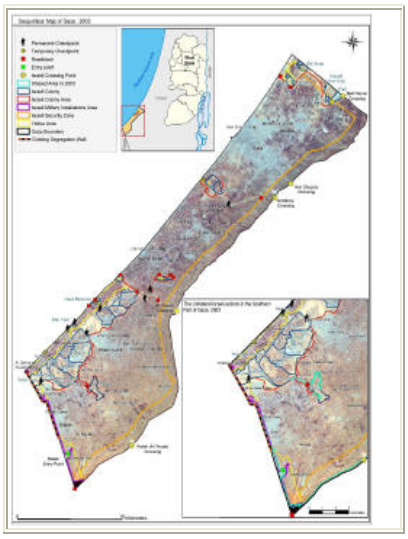
Applied Research Institute – Jerusalem (ARIJ)
P.O.Box 860, Caritas St.
Bethlehem, Palestine
Tel: +972-(02)-277-0535
Tel: +972-(02)-274-1889

Environmental Impact Assessment of the planned expansion of the Philadelphi Corridor at the Southern border of the Gaza Strip

Introduction:

The Gaza Strip is a coastal area along the eastern Mediterranean Sea, 40 km long and between 6 and 12 km wide. The area forms a transitional zone between the semi-humid coastal zone in the north, the semi-arid loess plains in the east, and the arid Sinai desert of Egypt in the south. This area in the south constitutes the target area of this report.

As a spout of the proposed Israeli unilateral disengagement plan of the Gaza Strip, the reports also mention the "Philadelphi Corridor". Israel has been in the process of structurally and ethnically cleansing this area since the beginning of the second Palestinian uprising. This racial oppression accelerated within the last couple of years and concentrated intensely during May 2004, when it became reality on the ground through the ongoing campaign of house demolitions and bulldozing acts of the densely populated residential neighborhoods along the boarder line. **Figure 1** presents a geopolitical map of the Gaza Strip with the different Israeli prints.



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In 1993 the Oslo Accords granted limited territorial autonomy to the Palestinian National Authority (PNA) in the Gaza Strip. Under the agreement, the Israeli Occupying Forces (IOF) retains control of the Salah Al Din border road, located inside the Palestinian controlled areas. The road is a small strip of land about 12.6 kilometers long stretching along the border which divides the southern tip of the Gaza Strip and the Egyptian Sinai peninsula. It is referred to by the Israelis as the "Philadelphi Corridor" or the “Pink Area”. In 2003 the IOF erected a segregation concrete wall with a length of 7 Km and a height of 8 meters along this Israeli controlled border to Egypt similar to the wall that Israel is currently executing in the West Bank. This segregation wall separates the northern parts of Rafah city from its southern parts, along the Israeli controlled border dividing the city into two parts.

Among the major issues of contention in the area are the underground tunnels that link the Egyptian side with the Palestinian side of Rafah. According to the IOF these tunnels are used to bring in weapons into Gaza illegally. The Israeli solution to get this trade under control is to demolish several rows of houses in Rafah, which according to the IOF are used to dig the tunnels from, and by this widen the Philadelphia corridor. Another suggested solution is building a passage and fill it with water. According to the IOF this canal would prevent tunnels being built from the Egyptian side to the Palestinian side of Rafah. According to Jerusalem Post more than one option may be executed.[1] By these measures the IOF are creating new facts on the ground, aiming at isolating the Gaza Strip from the outer world in general and from Egypt in particular.

The widening of the boarder will affect the district of Rafah, which already is dealing with several problems. The over-population resulting from the large number of refugees and the limited possibilities for urban expansion due to the geopolitical restrictions by Israel has led to adverse living conditions. These conditions influence directly or indirectly the quality of health and social wellbeing of the population. In some situations human and animal life is directly threatened which requires an immediate response. The scarce land and water resources are being used in an unsustainable manner which inhibits both economic and social development of the area. This report will assess the impact of the suggested Philadelphi canal on the Rafah district with special emphasis on the water resources. **See Figure 1.** Geopolitical map of the Gaza Strip

Coastal and Land Resources:

The Gaza Strip is essentially a foreshore plain gradually sloping westwards, composed by a series of geological formations aging from the Tertiary and the Quaternary Periods. The Tertiary is compiled by the Saqiya formation, deposited during the Pliocene and Miocene Epochs. This formation consists of shallow marine clay, shale, and marl reaching a depth of about 1200 m at the shoreline and fanning out at the eastern boundary. The Quaternary deposits cover the Saqiya formation above a thin layer of conglomerate, and measure about 160 m in thickness. The most important formation in the Quaternary is the Kurkar,

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composing the main water bearing strata of the coastal aquifer, also referred to as Fagra. Locally perched aquifers[2] are found in the alluvial deposits overlaying the Kurkar formation. In the northern part of the Rafah district the quaternary deposits reaches 150 m in depth decreasing gradually in the eastern direction reaching 75 m in the south.

