Qabatya Town
A Vision for Water Resources and Water Services

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Introduction

This document presents the Vision for water service provision and water resource management of Qabatya town, in Jenin Governorate. It has been developed as part of a participatory project involving all main stakeholders and facilitated by the EMPOWERS partnership.

EMPOWERS is a regional project implemented simultaneously in three countries: Egypt, Jordan and West Bank/Gaza. While these countries reflect a range of very different water issues in the Mediterranean region, they also common features: the lack of involvement of all stakeholders, the centralized nature of management, and fragmentation of responsibilities among many players. EMPOWERS encourages and supports local water users and institutions through a process of dialogue between all stake holders at community, municipality and governorate levels. The national level is also involved to ensure the relevance of local water activities to national policy formulation processes. This document is the results of that process in Qabatya, setting out a shared vision for the further development of water resources and infrastructure, as agreed by all key stakeholders in the municipality.

The approach facilitated by EMPOWERS focused on:

- Enhancing stakeholder integration and involvement
- Improving access to and use of quality information

With the overall goal of improving access to water for vulnerable populations through integrated water resource management at the local level.

This diagram, presented below, shows the main steps of the planning cycle that EMPOWERS has used in working with the different stakeholders in Qabatya. Each step has involved a number of activities – mainly involving several stakeholders.

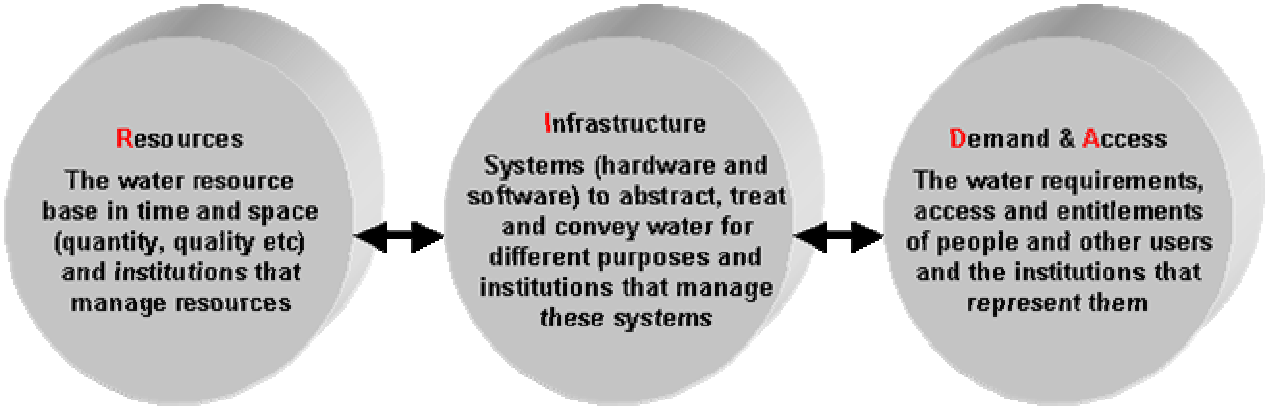
1. Part 1: Qabatya Town Water Resource Assessment

The overall conclusion of the WRA focus on two problem areas:

- Is the demand for water for domestic and productive purposes being met in the selected villages and municipality?
- How are water related decisions currently being made and on the basis of what information?

Methodology

The water resource assessment for Qabatya municipality was carried out in collaboration with all stakeholders, using the RIDA (Resources, Infrastructure, Demand and Access) framework. RIDA is a simple framework, that by making explicit the need for water supply infrastructure (and institutions) to link water resources to people (and their demand for and access to water services), helps to structure information collection and analysis.



To help to ensure that information collection (and further work on Vision, scenarios and strategies) was problem focused from the start, a problem tree analysis exercise was carried out. Based on this, and on the leading question for the exercise: is the demand for water for domestic and productive purposes being met in the selected villages and municipality, a data collection exercise was carried out. Following the principals for a water resource assessment set out in EMPWOERS working paper 6, the aim was to rely as much as possible on existing (secondary) data, and only to collect new (primary) data where this was necessary either to fill gaps, or where it was an important part of stakeholder buy-in as part of PRA.

