water from unlicensed wells. The production of all RO plants in Gaza is equivalent to 4 m^3 per year (PWA, Gaza Water Resources Status Report 2015) and sales are about NIS 130 million a year (US$35 million). Employment in the plants and trucks is estimated at about 1,500 to 2,000 full-time jobs.

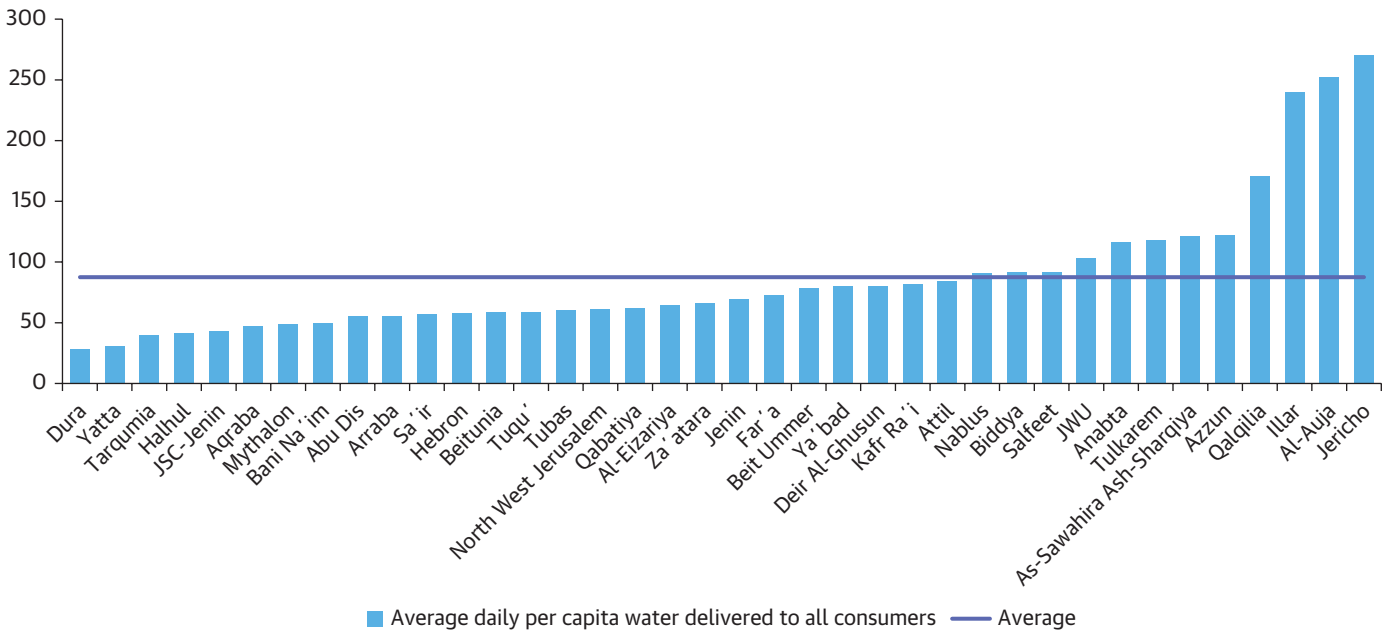
Operational Performance of Service Provision and Water Service Quality in the Palestinian Territories

High levels of investment have secured high connection rates. US$1.3 billion has been invested in the Palestinian water and sanitation sector in the last decade. As a result, water network connections reach almost every household. About 93 percent of the West Bank and Gaza populations are connected to a piped water supply. High connection rates, however, mask service challenges.

NRW levels are high for a water and financial resource-constrained region. Average NRW[10] ranges from 29 percent at the SPs' level and 15 percent (10 m^3/year) at the bulk water supply level (West Bank) to 40 percent (Gaza), with some municipalities seeing 53 percent of their water lost. This equates to 267 liters of water per day for each connection in the West Bank and 600 liters per day per connection in Gaza. In total, this translates to 82 m^3/year.

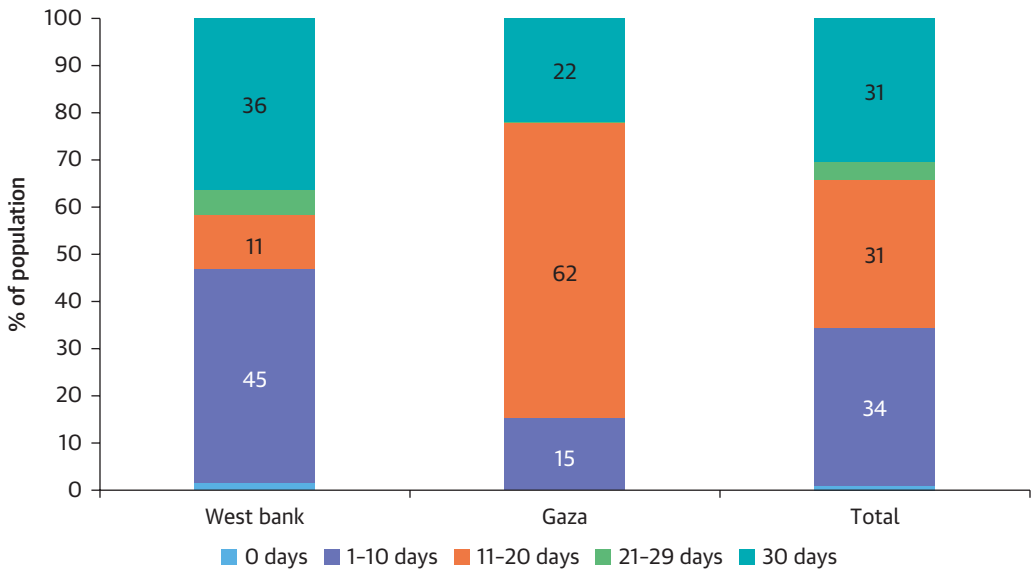
Despite high network coverage, service delivery is intermittent, with large variations in per capita supply between communities. Only 30 percent of households in Gaza have daily network water supply for limited hours, compared with 50 percent in West Bank. About 15 percent of the population in Gaza and 47 percent of the population in West Bank have access to piped water supply for fewer than 10 days a month. Thus, 97 percent of the

FIGURE 3. Average Daily per Capita Water Delivered to All Consumers, West Bank, 2015



Source: WSRC.

