

## ENHANCING OF SOCIO - ECONOMICAL - ENVIRONMENTAL IMPACT OF THE WASTEWATER FLOW ON COMMUNAL LEVEL

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### ABSTRACT

*The study investigates the wastewater flow in Sardia Wadi in order to specify their actual impact on the socio-economic factors and to pinpoint the possible improvement measures on communal level. A designed questionnaire had been distributed in November of 2013 to a random sample of Bruqin and Kafr Al-Dik villages' residents to assess the socio-economic and environmental changing aspects per time. Questionnaires data were collected and analyzed by SPSS package showing a confirming indicator for the negative effects on all walks of the people's life that were distinguished into healthy, economic and environmental outputs. With regard to healthy aspects, it is clear that the impact on public health is high in the two communities with average of 92% of respondents confirmed it, and 43.8 % of respondents showed diseased infections as a result. Economically, 47.7 % of the respondents as an average abandoned their agricultural lands as a result of wastewater impacts and 79.1% believed that their land production decreased. In addition, 96.9% of respondents are suffering the negative implication and 18% of them were changed their place of residence. The Impact on the aesthetic conditions was affected according to 86% of the respondents.*

**Key words:** *Wastewater, Sarida, Socio-economic*

### 1. Introduction

Pollution and limited access to available water resources caused by wastewater contamination are considered as major challenges that are facing, especially, the developing countries in the world. Palestine is a good example for such case where Israeli occupying authorities are controlling and depriving the Palestinians from their rights in groundwater share by force and the Israeli colonies are considered another source of the Palestinian environment contamination and a significant source of untreated domestic wastewater that up to 90% have been discharged directly into nearby Palestinian lands (Issac, 2007).

In particular, West Bank are facing serious problems regarding the availability of water resources and their quality for different uses, these problems includes pollution sources such

as wastewater flowing and According to ARIJ (2011), most of the generated wastewater in the West Bank and Gaza Strip, is discharged untreated in to the surrounding environments. Moreover, Palestinian environment in highly affected by the construction of Israeli "industrial zone" settlements. In the West Bank there are 13 Israeli industrial zones, occupying an area of 980 hectares (ARIJ, 2007) where the Palestinian people are suffering from other Israeli industrial wastes generated by some industrial colonies in manufacturing activities like batteries, electroplating, aluminum, electroplating, electroplating, plastic, textile dyeing, fiber glass, rubber, food canning and meet processing (CJPME, 2005; Qumsieh, 1998).

In the West Bank, only 6.33% of the generated wastewater is treated in wastewater treatment plants, compared to 93.7% that is discharged into the environment using septic tanks, cesspits, and

sewage collection networks. Whereas, untreated wastewater of Gaza Strip is discharged into the Mediterranean Sea. However, the operation of the vacuum tankers service cannot be considered a real solution to the problem, in addition to being costly service (ARIJ, 2011). The Palestinian consumption of water per capita is considered one of the lowest in the Middle East and North Africa, because of the restrictions of the Israeli occupation and the 1995 Oslo II agreement for water provisions (PWA, 2011). Moreover, there are many secondary effects such as the Fear and anxiety among the citizens as a result of the ongoing Israeli confiscation of their land and prevent them from exploitation and expansion to meet the requirements of the population increase. In other hand, Releasing large number of wild boars by occupation authorities attacking fields and trees and this has led to significant economic damage, in addition to the psychological harm and fear inflicted to children and the elderly.

As other catchments in West Bank, streams of raw wastewater in Sarida catchment that flowing in open channels are considered as serious threats affecting all walks of life adversely. This catchment has a main Wadi with its branches called Sarida Wadi, which has the most wastewater flow activity in the catchment along the Wadi polluting water resources and other environmental elements. Moreover, the catchment is one of the available groundwater resources, which is supposed to be a part of water problem solutions for its surrounding area. Current trends represented by discharging of wastewater into the Wadi prevents the population of that nearby villagers from the

benefit of this natural resource, and creates a critical environmental and public health threat. Accurately, the surface flow of wastewater in the Wadi crossing agricultural lands has been considered as sever factor for polluting the nearby lands with many pollutants, resulting migration of these lands from cultivating. There are decreasing in animal production for the same reason where the animals graze and drink from contaminated sources. By passing the wastewater flow from the middle of Bruqin and alongside Kafr Al-Dik villages, serious risks have been shown related to public health including waterborne insect borne diseases. This study was conducted in order to assess the pollution problem in order to fill this gap and open prospects for additional studies that evaluating the environmental status of the rest issues in the catchment.