Secondary data sources

Information from secondary sources included: data on demographic, economic, social, and general physical conditions in the Governorate was acquired from the publications and data files of the Palestinian Central Bureau of Statistic (PCBS), Palestinian Water Authority (PWA), Ministry of Agriculture (MOA), Palestinian Hydrology Group (PHG), Applied Research Institute-Jerusalem (ARIJ), United Nation Development Program (UNDP), Jenin Governorate, and other scattered sources.

Primary data Sources

Primary data sources were:

- Leaders and members of municipalities and village councils.
- Municipality and village councils water staff (including engineers, technicians, operators, accountants, bill readers…).
- Farmers' focus group.
- Quarries and stone-building houses owners' focus group.
- Women focus group.
- Working institutions' focus group (including both Governmental and Non-Governmental institutions).
- People from different social groups (poor, women, farmers…).
- Individuals meetings.

- Local institutions.
- Participatory Rapid Appraisal techniques.
- Problem tree.
- Maps and diagrams.

Background to Qabatya municipality

Qabatya is located at 11 kilometers south west of Jenin city (Fig. 1). It is the biggest town in Jenin governorate in terms of population and area. It is renowned for its fertile agricultural land, the number of agricultural wells, and its quarries and stone cutting industries. Qabatya town area lies between 250 to 475 meters above sea level (Fig. 3).

Fig.(1): Jenin Governorate.

Land use

The areas of Qabatya, was estimated to be 55,000 dunums, while the agricultural areas make up 92% of the total area. Land use in Qabatya is shown in Table (1).

Table (1): Land use in Qabatya.

Item	**dunums**
Agricultural area	50811
Built up area	2000
Structural planned area	5917
Reclaimed agricultural area	1500
Cultivated area	41394
Irrigated area	3604
Rain fed area	37790
Un used agricultural area	9417
Others	2189
Total area	**55000**

Demography

The projected total population in mid 2004 in Qabatya was 19,436 inhabitants. The average household size in the town was estimated to be 6.3.

Population activities

Agriculture is the main economic activity in Qabatya (Table 2). Due to the current political situation, the unemployment rate has risen among the inhabitants of all Palestinian communities.

Table (2): Economic activities in Qabatya.

Economic Activity	Percentage
Agriculture (Farming, Raising Animals)	28
Mining and Quarrying	10
Manufacturing, Construction	10
Wholesale and retail trade	10
Employee	10
Unemployed	30
Not stated	2
Total	100

Source: Municipal council.

Wealth ranking

According to the Social Affairs Department, the wealth ranking categories in Qabatya community is shown in Table (3).

Table (3): Wealth ranking categories.

Wealth ranking	Percentage (%)
Very poor	10
Poor	35
Better off	52
Well-to-do	3
Total	100

Water resources and water services in Qabatya

Problem tree analysis

At the start of work with stakeholders, a one day exercise was carried out to develop a problem tree of the main issues facing staff working in the water sector. This tree was to guide much of the subsequent work of information collection, and subsequently visioning, scenario development and strategy formulation. The problem tree constructed for Qabatya town by the stakeholders. Most of these problems and obstacles are brought about by the political situation and the restrictions imposed on water sector activities.
Generally, the main problems are summarized in the following points:

1. **Shortage in water resources**: Despite being famous in the region for having a significant number of wells, Qabatya suffers from water shortage as identified by the stakeholders and reflected in the problem tree. Water shortage is mainly related to high losses in the deteriorated municipal network, weak management of technical and managerial staff, rainfall fluctuation or drought -that mainly affects well water production making the wells dry or of reduced discharge to more than the half its average during certain years or in the summer months -, increasing of agricultural groundwater wells also affect on its discharge, and the non-use of

surface water (runoff) in rainy months that could serve as an alternative water resource. Water shortage hinders mainly agricultural and industrial expansion, and increases the cost per water unit adversely affecting the economic situation.

