Infrastructure development after Oslo B in the West Bank governates of the Palestinian National Authority

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Abstract Water and wastewater infrastructure was either nonexistent or in a state of deterioration at the time of the establishment of the Palestinian Water Authority. Despite the lack of sufficient water supplies, the Palestinian Water Authority has been working to deliver new water supplies to unserved areas and at the same time is pushing a program of rehabilitation in order to reduce the quantities of either lost or unmetered water. A presentation will be made of the immediate needs of the Palestinian Water Authority for Palestinians in the West Bank districts. A summary will be made of the unserved towns and villages, of the ongoing rehabilitation projects, and a brief outline of the larger packaged projects that should be completed in the next couple of years. As a conclusion, a review will be made of Article 40 of Oslo B illustrating the status of the delivery of “allocated” water quantities during this “interim period” before the final status negotiations, where the rights of the Palestinians in the water resources of the region will be detailed.

Keywords Article 40; development; Middle East; Oslo B agreement; Palestinian Water Authority; West Bank

Introduction

The West Bank is made up of an area of approximately 5,572 square kilometres. The greater part of it is considered mountainous except for the lands in the Jordan Valley bounded by Beisan Valley in the north and the Dead Sea in the south as well as some coastal plain areas in Tulkarm District. The main axis of the mountain series in the West Bank runs north-south, parallel to the Jordan Valley.

The West Bank is administratively divided into eleven districts, namely: Jenin, Tubas, Tulkarm, Qalqilia, Salfit, Nablus, Ramallah, Jerusalem, Bethlehem, Hebron and Jericho.

The total population of the West Bank is about 1.6 million living in 642 localities, half of which live in rural or semi-rural localities. The population growth rate is about 3.5%.

Existing condition

Approximately 1.38 million of the total population (about 86% of total population) in the West Bank are supplied with water through piped water networks, living in 347 localities (about 54% of the total number of localities). Table 1 shows the population and localities served with piped water networks in each district.

The total water supply for the West Bank for Municipal and Industrial (M&I) purposes during 1998 was about 47.3 million cubic metres (mcm). The overall supply rate varies between 68 litre per capita per day (l/c/d) in Jenin and 132 l/c/d in Jericho, with an overall weighted average of 94 l/c/d.

The total water consumption for M&I purposes in the West Bank was based on an estimated unaccounted for water (UFW) in the various districts and the above mentioned supply rates. The UFW varies between 30% in Ramallah district and 50% in Jericho district with an overall weighted average of 42% of the total water supply.

Accordingly, the total M&I per capita consumption rate varies between 40 l/c/d in Jenin and Salfit and 71 l/c/d in Ramallah, with an overall weighted average of about 55 l/c/d. These rates are lower than the World Health Organization (WHO) minimum value of 100 l/c/d.
Most of the existing facilities serving the localities are in bad condition, deteriorated, inefficient and insufficient to meet the increasing demand of the population. The water supply is irregular and not continuous especially in summer time.

It is important to note that there is still about 14% of the Palestinian population in the West Bank who do not have access to piped water supply living in about 295 localities (46% of the total localities). People living in unserved localities are supplied with water for domestic use either from rain water harvesting through cisterns or by transporting water from nearby sources either in small cans carried by humans or animals or by truck tankers with very expensive cost (US$ 4/m³) and unsafe quality.

It became the responsibility of the Palestinian Water Authority (PWA) since its establishment in 1995 to work very hard with enormous efforts to prepare plans to locate new water resources to meet the immediate and future Palestinian needs and to deliver new water supplies to unserved areas and at the same time to prepare a rehabilitation program for the old