The most important factor in shaping the Eastern Mediterranean coast is the continuous supply of sand transported from the Nile Delta. This sand forms the bulk of the coastal sediments, together with the additional calcareous material originating from marine debris and eolian and alluvial silty and clayey materials. The land forms dominating the area are the recent dune accumulations closest to the sore, the Muntar ridge with a mean elevation of 80 m a s l and the elongated depression. Active dunes are found near the coast penetrating an area of 4-5 km inland. The transition is gradual from the sandy dune landscape toward the rolling loess plains of the North-western Negev. An elevation map with 20 meter interval over the entire Gaza Strip is presented in **Figure 2**. The soil types of which the active sand dunes and the undulating stabilized dunes are composed are sandy regosols. The flat rolling inter-dune areas toward the interior are composed of loessial sandy soils and further on where the gently rolling plains are found is the sandy loess soils found over the layers of loess. **See Figure 2**. Ground elevation at 20 meters interval, with contour line compliment at 10 meters interval

Mean annual rainfall ranges between 200 in the south and 300 mm in the north due to aerographic[3] effects (for the period 1967-1997). Temporary flow of surface run-off during winter is the only source of ephemeral surface water. More lasting is the coastal plain aquifer which is the only groundwater source. It stretches over the whole district but varies significantly in depth and occurrence. It has a wedge-like cross section with the maximum thickness of 180 m near the sea tapering eastwards. In the east the saturated part of the aquifer appears to be negligible with a distance of 12 km from the seashore. The aquifer is composed of clastic sediments overlying impervious clays. In the eastern half the aquifer is uniform and phreatic, while as towards the west it is partially divided by intervening clay layers. These layers separate the aquifer into sub-aquifers of which the lower ones are confined. The seawater-freshwater interface has a slight incline towards the east from the shoreline. The thickness of the unsaturated zone ranges from a few meters to 90 meters with a transit time to the water table ranging from 1 to 50 years.

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Under natural conditions the groundwater drains into the sea. The aquifer has a high transmissivity with a big water bearing capacity which decreases to the east. The estimated recharge from rainfall in the district is 5 MCM per year.

There are 397 wells in the district of Rafah of which approximately 170 wells are registered. Among the registered wells around 130 are in operation where six are owned by the Israeli National Water Company MeKorot and 15 are owned by the Palestinian Water Authority (**Figure 3**). The total abstraction from the PWA wells is 19 MCM per year. The rest of the wells are privately owned and only used for agricultural purposes. Irrigation consumes more than70 % of the supplied water in the Gaza Strip. Most of the wells exploit the water of the upper aquifer layer to a depth of 20 to 60 meters. Some of the wells are large-diameter, had-dug wells of only a few meters in depth. **Figure 3.** Generalized map over the groundwater properties in the Gaza Strip, with the groundwater direction and nitrate concentration, and the main groundwater wells.

The quality of the groundwater is deteriorating at a very high rate mainly due to over-exploitation. Another important reason for the deteriorated water quality is by the agricultural use of fertilizers, pesticides and so called soil-cleaners such as methyl-bromide. Other factors that contribute to the deteriorating quality are the uncontrolled discharge of sewage water at the soil surface along with the increase of salinity content of the groundwater. The wastewater treatment plant in Rafah was initially built in 1987 with a capacity of 1800 m^3 per day, but at present it receives an excess of 4000 m^3 per day.[4] As a result, effluent from the plant far exceeds the recommended values. The nitrate content in the groundwater ranges between 50-150 mg/l in the central parts of the district

while chloride reaches values higher than 1000 mg/l in the south. The high salinity may be the result of groundwater flow from the east, re-cyclic salting at the surface, seawater intrusion from the west, and possible interchange with high salinity pockets in the underlying Saqiya formation. The highest chloride content is found in the south with decreasing towards the north were the values can be less than 200 mg/l. In most cases the high salinity and high nitrate content makes the water unsuitable for drinking.