2. **Lack of wastewater systems**: Lack of funds is the main reason for the absence of wastewater systems. Consequently, inhabitants are forced to dispose of wastes in cesspits, causing contamination of water resource and related water borne diseases.
3. **Water resources contamination**: The absence of wastewater systems, deterioration in the water networks, disposal of stone cutting wastewater in valleys and in agricultural plains, over-pumping of groundwater, and the increased use of fertilizers and pesticides are the main causes in the increase in water resources pollutants that adversely impact health.

Access to, and use of water by different users in Qabatya

A key part of the EMPOWERS approach to water resource assessments is to gain a good understanding of people's actual access to water (the amount of water they actually use), as opposed to the amount that is nominally supplied to them by often inefficient infrastructure. In Qabatya it was very difficult to come to a direct estimate of actual household water use.

The table below therefore uses total quantity supplied, together with an estimate of system losses to come up with an estimate of what citizens actually receive. As can be seen, losses are estimated to be 40% of the supplied quantity of 553,116 m^3 (81l/c/d). This suggests an actual quantity consumed of 331,869 m^3 (or approximately 50l/c/d). This average is thought to represent a range of actual water use of between 43-125 l/c/d (PRA data).

Table (4): Domestic water resources of Qabatya.

Water Resource	**Quantity**
Population in mid. 2003	18,607
Municipal wells (m^3)	410,000
Cisterns (m^3)	53,116
Agricultural wells (m^3)	90,000
Total (m^3)	**553,116**
Per capita supply (l/c/d)	81
Physical Losses (%)	40
Actual water use (l/c/d)	49
Range of actual use (l/c/d)	33-111

In terms of access to the network, in Qabatya this is generally satisfactory. The municipal well supplies a good percentage of domestic water needs. In summer months, given the increase in consumption, additional water quantities are supplied by agricultural wells. The water network coverage is 95%, and there is a 24 hour supply. The water supplied is of good quality, except for the high concentration of carbonate sediments and color. The latter is caused by aquifer composition and the iron-stain caused by the leaching of the pipes' material. Water is continuously disinfected though. Hence, the inhabitants are generally satisfied with water supply. This also encourages the establishment of industrial activities that rely on water availability such as stone cutting and olive pressing.

Access to water for irrigation:
As mentioned earlier, groundwater wells are the main water resource, in the Palestinian communities. These wells are privately owned, and have been drilled prior to 1967. Agricultural wells in the area are characterized by shallow depths, not exceeding 250 meters. Regarding its pumping capacity, and the distribution system coverage area, the irrigated area is depending. In general, access for irrigation water is mainly dependent on the availability of the water resource (wells), the availability of the agricultural land, and the coverage of the distribution system.

In Qabatya, the availability of many agricultural wells, and the existence of suitable agricultural lands makes the village one of the main productive irrigated crops in the Governorate. Although irrigation water is available, however, it is insufficient for all of the areas suitable for irrigation of crops.

Agricultural use
Water use for agricultural purposes means includes both irrigation and livestock drinking. Water resources for agricultural purposes are limited to private agricultural wells, cisterns, and to some extent, to the public network.

Irrigation use
Qabatya, one of the most agricultural areas, has 3,604 dunums of irrigated areas. About 2.178 MCM abstracted from groundwater wells to supply irrigation needs, with an average water supply of 604 m^3/dunum/year.

Livestock drinking:
Water demand for livestock was estimated at 7,884 m^3 in Qabatya.

Industrial use:
In the absence of accurate measurements, industrial water in the Palestinian Territories is included with domestic use. According to Palestinian Water Authority estimates, 7% of the domestic water is used to meet industrial needs. In Qabatya, and due to the considerable water consumption by the stone manufacturing industries, the municipality does not allow the latter to connect to the municipal water network. Consequently, water is purchased from agricultural wells. There are 30 quarries and 40 stone cutting stone factories; their total water requirements are estimated at 298,800 m^3/yr.

