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Linking knowledge with actions in the context of Fara'a watershed management in the West Bank

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LINKING KNOWLEDGE WITH ACTIONS IN THE CONTEXT OF FARA'A WATERSHED MANAGEMENT IN THE WEST BANK, PALESTINE

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Abstract

There is a deep understanding and appreciation of the water scarcity problem in Palestine. This understanding led to actions and approaches to save water for its traditional uses. The total current water use in the West Bank and Gaza Strip (WBGS) is estimated to be about 286 million cubic meters (MCM) per year (85 m^3/capita/year). Agriculture continues to be the largest consumer of water accounting for more 65 percent of total use.

Groundwater wells constitute the only source of irrigation water in WBGS. In the West Bank, wells and springs contribute almost equal amounts of irrigation water, though the vast majority of springs are concentrated in Jordan Valley and Fara'a watershed (FW). FW watershed constitute a unique ecosystem in the West Bank that is rich in water resources and has a special agricultural value.

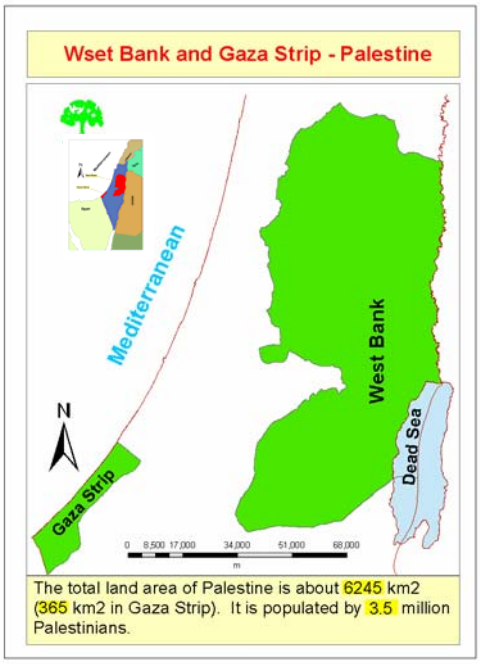
A project entitled: *The Faraa Integrated Watershed Management Project* implemented in the area represents a typical example of constructive engagement of different social solidarities in the context of integrated water resources management. One of the main outcomes of this constructive engagement is linking scientific and traditional knowledge with actions undertaken to mitigate the water scarcity and increase the water use efficiency. This project is implemented by the Palestinian Environmental Quality Authority and the Land Research Center-Jerusalem and funded by EU under SMAP program.

This paper displays a background about the area and the dimensions of water scarcity problem, the collected baseline data and information and how they are translated into language understood by policy makers and farmers. A cause effect evaluation utilising DPSIR (**D**riving force, **P**ressure, **S**tate, **I**mpact and **R**esponse) environmental model approach was utilised in this project for the purpose of determining the needed actions for water savings and efficiency increase purposes. Interventions related to land conservation and water harvesting to mitigate poverty and increase food security were also suggested.

Keywords: ***IWRM, West Bank, Fara'a Watershed, Constructive Engagement, DPSIR.***

INTRODUCTION.

The West Bank and Gaza Strip (W&G) are located east to the Mediterranean Sea. The total area of Palestine (including the Palestinian part of the Dead Sea) is about 6245 km^2 (365 km^2 in Gaza Strip). It is populated by more than 3.5 million Palestinians[1].



Map1: West Bank and Gaza Strip – Palestine.

Palestine is among the countries with the scarcest renewable water resources per capita due to both natural and artificial constraints, amounting to only 85 cubic meters per capita per year. The available water resources to Palestinians is about 286 MCM only. Available estimates of the water resources are displayed in Table1 that provides an approximate breakdown of the water resources according to various water resources studies.

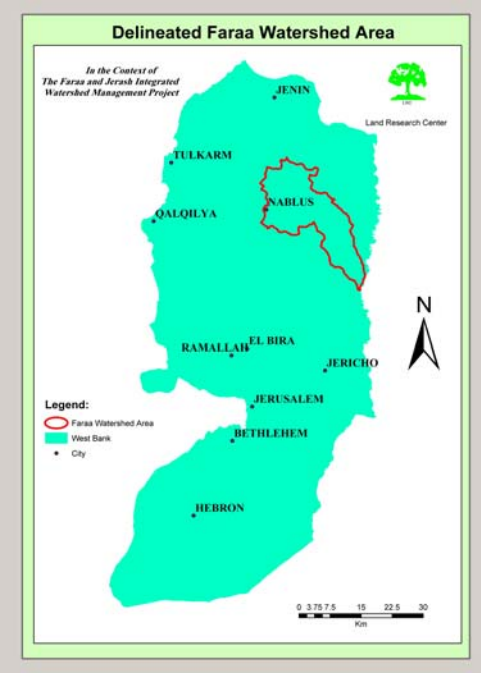
This paper concentrates only on Palestinian successful experience in participatory water management in the context of Fara'a Integrated Watershed Management Project taking in consideration that Palestinians do not have control over their natural resources.