FIGURE 4. Days of Piped Water Supply, 2016



Source: LGPA 2016.

population in Gaza and 92 percent of the population in West Bank reported having a water storage tank on the roof or in the courtyard. Quality of service is highly dependent on the availability of bulk water, which is uneven among West Bank communities, particularly varying from 26 lcd in Yatta and Dura to over about 250 lcd in Jericho.

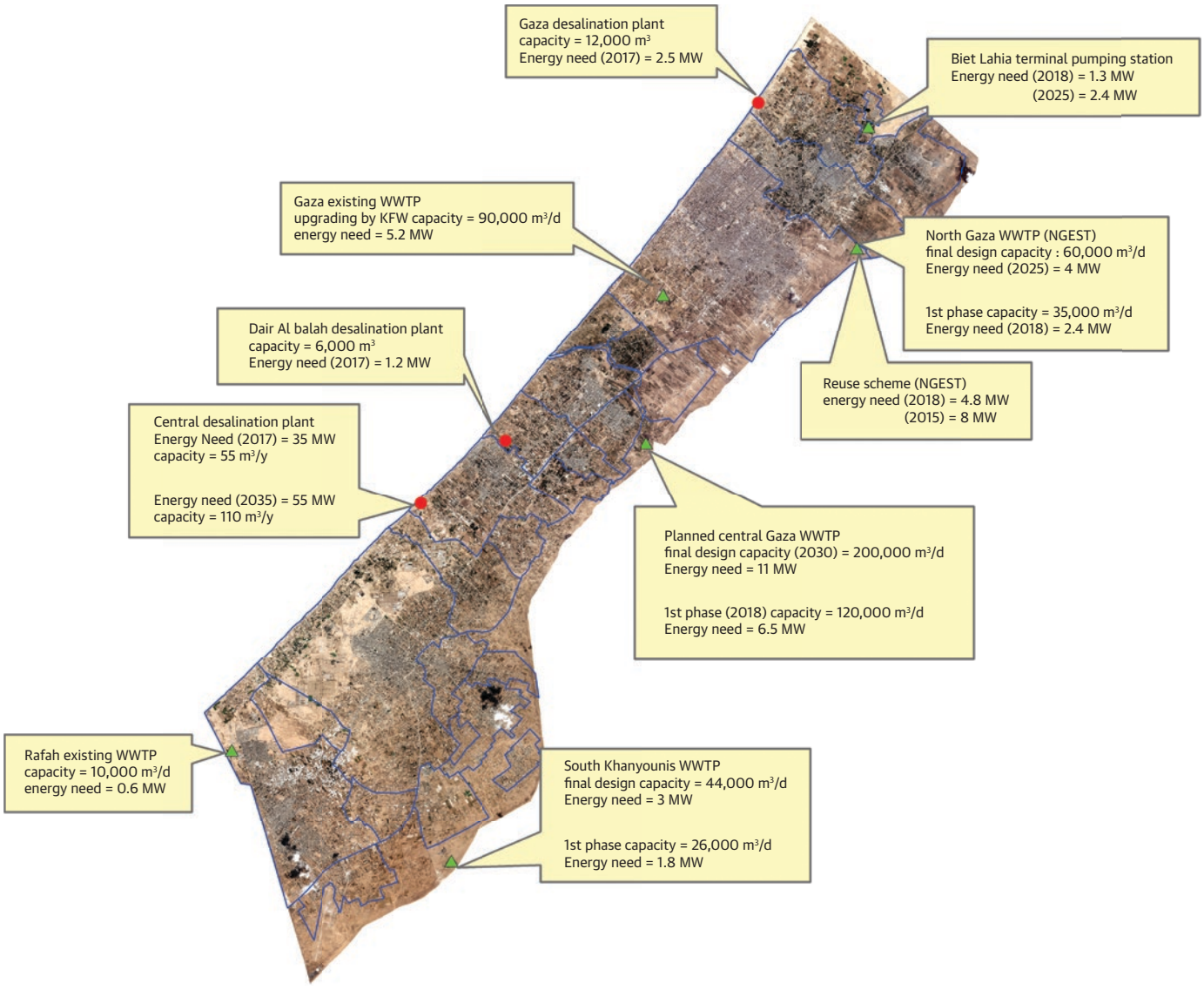
Lack of sufficient and reliable electricity supply to the water and wastewater sector in Gaza is an obstacle to achieve efficient and adequate water service provision. The Gaza water sector needs around 127 MW until 2030. Palestinian electricity demand is projected to grow at an average annual rate of just above 3.5 percent for the coming years, including 30 MW for the initial central desalination facility and its associated works of 55 m^3 per year. If no further power generation options are developed, the unmet demand for electricity will increase to 63 percent by 2030. The current available power supply only meets half the demand, leading to rolling blackouts, typically alternating between 6 hours on and 12 hours off. This interrupts water supply since there is no perfect match between times of water and electricity supplies for the same area. As of 2015, about 64 percent of Gaza's electricity was supplied by imports from the Israeli Electric Corporation (IEC). The PA set targets of 130 MW of renewable energy by 2020, but only 18 MW has been developed to date. Until the Gaza power plant is switched over to gas-fired generation, it would be preferable to substitute domestic diesel-fired power generation with Israeli power imports, taking advantage of the planned 161 KV line.

Financial Viability of Water Services in the Palestinian Territories

A lack of commercial focus undermines the viability of the sector at multiple levels. Tariffs in both West Bank and Gaza are low. In Gaza, tariffs cover two-thirds of costs and SPs collect only 37 cents on each dollar of sales with the result that the average SP covers less than 24 percent of its costs. In 2014, on average, Gaza SPs incurred a shortfall of NIS 2.01 (US$0.7) for every m^3 supplied. In West Bank the average tariff barely covers operating costs, but SPs collect only 68 percent of bills issued, collecting only 76 cents on each dollar of costs, using

Collection rates are very low (68 percent of customers pay their bills, on average) and tariffs barely cover the O&M costs and make no provision for depreciation.

MAP 1. Needs of Major Water and Wastewater Facilities until 2030



Source: CMWU.