Table (5): Access to water (actual water use) by different group in Qabatya

Group			Water Use
Domestic	Average per-capita use	l/c/d	49
	Range of per-capita use	l/c/d	33-111
	Actual water use	m^3/yr	**339,578**
Industrial	**Actual water use**	m^3/yr	**283,860**

Agricultural	Total cultivated area	dunum	41,394
	Irrigated area	dunum	3,604
	Irrigated water use	m^3/yr	1,748,707
	Livestock demand	m^3/yr	7,884
	Actual water use	m^3/yr	**1,756,591**
Total actual use		m^3/yr	**2,380,029**

Towards a calculation of demand for Qabatya municipality

Calculating demand for water services is not easy. There are no nationally accepted norms – for example – for domestic water supply. Nonetheless, it is essential for planning purposes to identify targets, hence in the table below an attempt is made to estimate the demand for the different principal uses and user groups within the municipality.

Domestic

Domestic demand is based on a figure of 100l/c/d in 2003 rising to 120l/c/d in 2010. These are derived from the towns own Vision – see next section, and are broadly in line with figure form other sources – such as those of the PWA which estimates a per-capita demand of 105l/c/d for 2005, rising to 126 in 2010, and to 223 in 2025! Based on the figures of 100 and 120 l/c/d, demand for domestic water can be estimated as being 679,620m^3/yr in 2003, rising to 1,078,963m^3/yr in 2010 (when the population will have risen to 24,617)

Agriculture

Agricultural demand is based on 3604 donums as an irrigated area in 2003 rising to 7023 donum in 2010. This gives rise to a demand of 2,256,780m^3/yr in 2003 rising 4,399,071m^3/yr in 2010.

Industrial

Industrial demand excluding cutting stone industries is expected to grow proportionately with the general population, and will continue to represent about 7% of domestic use.

Table 6 below shows the calculated figures for demand in 2003 and 2010.

			Year 2003	**Year 2010**
Domestic	Average per-capita demand	l/c/d	100	120
	Total domestic demand	m^3/yr	**679,620**	**1,078,963**
Agricultural	Total cultivated area	dunu	41,394	41,394

		m		
	Irrigated area	dunum	3,604	7,023
	Potential water requirement	m^3/yr	2,248,896	4,389,375
	Livestock demand	m^3/yr	7,884	9,696
	Total agricultural demand	m^3/yr	**2,256,780**	**4,399,071**
Total demand		m^3/yr	**3,220,260**	**5,478,034**

Identification of Access barriers for vulnerable groups

The vulnerable groups are defined as those unemployed and with a low income. Since the beginning of the current political crisis, the percentage of vulnerable people has increased. Given the reduction in econmical activities, a lot of poeple have lost their jobs, or have had their income reduced to the minimum. Women and children are considered the main category affected among the vulnerable groups.

However, at the community level, the municipality provides water services to all social groups including the vulnerable ones, who are unable to cover the costs. Services continue to be provided to those groups through the support of the Palestinian people and institutions.

Participation in community decision making

The water decision making process, at the community level, is restricted to the municipality or village councils, who sometimes coordinate with the Palestinian Water Authority. Unfortunately, the end users of the various groups and institutions do not currently have a role in the decision making process.

Water abstraction and supply infrastructure

As mentioned earlier, Qabatya is entirely reliant on groundwater (with the exception of a small quantity of rainfall harvested from roof-tops, and stored in cisterns). Making use of this resource to meet people's needs calls for abstraction, storage, treatment and transmission infrastructure, and the institutions to ensure that it functions correctly.

This section examines Qabatya's water supply infrastructure and the institutions that manage it.

Wells and cisterns are the main water resources in Qabatya town (Table 7). Wells are classified according to water usage to domestic and agricultural wells. Table (7) summarizes the main water sources currently available in Qabatya.