### Table 1  Population and localities served through piped water networks in each district

<table>
<thead>
<tr>
<th>No</th>
<th>District</th>
<th>Total Population</th>
<th>Localities Served</th>
<th>% served</th>
<th>Total Localities</th>
<th>% served</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Tubas</td>
<td>35,216</td>
<td>22,487</td>
<td>64</td>
<td>23</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>Tulkarm</td>
<td>129,030</td>
<td>116,525</td>
<td>90</td>
<td>42</td>
<td>26</td>
</tr>
<tr>
<td>4.</td>
<td>Qalqilia</td>
<td>69,268</td>
<td>58,156</td>
<td>84</td>
<td>35</td>
<td>17</td>
</tr>
<tr>
<td>5.</td>
<td>Salfit</td>
<td>46,688</td>
<td>38,267</td>
<td>82</td>
<td>23</td>
<td>15</td>
</tr>
<tr>
<td>6.</td>
<td>Nablus</td>
<td>251,392</td>
<td>197,697</td>
<td>79</td>
<td>72</td>
<td>37</td>
</tr>
<tr>
<td>7.</td>
<td>Ramallah</td>
<td>205,448</td>
<td>194,956</td>
<td>95</td>
<td>80</td>
<td>71</td>
</tr>
<tr>
<td>8.</td>
<td>Jerusalem</td>
<td>113,896*</td>
<td>111,075</td>
<td>98</td>
<td>31</td>
<td>28</td>
</tr>
<tr>
<td>9.</td>
<td>Bethlehem</td>
<td>132,090</td>
<td>125,777</td>
<td>95</td>
<td>71</td>
<td>47</td>
</tr>
<tr>
<td>11.</td>
<td>Jericho</td>
<td>31,501</td>
<td>29,651</td>
<td>94</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1,600,100</td>
<td>1,377,214</td>
<td>86</td>
<td>642</td>
<td>347</td>
</tr>
</tbody>
</table>

* Does not include population for those parts of Jerusalem annexed by Israel in 1967

### Table 2  Water supply, losses and water consumption in the different districts of the West Bank

<table>
<thead>
<tr>
<th>District</th>
<th>Total Population</th>
<th>With network</th>
<th>Total mcm/y°1</th>
<th>Per capita supply l/c/d</th>
<th>% Overall losses</th>
<th>Per capita consumption l/c/d °2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jenin</td>
<td>195,299</td>
<td>121,195</td>
<td>3.01</td>
<td>68</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Tubas</td>
<td>35,216</td>
<td>22,487</td>
<td>0.70</td>
<td>85</td>
<td>45</td>
<td>47</td>
</tr>
<tr>
<td>Tulkarm</td>
<td>129,030</td>
<td>116,525</td>
<td>5.28</td>
<td>124</td>
<td>45</td>
<td>68</td>
</tr>
<tr>
<td>Nablus</td>
<td>251,392</td>
<td>197,697</td>
<td>7.78</td>
<td>107</td>
<td>45</td>
<td>59</td>
</tr>
<tr>
<td>Qalqilia</td>
<td>69,268</td>
<td>58,156</td>
<td>2.56</td>
<td>120</td>
<td>45</td>
<td>66</td>
</tr>
<tr>
<td>Salfit</td>
<td>46,688</td>
<td>38,267</td>
<td>1.01</td>
<td>72</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>Ramallah and part of Jerusalem</td>
<td>292,722</td>
<td>277,015</td>
<td>10.30</td>
<td>102</td>
<td>30</td>
<td>71</td>
</tr>
<tr>
<td>Jericho</td>
<td>31,501</td>
<td>29,651</td>
<td>1.43</td>
<td>132</td>
<td>50</td>
<td>66</td>
</tr>
<tr>
<td>Bethlehem, Hebron and part of Jerusalem</td>
<td>548,984</td>
<td>516,221</td>
<td>15.26</td>
<td>81</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>1,600,100</td>
<td>1,377,214</td>
<td>47.33</td>
<td>94</td>
<td>42</td>
<td>55</td>
</tr>
</tbody>
</table>

*1 mcm/y = million cubic metre per year
*2 l/c/d = litre per capita per day

Most of the existing facilities serving the localities are in bad condition, deteriorated, inefficient and insufficient to meet the increasing demand of the population. The water supply is irregular and not continuous especially in summer time.

It is important to note that there is still about 14% of the Palestinian population in the West Bank who do not have access to piped water supply living in about 295 localities (46% of the total localities). People living in unserved localities are supplied with water for domestic use either from rain water harvesting through cisterns or by transporting water from nearby sources either in small cans carried by humans or animals or by truck tankers with very expensive cost (US$ 4/m³) and unsafe quality.

It became the responsibility of the Palestinian Water Authority (PWA) since its establishment in 1995 to work very hard with enormous efforts to prepare plans to locate new water resources to meet the immediate and future Palestinian needs and to deliver new water supplies to unserved areas and at the same time to prepare a rehabilitation program for the old
water networks and main conveying pipelines to reduce the UFW. Table 2 shows the water supply, losses and water consumption in the districts of the West Bank.