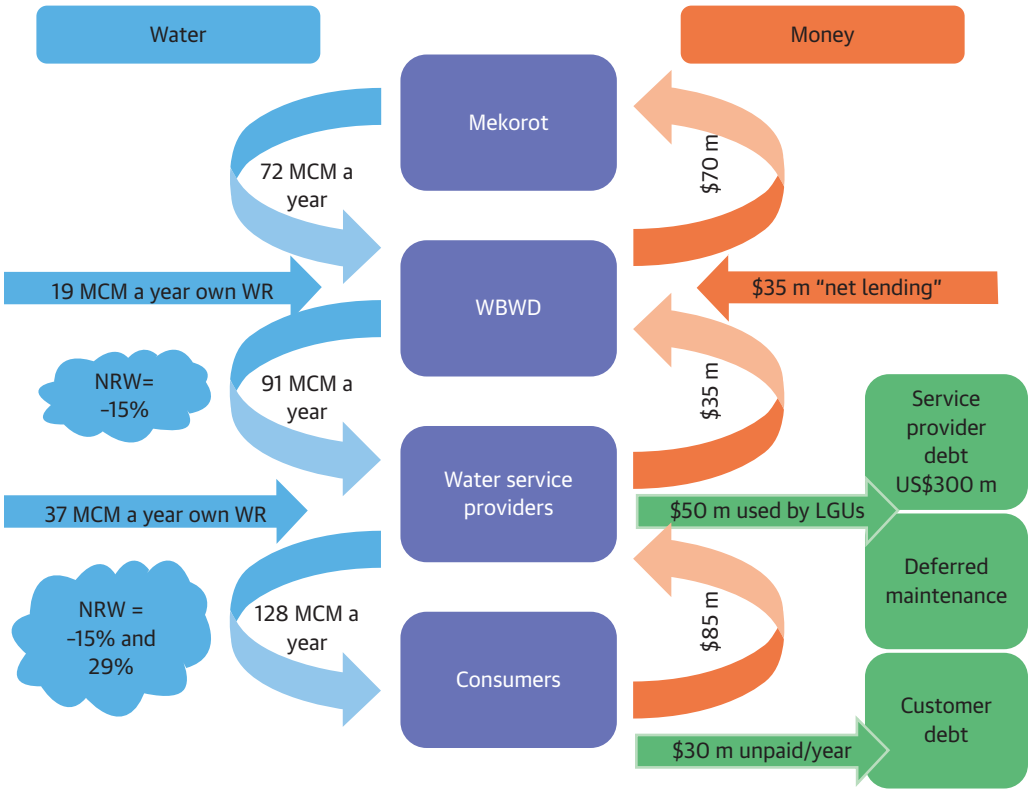
Note: m^3 = million cubic meter; MW = megawatt; WWTP = wastewater treatment plant.

part of these collections for other municipal expenditures, leaving them with high arrears to the bulk supplier reaching about US$335 million. In 2014, on average, West Bank SPs lost NIS 1.57 (US$0.44) for every m^3 supplied. There is a wide variation in tariffs, particularly in West Bank, where rates range from NIS 1.63/m^3 (US$0.43/$m^3$) to as high as NIS 8.13/m^3 (US$2.14/$m^3$). Nonpayment for piped water is widespread (US$447 million equivalent), especially in Gaza, and the poor are least likely to pay.

A combination of high NRW, inadequate tariffs, and low collection rates undermine the financial viability of most SPs and impair their ability to invest in O&M.

The inability of SPs to cover operating costs leads to the need for operational subsidies. Municipalities exhibit sub-optimum user fee collection and cost-recovery rates for all municipal services. High NRW rates together with low tariffs and low collection rates means that the SPs run persisting financial deficits of about US$70 million per year. In 2016, the West Bank water sector experienced a total deficit of NIS 110 million (US$30.7 million equivalent), adding to a total deficit of over NIS 1 billion, or US$350 million, in the WBWD books. West Bank SPs compensate for the deficit by not paying the WBWD for the purchase of bulk water; despite that the WBWD already provides a 20 percent subsidy on the cost of bulk water. In Gaza, the operating deficit is covered in part by donors and in part through SPs' nonpayment of bills, primarily energy bills. Figure 5 shows the water sources in comparison to the revenues, debts, and subsidies at different levels.

FIGURE 5. Water Sources versus Revenues, Debts, and Subsidies at Different Levels



Note: LGU = local government unit; MCM = million cubic meter; NRW = nonrevenue water; WBWD = West Bank Water Department; WR = water resource.

Water sector financing is conjoined with the need for municipal finance reform. The revenue base of LGUs is weak. The absence of ring-fencing of water tariff accounts means that water revenues may be diverted to general revenues. Municipalities derive 15 percent of their total revenue from water services, and VCs derive 16 percent. In overall municipal financing, water revenues are second only to electricity, which makes up 33 percent of revenues. As electricity reforms are progressing, District Electricity Companies (DESCOs) have been established that are preventing LGUs from tapping electricity revenues. Although few LGUs derive an accounting surplus from their water operations, many simply retain a share of the water revenues to finance other operations and do not pay for their bulk water, contributing to the net lending problem. Unless the financing of LGUs is put on a more solid footing, LGUs will have limited incentive to separate their water operations as autonomous cost accounting centers, and even if they do, they may find other ways to divert water revenues to their own account. The experience from the energy sector reforms is that net lending has been reduced by only 7.5 percent, as LGUs divert revenues in the form of dividends.

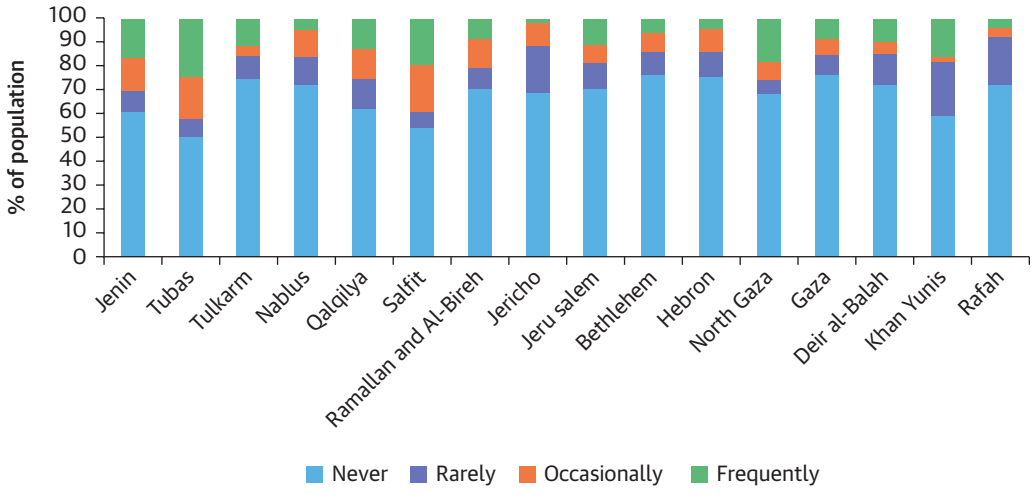
Domestic revenues are not being allocated to meet sector investment needs. The National Water and Wastewater Policy and Strategy for 2012–32 estimates sector investment needs at about US$7 billion by 2032 yet only US$100 million/year has been allocated over the last 5 years. Overall, municipal revenues remain significantly below potential with local government revenues accounting for only 11 percent of total government revenues, sufficient to cover only a minority of LGUs' functions. SPs contribute 15 percent of total municipal revenue, but with little tax revenue, municipalities that provide water and/or electricity often divert user fees to cover other municipal costs, contributing to the national debt to water and electricity suppliers.