Table (7): Water abstraction in Qabatya from different sources (m^3/year).

Source	Domestic	Agricultural	Industrial
Groundwater wells	500,000	2,177,920	298,800*
Water harvesting	53,116	7,964	-
Total	553,116	2,185,884	298,800
Total	3,270,108		

*: limited to stone cutting industries.

Domestic infrastructure:

In Qabatya, the main domestic water resource is the municipality well that was drilled in 1999 to a depth of 174 meters, into the Eocene aquifer. Through the use of a 40 hp pump, the well discharges 60 m^3 /hr to the adjacent 20 m^3 balance tank. The water is then pumped by two electrical booster pumps (20 & 30 hp capacities) to the 500 m^3 concrete reservoir situated at 393 meters above sea level. The water then flows by gravity into the municipal network. This network, (estimated to have a total capacity of 800,000 m^3/yr) is connected to 3,700 households and commercial connections, covering about 95% of the population. The remaining 5% of the population is not connected to the water network, due to the higher altitudes beyond the municipal reservoir. The network, laid down in 1978 is deteriorated and suffers a total paper loss (unaccounted for water) of 40%. This paper loss is attributed to a combination of a) meter losses; b) unregistered connections, and c) leakage. The distribution of paper loss among these different items is unknown. These losses affect the quantity and quality of water supplied, the pressure needed and consumers efforts and funds.

Irrigation infrastructure:

In Qabatya, groundwater wells are used for irrigation purposes. Farmers deliver water to their fields by using plastic or metal pipes. The most predominant irrigation systems are the pressurized techniques (drip and sprinkler systems); the needed pressure is provided by either the well pump or from the booster pump that delivers water from the storage tanks to the irrigation system. Losses from the system are unknown, but are unlikely to be less than 20%.

Functionality and reliability of infrastructure:

The existing water infrastructures in Qabatya include groundwater wells as water resource, and water networks and reservoirs as distribution systems. For domestic use, available water resources are limited to municipal wells that exploit the shallow aquifer, agricultural wells, and cisterns. Wells of the Eocene aquifer system are characterized by high fluctuations in water levels, which mainly affect their discharge capacity. Water levels are a function of rainwater recharge. For example, the discharge of a well decreases from more than 100 m^3/hr in winter months, to less than 20 m3/hr in summer months. In addition, the water quantities stored in cisterns depend on rainfall, which varies temporally. Due to the unconfined nature of the Eocene aquifer, the wells show contamination especially in heavy residential and intensively cultivated areas. The

absence of wastewater networks and the use of cesspits for wastewater disposal, lead to water contamination through leakage in water networks, or mixing with cistern water.

The water distribution system in the selected communities exhibits several problems both quantitatively, and qualitatively. In Qabatya, there are high network losses, the reservoir location is unsuitable, storage capacity and volume are insufficient, and there is a need for repeated maintenance works.

Effectiveness of institutions:

The success and sustainability of water projects are dependent on the ability of the implementing institution to manage, follow-up, and maintain the project. Water supply services are managed and regulated by the Palestinian Water Authority (PWA), and the local communities.

In Qabatya, the water sector is managed and followed-up by water division of the Municipality council. The division is made up of one engineer as Head of division, 6 technicians, 2 meter readers, and 1 accountant. Given their limited number, and their exhausted schedules, all water staff has daily work in well operation, maintenance of networks, execution of new connections, and management of water distribution. The Municipality and the water division face several problems that can be summarized in the following:

- Limited qualified staff.
- Shortage in financial resources.
- Lack of essential equipments and tools.

Resources: Rainfall, surface and ground water resources of Qabatya

Based on available rainfall data, average rainfall has been measured in Qabatya at 565 mm. Rainfall varies temporally; both yearly and monthly.

Figure(2): Rainfall distribution map.

Drainage

Flood water drains during the winter season mainly towards the Mediterranean. Valleys, and intermittent streams in these areas form tributaries to the main drainage systems of Muqata'a, Abu Nar, Massin, and Marj Sanour. However, due to restrictions placed by the Israelis, there is currently no possibility of developing structures to harvest drainage water.