## 2. MATERIALS AND METHODS

The study area was represented by Sarida Wadi sub-catchment that mainly contains the flowing raw wastewater as the major pollution source with its two branches, the seven surrounding affected springs (Al-Fawwar, Al-Mizrab, Al-Msila, Al-Yanbou, Al-Matwi, Al-Shalal and Al-Adas), the two wastewater sources points which are Salfit city and Ara'el colony and finally the two Palestinian affected localities (Bruqin and Kafr Al-Dik) (Figure 1). However, these materials components were very important to identify for a good understanding of the current situation of the study area and the Dimensions of the problem.



Figure 1: The study area.

Related to the two localities, Bruqin is considered as a rural area according to the PCBS (2011), and located 8 km in the west of Salfit city, rising 390 m above the sea level with 18000 acres area. An estimated Population of 3194 residents with some archaeological sites that exist in the vicinity of the village (PSBC, 2011). The village plants several kinds of crops like wheat, grains and little of vegetables which is irrigated almost by spring's water. About 2974 acres are cultivated with olive trees and fig trees respectively (PCBS, 2011). In the other hand, Kafr Al-Dik village is considered a rural area according to classification of the PCBS (2011), located in the south-west of Salfit and rises 390 meters above surface of sea. The total land area of the locality is approximately 20,000 acres with a population of 4494 people (PCBS, 2011). Olive planting is the dominant in the agricultural sector, which occupies nearly 1653 acres of land. In addition to olive, this locality plants grains vegetables, fruits trees and raising sheep and cows which are represented 300 acres area (PCBS, 2011).

Moreover, with regard to wastewater collection, there is no sewerage network serving people. Thus, they dispose the wastewater through emptying septic tanks and cesspits and then discharged it into Sardia Wadi, which lies about 2.5 km away. There is also an uncontrolled dumping site where the people dispose their solid wastes weekly and burn it frequently that located 3 km away from the nearest residential area.

The questionnaire has been classified according to four main components, affected by wastewater within the study area, including the effects of wastewater on livestock and agricultural production (economic), the effects of wastewater on natural and aesthetic wealth (environmental), the effects of wastewater on socio-healthy aspects (social and health) and the effects of wastewater on used nearby water springs.

The survey targeted the affected localities of the study area, and was conducted on a sample from Bruqin and Kafr Al-Dik citizens which amounted to 50 persons as a random samples; 25 for each locality to ensure the highest level of accuracy of the total survey. The results of the survey have been analyzed through SPSS Statistics program; a software package used for statistical analysis. The survey results created a clear vision about the significance of wastewater effects on the two localities life's aspects.

### **3. Results and Discussion**

The research method is statistical and approach adopted for this assignment based on a designed questionnaire which has been structured for this study, seeking for representing most of life's aspects and consists of four sections; personal, healthy, socio-economic and environmental sections.

#### **3.1 The Demographic and Personal Aspects**

The total number of questionnaires divided equally among the two agglomeration, so that each has approximately equal number of questionnaires, which could guarantee homogeneous covered area. Although Palestinian women play an important role in the management of their household water resources, only 30% of the respondents were females.

#### **3.2 Healthy Section**

The majority of the respondents in both communities believe that raw wastewater has negative influences on public health. More than half of the respondents from Bruqin village reported having been infected with a waterborne/sanitation disease as a result, while 33 percent report the same in Kafr Al-Dik. Most common health implications mentioned include skin infections, Leishmania, Amoeba and Respiratory problems (Figure 2).

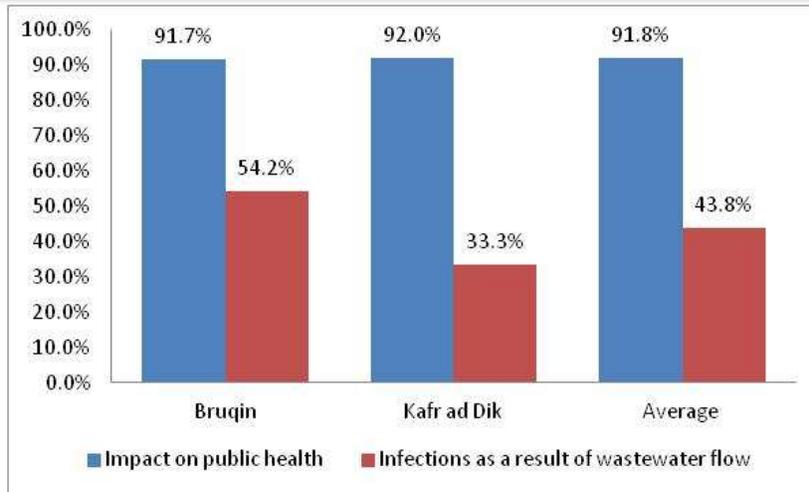


Figure 2: Public Health Impact of Sarida Wadi Flow and Infections Proportions of Raw Wastewater Flow

In terms of public awareness, the questionnaire clarifies that most of the respondents believe that the wastewater has a negative impact on public health.