Sanitation and Wastewater in the Palestinian Territories

Sewerage connections lag in the West Bank compared to Gaza. Sanitation coverage is high, but connection to sewerage networks is much higher in Gaza than in the West Bank. In Gaza, access to improved sanitation is universal, with 78 percent of the population connected to sewerage networks and the remainder relying on on-site services. In the West Bank, despite near universal access to improved sanitation (94 percent), access to sewer connections is only 30 percent, with rates varying widely by governorate, from 0 (in Tubas) to 59 percent (in Qalqilya). Access also varies strongly by household income: only 13 percent in the poorest quintile are connected to sewer networks, compared to 42 percent in the richest quintile. Two-thirds of West Bank residents are using cesspits, which are emptied by vacuum tankers, who usually dump their contents in open areas, valleys, sewage networks, and/or dump sites, (Palestinian Hydrology Group. 2006) thereby increasing the risk of groundwater contamination. The existing Wastewater Treatment Plants (WWTPs) have not been designed to specifically treat the sludge collected from septic tanks, but some treatment plants accept these trucks, for example, the Al Bireh WWTP.

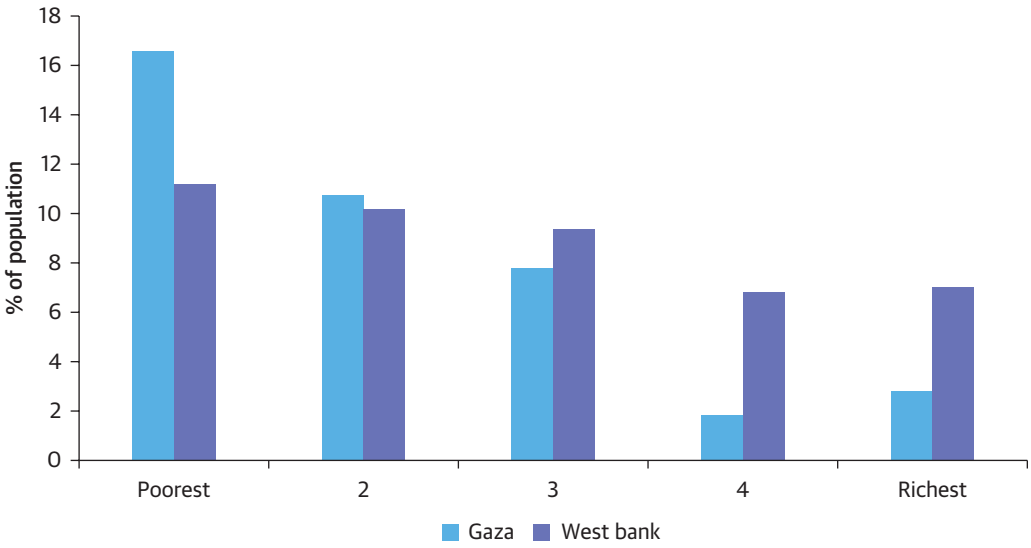
Inadequate wastewater and fecal waste treatment poses real environmental and health threats to Palestinians. Only 30 percent (or 21 m^3) of the 69 m^3 of West Bank wastewater is collected and only 9.5 m^3 is treated. The result is that 25 m^3 of untreated sewage is discharged into the environment each year from 350 locations. Some 21.4 m^3 of this flows into Israel which charges the PA for necessary treatment; Israel billed the PA US$31 million in 2017. In Gaza, out of the 80 m^3 of wastewater, around 1 m^3/year treated wastewater is

FIGURE 6. Sewage Overflow Occurrence across 2016, Percent of Population



Source: LGPA 2016.

FIGURE 7. Frequent Sewage Overflow Governorates, Occurrence across Asset Quintiles by Region, 2016, Percent of Population



Source: LGPA 2016.

reused, 13 m^3 is treated and discharged into the aquifer for its recovery, and 46 m^3 untreated and partially treated wastewater is discharged into wadis, being infiltrated in the ground and directly into the sea.

Across all governorates, overflows of sewage are frequent or occasional for 18 percent of the population using improved sanitation. These overflows occur more often in the northern governorates of the West Bank. Tubas, Salfit, and North Gaza had the highest percentage of the population experiencing an overflow at least once in a month in 2016. Overflows are more likely among the poor in Gaza than the wealthy.

Reaching Water Security in the Palestinian Territories

Inaction is not an option; the goal of water security has been receding in recent years. The population is growing rapidly. With economic needs for water rising and water resources dwindling, demand already far outstrips supply. The situation is deteriorating from one year to the next. Internal renewable water resources are being overdrawn—very heavily so in Gaza, where the quality of water from the aquifer has become undrinkable. Dependence on Israel has been growing and the Palestinian need for further water resources from Israel, which may not always be available, may complicate matters. Obtaining new water resources has become a transboundary and political issue. Huge efforts have been made to improve water and sanitation services in recent years and access had improved considerably, but the decrease in water quantity available per person and above all the plummeting quality of Gaza's water resources have led to a steep decline in both access to and quality of water services. Meanwhile, inadequate treatment and disposal of wastewater is a growing environmental issue.

