ANALYSIS OF URBAN TRENDS AND LAND USE CHANGES IN THE GAZA STRIP

BETWEEN 2001 – 2005

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CHAPTER ONE

INTRODUCTION

1.1. Background

The Palestinian Territory (PT) consists of two physically separated landmasses: the West Bank and the Gaza Strip. Their total area reaches approximately 6,026 km^2. The West Bank covers an area of about 5,661 km^2 and the Gaza Strip covers an area of approximately 365 km^2. The Gaza Strip is a coastal area along the eastern Mediterranean Sea. It is 42 km long and between 6-13km wide (ARIJ database, 2005). It is bordered by Israel from the east and north, Egypt from the south and the Mediterranean Sea from the west and ranges between 20 and 100 meters above see level, see map (1-1). The area forms a transitional zone between the sub-humid coastal zone of Israel in the north, the semiarid loess plains of the northern Negev Desert in the east and the arid Sinai Desert of Egypt in the south. The Gaza Strip has a Mediterranean dry summer subtropical climate with mild winters.

The total Palestinian population in the Gaza Strip by the end of 1997 was approximately 1.02 million with 24.5% of the population living in refugee camps (PCBS, 1997). The population was projected to increase by 36% by the year 2005 increasing the total to 1.39 millions with a population density of 17,363 capita/km^2 of the total built-up area in the Gaza Strip, making it one of the most overcrowded areas in the world.

During the last century, the administrative boundaries of the Gaza Strip were reshaped several times by the powers that ruled Palestine. Under the Ottoman Empire (1516 – 1917/1918), Palestine (like the other Arab provinces) was divided administratively into regions, Gaza being one of the regions, with Acre, Nablus and Jerusalem as the others. On the 1st of October 1906, an agreement was signed between representatives from Egypt and Turkey. The agreement demarcates the Administrative boundaries between Palestine and Egypt running from the Mediterranean Sea to the Gulf of Aqaba. After the World War I, when the Ottoman Empire fell and the British gained a 'Mandate' to govern Palestine, they established the first international boundaries of Palestine in 1922. Map (1-2) shows the Palestinian sub-districts in the period 1917-1948 according to the British Mandate Administration.

In 1937, the Peel Commission recommended that Palestine should be divided into two separate states; one Jewish and one Arabic. As part of this recommendation, the Jewish population would be designated a much larger area for their state than seemed justified by the 6% of land they owned; this obliged the Palestinians to reject the Peel plan which ended in the eruption of clashes. The next Partition Plan - known also as “The United Nations General Assembly’s Resolution 181 of 1947” - also called for the partition of Palestine into two states, one Arabic and one Jewish, in 1947. Palestinians rejected the UN Partition Plan for the same reason that they rejected the British plan, because Jewish minority - who only owned 6% of the land - were given such a large share. (see map 1-3). After the 1948 War, Israel seized control of 78% of the British Mandate of Palestine, and as a result, about 200,000 Palestinian refugees fled to the Gaza Strip from the Israeli controlled parts of Palestine, therefore doubling its population. (see figure 1-1). After the Arab Israeli Armistice Agreement of 1949, the West Bank was administered by Jordan and the Gaza Strip was administered by Egypt. During the spring of 1956 several military clashes between Egypt and Israel took place in the Gaza Strip as part of the Tripartite Invasion of Egypt by Britain, France and Israel. In 1967 Israeli Forces (IF) occupied the Gaza Strip and the West Bank (known later as 'Occupied Palestinian Territory' [OPT] which constituted the remaining 22% of British Mandate of Palestine - see map 1-4), as well as the Golan heights. This seizure of land took place during the Six-Days War between the combined forces of Egypt, Jordan, and Syria on one side and Israel on the other. On November 22nd, 1967, the United Nations (U.N.) Security Council issued resolution 242 which emphasized the inadmissibility of territorial acquisition by war and the need to work for a just and lasting peace in which every State in the area can live in security. It called for the withdrawal of all Israeli armed forces from the newly occupied territories captured in the recent conflict. Significantly it also called for a just colony of the 'refugee problem'.

In 1987, the First Intifada broke out in the OPT as an attempt to end the Israeli Occupation. In 1991 the nations of the Arab league and Israel met at the Madrid Conference to outline the discourse of peaceful negotiations. The guiding principles of these negotiations were 'Land for Peace' along with the United Nations Security Council Resolutions 242 and 338.

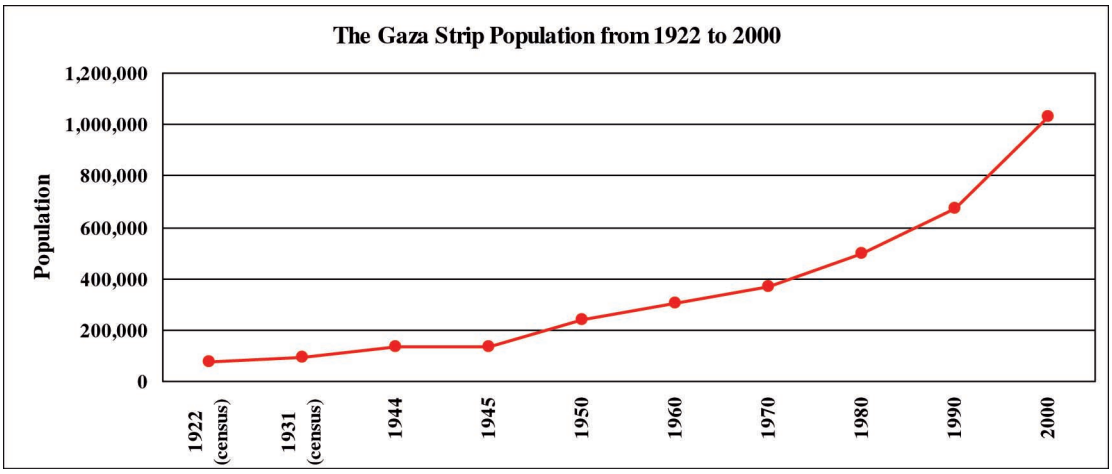
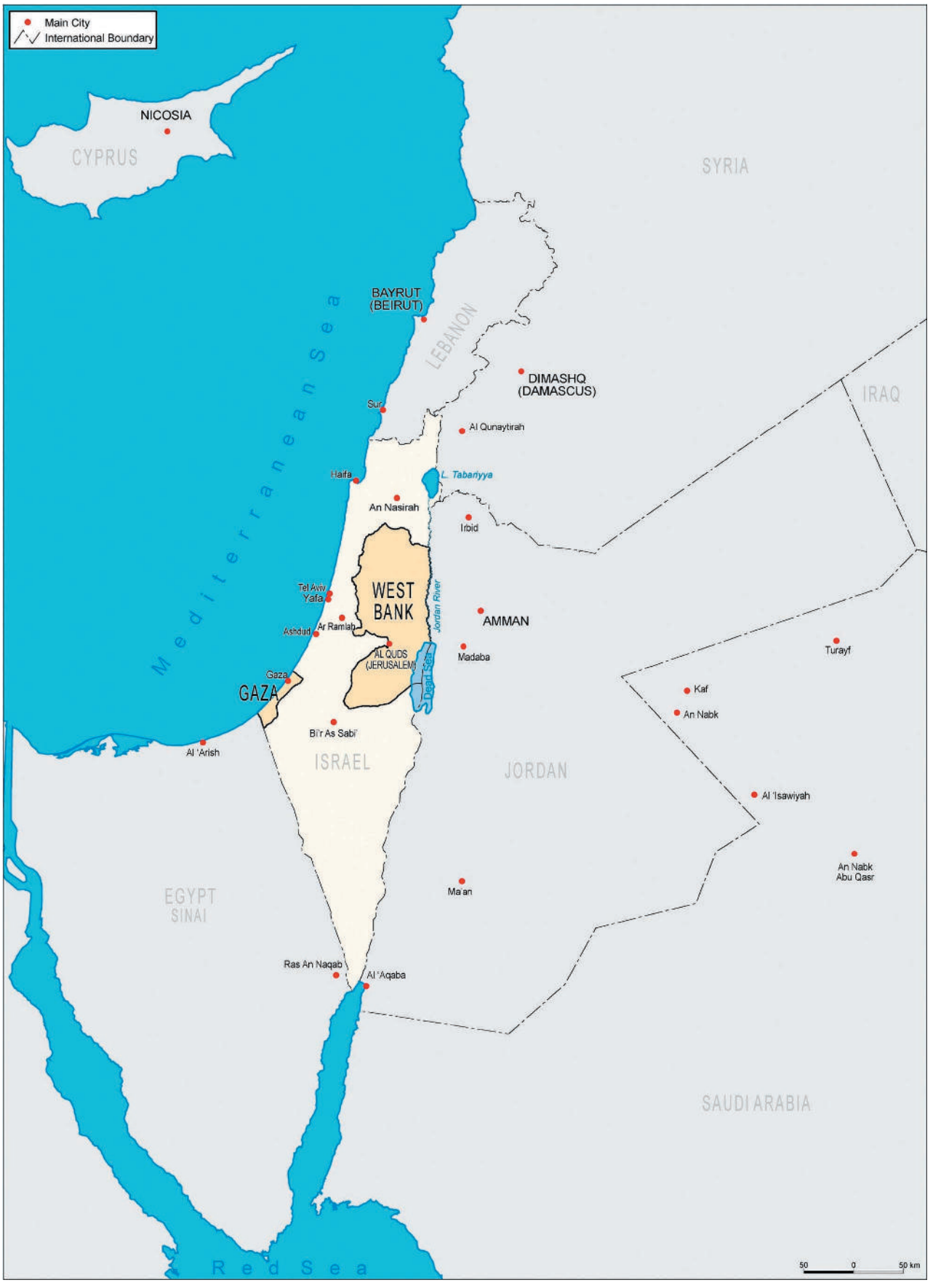


Figure (1-1): Arab population in the Gaza Strip from 1922 to 2000[1]

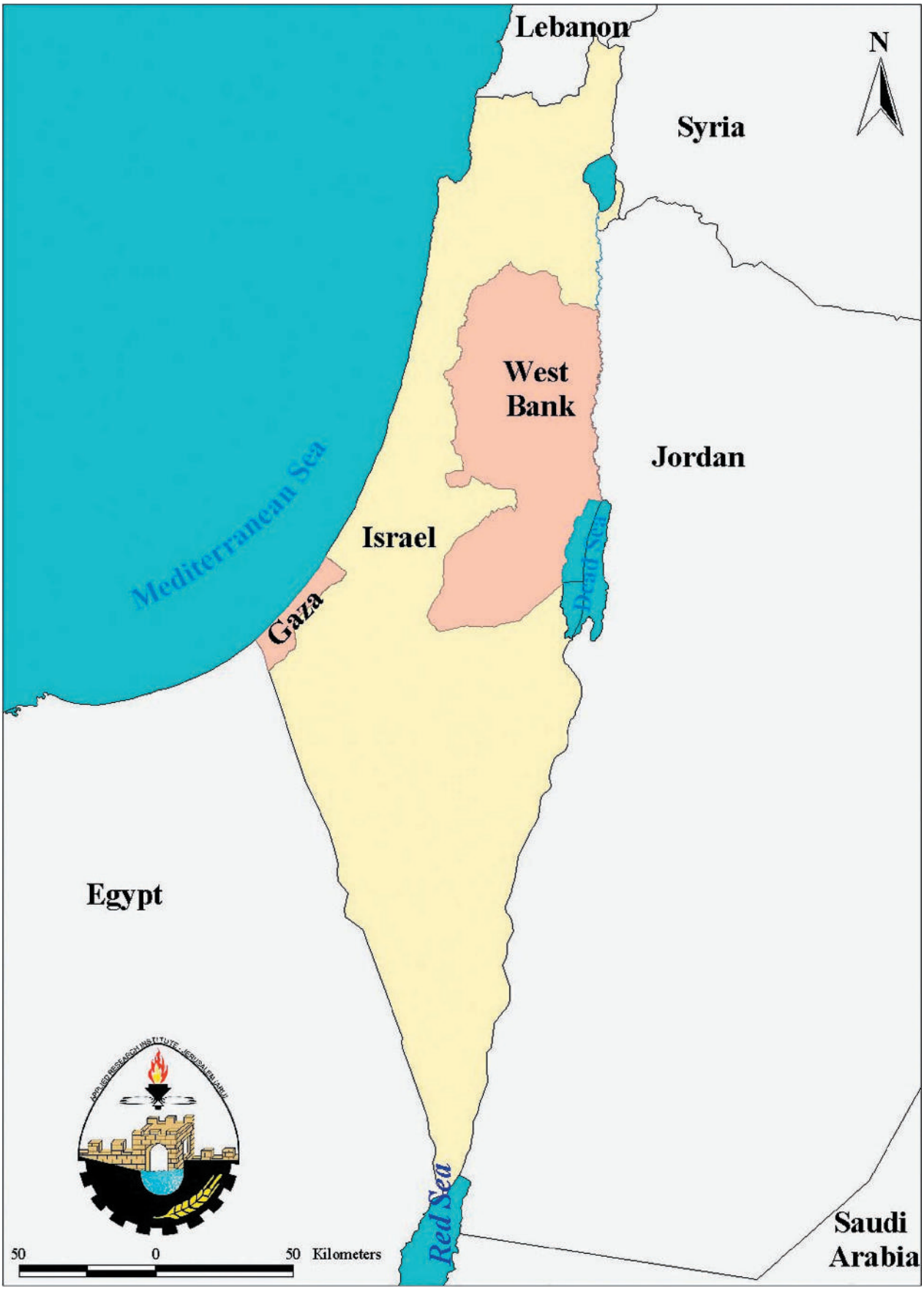
[1] **Sources:** *(1922, 1944): A Geopolitical Atlas of Palestine - The West Bank and Gaza. Bethlehem: Applied Research Institute- Jerusalem (ARIJ), October 2004.*
(1931, 1945): Abu-Sitta, Salman H. Atlas of Palestine 1948, October, 2004.
(1950-2000): "Palestine's Population During The Ottoman And The British Mandate Periods." www.palestineremembered.com. 8 September 2001 <http://www.palestineremembered.com/Acre/Palestine-Remembered/Story559.html>.