**3.3 Socio-Economic Section**

80% of the research sample, own land parcels adjacent to the wastewater flow channel in Wadi Sarida. The average area of land owned by the respondents adjacent to Wadi Sarida is 21 acres

(ranging between 1 to 205 acres), and 8 acres (ranging between 1 to 30 acres) in Bruqin and Kafr Al-Dik respectively (Figure 3). A very high percentage of the respondents in the study area cultivated their lands in the past, however, they prevented from agricultural activities concurrently due to Israeli practices against local people represented by land confiscation, (About 40% of the respondents report owning land that has been confiscated by the Israeli Authorities), Wastewater pollution, as well as other unfair practices.

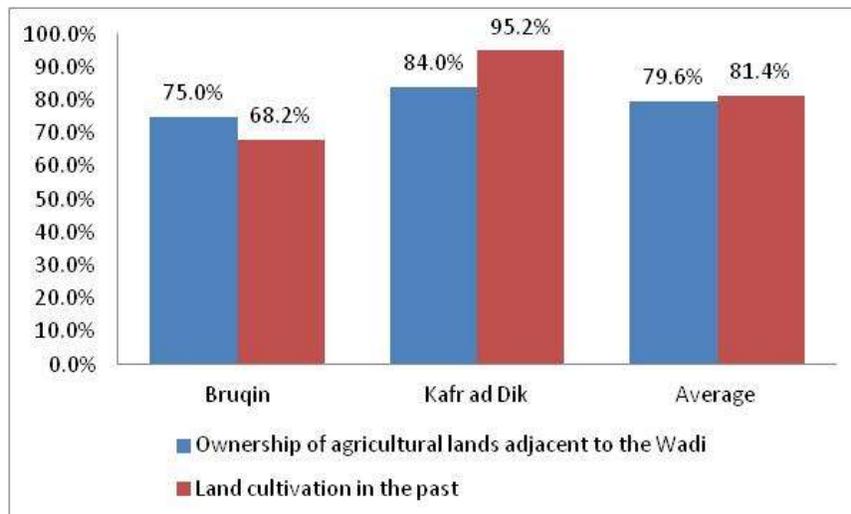


Figure 3: Represents the Proportions of the Cultivated Land Areas and the Land Ownership Adjacent to Wadi Sarida

Almost 80 percent of the respondents reported the decrease of their land production rates because of the spread of Plant Pathology resulting by wastewater flow in the region. Moreover, 48 percent said that they had abandoned their land cultivation as a result of the negative impacts of the wastewater flow. Furthermore, 68 % of the sample agreed that wastewater impact on the soil, make it

unsuitable for cultivation because of the high salinity levels (Figure 4). The results vary between the two agglomerations, with a clear negative effects on Bruqin lands because of the village location near the Wadi's flow, and emphasize the extent of the Wadi's flow impact of agricultural production rates and livestock on the study area.