West Bank and Gaza is a very water-scarce lower-middle-income territory with a relatively water-dependent economy and is vulnerable within its geopolitical setting; thus, assuring water security is a priority. Water security requires adequate water resources that are well managed, including management of risks, and water SPs that provide sustainable, efficient, and equitable services. To improve water security in the Palestinian water sector, there are two pathways and four pillars, which are recommended for consideration:

1. **Efficient use of natural and financial resources to better meet demand; this pathway can be achieved by the following pillars:**
    a. Addressing water supply and demand gap incorporating desalination, water importation, wastewater treatment, and reuse
    b. Strengthening the water sector institutions in alignment with the water law structure
    c. Enhancing the financial viability and sustainability of the water sector institutions
2. **Collaborative solutions within the region and the Palestinians to improve access to water supply and protect resources; this pathway can be achieved by**
    d. Attracting other development partners, including strong cooperation and coordination with Israel.

The first pathway is largely within the control of Palestinians and can be fast-tracked to break the negative financial/service cycles in West Bank and Gaza. This pathway would target service delivery improvements to improve financial viability, efficiency, and accountability—fundamental to commercialization and corporatization. A progressive and integrated framework is needed that combines *institutional change* with steps to address bulk *water availability*

and promote *investment* and is aligned with *incentives* (IWII). This requires the Palestinian water sector leaders to move dedicatedly in the sector reform and make the *institutional change* a reality, moving progressively toward full implementation of the 2014 Water Law, which entails among many other things, the sector structure (establishment of the NWC and the water utilities and strengthening the WSRC), the achievement of financial viability with a sustainable and affordable tariff system, and strategic development planning and *investment* that ensure value for money and attract the private sector engagement. All three components need to be integrated with *incentives* for all stakeholders to implement change. This integrated framework is a practical and progressive way to improve performance and accountability, provide adequate water and wastewater services, and attract investment that will deliver affordable quality water and sanitation services for West Bank and Gaza.

In the short term, unregulated alternative SPs will become even more prevalent. As a coping mechanism, households are increasingly reliant on small-scale providers who provide water of dubious quality and at high prices. A PWA/WASH Partners/GIZ study found that although 59 percent of RO plants in Gaza are monitored by the Ministry of Health, nearly about 20 percent of the plants produce water contaminated by coliforms,[11] where such contamination increases through transportation and storage to more than 70 percent of the cases, a proxy indicator of fecal pollution. While stunting is not attributable solely to unsafe or limited access to WASH, 7.4 percent of Palestinian children under the age of five suffered from moderate and severe stunting in 2014—a percentage that could rise without better access to safe WASH.

The PWA instituted a medium-term Strategic Development Plan (SDP) (2017–22) to improve the water sector. The SDP focuses on institutional development as a main pillar to sustain the development process and achieve its objectives in improving water security by enhancing the delivery of water and wastewater services. It includes improvement of water resources and water supply by increasing water importation and slowing the deterioration in the groundwater of the coastal aquifer by developing unconventional water resources (desalination) and wastewater treatment systems. It also supports the continuation of the reform process by establishing sustainable and financially viable water service delivery institutions and strengthening their institutional setup. The World Bank and other development partners are exploring support to the SDP toward water security for the Palestinians.

The second pathway is important to enhance the fourth component of the cycle, which is increasing access to adequate water supply and to lay the groundwork for future water resource availability and risk management. This requires regional dialogue and collaboration with Israel. The framework also works toward essential increases in *bulk water availability* and *investment*. This pathway requires that all donor communities to establish a platform that would act as moderator to enhance the dialogue and cooperation between the Palestinians and Israelis and activate the joint water committee to provide reasonable solutions for increasing the water supply and improving wastewater and reuse services for the Palestinians and set the framework for transboundary water and wastewater negotiation.

Enhancing the Palestinian-Israeli cooperation and constructive dialogue toward better water resources management is a mutual benefit and would support peace and stability. Based on current trajectories, allowing the status quo to continue will compound the current negative outcomes in the sector. In addition to the natural stress on water availability through climate change and the inability to address urgent water and wastewater needs immediately due to financial and institutional capacity, the groundwater scarcity and quality issues will become increasingly problematic unless abstractions are regulated and supplies are increased and used more efficiently. Due to over-abstraction for domestic and agricultural purposes, Gaza groundwater will soon become so contaminated that its entire volume will cease to be available for use and the aquifer will be irreversibly damaged. Then the people of Gaza would be fighting for their survival (to drink clean water) through movement toward Israel or the Arab Republic of Egypt or more violence that would affect all parties.

Fast-Track Options to Address Immediate Needs of Water Supply and Demand under the First Pathway

A prioritized investment plan is needed to make the most strategic use of the additional 32 m^3 per year coming on stream. The new purchase deal between Israel and the PA to supply 22 m^3 per year to West Bank and 10 m^3 per year to Gaza may become effective before sector efficiencies can be achieved and thus initially add to the arrears with Mekorot. A priority plan, specifically tailored to the distribution of those quantities, should be developed now to direct allocation of the new supply toward the areas of greatest need, particularly in Gaza and southern West Bank, building from the 2016 Strategic Investment Plan. In Gaza, improving the bulk water system (associated works to the desalination plant) and the internal network to be able to absorb the additional water, whether it is from the desalination plant or from water purchased from Israel, is needed.

Alternative service provision, especially in Gaza, is a short-term necessity and requires better oversight. Abstraction, water quality, price, and service monitoring of small RO plants and tanker fleets is limited in scope and effectiveness, creating pressures on consumers and the environment. Improvements can be achieved through (1) recovery of the aquifer by closing unlicensed wells; (2) improvement in the wastewater treatment efficiency and use the reclaimed water for irrigation, to reduce extraction from the aquifer; and (3) tighter monitoring regimes and/or a commercial licensing regime that makes the private sector accountable for the responsiveness of tanker services and the safety of water provided to citizens. At present US$600,000 per year is spent to disinfect the nonpotable water distributed through the network in Gaza; the same or more attention should be directed toward the improvement of water quality that is used for drinking provided by the private sector.

Priority should be given to energy and operational solutions for STLV desalination plants. While longer-term solutions are negotiated among the PA and Israel, the STLV plants (about 13 m^3/year in 2019) need to maintain production as the most practical decentralized option for potable water supply (for example, establishing the NWC or partnership with private sector, that is, management contract to manage the facilities). Israel needs to be engaged in a rapid dialogue around streamlined material entry and construction permits. Given the scarcity of fuel for generators, there should be proactive investment, in coordination with donors, humanitarian agencies, or private sector, on the application of solar power options in addition to increased electricity supplies from all sources (Egypt, Israel, and Gaza power plant).