Map (1-1): Palestine within the current regional context

Map (1-2): The Palestinian sub-districts according to the British Mandate Administration from 1917 to 1948

Map (1-3): The United Partition Plan in 1947



Map (1-4): The West Bank and the Gaza Strip boundaries after 1967

On September 13th 1993, the Palestinians and Israel signed the Declaration of Principles (DOP)[2]. Afterwards, a series of subsequent agreements, popularly known as the Oslo Accords, were signed in order to implement the DOP. In Oslo I (also called the Gaza-Jericho Agreement) of May 4th 1994, The Israeli Government agreed to withdraw from Jericho and most of the Gaza Strip where the newly formed Palestinian National Authority (PNA) would assume control. The Oslo I agreement partitioned the Gaza Strip into:

- Palestinian Area which was to fall under a complete Palestinian control.
- Yellow area[3], where the Israeli Authority would retain the responsibility and powers of security and the PA would gain responsibility for civil affairs.
- Israeli colony (settlement) areas remained completely under Israeli control.
- Israeli security zone where Israel would retain complete control.

The total area controlled by the PA after Oslo amounted to 254.2 km², with the remaining 108 km² of the Gaza Strip still under Israeli control; including the yellow area, the Israeli colony (settlement) areas and the Israeli security zone.

The areas under Israeli control in the Gaza Strip in 2005[4] can be classified as shown in table (1-1). The total area controlled by Israel in the Gaza Strip is 116.7 km² which comprises about 32% of the Strip's total area. The Areas in table (1-1) often overlap; therefore, the total areas controlled are not the sum of the areas detailed in the table.

Table1-1: Area controlled by Israel in the Gaza Strip in 2005

Type of area	Area (km²)
Yellow Area	15.81
Israeli colonies' Area	53.70
Israeli colonies (settlements)	28.40
Israeli Security Zone	58.04
Israeli Military Installation Areas (at the border between the Strip and Egypt)	2.418
Israeli Military Bases	2.14
Israeli Controlled Roads	2.84

Source, ARIJ database, 2005

In 2004, the Israeli Government revealed plans to evacuate all its colonies from the Gaza Strip - along with four remote colonies in northern West Bank - by late 2005. The plan came to be known as the "Israeli Unilateral Disengagement Plan". The PA was informed about the plan, but the disengagement procedures were not coordinated with them. Although the PA welcomed this plan, it stated that the Gaza Strip is still legally under Israeli occupation since Israel will continue to control Gaza's borders, the airspace and the sea. The "Disengagement Plan" was approved by the Israeli Knesset in February, 2005; while the implementation began on August 15th 2005 when 21 colonies were evacuated by the Israeli Occupation Forces (IOF), further withdrawals by the Israeli Forces were seen in other areas that were under Israeli control (refer to table (1-1)) except for 650 meter fence along the borders between Israel and the Gaza Strip.

It is worth mentioning that after having finished this report, the "Disengagement Plan" was approved and implemented in 2005. Therefore, another chapter was added (i.e. chapter four: "The Gaza Strip Disengagement Plan") to include detailed information about this plan and its impacts on the Palestinians in the Gaza Strip. Whilst chapters one, two and three cover the period between 2001 and 2004, the time in which the land use / land cover and population analysis was conducted.

[2] The Declaration of Principles (DOP) has two salient features. First, it aims at establishing permanent settlement based on Security Council Resolutions 242 and 338. Second, the DOP also provides for the establishment of interim arrangements.

[3] The yellow area's representation is similar to areas B in the West Bank, where the PA has jurisdiction over civil affairs, while Israel controls security, with more limited power than it has in areas B in the West Bank because parts of the settlements in the Gaza Strip are laying inside the yellow area (ARIJ, 2001).

[4] Before Israeli withdrawal.

1.2. Study Objectives

The scarce availability of resources - such as land and water - in the West Bank and the Gaza Strip, combined with the demands and pressure placed upon them by agricultural development and urban expansion, means that Palestinian planners - at the PNA as well as at the local municipal level - must start thinking about possible strategies for the management of these limited resources in the PT. The expansion of land development only serves to exacerbate the competition over limited land and water resources, whilst the presence of Israeli colonies and bypass roads adds an additional political dimension to this competition.

Great concerns have emerged in recent years about uncontrolled urban expansion in the Gaza Strip, in the form of both Palestinian built-up areas and Israeli colonies and their associated infrastructures. The expansion of built-up areas has significant environmental ramifications. Urban developments and infrastructure encroach upon agricultural and grazing lands creating additional pressure on the limited natural resources of the PT.

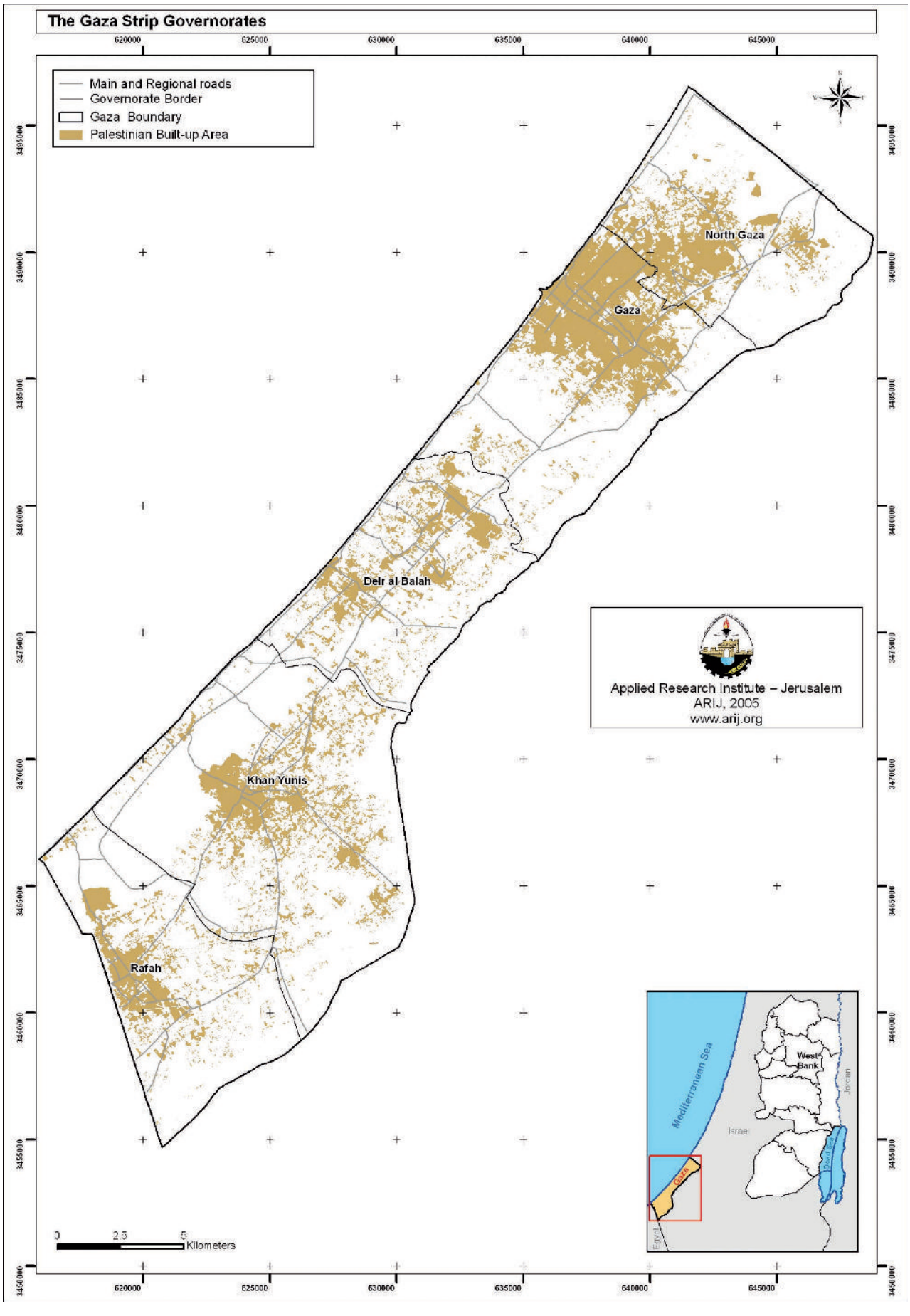
The main objective of this project was to develop quantitative and qualitative analysis - for the first time ever - of urban development trends in the Gaza Strip via time series satellite images in the time period between 2001 and 2004. The project also aims to assess the impact of this urban development on both land use and the local Palestinian communities in Gaza's area by also assessing the effect of the current Second Intifada on urban activities. Ultimately, the project aims at making projections of possible future trends of demographical and urban expansions in the study area. In order to fulfill these main objectives, the following specific objectives have been defined:

1. Modeling overall urban forms and recognizing emergent trends that have been present in shaping the Palestinian urban structure since 2001.
2. Reporting the changes of land use and land cover during the period between 2001 and 2004 and highlighting these changes in the targeted areas.
3. Relating trends of urbanization to political changes.
4. Observing the land changes in many areas of Gaza where the Israeli Authorities have control including any new built-up areas, newly added housing units, areas of the lands that have been leveled to earth, and estimating numbers of trees uprooted using the Geography Information System (GIS) and the Remote Sensing Technology.
5. Investigating the crucial role played by the Israeli colonies - on the development of Palestinian cities and their impact on cultivated land, water and on the future of Palestinian urban development - as a major factor limiting the natural resources in the Palestinian Territory.
6. Quantifying the relationship between urban growth rates and future population growth, in order to estimate the extent to which these factors will create further demands for land.
7. Estimating future possible urbanization trends and their impact upon the availability of natural resources.
8. Creating scenarios for potentially suitable urbanization sites which may assist planners and decision-makers when identifying new boundaries for future urban development.
9. Disseminating research results to other researchers, national and local authorities, Ministries, Planners and NGO's.

1.3. Study area

The current administrative boundaries of the Gaza Strip were defined by the PNA after 1993. Accordingly, there are five Palestinian Governorates in all - named after the main cities located in each one - which comprise the administrative divisions the strip. The Palestinian Ministry of Planning (MOP) selected suitable regional urban centers for the Governorates according to their local functions; their available urban services and the social infrastructural facilities they contain, as well as the role they play in relation to the surrounding Palestinian communities and to each other. The Palestinian Governorates in the Gaza Strip (which cover the 362.7 km^2) start in with North Gaza in the north and extend down through Gaza, Deir al Balah and Khan Yunis Governorates reaching Rafah Governorate in the south.

The study focused on urbanization and its physical impact upon all of the Gaza Strips Governorates (i.e. North Gaza, Gaza, Deir al Balah, Khan Yunis and Rafah, see map 1-5). It was conducted at a time when Palestinian movement around the Occupied Territories was heavily restricted by the Israeli military, during the fifth year of the Second Intifada which erupted in September 2000.



Map (1-5): The Municipality borders of the Palestinian localities in the Gaza Strip

1.4. The Gaza Strip Demography

The estimated population of Palestinians all over the world reached 9.7 millions, by the mid of 2004. The total number of Palestinians in the Diaspora at the mid of year 2004 was 4.9 millions, distributed as explained in the table (1-2), and the total number of Palestinian beyond the Green Line (inside Israel) is about 1.1 millions (Palestinian Central Bureau of Statistics (PCBS), 2005). The total number of registered Palestinian refugees in Jordan, Syria, Lebanon, and PT by the end of March, 2005 were 4,255,120 with 961,645 registered refugees (471,555 registered refugees in camps) in the Gaza Strip alone (UNRWA, 2005).

Table 1-2: The estimated Palestinian Population in Diaspora, 2004

Region	Population
Jordan	2.84 millions
Syria	443 thousands
Lebanon	421 thousands
Egypt	63 thousands
United State	239 thousands
Foreign countries	303 thousands
Other remaining Arab countries	604 thousands
Total	**4.9 millions**

According to the Palestinian Central Bureau of Statistics (PCBS), the estimated Palestinian population of the West Bank and the Gaza Strip in 2005 was 3,762,005 with a growth rate of 3.3%. The estimated population of the West Bank was 2,372,216 with a growth rate of 3.0%, while the estimated population in the Gaza Strip was 1,389,789 with a growth rate of 3.8% (PCBS, 2005).

In 1997, PCBS conducted the first Census in the West Bank and the Gaza Strip. The results showed that the actual population living in the Gaza Strip was 1,022,207 (as opposed to the recorded figure of 1,001,569 persons); of which 518,813 were males and 503,394 were females a with sex ratio of 103.1 males per 100 females, (see table 1-3). The population has been projected to increase by 36%, reaching 1,389,789 in 2005. On the other hand, a team of Israeli and American researchers carried out a study of the Arab population in the West Bank and Gaza Strip; the results showed that the population in the Gaza Strip had reached 1.06 million in 2004[5]. The number of people under 15 years old was about 502,904 (50.21%) and 498,665 (49.79%) were 15 or more years old (PCBS, 1997).

Table 1-3: The population in the Gaza Strip according to the type of localities and sex in 1997

Type of Locality	Both Sexes	Male	Female
Urban	636,473	323,865	312,608
Rural	53,760	26,933	26,827
Camps	311,336	157,122	154,214
Total	**1,001,569**	**507,920**	**493,649**

According to the updated population projection prepared by the PCBS in 2005, the population of Palestinians in the Gaza Strip was about 1.39 millions. Gaza Governorate was shown to have the second highest population after Hebron Governorate in the West Bank, which amounts to 13% of the total population in all of the governorates in the West Bank and the Gaza Strip. Furthermore, the total estimated number of males is about 704 thousands and the total number of females was 686 thousands with a sex ratio of 105 males per 100 females. 49.1% of the total population in the Gaza Strip was under 15 years, while the percentage of Palestinians who are above 65 years is 2.6%. A median age of 15.65 years was recorded in the Strip in 2005 (PCBS, 2005).