Groundwater

As with the rest of Jenin Governorate, Qabatya town draws the shallow Eocene aquifer. No estimate exists of the renewable share of groundwater resources available to Qabatya municipality. However it is not thought that current, or any of the potential future use discussed in the Demand and Access section is likely to stress available resources.

Summary of water resource assessment for Qabatya

Summary of the water services in Qabatya are listed in the following points:

- Current total water use by different user groups in Qabatya is in the region of 2.4 Mm^3/yr. This compares with estimated demand of 3.2 Mm^3/yr rising to 5.5 Mm^3/yr by 2010. The first important point to note is therefore that current access to water is considerably below demand. This is due principally to a combination of low abstraction (and harvesting) capacity – estimated at 3.3 Mm3/yr together with high system losses (currently in the region of 40%).
- Even were total water production to be sharply raised, the current capacity of the supply network (approximately 0.8Mm3/yr) is sufficient to meet combined domestic and industrial demand (excluding building stone industries that have private systems) of 0.68 Mm3/yr in 2003 – rising to 1 Mm3/yr in 2010.
- Water resources (primarily groundwater) are not believed to be a constraining factor for improving service delivery, and the challenge therefore exists primarily in expanding supply capacity both by developing new water sources, and by expanding the capacity of the piped network.
- Average figures hide sharply differing access to domestic water, with the poor on average accessing only 33-40l/c/d, while the better off access between 80-111l/c/d. This is for a range of reasons, including location (higher up and therefore subject to low pressure), and relatively high water tariffs being amongst the most important.
- The primary challenges faced in expanding he network for both agricultural and domestic/industrial water lies in a) the difficulty of obtaining licenses from the Israeli's to develop new sources; and b) the chronic lack of capacity and under-funding of the municipalities staff.

Part 2: Developing a Vision for Qabatya municipality

The vision, scenarios, strategies, and planes developed during the workshop are presented in this section. The Scenarios and strategies have had additional data form the light water resource audit included to make them more comprehensive.

The Vision

- By 2010 every one will have access to domestic water of 120 l/c/d of a good quality instead of the 50 l/c/d nowadays, enough water for the agricultural purposes will be available by increasing the 3604 donums of irrigated area to include more from the 41394 donums of planted area every year, and reduction in the contamination of groundwater caused by: the contamination problems which are represented by: the pollution of the water sources from the wastewater cesspits, the polluting

agricultural activities (excess fertilizer use and poor disposal of agricultural wastes); and ,mainly in Qabatya, from the stone cutting areas will be limited.

Principal Factors Affecting the Vision

1. Availability of required funds.
   There are many problems that are related to the non availability of funds, since many of the problems facing the water sector could be solved immediately if funds were available. Bad economic factors play a major role in the West Bank, and the funds for implementing projects are basically only available from non-governmental institutions.
2. Public awareness to water issues and water usage.
   Public awareness is crucial to solving water sector problems since while people in general need the water they suffer from a lack of knowledge about key factors constraining water service development including:
3. Do not really understand the sources of water, do not realize the limitations on the amounts taken from the Palestinian side compared with the Israeli side, do not implement activities to reduce the water consumed
4. Do not avoid the problems of groundwater pollution resulting from using the cesspits for the wastewater.
5. Availability of technical and management teams to manage water sources (For drinking and agriculture).
   While little information is available on current staff availability, an indicative example of this problem is given by the fact that Qabatya has 40% losses in the water network which is clearly not resulting solely from the non availability of funds but also from the lack of proper technical skills.
6. Poor maintenance of water networks.
   The 40% losses as well as the pollution resulting from not maintaining the network regularly are considered the reasons for having the 50 l/c/d instead of the 81 l/c/d which are supplied.
7. The capacity of the Municipality.
   In Qabatya, the capacity of the municipal team reflects the developments in the village since for example; there is no active women club or other institutions that share the basic role taken by the municipality role.
8. Obtaining the required licenses from the Israeli side.
   There are many activities for improving the water sector in Qabatya in which licensing can be considered as the main problem for implementing such activities.
9. One main example of such projects is the lack of wastewater networks, digging new artesian wells especially in the village that has no water network or another source of water.