Immediate improvement of the bulk NRW, where majority of it is in the southern area of West Bank, which accounts under commercial losses (thefts), is needed. The WBWD and PA should exert efforts and cooperate with the Israeli authorities to stop the thefts on the main pipelines in Area C. The people in the southern area of West Bank (Hebron governorate) receive the least per capita share (15-35 lcd) in the West Bank and Gaza. The NRW in bulk water supply reaches 15 percent; reducing 50 percent of this will add about 5 m^3 per year to the system, which is the short-term shortage in Hebron.

Fast-Track Options to Strengthen Water Sector Institutions under the First Pathway

Ensure that the leadership adheres to the reform process to take immediate actions and approve required bylaws and regulations. Three immediate bylaws are essential for institutional reform and development and need to be approved: (1) the establishment of the water utilities, which set the roles and steps for the establishment of the sustainable water SPs; (2) the tariff bylaw, to set the financial bases for the utilities' sustainability; and (3) the licensing bylaw, which allows the WSRC to start licensing the SPs and collect fees to cover its operations.

Institutional efficiencies should be implemented toward commercialization and corporatization of service provision. Beyond immediate improvements in cost recovery, SPs need to make progress toward the long-envisioned corporatization of service provision. Critical steps include opening separate bank accounts, developing business plans, establishing financial and cost accounting systems, and adopting procedures for asset management and maintenance. As performance improves, the SPs can transition from commercialized to corporatized business models to make gains in efficiency sustainable.

Aggregation of SPs brings additional efficiencies over the longer term. While more than 54 percent of the population in West Bank and Gaza reside in 11 municipalities, there are over 100 municipalities with fewer than 25,000 residents, with the smallest municipality consisting of only 2,500 residents. To achieve economies of scale, some municipalities and VCs have formed JSCs to jointly provide services, planning, and development functions. However, utility service consolidation remains slow, as evidenced by the 226 small-scale water SPs. The PWA is in the process of establishing sustainable municipal water utilities and anticipates having additional 4 (to the existing 3) by the end of 2022. By the end of 2018, the PWA plans to submit to the Cabinet a regulation for the establishment of regional water utilities. A model exists with the CMWU and JWU, both of which were initially successful in achieving service and financial improvements. In Gaza, the CMWU should be reenergized and used as a demonstration model for improved commercial practice with the intent of attracting coastal municipalities back to the Utility and encouraging further sector aggregation.

Fast-Track Options to Enhance Financial Viability and Sustainability under the First Pathway

Forming a national committee to settle debts and adopt an incentive-based mechanism for water investments is a priority. National committee composed of relevant ministries (that is, Ministry of Finance [MoF], MoLG, PWA, and so on) to be formed to agree with municipalities and SPs on their debt balances and payment schedules. This should be linked with a performance-based incentive program for investment support. Those municipalities (SPs) that implement the agreement and improve performance (that is, increase collection, reduce costs, implement tariff structure, reduce NRW, and so on), would be illegible for incentive to finance their activities. The same committee could follow up on improving the governmental fiscal transfer policy to be adopted in the long term. In addition, this committee should prepare a mechanism to enhance revenue collection from the refugee camps or agree on a mechanism that subsidizes the utilities' fees.

Existing cost-recovery mechanisms can be enforced to tighten the value chain in the sector. Better financial viability will be achieved when (1) suppliers (NWC) are established and provide water to SPs, (2) SPs provide service to consumers, (3) consumers pay SPs, and (4) SPs pay suppliers. The MoLG and PWA drafted a Memorandum of Understanding to enforce LGU establishment of independent sustainable water utilities while moving toward establishment of bank accounts for water revenues. The proposed Water Security Development Project currently under preparation by the World Bank and the PWA will focus on improved efficiency of the distribution system leading to improvements in bill collection and increased water supply, while the West Bank and Gaza Fiscal Stability and Business Environment Development Policy Grant targets the ability of the SPs to pay suppliers by introducing the mechanisms to ring-fence utility revenues, limiting their absorption into general municipal revenues and non-sector use. As a pilot project, the PWA committed to start with eight LGUs which satisfy certain criteria,[12] which can be a nucleus for regional utilities.

NRW must be reduced. District metering areas (DMAs) should be established to allow for identification of physical leaks in the distribution network. These should be accompanied by efficient asset management and maintenance programs. Opportunities for performance-based contracts for the reduction of NRW should be explored, with the contractor paid a percentage of the revenue gained through increased water sales. Possible engagement of the private sector in sector development should be enhanced and clear policies, regulations, and trainings should be enforced. NRW program at the bulk level shall be introduced to recover the huge losses in the system, in West Bank and in Gaza (under the associated works of the desalination project).

Necessary sector subsidies should be transparent and targeted to have a beneficial impact on the poor, rather than perpetuating inefficiencies. West Bank bulk and retail tariff reforms

should be operationalized and subsidies made targeted and transparent. The sales price of bulk water from the WBWD to the SPs should be set at a price at least equivalent to the purchase price, as was intended. Any subsidy has to be transparent and directed to benefit the poor through a well-managed subsidiary system. The Water and Wastewater Tariff Bylaw approved by the PWA (January 2013 and updated and to be approved soon) and methodology determined through the Water and Wastewater Tariff Model approved by the PWA (October 2015) also need to be operationalized through the WSRC to improve cost recovery.

Collaborative Solutions for Improving Water Supply and Protecting Water Resources under the Second Pathway

The sector working group should be reactivated and agree with development partners to form a platform (representatives) to support the PWA in its dialogue with the Israeli authorities toward improving water services and provide solutions.

Since all long-term options for a secure water supply require collaboration with Israel, the dialogue needs to be reframed. The PA and PWA need to reframe the dialogue with Israel, and other regional players, around the shared risks of water insecurity in the Palestinian territories. There is increased documentation of the links among water insecurity, political instability, and regional upheaval (Sadoff, Borgomeno and de Waal 2017), with examples of water playing directly into the dynamic of fragility, acting as a "risk multiplier" that can compound or trigger simmering tensions. Water insecurity, for instance, can intensify perceptions that the government is unwilling to or unable to meet the needs of its citizens—thereby weakening the social contract between the government and citizen groups and acting as an internal destabilizing force. It is clearly in the best interest of all regional players to both avert internal fragility and to mitigate regional instability. Shared commitment and action toward water security in West Bank and Gaza mitigates these risks.