In the Gaza Strip, the fertility rate is considered high when compared with other countries. This could be due to the prevailing traditions of the Palestinian society which encourage early marriages among females and a desire to have many children. However, the fertility rate started to decline towards the end of the 20th century - dropping to 5.8 in 2004 from 6.9 in 1997 - this means that the crude birth and death rates also decreased from 45.4 and 4.7 to 42.7 and 3.9 per 1,000 persons respectively in the period between 1997 and 2004. The

[5] The study" Arab Population In the West Bank & Gaza – *The Million and half Person Gap*" include projected population in the West Bank and Gaza Strip assuming three scenarios, and the 1.06 million Palestinian according to the third scenario which depend on the Israeli's Civil Administration data for Palestinian births

number of marriages increased in 2002 to reach 10,292, an increase of 1.4% when compared with 2001, and 35.3% when compared with 1997 when the crude marriage rate was equal to 8.1 per 1,000 of the population in the Gaza Strip. On the other hand, the number of registered divorces totaled approximately 1,270 which comprised 12.3% of the total registered marriages in 2002, while the registered divorces in 2001 totaled about 1,450 with 14.3% of the total registered marriages.

The main findings of the Educational Institutions Census 2004/2005 conducted by the Palestinian Ministry of Education and Higher Education (MoEHE) showed that there are 527 schools attended by 425 thousand students in the Gaza Strip. These schools are distributed as listed in table (1-4).

Table 1-4: Distribution of Schools, Students, Teachers and Classes in all Schools by Supervising Authority in 2004-2005

Type of School	Number of Schools	Number of Students	Number of Classes	Number of Teachers	Average number of Students/Class
Governmental	322	224,460	5,473	7,855	41
UNRWA	180	192,735	4,330	5,620	44.5
Private	25	8,230	332	514	24.8
Total	**527**	**425,425**	**10,135**	**13,989**	**42**

In 2005, the PCBS published a Labor Force Survey report based upon the updates of population projection in 2005; the results of this study are shown in table (1-5).

Table 1-5: Distribution of persons aged 15 years and above in the Gaza Strip by Labor Force components

Inside Labor Force		Outside Labor Force		Total	
No.	%	No.	%	No.	%
254,000	36.6%	441,000	63.4%	659,000	100%

According to the ILO[6] standards of Labor Force[7], the percentage of participation in the labor force fluctuated between 1997 and 2005 as shown in table (1-6). The rate for the percentage of participation in the labor force in 1997 equaled 35.7% of the total persons aged 15 and above in the Gaza Strip. This percentage decreased in 2001 to a low of 33.3% before increasing again in 2005 to 36.6%. A fluctuation was also noticed in the percentages of full employment participation rate, the underemployment rate and the unemployment rate in 2001 when compared with the year 1997. All rates then increased again by the year 2005, see table (1-6)

Table 1-6: Basic changes in Labor Force for the Gaza Strip during 1997-2005 according to the ILO standards

Labor Force Type	1997	1999	2001	2003	2005
Labor Force Participation Rate[8]	35.7%	38.0%	33.3%	37.5%	36.6%
Full Employment Rate	68.8%	81.2%	63.9%	67.2%	64.0%
Underemployment Rate[9]	4.4%	1.9%	1.9%	3.6%	2.0%
Unemployment Rate	26.8%	16.9%	34.2%	29.2%	34.0%

[6] International Labor Organization: is a specialized agency of the United Nations created in 1919 to promote social justice and internationally recognized human and labor rights.

[7] Unemployed (According to the ILO Standards): Unemployed persons are those individuals 15 years and over who did not work at all during the reference week, who were not absent from a job and were available for work and actively seeking a job during the reference week. Persons who work in Israel and were absent from work due to closure are considered unemployed, and also those persons who never work and are not looking for work but waiting to return back to their works in Israel and settlements.

[8] Labor force: the economically active population (Labor Force) consists of all persons 15 years and over who are either employed or unemployed.

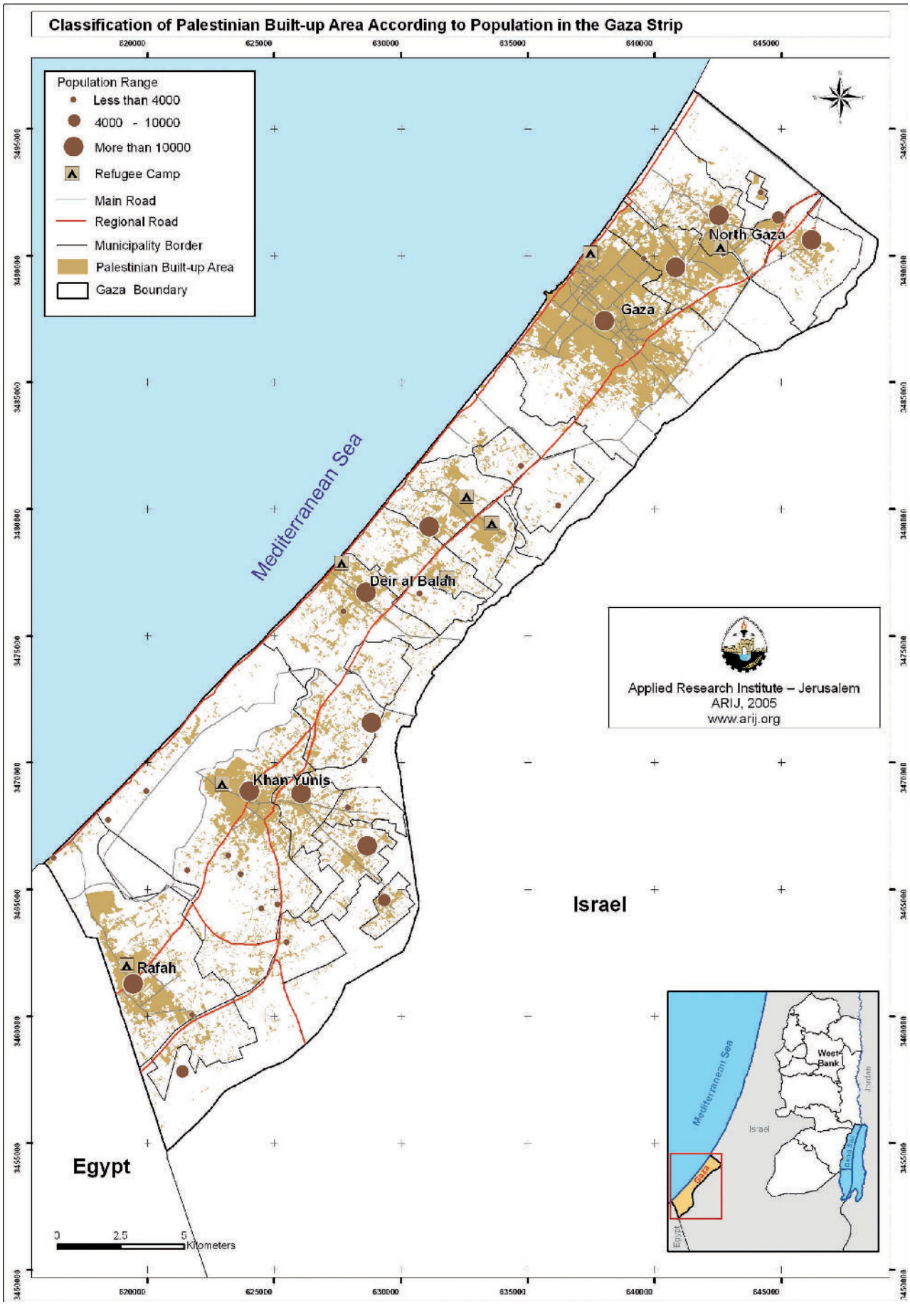
[9] Underemployment: underemployment exists when a person's employment is inadequate in relation to alternative employment, account being taken of his/her occupational skills.

1.5. Urbanization of the Gaza Strip

The Gaza Strip consists of five Governorates (i.e. North Gaza, Gaza, Deir al Balah, Khan Yunis and Rafah) according to the current administrative divisions. The localities in the Governorates are divided into three types: Urban, Rural and Refugee Camps. According to PCBS, the definitions for the three types are stated as follows:

- **Urban:** Any locality whose population amounts to 10,000 persons or more. This applies to all governorate/district centers regardless of their size. Beside, it refers to all localities whose populations vary from 4,000 to 9,999 persons provided they have, at least, four of the following elements: public electricity network, public water network, post office, health center with a full-time physician and a school offering a general secondary education certificate.
- **Rural:** Any locality whose population is less than 4,000 persons or whose population varies from 4,000 to 9,999 persons but lacking for the aforementioned elements.
- **Camps:** Any locality referred to as a refugee camp and administered by the United Nations Refugees and Work Agency in the Near East (UNRWA, 2004).

There are 25 localities in the Gaza Strip; and eight refugee camps with a combined population of 471,555 registered camp refugees which are distributed as follows: one camp in each North Gaza, Gaza and Khan Yunis and Rafah Governorates and four camps in Deir al Balah Governorate (UNRWA, 2005), (see map 1-6).



Map (1-6): Classification of Palestinian built-up area according to population in 2005 in the Gaza Strip

In 2005, the distribution of housing units[10] for urban, rural and camps were 63.7%, 5.1% and 31.2% respectively. The distribution percentage of housing units according to connections to water public network, electricity public network and sewage public system was 99.3%, 99.3% and 63.4% respectively in 2004. Moreover, 92.5% of the household resided in owned housing units, while 7.5% of them resided in rented housing units (PCBS, 2005).

According to the Ministry of Planning (MOP) both rural and urban areas are in need of development after 30 years of occupation:

> "The Israeli territorial strategies of unrealistically limiting border expansion of cities and villages has overloaded infrastructure and increased population density in the built-up areas. It has also translated to the random, unplanned, and unlicensed construction of houses and urban sprawl. Furthermore, it has contributed to rural-urban migration by people who are unable to find housing in the rural areas (MOP 1998:51)".

The urban structure in the Gaza Strip Governorates is concentrated in one large center which has the 1/3 of the Gaza Strip population, while the 2/3 of the population in the Strip clusters in the north and south of smaller towns and cities. Refugee camps and large villages dominate the urban development in the middle area. Gaza city is the regional centre or capital of the region (MOP, 1998). Refugee camps in the Gaza Strip are urban and rural refugee camps where urban camps might be characterized as "urban slum areas" because of the physical and socioeconomic similarity in those areas to the slum areas in other so-called developing countries. The urban refugee camps are located around the population centers, while rural refugee camps are located in rural areas where agricultural activity is offered to camps' inhabitants.

Photo (1-1): Different urban types and land use in Gaza Strip including the main cities, beach area, refugee camps and industrial and agricultural areas.

[10] According to PCBS, a housing unit is a building or part of a building constructed for one household only.

1.5.1. The Archaeological Sites in the Gaza Strip

There are about 74 important archaeological sites distributed along the Gaza Strip. Four of these sites refer to the Pharaonic period; three belong to Hellenistic period, while 13 belong back to Roman-Byzantine period and two are Historical buildings which belong the Mamluk and Ottoman periods. However, 52 sites that are considered to be from the Roman-Byzantine period are still not excavated (PEPA et. al., 1994).

According to the Ministry of Tourism and Antiquities (MTA) the most important archeological sites are located in the old city of Gaza; selected archeological sites are listed in table (1-7).

Table 1-7: Selected archeological sites in the Gaza Strip

Archeological Site	Location	Historic period
Al Omari Great Mosque	Downtown Gaza	Crusaders in the 12th century
Al Qissariya Market	Old city of Gaza	Mamluk period
Qassr Al Basha	Old city of Gaza	Mamluk period
Sultan Abdulhamid Public Fountain	Old city of Gaza	16th century (Ottoman period) established by Behram Bin Mustafa Basha
El Sayyed Hashem Mosque	Old city of Gaza	Ottoman period
Al Ahmediya Prayer Corner	Old city of Gaza	established by El Sayyed Ahmed El Badawi in the 14th century
Kateb al Wilayah Mosque	Old city of Gaza	the oldest part of the structure belongs to the Mamluk period, while the addition structure refers to the Ottoman period
The Greek Orthodox Church the Catholic Church and The Protestant Church	Old city of Gaza.	The existing buildings belong to the 12th century, while the original building were established in the beginning of the 5th century
Ali Bin Marwan Mosque	Outside the Eastern walls of Gaza	Mamluk period
Ibn Othman Mosque	East of Gaza	Mamluk period
Mosaic Floors	Near the Port of Gaza	beginning of the 6th century A.D.
Tell el Ejoul	South of Gaza	The castles belong to: 1) the Egyptian Family1580-1350 B.C. 2) families in the 16th,15th and 12th centuries
El Nassr Mosque	Beit Hanoun - North Gaza	Ayoobi period
The Omeri Mosque	North Gaza	Nothing is left from the ancient mosque apart from the portico and the minaret. A cemetery was excavated that refers to the Byzantine and the Roman periods and a mosaic floor of a church dating back to the Byzantine period
The Roman Byzantine Cemetery	North Gaza	The Byzantine and the Roman periods
Arts and Crafts Village	-	A beautifully designed gallery inspired by traditional Islamic architecture, the village offers for sale embroidery, copper, rugs and pottery. It also exhibits modern arts from renowned national and international artists.