District of Rafah:

The district of Rafah has an area of around 65 km^2 and is densely populated with an estimation of 159 000 inhabitants including some 101 000 refugees. More than 55 000 of the refugees in the district live in the Rafah Refugee Camp. The population density in the Camp, which covers an area of 3 km^2 in total, is 18 300 persons per km^2. The main urban center in the study area is the town of Rafah which is divided into an Egyptian side and a Palestinian side, by an Israeli controlled boarder. Other built up areas are Al Bayuk, Al Suwaydiya, Al-Mawasi (Rafah), Shokat as Sufi, Tall as Sultan, and the Rafah refugee camp (**Figure 4**).

There are four Jewish colonies in the district that occupy a territory of about 7.6 km^2 in total. The number of colonists is 811 indicating a population density of 107 persons per km^2. In addition to the colonized land, and including the security zones and the yellow area there are about 22 km^2 of the district under full Israeli control.

Figure 4. Main urban centers and general land use in the district of Rafah

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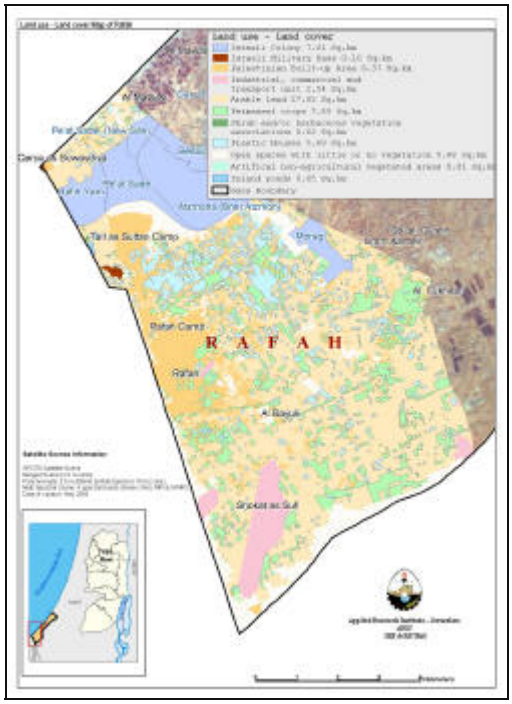

The population of Rafah profoundly depends on agriculture for their living. More than 20 % of the labor force works within the sector of agriculture, hunting, and forestry[5]. About 41 km^2 of the district are arable land, but due to the political constraints only 13 km^2 are used for cultivation. The main cultivation practices in the area are the plastic houses and the permanent crops. The land use is described more in detail in Table 1. The water bodies indicated in the table are most likely to be agricultural water ponds.

Table 1: Description of land use in the district of Rafah based on analyses of satellite images

Land Type	Land Use	Area [km2]
Water body	Inland ponds	0.05
Forests and semi-natural areas	Open space with little or no vegetation	5.88
	Shrubs and/or herbaceous vegetation	0.02
Artificial surfaces	Industrial, commercial and transport	2.54
	Built-up area	8.37
	Israeli colony	7.61
	Israeli military base	0.10

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	Artificial non-agricultural vegetated area	0.01
Agricultural areas	Plastic houses	5.60
	Permanent crops	7.69
	Arable land	27.62
Total	**65.49**	

Source: ARIJ database

Since the outbreak of the second Intifada, Rafah has been reportedly sustained different damages as a result of the occupation activities. Almost 2 km^2 of agricultural land have been razed only during the year 2003. According to the Palestinian Center for Human rights report in May 2004 the IOF demolished 1059 in Rafah. Beside the demolition of houses the IOF has also damaged several water networks, and even the Rafah wastewater treatment plant has been target for these violations. There are two Israeli Road blocks, and two Israeli Barriers in the district of which one is permanent and the other is temporary.

The Border between the Gaza Strip and Egypt:

The Salah Al Din border road between the Gaza Strip and Egypt is usually referred to as the Philadelphi Corridor by the Israelis. It has a width of 100 meters and is under the control of the IOF. The infrastructure around the boarder was constructed by the IOF after the expropriation and destruction of the Palestinian land and the private properties.