Source	**Approximate Capacity (MCM)**
Groundwater	785
Surface water	52
Spring water	121
Wastewater	16
Runoff	73
Total	**1047**

Table 1 - Breakdown of Yearly Available Water Resources.

Fara'a Watershed at a Glance:

The area of interest is located at the northern part of the West Bank and extending over three districts: Nablus, Tubas and Jenin as shown in Map2. The estimated area of the mapped area of interest is about 330 km^2.



Map 2: Location of the area of interest.

Methodology:

DPSIR environmental model approach is adopted in displaying the cause effect status of Fara'a Watershed (FW). In this report, we look at DPSIR model or framework for the aim to help identify the cause-effect chains that let us understand and scientifically analyze environmental resources, use and problems and then help in identifying prospected interventions to mitigate the ecosystem degradation. All social solidarities, i.e. governmental agencies, NGOs, private sector and civil society were involved in this process. The obtained results would be displayed in the following sections.

Factors Inducing FW Degradation

FW is considered here, as the ecosystem but it should be taken in consideration that this ecosystem is affected by external factors especially the socioeconomic situation in the

surroundings. The driving forces or factors inducing FW degradation can be classified into human activities and natural factors. These factors would be described as follows:

I. Human Induced Factors

I.1. Historical Aspects:

It is beyond the scope of this report to describe in detail the history of activities in the FW. The oldest city inhabited in the world (Jericho) is located nearby this area. The successive civilizations and wars put certain degree of pressure on land and water resources in FW which lead to severe vegetation destruction. At the same time, the positive impact of Romans management of land by building retaining walls to prevent soil degradation should be noted.

I.2. Economic Driver:

Irrigated agriculture is the most important economic activity in the Wadi. Moving towards intensive and irrigated agriculture reduce the required area to be planted and increases family income significantly. In addition to the high returns of irrigated agriculture, it requires more labor. Therefore, irrigated agriculture is playing an important role in creating jobs.

At the beginning of Israeli occupation, the labor market forced some inhabitants in FW to quit the agricultural work as a main source of living. The reduction of prices due to marketing problems combined with the lack of agricultural industries that are able to absorb the surplus agricultural products in the area resulted in the creation of a situation where prices are reduced down into a level where it is no longer economically feasible to cultivate. Therefore, solving marketing problems to the farmers is an essential step towards agricultural development and agricultural sustainability.

I.3. Sociopolitical Drivers

Two categories of sociopolitical forces appear to be undergoing major changes in the last 40 years in FW:

- The general role of the public in decision-making appears to be expanding as evidenced by the extent of democratization and participatory approach represented in municipal elections and formulation of cooperatives. As well, there is some evidence of improving governance of natural resources at the national and FW levels. This governance enhancement is noticeable after the establishment of the Palestinian National Authority.
- The voices that are heard and how they are expressed has changed, as evidenced in the changing role of women and the rise of civil society represented by the involvement of NGOs in FW activities.

Population growth rate is estimated to be about 3.5%, which means that population doubles in nearly every 16 years which is mainly a young society. The inadequacy of health services in the area is clearly noticed in FW. The inadequacy of educational facilities represented in shortages in the number of schools (the only secondary school in the Wadi is located in Al-Aqrabaniyya) and well maintained schools is evident in the area.