Source: Ministry of Tourism and Antiquities, <http://www.visit-palestine.com/gaza/places/places.htm>

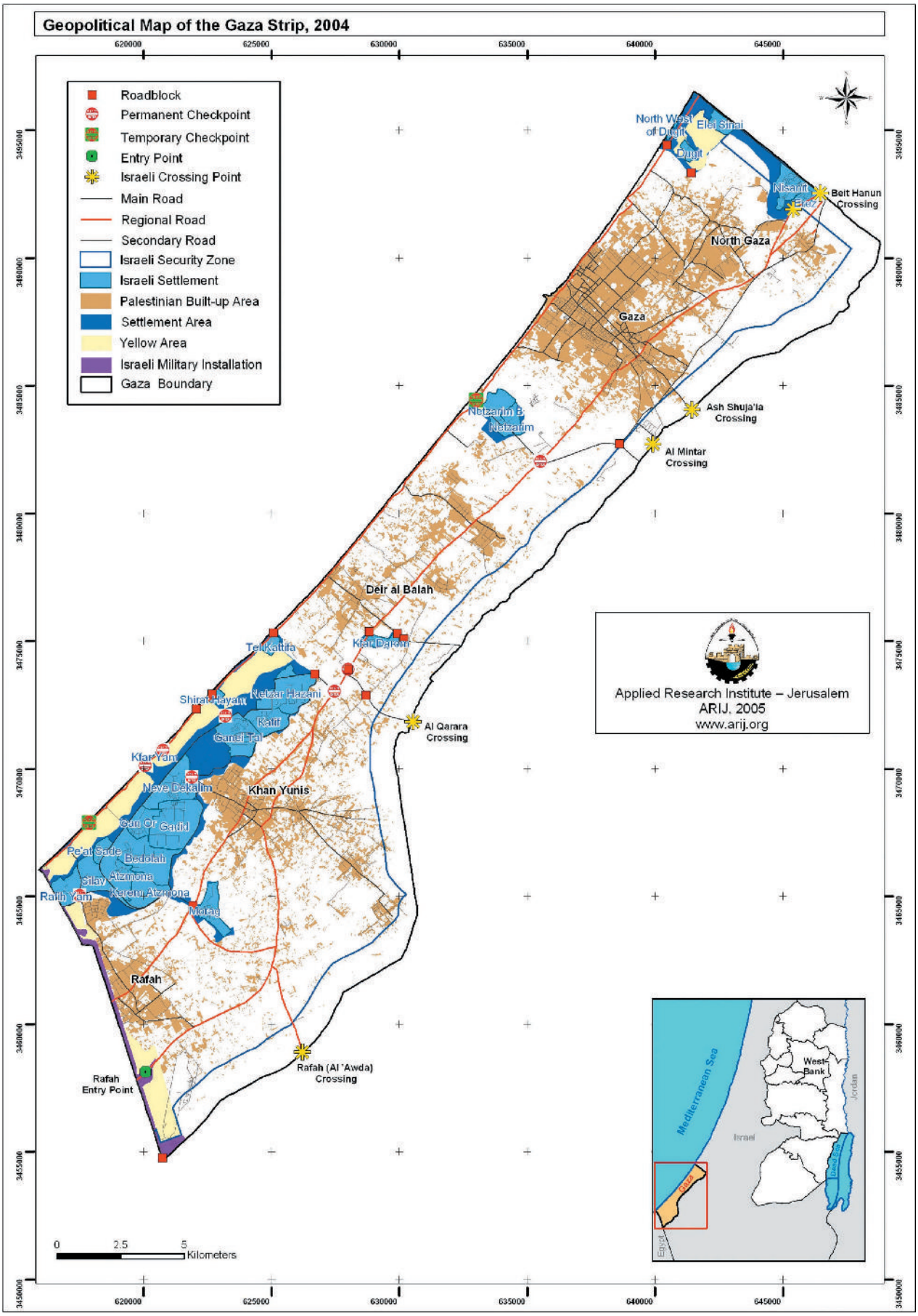
1.6. Israeli Colonization

After the Oslo agreement, the Gaza Strip was separated into two areas, area under the PA control and area under the Israeli control as mentioned in section 1.1. Israeli colonies and their expansions, Segregation Walls and fences, by pass roads, military bases, Observation towers and land leveling have been violating the Palestinian lands, separating the Palestinian communities from each other and from their lands. Confiscation of approximately 32% of the Gaza Strip land under various pretexts has imposed enormous limitations on Palestinian development. Significantly, the Israeli colonization has raised the population density in Palestinian built-up areas to reach 5,650 capita/km^2 of the area under Palestinian control when compared to the population density according to the total area of the Gaza Strip (i.e. 3,832 capita/km^2 of Gaza Strip total area) (ARIJ database, 2004 and PCBS, 2004).

1.6.1. Israeli Colonies

Since the Israeli occupation of the Gaza Strip in 1967, the Israeli land policy in the PT focused on land expropriation for the construction of Israeli colonies on Palestinian lands. According to the international law and United Nation's resolutions these colonies are illegal. The scope and type of land affected by Israeli colonization of the PT lands is determined by the unique geopolitical ambitions of Israel to the OPT. The Israeli colonization activities exceed colonies construction to include confiscation of lands for agriculture, industry, mineral extraction and initiating road networks connecting the Israeli sites. Two primary goals guided the expropriation of Palestinian land for the colonization of the OPT: expansion and separation from the Palestinian population. Land is therefore chosen for expropriation surrounding Palestinian built-up areas, areas that block the merging of Palestinian built-up areas while facilitating the merging of colonies, areas that may be easily annexed to Jews in the future, or that secure economic resources, militarily advantage or negotiating leverage.

According to the satellite images, there are 21 colonies distributed in 26 built-up areas in the Gaza Strip with an area of 28,400 dunums (ARIJ database, 2005). The Israeli colonies are scattered all over the Gaza Strip but are concentrated at the north and south of the Strip, the growth of colonies is mainly geared to the formation of blocs (i.e. they grow outwards and towards each other). The colonies are administered by Yesha Council through a completely different process and the colonists live under Israeli civil law. In 2004, it was estimated that the Israeli colonies population in the Gaza Strip was around 8,693 Israeli colonists. The year 2004 has experienced a remarkable increase in the colonists' population in the Gaza Strip where at least eight of Gaza's illegal colonies have undergone expansion. It is worth noting that there is a discrepancy between the average growth rate for Israelis in Israel and that in Israeli colonies in the PT. The average growth rate for Israelis in Israel is 2.0% per year (the rate including non-Jews is 2.5% per year). However, the population of the Israeli colonies yearly growth rate is around 8%, which amounts to over four times the Israeli growth rate. Map (1-7) illustrates the geopolitical situation of the Gaza Strip.



Map (1-7): Geopolitical Map of the Gaza Strip

1.6.2. The Segregation Wall in the Gaza Strip

There are three areas in the Gaza Strip that are completely controlled by IOF. These areas are: Al Sayafa in North Gaza Governorate and Al Mawasi in Rafah Governorate, which are completely surrounded by the Segregation Wall. The third area, Al Mani, is directly adjacent to Kfar Darom colony in the center of the Gaza Strip and is bordered by the Segregation Wall.

In February 2004, IOF began to build additional sections of the Segregation Wall around Kfar Darom and the colony of Netzarim – also centrally located south of Gaza city. The walls and fences around Netzarim and Kfar Darom colonies are the newest additions to Israel's Segregation Wall network in the Gaza Strip which equal to 39 km. An approximately 59 km long Wall surrounds Gaza on the northern and eastern borders (i.e. Israeli Security Zone). An additional 9 km of Wall is inside the Gaza Strip that surrounds Nisanit colony.

1.6.3. The Segregation Wall in Rafah

IOF control a "security corridor" along Gaza's southern border with Egypt and the illegal colony of Rafia Yam in the south of the Gush Katif bloc. The Wall was originally constructed on Palestinian land adjacent to the Rafah Refugee Camp and is composed of metal and cement, see map (1-8). In April 2005, Israel began constructing additional sections of the Wall to the west, from the Yebna area of the Refugee Camp towards the Tal Al Sultan area and the Rafia Yam colony. Averages of 231 dunums of land have been cleared along the Wall and Israel has continued its brutal campaign of home demolitions and land confiscation (ARIJ, 2004), see figure (1-2) and map (1-9).

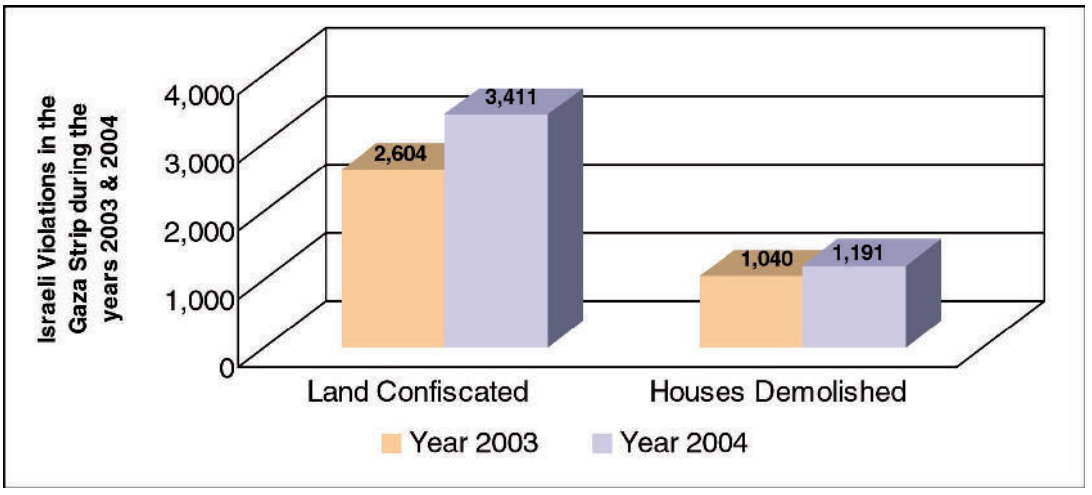
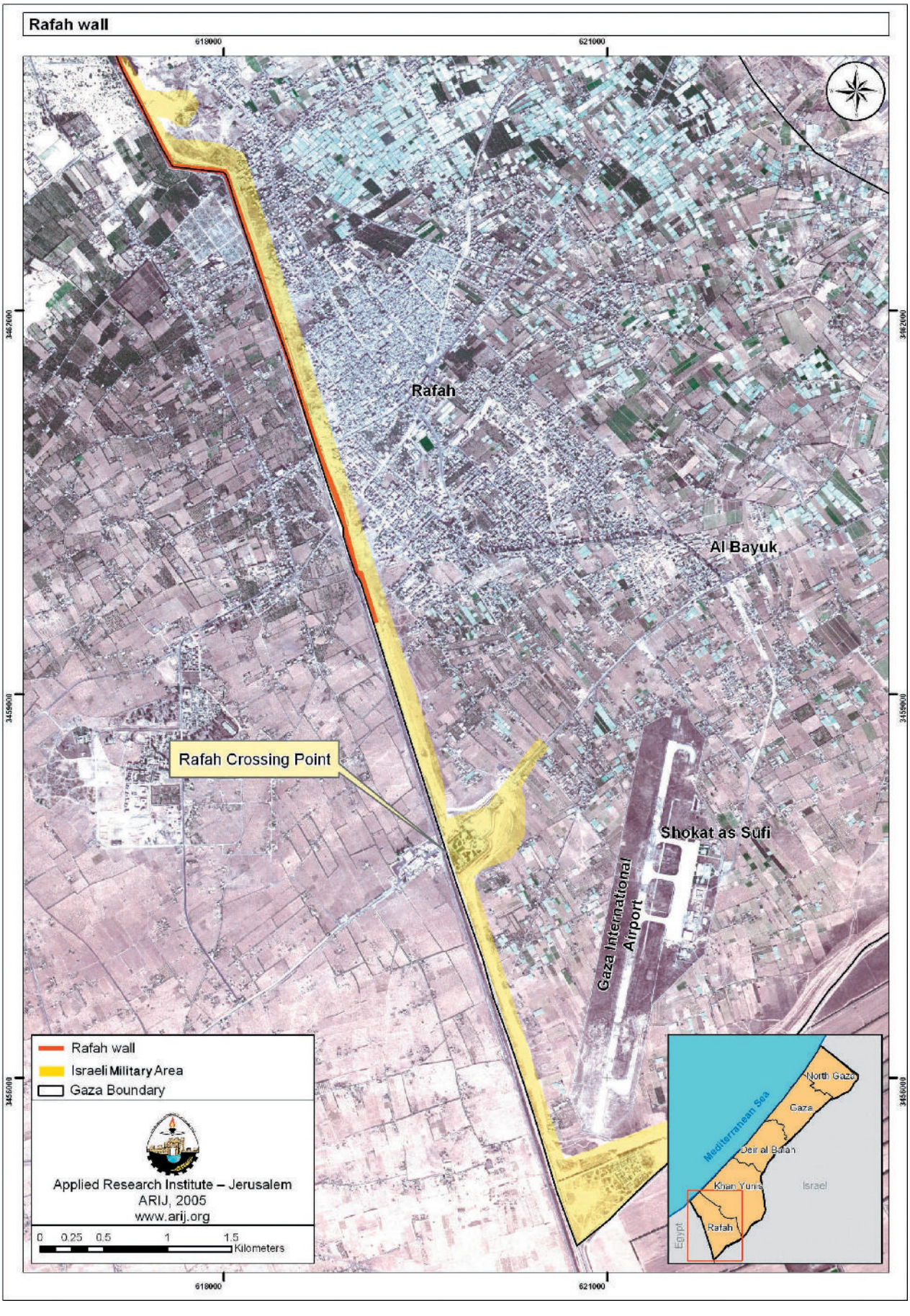
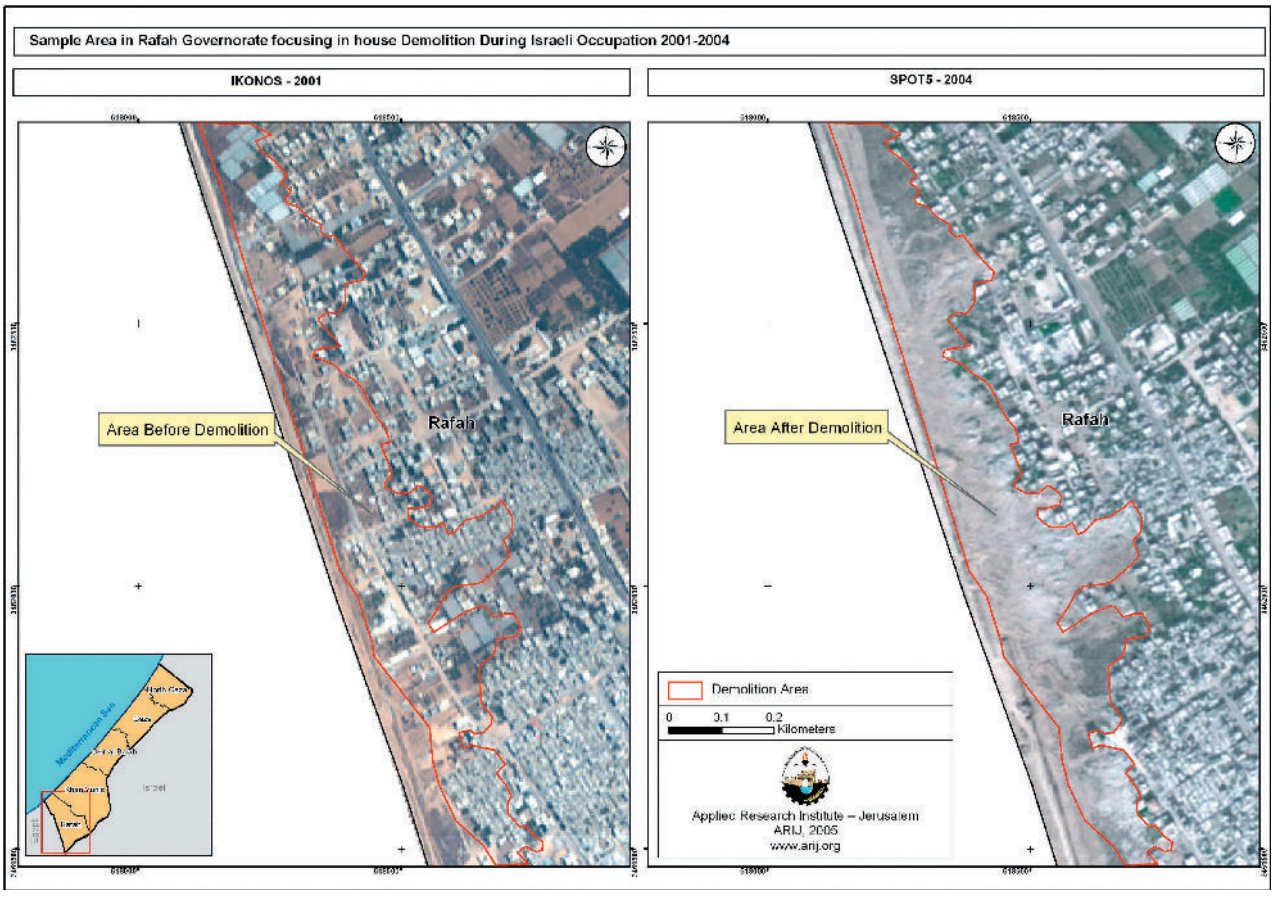