The city of Rafah which is situated at the boarder has long been the grain in the eye of the Israelis. The city is considered to be the transit point of weapon smuggling between Egypt and Palestine. According to the IOF, the Palestinians constructed a complex network of tunnels underneath the Egypt-Israel border in the Rafah area in the period after the 1993 Oslo Accords. The tunnels are conceited to be used to smuggle weapons, cigarettes, drugs, and people from Egypt into Gaza. Consequently, the city of Rafah has become a focal point of attention for the IOF as it is considered the source for smuggling contraband throughout the Palestinian Territories. Furthermore, Israel claims that the weapon smuggling is run and managed by Palestinian terrorist organizations with the approval and active participation of the Palestinian Authority. With this as an excuse Israel keeps its power hold of the Egyptian boarder.

The first steel wall was erected already in 2001. This wall is 9 to 10 kilometers long, 16 meters high, and three centimeters thick, stretching from Al Suwaydiya village in the north, and to Shokat as Sufi in the south. The wall is rife with Israeli military posts, watchtowers, sniping spots, and iron gates only used for the entry of tanks and armored personnel carriers along the border areas to invade the adjacent areas of Rafah.

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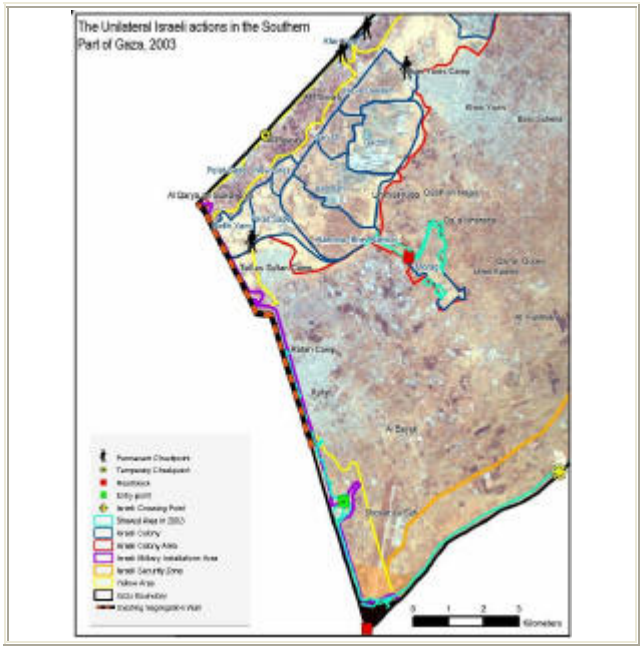
In September 2003 the IOF started executing a concrete wall "to prevent Palestinians from firing at troops". The wall have a length of 7 km and a height of 8 meters, similar to the wall that Israel is currently erecting in the West Bank (**Figure 5**). This segregation wall completely isolates the northern part of the city of Rafah from the southern part. The erection of the wall includes the uprooting of 750 000 of fruitful trees mainly citrus and banana and the destruction of a number of plastic houses which resulted in a complete destruction of the agriculture sector in the entire Gaza Strip.A number of 900 Palestinian houses were demolished and more than 13 thousand Palestinians living in the Gaza Strip were left homeless for the purpose of establishing different security zones and segregation walls.**Figure5.**The map illustrates the Israeli unilateral actions in Rafah in 2003



Since the last incursion in Rafah in May 2004 the IOF has declared the intention of changing the infrastructure at the border by the construction of a moat filled with seawater to "distance the threat from the Philadelphia route". According to the specifications, this isolating trench will be 15 kilometers long, stretching from the south of the Gaza Strip and abutting to the Mediterranean Sea to exceed the borders. It will be 15-25 meters deep, and 100-120 meters wide including the security zone **(Figure 6).**

The canal will be flooded with sea water that would collapse any underground tunnel. On Thursday 17th of June the Israeli Defense Ministry announced that it is issuing a tender for the construction which is supposed to be completed before the withdrawal from the Gaza Strip. This announcement came 11 days after the Israeli cabinet in principal approved the unilateral plan of Israeli withdrawal from Gaza. The plan includes keeping the Israeli troops at site of the Egyptian border, in anticipation of possible security

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arrangements with the Egyptian government. According to an Israeli daily newspaper a senior defense official said that the moat will be financed by the sale of the large quantities of sand that will be dug up during the construction[6]. **See Figure 6**.

A planned sketch of Philadelphia route as published on Ha'aretz daily newspaper.