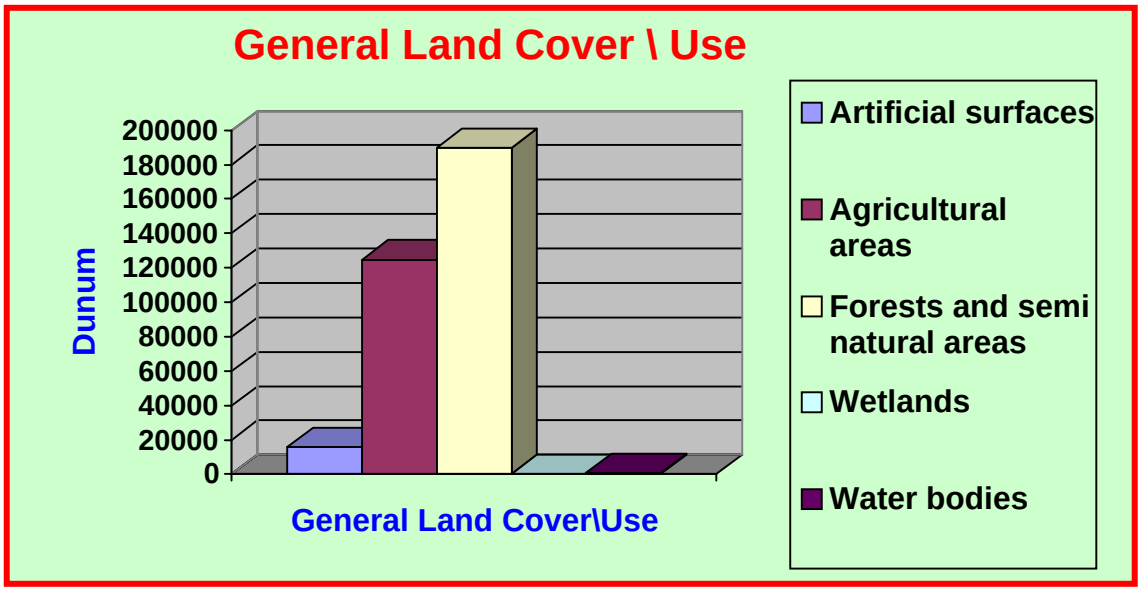
Despite the above-mentioned positive driving forces at the social aspect, Israeli occupation and absence of control over land remain to be the main factor affecting the state of land degradation in FW. This situation affected all aspects related to land conservation and land use planning.

I.4. National – Land Use (mismanagement of land).

The influence of humans over FW is most obvious at the local level. The land use is a clear reflection of this factor when looking especially at the urban communities and other artificial surfaces. If we classify the Faraa watershed area at the first CORINE level, the following table and chart displays the results:

Table 2: General land cover/Use of FW.

General Land Cover/Use	**Area (km^2)**	**Percentage (%)**
Artificial surfaces	16.94	5.1
Agricultural areas	115.89	35.1
Forests and semi natural areas	197.17	59.7
Water bodies	0.28	<0.1
Total	**330.28**	**100**



Unfortunately, the urban community is localized at land with high agricultural value. The reason for this may be the harsh topography of the non-agricultural land. Demographic projection distribution suggests that future population growth rates will not be uniform throughout the ecosystem.

Discharge of wastewater effluents from built up areas into the open environment contributes to the extent of the health and environmental health hazards existing in the area. Solid waste management in the area is another aspect of land mismanagement. FW produced slightly

more than 5000 tones of waste every year and this amount is expected to increase up to more than 12,000 tones per year in 2020.

In general, Effective land management is negatively affected by the absence of land use planning.

II. Natural Factors

Natural drivers include climate variability and extreme weather events (such as droughts), pest and disease outbreaks, harsh topographic features and natural biological evolution.

II.1. Climate.

The climate of the West Bank (as well as FW) is traditionally described as Mediterranean, which is characterized by winter rain and summer drought. However, there is a great diversity in this climate. This diversity ranges from hyper arid in the southern part to sub humid in the northwest. The total area of the hyper arid is 34 km^2 which comprising about 10% of the land area of the FW; the area of the arid part is 131 km^2 (about 40%); the area of the semi arid part is 105 km^2 (about 32%); the sub humid area is 60 km^2 (18%).

The area suffering from the aridity (82%) is located at the eastern and far southern part of the FW. However, this degree of aridity imposes hard restrictions on utilizing this land for agriculture in the absence of control on it.

II.2. Geomorphology.

Although it is a comparatively small area, FW is characterized by a large degree of variation in topography. Its topography is characterized by its very steep hills surrounding Fara'a Valley which contribute to land degradation. The elevation ranges between 920 m above sea level to 350 m below sea level. FW watershed is composed of the following landform elements prone to severe land degradation:

- Very steep hills (>25% of slope): It has an area of 64 km^2 which is about 19.5% of FW. This area is very difficult to utilize either for agriculture or for urbanization. The most probable use of this part is forests or rangeland.
- Moderately steep hills: It composes the highest percentage among the landform elements. It covers about 101 km^2 which represents 31% of the watershed area. This part is biased toward the highest slope % (20-25%) which indicates that the topography of the area is harsh one. It is possible to reclaim this land utilizing the mechanical land reclamation techniques. However, is such area with low amount of precipitation, it is preferable to utilize it either as forest or rangeland area.