Figure 1-2: Land Confiscation and Home Demolitions in the Gaza Strip (2003 and 2004)



Map (1-8): Rafah Wall in the Gaza Strip



Map (1-9): Area of demolished houses in Rafah Governorate as shown in satellite images in 2001 and 2004

1.7. Contents of the Report

The remainder of this book is in four chapters. Chapter two provides a description of the methodology adopted for the physical analysis to accomplish the objective of the research and discusses the spatial analysis results of urban growth trends at the Gaza Strip and Governorate levels. Chapter three predicts possible future directions of Palestinian urban development and population scenarios that are shown in illustrative figures and provide analysis which determines the suitable areas for the urban development in the Gaza Strip by Governorate. Chapter four is designated to provide detailed information about the 'Unilateral Disengagement Plan' declared by the Israeli Government to withdraw from Israeli colonies and other Israeli controlled areas in the Gaza Strip allowing the PA to take over control over the Strip. Finally, the last chapter outlines the importance of the findings and provides a guideline for stressing future urban land use problems the Palestinians would confront in the near future through the set of conclusions and recommendations drawn out from the analysis.

CHAPTER TWO

SPATIAL ANALYSIS OF URBAN GROWTH TRENDS AT MACRO SCALE (GAZA STRIP AND GOVERNORATE LEVELS)

The structure of urban cities is a dynamic one as it is related to changes in the population and economy; which in turn are related to technological innovations within the urban area. In the Palestinian context, whilst these factors are important, the primary influence on urbanization is the political situation, which is a key factor in determining the degree of economic growth. During the 38 years of Israeli occupation, Palestinian urban growth was limited in its extent and rate. However, the onset of the peace process has allowed the Palestinians to govern *some* of their own land, giving them more freedom to carry out land development under their own administration. This has resulted in a wave of new Palestinian urban development.

In order to investigate the trends of urbanization in the Gaza Strip Governorates, time series GIS layers were extracted for each Governorate and analyzed. The time series data includes information on urban areas for the years 2001, 2003 and 2004. The aim of this chapter is to analyze the nature of urban trends and to model the overall urban forms and dynamics to identify the emergent trends in the Gaza Strip during the period from 2001 to 2004. This chapter also highlights the methodology used in classifying the land use / land cover of the Gaza Strip using SPOT 5 AND IKONOS images.

2.1. Methodology

The mixed nature of urban land use in Palestinian Territory - both from Palestinian urban land use as well as the land used by the Israeli colonies and military bases - requires studying and analyzing the current trend of urban development to assess its impact upon the agricultural land and natural resources of the study area. Using Geography Information System (GIS) and remote sensing, the area and direction of urbanization trends were investigated in the Gaza Strip Governorates. Time series satellite images for the years 2001, 2003 and 2004 were utilized in this analysis.

The direction of the urbanization trend is determined by observing the spatial formation of the urban area in order to identify locations that experienced development in land use. In this context, the distinction between Palestinian and Israeli land use developments has been emphasized to assess their separate impacts upon the amount of agricultural land lost in the Strip. However, the future urban trends for each Governorate are investigated in chapter three where projections of land needs and the availability of land for future urbanization are applied to different population scenarios.

2.1.1. Spatial Analysis

The change in the spatial structure of an urban area can be determined through the usage of time series aerial photos or satellite images. Using the current state of the art Geographic Information System (GIS) and remote sensing technologies, it is possible to extract and plot land use patterns from these two sources of imaging. In this study, the analysis involved classifying two types of dataset, comprising remotely sensed data acquired from IKONOS and SPOT 5 satellites (see annex (2-1)) in 2001, 2003 and 2004, that were utilized to extract the developed land in the region, see table (2-1).

Table (2-1): Satellite images used in the land use changes analysis

Image Type	Date of acquisition	Spatial resolution
IKONOS	July ,2001	4 meter
SPOT 5	May, 2003	2.5 meter
SPOT 5	November, 2004	2.5 meter

To achieve the goals set out for this research, several technical steps in the remote sensing and GIS framework were completed. These involved data organization, processing, interpretation and analysis. The resultant output was used to synthesize the observed trend of urbanization in the region. The technical steps include:

- **IMAGE PRE-PROCESSING**

Before the different land use types were classified it was necessary to preprocess the data, to fit it to the study area and to ensure that the data is compatible with all datasets involved in this research. The satellite images for the years 2001, 2003 and 2004 were radiometrically corrected, georeferenced, scene cropped and, processed in ERDAS Imagine 8.7 software. The satellite images were projected to the UTM WGS84 Zone 36 projection system. As a result, three images with a root mean-square error of about 10 meters - and with a compatible projecting system that can further be integrated in GIS - were produced.

- **IMAGE ANALYSIS**

An image classification procedure was carried out after the satellite images were georeferenced and projected onto a UTM grid. The analysis was based on visual interpretations and onscreen digitizing using the ArcGIS 9 software package. CORINE second level classification inventories were adopted to derive the whole set of satellite images for the Gaza Strip, see annex (2-2). This approach provided an accuracy rating of about 85% for up-to-date information on the latest urban developments in the region. This Chapter includes maps of the classified land use / land cover inventories and their areas for each Governorate for all the years of the study.

- **IMPLEMENTING THE GIS DATABASE**

The classified images presenting the urban development and land cover classes were imported into the GIS system as coverage's and shapefiles. These types of data are compatible with other GIS data and can be presented in GIS as layers for further analysis. It is worth mentioning that the obtained layers of land use / land cover were cropped by using the Governorates' borders in order to calculate the areas of each land cover type in each Governorate in the analysis' time period.

- **DATA CALCULATION AND EXTRACTION**

Different figures were extracted from the GIS database using the computational functionalities available in GIS. These included; the total amount of Palestinian built-up area in dunums on the Gaza Strip and Governorate levels in the three time periods, total area of land occupied by Israeli colonies in dunums in the Gaza Strip and by Governorate in years 2001, 2003 and 2004, and total areas in km^2 of the land use / land cover classes derived from classifying the satellite images by Governorate in the same period.

- **DATA VALIDATION**

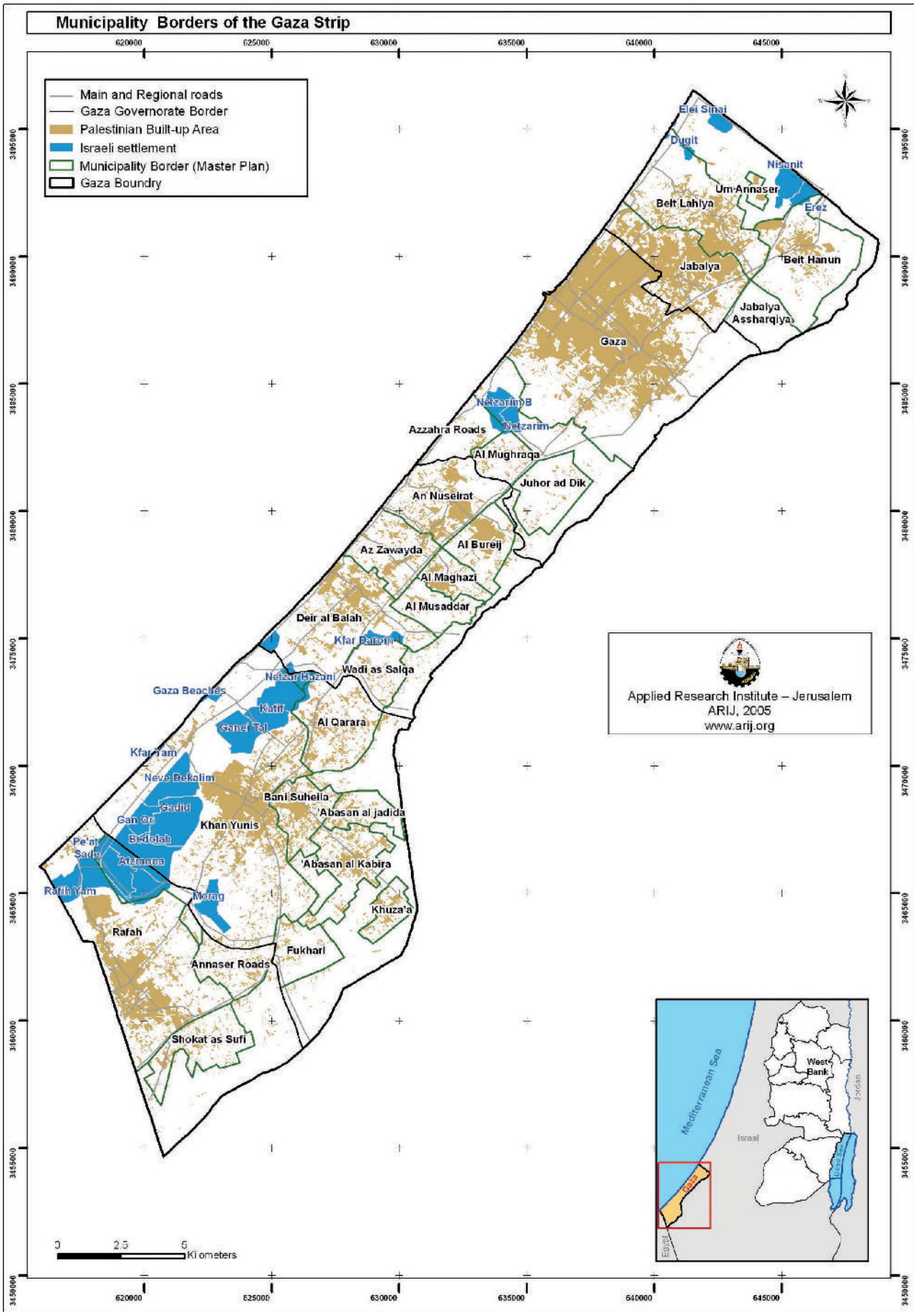
The validation of the digital data which was a result of the onscreen digitizing in the GIS platform was carried out as an auxiliary step to check the reliability of the extracted figures. However, field trips of data validation

were not conducted to verify the classified land use / land cover types due to difficulties in reaching the Gaza Strip under the imposed restraints of the Israeli authorities over obtaining permits to enter the Strip. Therefore, the validation of the classified land use / land cover layers was based on our personal expertise with interpreting the satellite images.