Plans and projects of the PWA
Article 40 of Oslo B Agreement is the section regarding water and sewage and is a binding agreement between Palestine and Israel. This agreement which was signed on September 18th 1995 is being used as the basis for water sector planning and project implementation during the “Interim Period”. In this Article an additional quantity of 28.6 mcm/y of fresh water is designated for domestic use to meet the immediate needs of the Palestinians during the “Interim Period”. Directly and since its establishment, the PWA in cooperation with the USAID and other donors provided the necessary data collection, investigations, planning, design, training, institutional support, commodities procurement and construction services procurement for a balanced water resources program with geographic focus on major population centers suffering from shortage of water supply. Master plans were prepared to cover the areas of Jenin, Nablus, Ramallah and Bethlehem-Hebron, through an American consulting firm (CDM/Morganti). These activities focused on the development of the water resources in the eastern aquifer basin of the West Bank and aims for a staged rehabilitation, expansion and improvement of the municipal services in the water supply sector, major water supply and transmission systems to serve the five major districts, and to supply water for more than fifty of the unserved cities and villages.

Implemented water projects
The PWA with the assistance of different donors has implemented many water projects during the interim period to improve the water supply services in the municipalities including drilling new wells to supply water for unserved localities, to rehabilitate the old water networks, and to construct storage water tanks to improve the water supply and to meet the demand of customers in the peak hours.

Drilling new wells and facilities
To improve and to increase the water supply for Nablus Municipality, Odalah well was drilled with a total production of 2.0 mcm/y and all facilities needed were constructed. The water available for the customers was raised from 59 l/c/d to about 90 l/c/d. The project was financed by the KFW of the German government at a total cost of about US$ 2.0 million.

New water supply projects
Despite the lack of sufficient water supplies, the PWA has been working very hard to deliver new water supply projects to unserved areas in the different districts of the West Bank. Since 1995, the PWA has finished the implementation of about 25 new water supply projects for unserved localities in the different districts of the West Bank. The total cost for these projects is about US$ 7.0 million. The total number of beneficiaries from these projects is about 54,000 inhabitants.

Rehabilitation of water projects
Most of the water distribution networks have shown an average of 45–50% loss in water supplied to the localities due to the deterioration of the networks. This deterioration is due to the poor material of pipes and due to the haphazard laying of pipes. The networks are mainly undersized and cannot meet the increasing demand of the customers. Possibility of contamination exists from the cess pools of each household.

Since 1995, the PWA has been working in two directions. The first direction is the rehabilitation of the old water networks to improve the water quality and quantity of the basic
municipal water services, to reduce the UFW to 25% and to improve the daily lives of the Palestinians. About 30 water networks were rehabilitated at a total cost of about US$ 32 million. The second direction is the execution of a leak detection program, replacement of the old water meters, disconnecting the illegal connections and institutional development. Two projects were executed; one in Bethlehem district and the other in Hebron. In phase 1, the losses were reduced from 48% to 38%. France financed a project with a total cost of about US$ 4.0 million.

Construction of water tanks
To improve the water supply and to meet the demand in the peak hours, PWA has finished the construction of water tanks in 24 localities in the different districts of the West Bank at a total cost of about US$ 4.0 million.

The total costs of the implemented projects in all fields are about US$ 45 million.

Ongoing projects
The PWA is currently implementing a series of different projects in the districts of the West Bank with the assistance of USAID and other donors. These projects include locating specific sites and drilling wells to deliver additional water supplies and to construct all facilities needed, to supply water for unserved localities, to rehabilitate the old water networks and to construct storage water tanks. The ongoing projects cover three service areas in Hebron, Bethlehem and Jenin. These projects are considered the first stage of the PWA project and consist of the following components.

- Drilling of two boreholes in Hebron area financed by KFW of the German government and construction of all facilities needed including installation of 16 km of 400 mm pipeline. The total production of the two boreholes is about 2.5 mcm/y and the total cost is about US$ 7.3 million. In addition, the USAID is financing the drilling of four wells in the Bethlehem-Hebron area and construction of all the facilities needed including construction of two water tanks, 2,500 m³ in Halhul and 10,000 m³ in Bethlehem. Construction of a booster station and installation of 32 km of 900 mm and 600 mm pipelines. The total production is about 7.0 mcm/y with a total cost of about US$ 34.2 million. After the start of the operation of both projects in July 1999 the water available for the customers was raised from 45 l/c/d to about 90 l/c/d in addition to providing water supply to 20 unserved localities.