Pressures on Land

The following are the main land degradation processes that are taking place in the FW:

Water pollution
Soil Erosion
Soil Salinization
Soil Contamination
Soil sealing
Loss of biodiversity

Relative Water Scarcity and Deteriorating Water Quality

The apparent situation in FW indicates that there is a surplus of water; on the contrary, careful analyses of the water situation indicate that there is a relative water scarcity in some domains as shown in the following: Annual discharge from springs varies from 4.4 MCM to 41 MCM with an average amount of about 14 MCM/year. Based on the data available, the total utilization of the Palestinian wells ranges from 4.5 to 11.5 MCM/year. Domestic water supplies to the villages and towns in Wadi Al-Fara'a is obtained from the existing springs and wells in the area. Ras Al-Fara'a and Wadi Al-Fara'a villages don't have domestic pipe networks[6]. The rest of the villages have either partial pipe networks or full pipe networks.

The water quality also is deteriorating due to several reasons. Records for wells in upper Cenomanian, alluvium and Eocene aquifers in the middle and lower areas of Fara'a Valley showed significant reductions in water table elevations. This leads to an increase in water salinity for wells in the lower parts of the FW. Water salinity for these wells is the major concern for utilizing water from these wells. Also, spring water is mixed with untreated waste water from Nablus and Al-Fara'a camp resulting in serious deterioration for the water quality along the main stream of Valley.

Results and Discussion

Land in FW has been affected greatly by a series of combinations and interactions of topographical, hydrological and climatic conditions, as well as by political conditions. These driving forces are dominated and exaggerated by the ***current political situation*** of the division and classification of Palestinian territory into different classes, depending on authorities exerting control over each area. This situation is rendering comprehensive natural resource management, which in turn, renders sustainable management and development.

Absence of land use planning is an important driving force toward land and soil degradation. This absence leads to a lot of human induced pressure on the land. Waste disposal resulted from either municipal or industrial origin is a serious land degradation source

Natural conditions like topography, climate are representing major driving forces toward land and soil degradation. The harsh topography in large areas of the FW induced soil degradation by various erosion processes.

Pressures, resulted from the above-mentioned driving forces, affect the quality of land and accelerates soil degradation.

The **impacts** of land degradation on health, agriculture and environment are not displayed due to the unavailability of statistical data and information.

Palestinian National Authority (PNA) has recently developed national policies in the areas of water, environment and agriculture. However, such policies have not been implemented at the local level. There is no single authority or agency responsible for regional planning in the area. The village councils and municipalities plan and work separately. Stakeholders' analyses showed that the institutions in the area are working independently of each other. Therefore, constructive engagement of the various stakeholders took place in order to advance policy implementation in the context of this Project.

The local people and the farmers are misrepresented at most levels. Their participation in the decision making process is also minimal. There are no active farmers unions which represent the interests of farmers. There are no water user associations which represent the interests of water users and operate and manage water systems.

In **response** to the impacts although very few due to several reasons, PNA set the necessary legislation, policies and strategies of the concerned ministries to conserve land resources in general and soil in particular. On the ground, a lot of practical measures and actions took place by PNA in cooperation with concerned NGOs to prevent the acceleration of soil degradation and increase water harvesting. This work is mainly done with farmers and land users in the form of land reclamation projects, afforestration, water harvesting and agricultural advisory fieldwork.

Conclusions

Natural resources are most effectively managed using an integrated approach, including consolidation of authority in watersheds where possible. Clean environment is a function not only of natural processes, but also of responsible social behavior by citizens and integrated and coordinated management by government agencies. Management of natural resources requires understanding that the human dimension, including economic and social processes, are components of the overall system that should be accounted for in planning and management. Integrated water resources management approach (IWRM) is conjugate to the approach adopted in this Project.

Science and policy must function together for watershed management to be successful, so there also must be more attention to the role of politics in decision making. A solid scientific foundation of basic and applied research is needed to provide the data, information, and tools necessary for effective implementation of watershed management activities.

Almost all types of land degradation processes are taking place in FW and unless conservation measures are urgently introduced, land degradation will have catastrophic impacts on the environment and on the national agriculture capability. Interventions suggested in the context of this Project were an outcome of the constructive engagement and participatory approach among social solidarities in the watershed area.

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