Quantities and prices of water sales from Mekorot to the Palestinian territories should be reexamined within this new framework. The PA is being charged the full cost of producing desalinated water, which Mekorot makes available to Jordan at a discounted rate—reflecting the value of the political stability gained through availability of water.

Transfer of technology from Israel to Palestinian territories should be encouraged, consistent with Article 40 of the Oslo Accord and a shared interest in the viability of the Palestinian water and sanitation sector. As a world leader in water efficiency and reuse technologies, Israel is a critical partner in ensuring that West Bank and Gaza can manage desalination, wastewater treatment and reuse, and agricultural technologies for demand management. Israel has a tangible interest in improved environmental management in the Palestinian territories. West Bank releases 50 m^3 of sewage annually into transboundary streams and into groundwater while Gaza sends about 100,000 CM of sewage into the Mediterranean daily. Israel can support risk assessments and early warning, mechanisms of transboundary water management at a subregional level, and identification of regional projects of shared benefit. Real costs of desalinated water production, natural water production, and transport of blended water need to be critically analyzed and agreed between the parties, on which bases tariff of bulk water supplied has to be agreed.

The lynchpin of the PWA's strategy for secure water supply for Gaza is the Central Desalination Plant (55 m^3 per year). The plant has been in the planning phase for more than four years. The realism of this scheme, in terms of implementation and sustainable operation, should be

advanced in coordination with Israel and donor partners, to resolve challenges. The challenges to be resolved include availability of additional 30–35 MW of energy, security of investment, and entry of critical materials. Water purchase from Israel will remain a need in West Bank and an option in Gaza as well. The construction of the associated works to enhance the water network in Gaza to absorb additional water is necessary. Both options need Israeli cooperation and facilitation for the entry of materials and personnel and to avoid including these facilities in any conflict to protect them from destruction.

TABLE 4. Summary of the Fast-Track Actions under Each Pillar

Pillars	Options/recommendations	Time frame	Detailed key actions	Stakeholders
A. Efficient use of natural and financial resources				
Service delivery improvements to improve financial viability, efficiency, and accountability, fundamental to commercialization and corporatization. Integrated framework that combines *institutional change* with steps to address bulk *water availability* and promote *investment* and is aligned with *incentives* (IWII).				
(1) Addressing water supply and demand gap incorporating, desalination, water importation, wastewater treatment and reuse	(1) A prioritized investment plan is needed to make the most strategic use of the additional 32 m^3 per year coming on stream.	2018–20	• Secure financing • Start construction • Make the proper water connection • Manage additional water efficiently	PWA, SPs (CMWU), and WSRC
	(2) Strengthen the oversight for (a) recovery of the aquifer by closing the unlicensed wells, (b) improvement in the wastewater treatment and reuse efficiency, (c) tighter monitoring regimes and/or a commercial licensing regime that improves accountability	2018–30	• Apply the licensing procedures. • Regulate the licensing for private wells and close unlicensed wells. • Support the O&M for the treatment plant to produce efficient effluent that can be reused or used for infiltration into the aquifer. That would also subsidize the closed wells. • Monitor water quality that is distributed by the private sector.	PWA, WSRC, in collaboration with the PA executive agencies
	(3) Operational solutions for STLV desalination plants	2018	• Partnership with private sector to operate the STLV desalination plant	PWA, get support from the development partners to reduce the risk by improving collaboration and coordination with Israel.
(2) Strengthening the water sector institutions in alignment with the water law structure	(1) Approve required bylaws and regulations	2018	Immediate approvals of the following bylaws: (1) The establishment of the water utilities (2) The tariff bylaw, to set the financial bases for the utilities' sustainability (3) The licensing bylaw for the water utilities for efficient monitoring process	PWA, the Cabinet of Ministers, and the WSRC

table continues next page

TABLE 4. continued

Pillars	Options/recommendations	Time frame	Detailed key actions	Stakeholders
	(2) Implement commercialization and corporatization of service provision	2019	Support the SPs to open separate bank accounts for the water departments, develop business plans, establish financial and cost accounting systems, and adopt procedures for asset management and maintenance	PWA, SPs, WSRC; Development partners to support these activities
	(3) Aggregation of SPs	2019–30	• Approval of the utilities establishment bylaw • Contract management for the CMWU to restructure it and aggregate Gaza SPs in it • Performance-based contract for possible SPs in the West Bank (Qalqiliya, Tulkarm, and so on), • Technical assistance support for some municipalities to establish their own utilities as the first step and then join others to it • Enhancing of the capacity of potential JSC to become independent utility	PWA, SPs, and support from development partners
(3) Enhancing the financial viability and sustainability of the water sector institutions	(1) Forming a national committee to settle debts and adopt incentive-based mechanism for water investments is a priority	2018	• Agree with municipalities and SPs on their debts balances and payment schedules. • Link support with a performance-based incentive program (that is, increase collection, reduce costs, implement tariff structure, reduce NRW, and so on) for investment support. • Improve the governmental fiscal transfer policy to be adopted in the long term. • Prepare a mechanism to enhance revenue collection from the refugee camps or agree on a mechanism that subsidizes the utilities' fees.	PWA, MoF, MoLG, SPs
	(2) Existing cost-recovery mechanisms can be enforced to tighten the value chain in the sector.	2020–25	• Support the water supply chain from the bulk supply to the local service delivery by establishing the NWC and establishing sustainable water utilities. • Develop and implement a public awareness campaign to improve payments and civil contract with the SPs.	PWA, WSRC, SPs, and support from development partners