- After drilling of Jenin well number 2 with a production of 1.4 mcm/y (Israeli commitment in Oslo B) the USAID is financing a project in Jenin District consisting of main transmission pipelines (about 36 km), six water tanks, four pumping stations and eleven water networks. The total cost of this project is about US$ 20 million. This project will improve the water supply to Jenin Municipality and will raise the water available to the customers from 40 l/c/d to about 65 l/c/d, in addition to providing water supply to 11 unserved localities with a total population of 35,000 inhabitants at the end of 1999. The total cost of the ongoing projects is about US$ 61.5 million.

Planned projects
The PWA with the assistance and support of the USAID is preparing a comprehensive water facility master plan for the second stage of the water resources development to be implemented within the coming two years in order to meet future Palestinian needs in the Bethlehem – Hebron and Nablus service areas through an American firm (CH2M HILL). This master plan includes the drilling of ten production wells in the Bethlehem – Hebron areas to meet the water demand up to year 2010 with a total expected production of about 15 mcm/y; one production well in Nablus area (Aqraba well) with expected production of
1.5 mcm/y to provide water to seven unserved villages in this area; as well as another 16 monitoring wells to be drilled in the Eastern Aquifer area. Including all needed facilities the total cost of the execution of this project is about US$ 104.5 million (US$ 73.0 million from the USAID and US$ 31.5 million as soft loan from the European Investment Bank).

With respect to the delivery of new water supplies to unserved localities, network rehabilitation, water tank construction and leak detection programs, PWA has finished preparing the design, drawings and bill of quantities for more than 75 projects divided into packages and submitted to the different donors for implementation during the coming two years with total estimated costs of about US$ 50 million.

In addition, the KFW of the German government is committed to financing the drilling of one well in Nablus and two wells in the Ramallah service areas, including all the facilities, at a total estimated cost of about US$ 14.0 million.

The total cost of the planned projects is about US$ 168.5 million.

Review of Article 40

Article 40 of Oslo B Agreement is the section regarding water and sewage and is a binding agreement between Palestine and Israel. This agreement which was signed on September 18th, 1995 is used as the basis for water sector planning and project implementation during the “interim period”.

Principle number one of the Article is the guiding principle that “Israel recognizes the Palestinian water rights in the West Bank” and these rights will be negotiated in the Permanent Status negotiations and settled in the Permanent Status Agreement.

According to principle number six of Article 40, the agreed upon future additional water for the Palestinians in the West Bank during the “Interim Period” is stated as about 80 mcm/y. Principle number seven stipulates the immediate needs of the Palestinians for fresh water for domestic use during the “Interim Period” as 28.6 mcm/y from this allocated quantity, 23.6 mcm/y for the West Bank and 5.0 mcm/y for Gaza. The principle specifically outlines the areas and the quantities as well as the party financially responsible for each task.

Both Israeli commitments and Palestinian responsibilities are outlined in principle number seven as follows:

**Israeli commitment (9.5 mcm/y)**

Additional water supply to Hebron-Bethlehem, Ramallah, Salfit and Nablus service areas with a total quantity of about 3.1 mcm/y, drilling of Jenin well number 2 with a total production of 1.4 mcm/y, and an additional water supply to Gaza of 5.0 mcm/y.

**Palestinian responsibilities (19.1 mcm/y)**

It is the responsibility of PWA to locate specific sites for the extraction of an additional 19.1 mcm/y to serve Hebron-Bethlehem, Ramallah and Nablus areas.

To date, the Israelis have supplied the additional 3.1 mcm/y for the five above mentioned areas, in addition to drilling Jenin well number 2 with a production of 1.4 mcm/y. The additional 5 mcm/y for Gaza will be supplied when the connection point for the required pipeline extension is finalized by the Israeli side. The additional water by the Israelis provided water to seven unserved localities in the Ramallah area and another eleven unserved localities in Nablus and Salfit areas.

To date, the Palestinians have drilled one well for Nablus Municipality with a total production of 2.0 mcm/y and six wells in the Bethlehem-Hebron area with a total expected production of 9.5 mcm/y.
Of the 19.1 mcm/y new water allocated in the interim period, PWA has developed 11.5 mcm/y. The remainder of 7.6 mcm/y will be produced from the ten wells that are to be drilled in phase two of the USAID project to be implemented within the coming two years.

The remainder of the agreed upon future additional water supply (51.4 mcm/y) will be developed by the Palestinians from the Eastern Aquifer and other agreed upon sources.