2.1.2. Collection of Available Master Plans

In order to gain an insight into the influence which Palestinian municipalities and village councils have had on urbanization, master plan boundaries for the different Palestinian localities were collected and studied. Master plans represent the area designated for development by local authorities, and hence the area in which building permits are issued. The research is intended to study the extent to which urban development is limited to the master plan areas.

It was no simple task to collect the available master plans of the Palestinian localities in the Gaza Strip due to restrictions imposed by Israeli Authorities on issuing permits for Palestinians to enter the Strip. However, ARIJ was able to reach the Gaza Strip through a field visit which was conducted by one of its volunteer staff who managed to acquire an entry permit, and successfully obtained the localities' master plans. It is worth mentioning that the Ministry of Local Government (MLG) in the Gaza Strip has provided our field surveyor with the archived master plans prepared for 25 municipalities in the five Governorates of the Gaza Strip which were developed by the Palestinian National Authority (PNA). The obtained master plans were provided as AUTOCAD files, which were processed, transformed to UTM projection, converted into GIS shapefiles and used in the maps produced to show the historical urban development for each Governorate in this chapter. Map (2-1) shows the master plans that were collected and processed for the Gaza Strip localities.



Map (2-1): Master plans collected and processed for the Gaza Strip localities

2.2. Spatial Analysis at the Gaza Strip Level

This section demonstrates the urban trends and changes in the agricultural areas of the Gaza Strip from 2001 to 2004 in relation to the political situation which prevailed in that period.

2.2.1. Palestinian Urbanization

Urban information was analyzed for the years 2001, 2003 and 2004, but data was projected for 2000, 2002 and 2005 to provide a regular distribution for Palestinian built-up area in the studied period. The urban values in the missing years were projected using "linear trend at point" method. This is a numerical technique in which the observed values from the GIS for the three time periods were assigned to trend formulas. The trend formulas were then used to estimate the yearly value in 2000, 2002 and 2005. The accuracy of the fit for the trend formulas (R^2)[11] was found to exceed 0.90[12]. Figure (2-1) illustrates the actual and estimated total Palestinian built-up area in dunums[13] in the Gaza Strip. Map (2-2) presents the historical changes in urban fabric between the years 2001 and 2004. Maps at the Governorate level were produced to illustrate historical urban growth from 2001 to 2004 and will be presented in section 2.3.

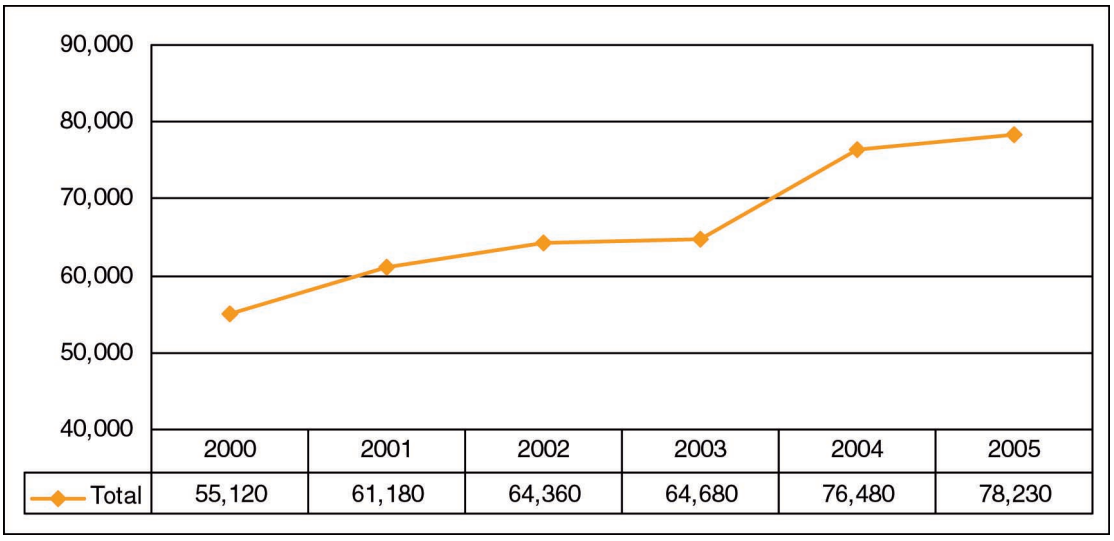
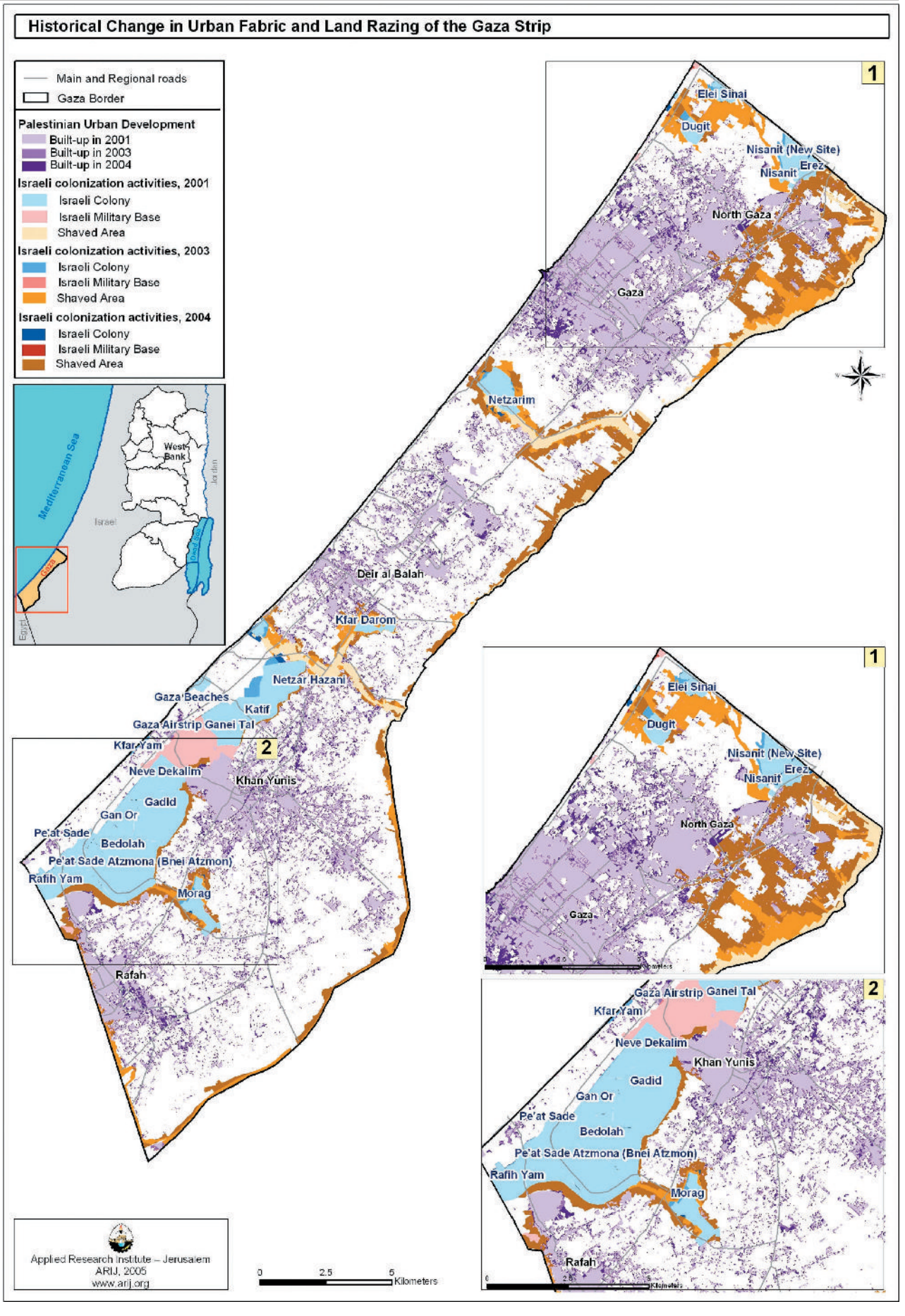


Figure (2-1): Urban trend of actual and estimated Palestinian built-up area in the Gaza Strip

The analysis showed that the Palestinian built-up area continued to increase during 2000-2005. The trend chart indicates that urban development in this period went through two main phases of change. These two phases comprise of the two time periods 2000-2003 and 2003-2005. It should be noted that the eruption of the Second Intifada in September 2000 was followed by continuous Israeli violations and incursions, however, the built-up area continued to increase till 2005.

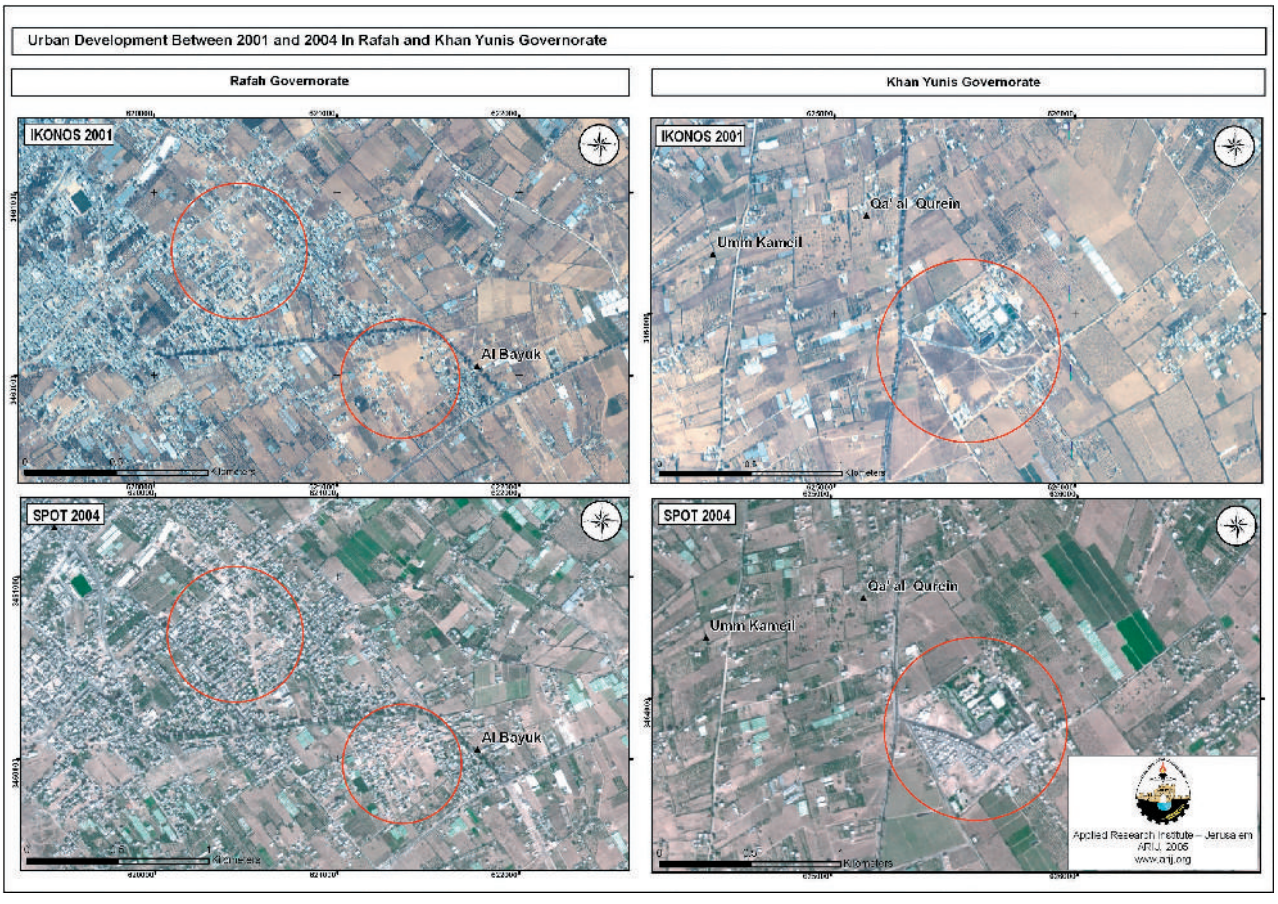
[11] R-squared value: is a statistical indicator that shows how well the model fits the data.
[12] If R-squared close to 1, then this indicates that the model accounted for almost all of the variability with the variable specified in the model.
[13] 1000 dunums = 1km^2



Map (2-2): Historical changes in urban fabric and land razing of Gaza Strip

The linear trend line indicates that total urban development grew at a slow rate between the years 2000 and 2003 - with approximately 3,187 dunums/year - and then accelerated after 2003 with 6,775 dunums/year until 2005, as illustrated in figure (2-1). The dramatic increase observed between the years 2003 and 2005 in the built-up area could be attributed to several reasons. One of the reasons which causes this continuous growth is the population growth which drives up the number of households - 207,346 households in 2004 - this requires more areas to be utilized for the building of new housing units which increased by 6% from 2003 to reach 13,051 units in 2004. Another reason worth mentioning is that financing institutions in the Gaza Strip have had an affect upon the economic situation of the Palestinian people by providing loans for new investments and building housing units for newly formed families. Such financing institutions include the United Nations Relief and Works Agency for the Palestine Refugees in the Near East (UNRWA) and Community Habitat Finance International (CHF).

Map (2-3) shows the urban development in Rafah and Khan Yunis Governorates - in the form of single houses and/or group of buildings - which is clearly illustrated by comparing the satellite images for 2001 and 2004. Nevertheless, this continuous growth in the built-up areas will result in the consumption of most of the available land and open spaces.