A planned sketch of Philadelphia route as published on Jerusalem post daily newspaper.
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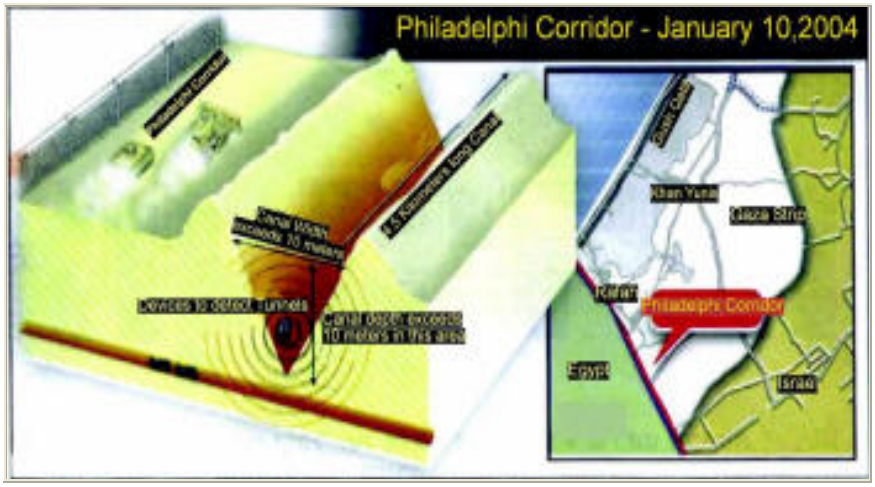
On January 10, 2004, A new suggested plan devised by the Israeli Security Cabinet to construct a new security Canal along the Philadelphi Corridor (the border area between Gaza Strip and Egypt) in Gaza Strip. According toIsraeli officials, this plan is required as Israel would retain more control of the Corridor, at the same time, giving up on the idea of filling it with sea water.

The new specifications will be a canal of 15 kilometers long, more than 10 meters deep forming the shape of a triangle with an opening of tens of meters wide. The canal will stretch along Philadelphi corridor with electrical devices that enables the detection of tunnels constructions. Israeli, to implement this new plan, would have to raze the "3000 + " Palestinian houses located along the path of the Corridor. **See Figure 7**



The new planned canal of Philadelphia route as published on the Israeli daily newspaper Yediot Ahronot.

According to a statistics issued by the Palestinian Center of Human Rights in Gaza Strip , since the start of the second Palestinian upraising in September 2000 and till December 2004, the IOF has demolished 1461 Palestinian houses in various refugee camps and neighborhoods in the Rafah area.

District Rafah	Totals
Number of houses completely demolished	1461
Number of houses partially demolished	1087
Number of Palestinians whose houses were totally demolished in Rafah	15360
Number of Palestinians whose houses were partially demolished in Rafah	13457

Source: (Palestinian Center for Human Rights) - PCHRGAZA 2005

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This number, according to the above table, includes the structures completely destroyed or rendered permanently uninhabitable. Some 15360 people have been rendered homeless by the demolitions. Most of the demolitions were carried out in Rafah, along the border with Egypt.[7]

Impact Assessment:

The current Israeli actions are a continuation of a three-year long process of ethnical cleansing of Palestinians from the border to Egypt. The military operations demonstrate a dramatically escalated agenda of destruction. It shows the Israeli desire to have free rein to enforce as many facts on the ground as possible before its planned unilateral disengagement from the Gaza Strip. The planned Philadelphi trench will contribute to turning the Gaza Strip into a big prison, on the one hand, and to ensure continued Israeli presence in the area on the other. It will completely separate the northern parts of the city of Rafah from its southern parts, and it will furthermore block the movement in and out of Gaza to Egypt for the 1.3 million people living in the Strip.

The widening of the border will also affect the Gaza Strip in other ways. Hundreds of dunums have already been seized along the border, and thousands of dunums have been flattened. Hundreds of thousands of fruit trees have been uprooted and cultivated areas have been razed along with the leveling of the landscape. There are one well with an average discharge of 33 000 m^3 per year that lies in the zone that is likely to be confiscated and trapped inside the planned security zone. Another 27 wells will be threatened as they tap the aquifer at a distance less than one kilometer from the Canal. These wells have a total discharge of approximately one million cubic meters per year.