table continues next page

TABLE 4. continued

Pillars	Options/recommendations	Time frame	Detailed key actions	Stakeholders
	(3) NRW must be reduced.	2019–25	• DMAs should be established to allow for identification of physical leaks in the distribution network. • Apply efficient asset management and maintenance programs. • Performance-based contracts for the reduction of NRW should be explored. • Possible engagement of the private sector in sector development should be enhanced and clear policies, regulations, and trainings should be enforced. • NRW program at the bulk level shall be introduced to recover the huge losses in the system.	PWA, WSRC, SPs, and development partners to support this effort
	(4) Sector subsidies should be transparent and targeted to have a beneficial impact on the poor.	2019–30	• Tariff reforms should be operationalized and subsidies made targeted and transparent. • The updated water and wastewater tariff bylaw to be approved. • Operationalize the tariff bylaw through the WSRC to improve cost recovery.	PWA, Cabinet of Ministers, WSRC, and SPs
B. Collaborative solutions within the region and the Palestinians to improve access to water supply and protect resources. To enhance the fourth component of the cycle, which is increasing access to *adequate water supply* and to lay the groundwork for future *water resource* availability and risk management.				
	(1) The sector working group should be reactivated.	2018–30	• Regular meetings • Agree on a platform to support the PWA in its dialogue with the Israeli authorities to manage relevant issues	
	(2) Reframe the dialogue with the Israelis to agree on long-term options for water supply to the Palestinians.	2018–30	• Keep the meetings with Israelis and activate the development partners platform to support the dialogue.	PWA, development partners, and Israeli authorities
	(3) Quantities and prices of water sales from Mekorot to the Palestinian territories should be reexamined within this new framework.	2018–30	• Open discussion about water prices with the aim of strengthening peace stability	PWA, development partners, and Israeli authorities
	(4) Transfer of technology from Israel to Palestinian territories should be encouraged.	2018–30	• Closer coordination with Israel to help in risk assessments and early warning and mechanisms of transboundary water management • Support for know-how and technology management • Identification of regional projects of shared benefit	PWA, development partners, and Israeli authorities

table continues next page

TABLE 4. continued

Pillars	Options/recommendations	Time frame	Detailed key actions	Stakeholders
	(5) Secure water supply for Gaza is the Central Desalination Plant.	2020–27	• Close cooperation and coordination with the Israelis is required to facilitate the entry of materials and personnel, keeping the plant and associated facilities far from any possible conflict. • Keep close coordination with the development partners for financing and during implementation.	PWA, development partners, and Israeli authorities

Note: CMWU = Coastal Municipalities Water Utility; DMA = district metering area; JSC = Joint Service Council; m^3 = million cubic meter; MoF = Ministry of Finance; MoLG = Ministry of Local Government; NRW = nonrevenue water; NWC = National Water Company; O&M = operation and maintenance; PWA = Palestinian Water Authority; PA = Palestinian Authority; SP = service provider; STLV = short-term low-volume; WSRC = Water Sector Regulatory Council.

Moving Forward

- Strengthen the capacity of the PWA and its role in leading the implementation of a programmatic and prioritized approach to sector reform.
- For efficiency improvements, solidify long-planned institutional and sector reforms; strengthen the regulator and rationalize water pricing to improve cost recovery.
- Improve the efficiency of the sector in financial, institutional, and natural resource terms to pave the road for private sector participation.
- Identify a package of critical infrastructure investments and accelerate those in collaboration with Israel.
- Set up an associated water quality and health monitoring program.

Strengthen the capacity of the PWA and its role in leading the implementation of a programmatic and prioritized approach to sector reform. Project-based approaches and ambitious long-term planning have not been effective responses to the immediate sector needs nor built a strong institutional platform for water security. The PWA need to instigate sector dialogue around (1) short-term prioritized investments to respond to humanitarian crisis and downward service spirals and (2) collaborative, aligned responses to longer-term water security issues. Sector partners must support the PWA's efforts and capacity to lead and help facilitate regional dialogue. The programmatic approach recognizes that water, wastewater, and energy are interconnected sectors and, in the case of West Bank and Gaza, solutions need to be crafted in collaboration with Israel and development partners.

In support of efficiency improvements, long-planned institutional and sector reforms need to be solidified. These include the crucial role of the WSRC as a regulator and the rationalization of sector pricing to improve cost recovery. SPs, together with the MoLG, also need to line up around the two pathways.

The fast-track priority should be on improvement of the efficiency of the sector. This is consistent with the thrust of other World Bank and development partners' operations and crucial to restoring viability to the sector. Efficiency improvements are necessary in financial, institutional, and natural resource terms. Unless these efficiencies are built, the options for private participation and investment remain limited and there will be a continued reliance on Israel and donors for sector support.

A package of critical infrastructure investments needs to be identified and accelerated in collaboration with Israel. These will be the investments to ensure the distribution of the new 32 m^3, to meet the immediate needs of West Bank and Gaza and establish a reliable desalination supply for Gaza.

There is a need for an associated water quality and health monitoring program. Baseline indicators of water quality need to be established and a monitoring strategy for private vendors implemented.

Notes

1. This paper considers the WHO benchmark as the minimum per capita consumption per day (100 lcd).
2. Palestinian Water Needs in Light of the RSDS Project, Dr. Muath Abu Sadah.
3. http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/gover_e.htm.
4. The source of data for 2017 is the PWA. The assumptions for 2030 depend on the PWA strategy with some modifications as indicated.
5. https://www.nad.ps/en/publication-resources/agreements/israeli-palestinian-interim-agreement-west-bank-and-gaza-strip.
6. WAB: Western Aquifer Basin, NEAB: North East Aquifer Basin, EAB: East Aquifer Basin.
7. PWA Gaza database; Coastal Municipalities Water Utility (CMWU) database; communications with Ahmed al Yaqoub and Rebhy Sheikh, PWA; Messerschmid 2008.
8. Data on groundwater quality in West Bank are limited to selected wells located in the Jordan Valley, Qalqiliya, and Tulkarm. Water testing shows that most of the wells in the Jordan Valley have a high concentration of chloride, exceeding the acceptable guideline set by the WHO (250 mg/L), while the nitrate concentration is quite low (PWA 2013). In Tulkarm and Qalqiliya, the nitrate concentration exceeds the WHO allowable limit (50 mg/L) in some wells, while the chloride concentration in these wells remains within acceptable limits (PWA 2013; The Applied Research Institute Jerusalem (ARIJ), Monitoring Reports, 2016, 53).
9. Average contamination is 92 percent and 86 percent in West Bank and Gaza, respectively, where the acceptable average according to the WSRC is more than 95 percent.
10. NRW includes actual physical losses from the system, theft of water through illegal connections, and water supplied to customers who are not billed. Depending on the service provider's policy, this may include refugee camps, surviving family of martyrs, mosques, and public buildings.
11. The presence of these bacteria indicates that the well water is contaminated with feces or sewage, and it has the potential to cause disease.
12. The criteria used in selecting the LGUs are the following: (1) central municipality of a governorate which is not included within an existing utility and (2) willingly agreed to work to form its independent water utility and achieve certain indicators to qualify for infrastructure investment.

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