Map (2-3): Palestinian built-up area expansion in selected areas of Rafah and Khan Yunis Governorates in years 2001 and 2004

Photo (2-1): Palestinian built-up area expansion on the agricultural areas And beach lands in Gaza Governorate

2.2.2. Israeli Colonization Activities:

The Israeli colonies established on the Gaza Strips lands have continued to expand at a significantly increased rate as analyzed up until year 2004, see table (2-2). This expansion has occurred on account of the quantity of fertile and valuable agricultural areas of the Gaza Strip which are isolated by the colonies. This reflects the Israeli Government's long established policies of building new colonies in the form of clusters, therefore leading to the confiscation of even more Palestinian lands, even during the peace process as in the case with the Gush Katif colonies block southwest of the Strip.

Table (2-2): Estimated total area of Israeli colonies in dunums between the period 2001-2004 by Governorate

Governorate	2001	2003	2004
Deir al Balah	693	773	1,160
Gaza	1,546	1,605	1,929
North Gaza	2,298	2,513	2,715
Khan Yunis	14,822	15,555	15,842
Rafah	6,749	6,764	6,772
Total	**26,108**	**27,210**	**28,418**

Figure (2-2) illustrates the estimated annual increase in the Israeli colonies' area from 2000 to 2005 in the Gaza Strip Governorates. The figures clearly reflect the non-stop rate of expansion. For example, an annual expansion of 214, 177, 155, 327 and 8 dunums/year occurred in Deir al Balah, Gaza, North Gaza, Khan Yunis and Rafah Governorates respectively in the period 2003-2005. Furthermore, the annual increase in the total area of Israeli colonies was about 660 dunums/year between the years 2000 and 2003, while it increased to approximately 880 dunums/year in the period 2003-2005.

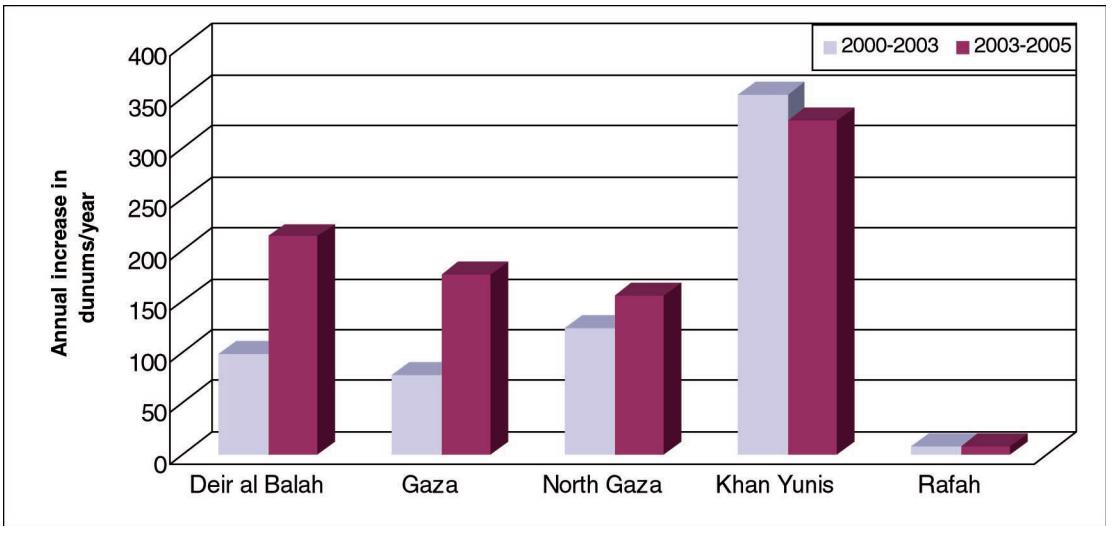


Figure (2-2): Annual increase of the Israeli colonies in the Gaza Strip Governorates

The percentages of change (increase rate) for the Palestinian urban growth trend and for the Israeli colonies total area expansion trend in the Gaza Strip Governorates between 2001 and 2004 are shown in figure (2-3). The data showed that the change in the Palestinian built-up area is higher in Khan Yunis and Rafah Governorates (about 29% and 24% respectively) when compared with the expansion of Israeli colonies (about 7% and 0.3% respectively) from 2001 to 2004. However, Deir al Balah Governorate has experienced a noticeably high percentage of change through the expansion of the Israeli colonies between the years 2001and 2004 with a 67% increase. On the other hand, the data revealed that the increase in the Palestinian built-up area was ranged between 22% and 29%.

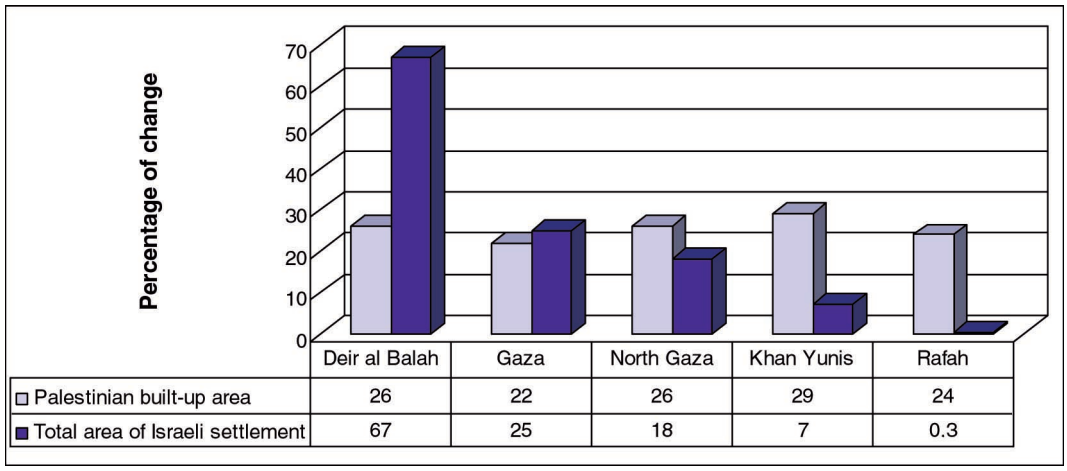


Figure (2-3): Percentage of change of Palestinian urban development vs. Israeli colonies' urban expansion between years 2001-2004 by Governorate

It is worth mentioning that according to the analysis of the IKONOS and SPOT 5 images, the Gaza Strip has lost 18% of its agricultural area (40,157 dunums) and 43% of its open spaces (15,004 dunums) between years 2001 and 2004. For example, Rafah and North Gaza Governorates were particularly affected. Approximately 71% and 55% of the land was lost between the period 2001-2004 respectively, see figure (2-4). Within the study area, the case of agricultural land shavings in the north of North Gaza Governorate is of particular significance where the total agricultural area shaved is about 10,000 dunums. Most of the area used to be owned by Palestinians and also used to be planted with permanent crops, citrus trees in particular (approximately 7,000 dunums). Map (2-4) shows the area in 1999[14] before it was shaved and compares the area of shaved lands in 2001, 2003 and 2004.

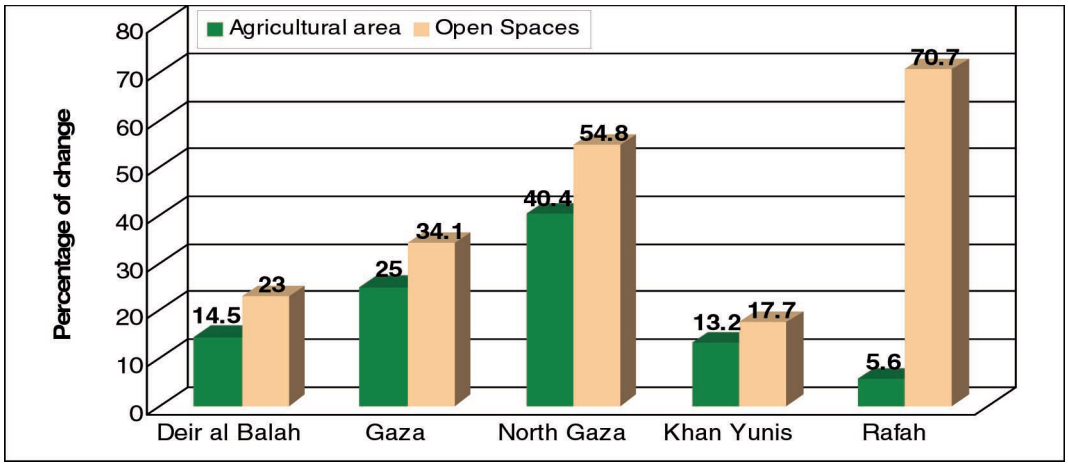
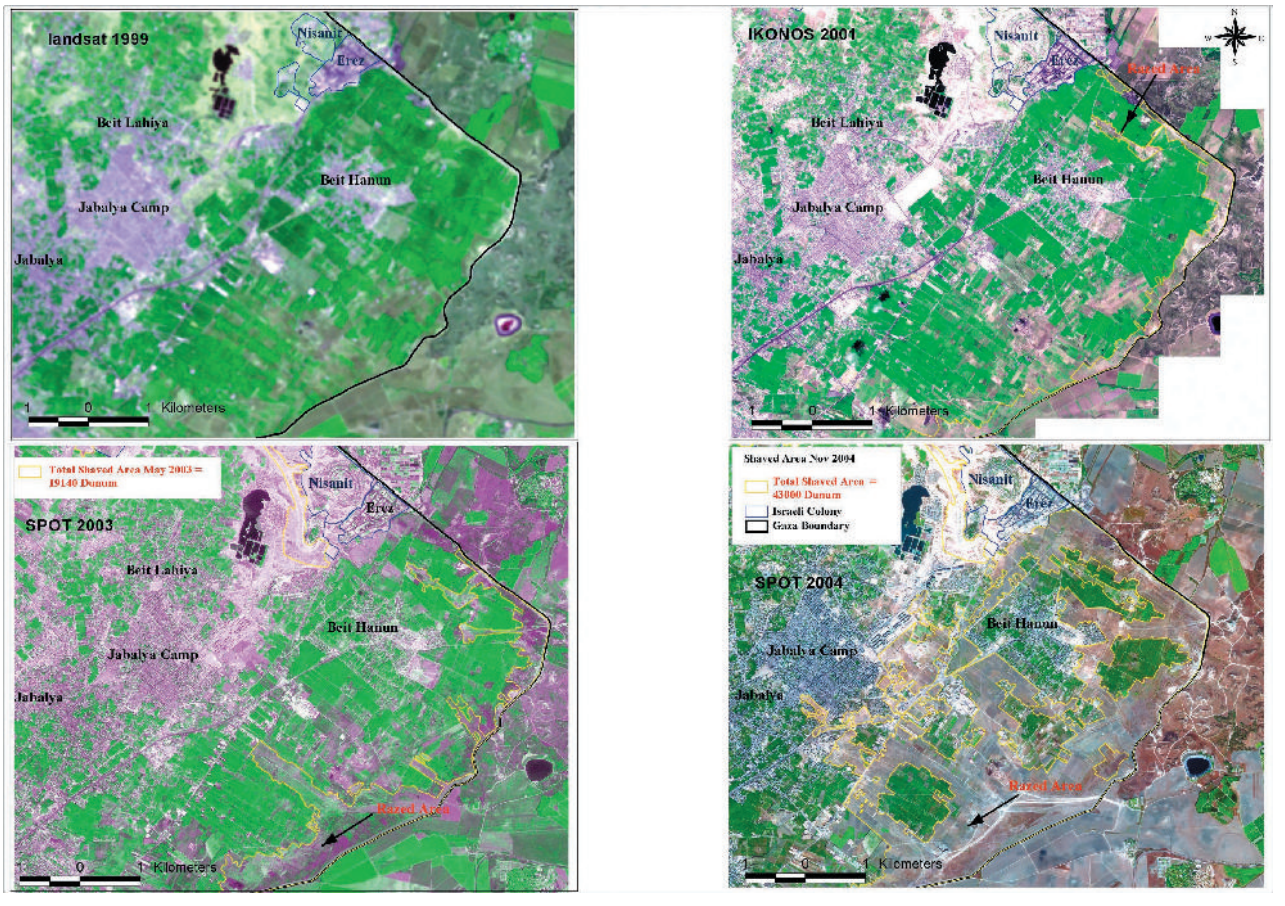


Figure (2-4): Percentage of lost agricultural area and open spaces as derived from the land cover analysis in the period between 2001 and 2004

[14] A LANDSAT that acquired in 1999 was used to analyze the case of north Jabalya because of its significance.