As the groundwater table in the area is near to the surface all activities at the ground will affect the phreatic water. And by leveling the dunes and digging a moat, the protective layer between the water table and the ground will diminish leaving the groundwater more vulnerable to pollution of any kind. The very existing of the canal itself will become the biggest threat to the groundwater as the arid climate will render a high evaporation rate of the salty seawater in the conduit, leaving a high salinity water to infiltrate through the porous media, to recharge the fragile groundwater.

The salinity of the Mediterranean Sea reaches 39 ‰ in the southeaster part of its Eastern Basin. With the annual evaporation exceeding the precipitation and river runoff the sea is turned into a “concentration basin” with an estimated freshwater deficit of about 2500 km^3/yr. This setting takes place on the macro scale of the entire sea, and when considering our area of interest it is obvious that the entire canal will turn into a “concentration trough” draining high salinity water into the previously threatened groundwater of the region (Table 1). The sea water filling into the canal will have an initial salt concentration of 39 ‰. The mean daily evaporation rate varies from 2.1 to 6.3 mm per day in December and July respectively. The mean annual rainfall varies between

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200 and 300 mm from the shoreline and south, with all the rain falling during inthe period of mid-October till the end of March. The transmissivity of the aquifer is estimated to vary between 200 and 700 m^2/day for the confined aquifer and the perched aquifer respectively. Together with the litho-logy of the region this indicates a hydraulic conductivity of 0.004 mm/day to 0.001 mm/day of the perched aquifer and a hydraulic conductivityof 0.0038 mm/day of the confined aquifer. The mean depth to the quaternary deposits ranges between 200 and 50 m from the shoreline and south. A rough estimate with the data at hand will give the following scenario of cyclic salting

Table 1.Estimation of the salt accumulation in the canal and in the groundwater as a consequence assuming start year to be 2004.

Year	Salt concentration in canal	Salt addition to groundwater
2004	39 ‰	19.2 g/l
2005	43 ‰	23.8 g/l
2010	61 ‰	33.2 g/l
2020	97 ‰	53.6 g/l

An open area of 0.9 km^2 with a water body of 13.5 million m^3 would therefore accumulate salt at a rate of 0.00988 ‰ a day, rendering a 43 ‰ salinity already after the one year, through an average evaporation of 3.8 mm/day from the open water surface. This water would eventually infiltrate the surface and reach the paretic groundwater table adding 24 grams of chlorine per liter water. Already in 2010 the salinity would reach 61 ‰ and 97 ‰ in 2020 adding 33 and 54 grams of chlorine per liter water respectively. It is worth mentioning here that there are at least 38 wells in use in the near vicinity of the canal, which will be directly threatened by this sudden increase of salinity.

Discussion:

In summing up the logic of the “Philadelphi Corridor”, it is given by the common sense, that if there will be a full withdrawal, then it is not reasonable to speak of any arrangements that oppose to the principle of a full withdrawal. After the withdrawal it should no longer be the responsibility of Israel what happens on the border. But by these unilateral activities Israel is fortifying its presence even after a “full” withdrawal.

In fact Israel wants to retain control of all entries into the Gaza Strip as well as of the land zone that might in the future become the mouth of a continuous link between the Mediterranean Sea and Red Sea.The expansion of the Philadelphi corridor will settle the control of Israel even more securely both geographically and topographically.

The geographical control will ensure the power over the land slice that could link the Mediterranean Sea to the Red Sea in a new “Suez” Canal (**Figure 8**),while the