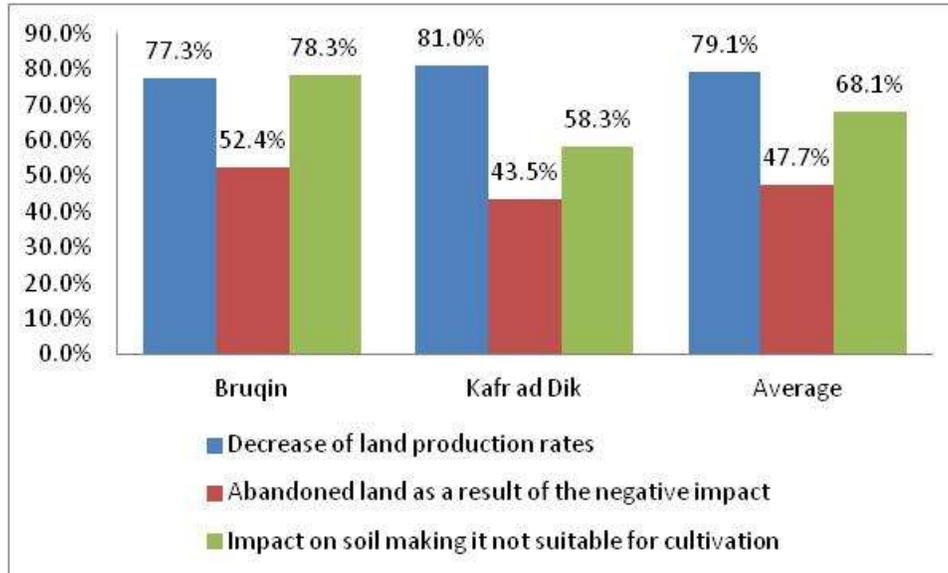


Figure 4: Impact of Sarida Wadi Flow on Land Production and Activities

The social dimension has been measured by the quality life in the dwellings near the Wadi. In Bruqin, most of the sample currently live within Wadi Sarida region, comparatively 28 percent of Kafr Al-Dik sample are living near the Wadi (Figure 5). The majority of the research sample have negatively affected directly or indirectly by the wastewater, such as bad odors. However, about 18% of the respondents have decided to change their dwellings locations to avoid negative impacts of the Wadi and this might refer to two reasons; the first is to stay near their lands, and the other is to avoid the costs of new residential units. Around 38 percent of the respondents use the springs in the area basically for agricultural purposes including irrigation and

for livestock. Most of the respondents do not use the water of near springs due to the bad water quality, especially for domestic uses.

### 3.4 The Environmental Section

The majority of the respondents in the communities believe that the raw wastewater has negative impacts on the aesthetic conditions of the surrounding environment. With regard to the wildlife including animals and plants, the majority of the respondents also believe that the wastewater has negative impact on both the wild mammals, birds, insects and the wildlife in the area.

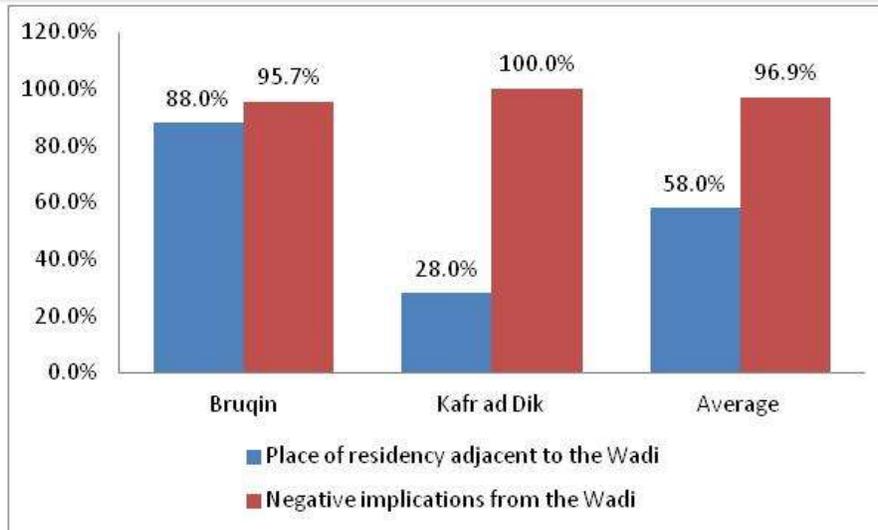


Figure 5: Impact of Sarida Wadi Flow on Residency Quality

Many of the respondents noticed the decrease in wild animals that used to be common to the area including birds such as the European Goldfinch and Dears, while other animals such as wild hogs increased. Thus, there is a noticeable decreasing in biodiversity which leads to affect the environmental sustainable adversely of the region.

#### 4. Conclusion

As result of the conducted socio-economic survey, The large wastewater flow that cross Bruqin and Kafr Al-Dik villages have catastrophic effects on health, socioeconomic and environment aspects. In addition, ruining the soil quality is due to the penetration of the wastewater flow towards the agricultural lands on both sides of the Wadi, playing an important role in by increasing or decreasing the proper elements concentrations as like increasing the heavy metals concentrations in the soil, thus influence directly and negatively the agricultural production either crops or trees. The spread of waterborne diseases and the diseases transmitted by mosquitoes such as leishmaniasis and rashes in Bruqin and to a lesser extent in Kafr Al-Dik because of its distance from the stream. In the other hand, there are relatively large numbers of people suffering from cancer in these villages, the reason for that is the possibility of increasing the concentration of heavy metals in agricultural and animal products that are reared in areas near the wastewater stream. As a result, there has

been little desire for residents of the same area to buy the agricultural and animal products as like dairy products or crops, and have begun finding out another alternative source. All of this led to a significant economic losses. In general, the analyzed results for the socio-economic survey showed a strong correlation between the wastewater flow in the Wadi as pollution source and the adversely effects on life's aspects of study area population, these evidences fulfilled the developed hypothesis of the study.

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