Categorization of factors

- **The most important with the most uncertain**
  1. Availability of the funds.
  2. Obtain the needed licenses for wastewater network, and for maintaining water network.

- **The most important with the least uncertain factors**
    1. Maintain the water networks regularly.
    2. Availability of technical and management teams to manage water sources (For drinking and agriculture).
    3. Public awareness of water resource and usage issues.
    4. **The least important with the least uncertain**
    1. The capacity of the Municipality Council.

There is no factors that is supposed as the least important with the most uncertain

Scenario Finalizing

This division of scenario finalizing is divided into two parts:

1. Determining the possible scenarios, and identifying the most likely scenario,
2. Determining the strategies and activities related to each possible scenario.

The Possible Scenarios

To be able to decide the possible scenarios, the most important with the most uncertain factors which are used to identify four very different possible future situations. It is important to bear in mind that these uncertain and important factors define the main differences. The other factors identified should of course not be forgotten when developing scenarios. These factors are therefore dealt with first under the heading of 'the background story'.

Background story

The factors that were identified as being important but certain related primarily to the technical capacity available to maintain the networks, as well as the quality of the network itself. In addition the awareness of end users was also important but certain. Less important, but relatively uncertain was the capacity of the municipality.

The background story to the four scenarios is therefore a situation in which the network is poorly maintained and in which the technical capacity available to the town is also poor. In addition people's awareness of water related issues is low, which combined with the network problems leads to a range of pollution problems – in both groundwater and the delivery network. In addition, the capacity of the municipal council is currently poor, and there is little certainty that it will improve.

This background needs to be combined with each of the four following sections to come up with the scenarios which are used to develop strategies for achieving the visions. The strategies therefore need to address the factors mentioned in this background story.

Scenario 1. Funding and licenses are available.
This scenario is considered as the best scenario, as it allows the most scope for quickly and easily achieving the vision. The scenario represents the solution of the current

political problems, and it is assumed that if these are solved funding problems are also likely to become less. However, this scenario while considered the idea, is also considered to be relatively unlikely – at least in the short to medium term.

Scenario 2. Funding is unavailable, but licenses are available.
This scenario is considered as a second best scenario with respect to finding a better solution for the situation. This is because having the fund is so much easier than having the licensing from the Israeli side; the first can be considered as an internal factor to some degree, and the other is an exterior factor.

Scenario 3. Funding is available, but licenses are unavailable.
This is considered as the third scenario but an important scenario as it reflects an improvement on the current situation, where to get licenses is a complicated and process but with little likelihood of success and which is unlikely to improve in the future but where funding which is currently difficult to get due to the limitations of the economic situation as a result of the Intefada, if improved would lead to large-scale improvement. This scenario is thought to be the most likely.

Scenario 4. Neither funding, nor licenses are available.
This scenario is considered as the worst scenario but it is an important scenario to discuss as it reflects both the current reality on the ground.

Strategies

Scenario 1. Funding and licenses are available
Strategy: prepare the all needed plans in order to develop the access to the water supply for all uses in the one hand, and to rehabilitate the old sources in addition to make awareness programs on the other hand.

2. Funding is unavailable, but licenses are available

The strategy: developing the existing water sources at a small scale in addition to improve the using ways by awareness, and training programs.

3. Funding is available, but licenses are unavailable
The strategy: to develop and rehabilitate the existing sources at a large scale in addition to the awareness and training programs.

4. Neither funding nor licenses are available
The strategy: to maintain and rehabilitate the existing sources at a small scale and concentrating on the training and awareness programs.