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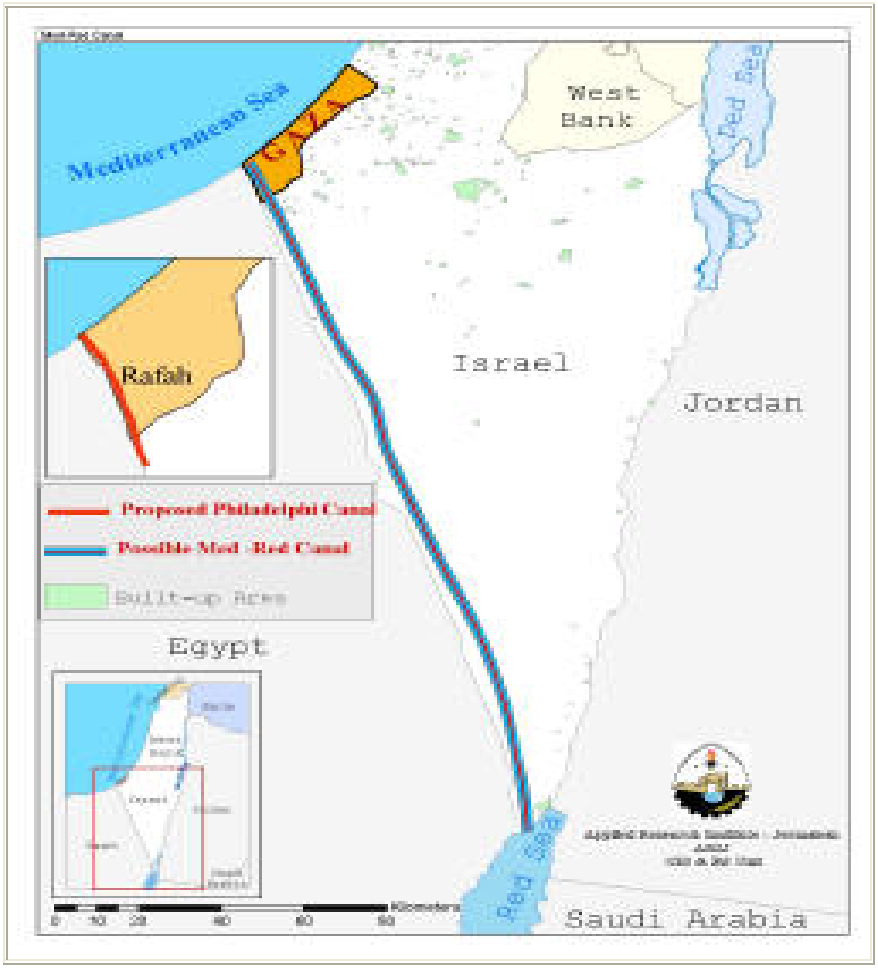
topographical control will guarantee the separation of the Gaza Strip and Egypt and further fortify the presence of the IOF with the claim of security intervention at the vantage moments.**Figure 8**:An anticipatedMed-RedCanal



All these new conditions caused by the colonial activities of the IOF are influencing the quality of health and the social wellbeing of the population of the Rafah district both directly and indirectly. The district is already overpopulated due to the large number of refugees and to the relatively high population growth rate. The possibilities for urban expansion are few and they are being controlled by the geopolitical restrictions. Beside the aforementioned Philadelphi Corridor the IOF are also closing in the citizens of Rafah from other crossing points. Recently the IOF has spent hundreds of thousands of shekels on the two checkpoints at Hila and Tufah. The checkpoints that were renovated cut of the Mawasi area. In particular the population of Khan Younis and Rafah are forbidden to enter the area because of its proximity to the Jewish colony Gush Katif. The Mawasi region is also considered the most agriculturally fertile section of the Gaza Strip, and produces much of the locally-grown fresh food.

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These closure activities are deterring the economic situation as well. The movement of people is becoming more and more limited along with their possibilities to earn their living in any other place except the closest vicinity to where they are actually living. In some situations human and animal life is directly threatened by the so called security measures of the IOF.The scarce land and water resources are also deterring either as a direct or indirect consequence of the colonial activities,further inhibiting the economic development of the area.

The most urgent threats of the proposed Canal will be on the people living along the border, and on their land and water resources. The land shaving together with the confiscation of lands will render a severe setback to the agricultural sector which is the backbone of the economy in the district. As for the water resources; taking into consideration the brackish nature of the deep groundwater, and the sensitivity to seawater intrusion caused by the over-abstraction, the fresh groundwater of the district will soon be irreversibly destroyed by the salt intrusion from the Canal. Some of the wells in the vicinity of the canal already have Chloride concentrations higher than 700 mg per liter, but they are all still usable either for agriculture or for domestic use. With the additional salt contribution from the canal the water will soon become so saline that it would need extensive treatment to become potable again. And for the remaining agriculture the continuous irrigation with high salinity water will eventually lead to soil salinization, turning the cultivated lands into a new Cartage.

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Links and References:-

[1] Jerusalem Post 2004-05-23
[2] A perched aquifer is a region in the unsaturated zone where the soil may be locally saturated because it overlies a low-permeability unit.
[3] The influence of rising altitudes
[4] Desk Study on the Environment in the Occupied Palestinian Territories, United Nations Environment Programme (UNEP)
[5] As classified by the Palestinian Central Bureau of Statistics (PCBS)
[6] Haaretz web edition 17th June, 2004
[7] Report published on Wednesday 23 June, 2004