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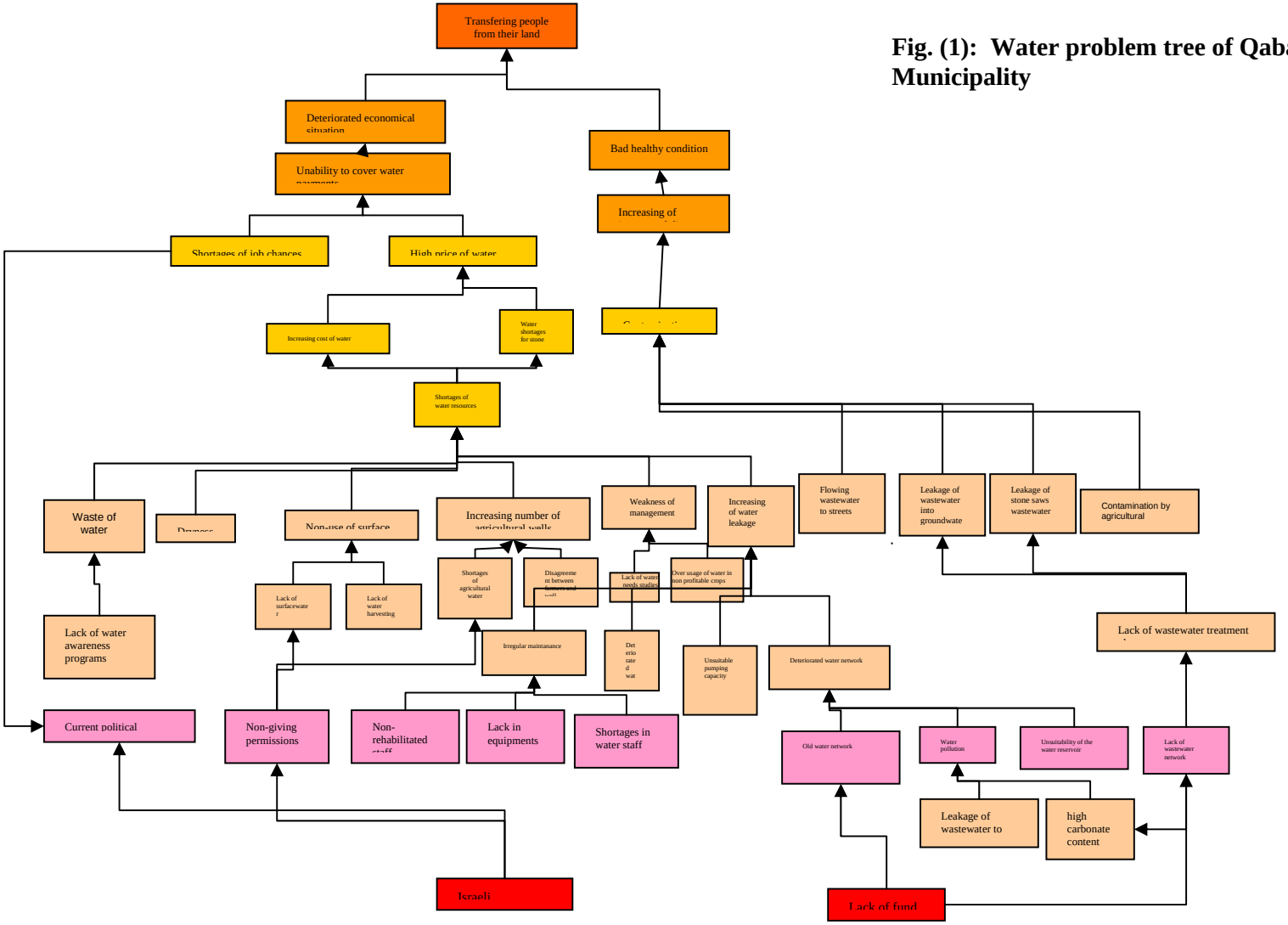

Fig. (1): Water problem tree of Qabatya Municipality