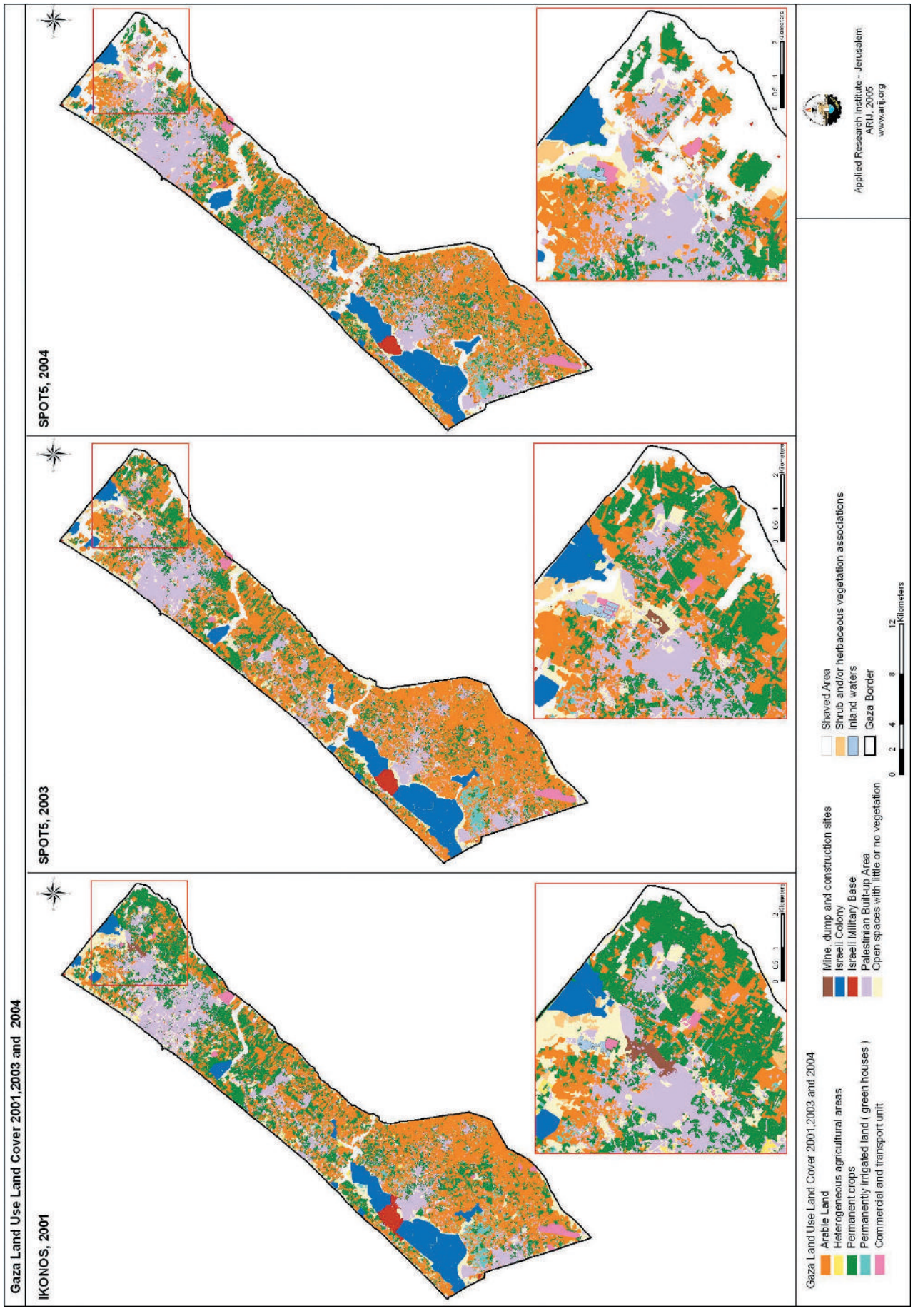
Map (2-4): Time series satellite images for years 1999, 2001, 2003 and 2004 showing the shaving of land in the northern part of the Gaza Strip

2.2.3. Land Use / Land Cover Analysis

As aforementioned, the analysis of the satellite images for the years 2001, 2003 and 2004 was based upon the classification system of CORINE level 2 in order to classify the agricultural land cover in the Gaza Strip, see map (2-5). Table (2-3) lists the total areas of the classified land use / land cover types in the period 2001-2004 by type.

Table-(2-3): Land use / land cover changes in the Gaza Strip and percentages of land cover types of the Strip total area in 2001, 2003 and 2004

Type of land use / land cover	Year 2001		Year 2003		Year 2004	
	Area (km^2)	Area (%)	Area (km^2)	Area (%)	Area (km^2)	Area (%)
Arable Land	123.9	34.2	151.2	41.7	112.1	30.9
Heterogeneous Agricultural Areas	1.3	0.36	0.39	0.11	0.47	0.13
Permanent Crops	82.6	22.8	54.1	14.9	55.9	15.4
Greenhouses	12.6	3.5	10.20	2.8	11.7	3.2
Industrial, Commercial and Transport Unit	4.4	1.2	3.9	1.1	4.3	1.2
Mine, Dump and Construction Sites	0.89	0.25	0.69	0.19	1.6	0.44
Israeli colonies	26.1	7.2	27.2	7.5	28.4	7.8
Israeli Military Base	3.4	0.92	2.57	0.71	2.1	0.59
Palestinian Built-up Area	61.2	16.9	64.7	17.8	76.5	21.1
Open Spaces with little or no Vegetation	34.9	9.6	25.7	7.1	19.9	5.5
Inland Waters	0.58	0.16	0.90	0.25	0.79	0.22
Shrub and/or Herbaceous Vegetation Associations	2.6	0.7	1.6	0.45	4.6	1.3
Shaved Area	8.4	2.3	19.5	5.4	44.3	12.2



Map (2-5): Land use / land cover changes in the Gaza Strip in 2001, 2003 and 2004 as classified from the satellite images

2.3. Spatial Analysis at Governorate Level

The area, in dunums, of developed land in the Gaza Strip was calculated in GIS from the different time series layers. The areas were calculated at Governorate level in the period between 2000 and 2005. The analysis showed that all Governorates have experienced a significant increase in their built-up area especially after 2003. This noticeable urban trend could be due to the following reasons:

- The prevailing social conditions have led to a horizontal urban expansion to take place instead of a vertical one to accommodate newly married families who prefer to split from their core families and live in separate houses.
- Palestinians, whose houses were demolished, were compensated though grants and funds provided by the Governments of Saudi Arabia and United Arab Emirates. A great number of housing units were supplied to those Palestinians especially in 'Ash Sheikh Zaied City' in North Gaza Governorate.
- New investments were implemented in the Gaza Strip by international institutions and Palestinians residing outside of the Palestinian Territories (PT),
- International organizations and Governmental institutions invested more in the PT by providing funds and grants for building the institutional and physical infrastructure of the Palestinian State. Such national projects included constructing road networks, installing water and sewer networks, in addition to rehabilitating electricity and communication networks.
- Moreover, some projects focused on supporting the agricultural, industrial and service sectors which improved the economic situation of Palestinians who consequently, invested in private and public constructions.

The urban trends obtained from the analysis in the period between 2000 and 2005 are discussed in the following sections for each Governorate separately.

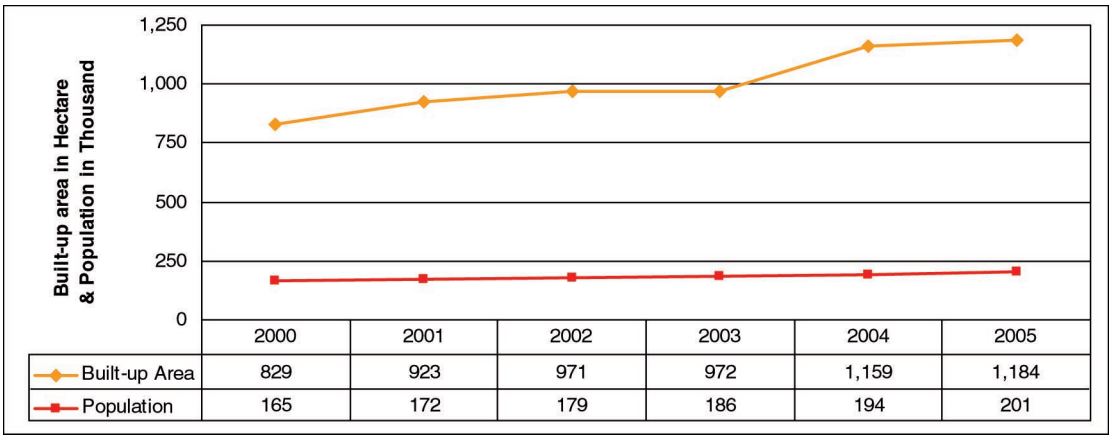
2.3.1. Deir Al Balah Governorate

Deir al Balah Governorate is located in the middle of the Gaza Strip, bound by Gaza Governorate to the north (14.5 km distance between Deir al Balah and Gaza cities) and Khan Yunis Governorate in the south (9 km distance between Deir al Balah and Khan Yunis cities). It covers an area about 57,120 dunums (about 16% of the Gaza Strip total area).

PALESTINIAN URBANIZATION

Analysis of the satellite images showed that the Palestinian built-up area increased from 9,230 dunums in 2001 to 11,590 dunums in 2004 with a total increase of 26%. At the same time, the population projection, according to Palestinian Central Bureau of Statistics (PCBS), indicated an increase in the total population of Deir al Balah Governorate from 172,190 in 2001 to 193,648 in 2004. Consequently, the built-up area in relation to population had increased from 54 m^2/capita in 2001 to reach 60 m^2/capita in 2004.

Figure (2-5) shows the relation between the built-up area and the population in the period 2000-2005, where the R^2 of the built-up area line is 0.92. The trend line shows that the annual increase in the built-up area in the period 2000-2003 was 477 dunums/year, while it was 1,060 dunums/year in the period 2003-2005. Thus, the percentages of increase in the built-up area during the same periods are 17.3% and 21.8% respectively.



	2000	2001	2002	2003	2004	2005
Built-up Area	829	923	971	972	1,159	1,184
Population	165	172	179	186	194	201

Figure (2-5): Actual and projected Palestinian built-up area vs. projected population between years 2000-2005 in Deir al Balah Governorate

The analysis showed that the annual increase in the built-up area in Deir al Balah Governorate was 245 dunums/year in the period between 2001-2003 (an increase of 5.3%), while it was 787 dunums/year during 2001-2004 (an increase of 25.6%). This increase in the built-up area was at the expense of open spaces which decreased from 4,340 and 4,280 to 3,340 dunums in years 2001, 2003 and 2004 respectively as illustrated in figure (2-6).

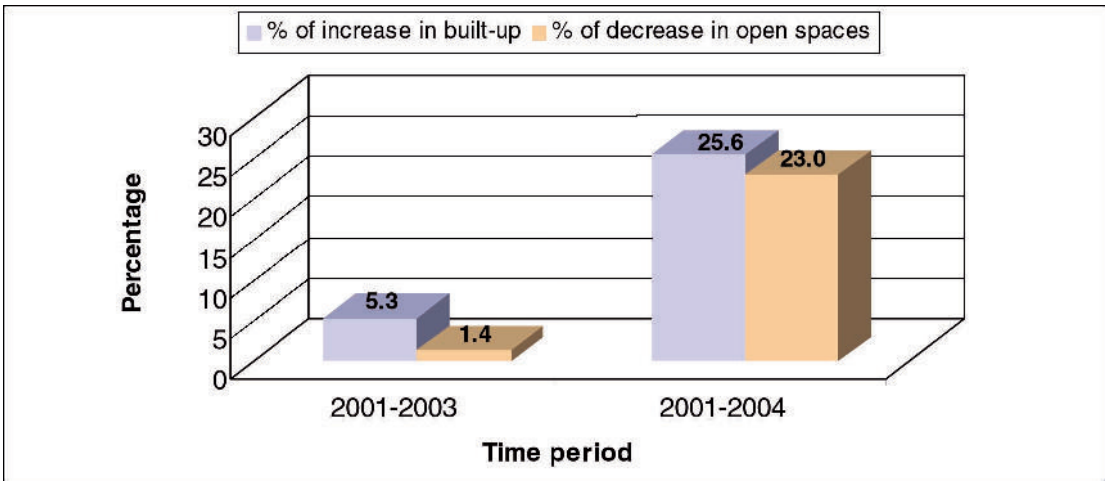


Figure (2-6): Percentage of change in built-up area and open spaces in Deir al Balah Governorate

Furthermore, map (2-6) shows that this urban development occurred mostly within the area designated by the master plans for residential areas in the Governorate localities, but started to expand beyond their borders such as in the cases of Az Zawayda and Al Bureij. However, the spatial distribution and areas of land use / land cover classes of Deir al Balah Governorate - as derived from the SPOT 5 image - for 2004 are shown in table (2-4), while the land use / land cover changes in the period 2001-2004 are illustrated in map (2-7). Nevertheless, the projections of future urban development would rely on future population scenarios and land suitability assumption which will be presented and discussed in chapter three.

Table (2-4): Area of land use / land cover types in Deir al Balah Governorate in 2004

Land Cover Type	Area (dunums)
Arable Land	20,097
Heterogeneous Agricultural Area	157
Permanent Crops	12,372
Greenhouses	1,792
Industrial, Commercial and Transport Unit	111
Mine, Dump and Construction Sites	260
Israeli colonies	1,165
Israeli Military Base	25
Palestinian Built-up Area	11,594
Open Spaces with little or no Vegetation	3,343
Inland Waters	224
Shrub and/or Herbaceous Vegetation Associations	838
Shaved Area	5,143
Total	**57,121**

ISRAELI COLONIZATION ACTIVITIES

There are two Israeli colonies in Deir al Balah Governorate. The first one is Kfar Darom, which was established in 1970 and is located to the south of Deir al Balah city. The total colony area in 2004 was equal to 632 dunums while the total colony population according to the Israeli Central Bureau of Statistics (ICBS, 2004) is approximately 491 colonists. The second colony is Tel Katifa which is located in the southwest of the Governorate and was established in 1992. The total area of the colony is about 401 dunums with a population of 60 colonists in 2004. In addition, the northern part of Netzar Hazani colony (127 dunums) is within the borders of Deir al Balah Governorate.

The Israeli colonies in Deir al Balah Governorate occupied an area equal to 693 dunums in 2001 and increased to reach 1,160 dunums in 2004, whereas, the population in the colonies increased from 323 to 551 colonists (ICBS, 2004) during the same period (2001-2004). Thus, the population density in the Israeli colonies reached 466 and 475 capita/km^2 in 2001 and 2004 respectively. Figure (2-7) shows the dramatic expansion of the Israeli colonies in the Governorate in the short period (2001-2004). The annual increase in the colonies areas calculated in 2003 and 2004 was about 40 and 157 dunums/year with an increase rate of 11.5% and 68.1% respectively, from 2001. This implies that the total percentage of Governorate land occupied by the colonies increased from 1.2% in 2001 to 2.03% in 2004. In 2004, the Israeli military base occupied about 25 dunums of the Governorate area. Map (2-6) shows the distribution and expansion of the two Israeli colonies in Deir al Balah Governorate between 2001and 2004.

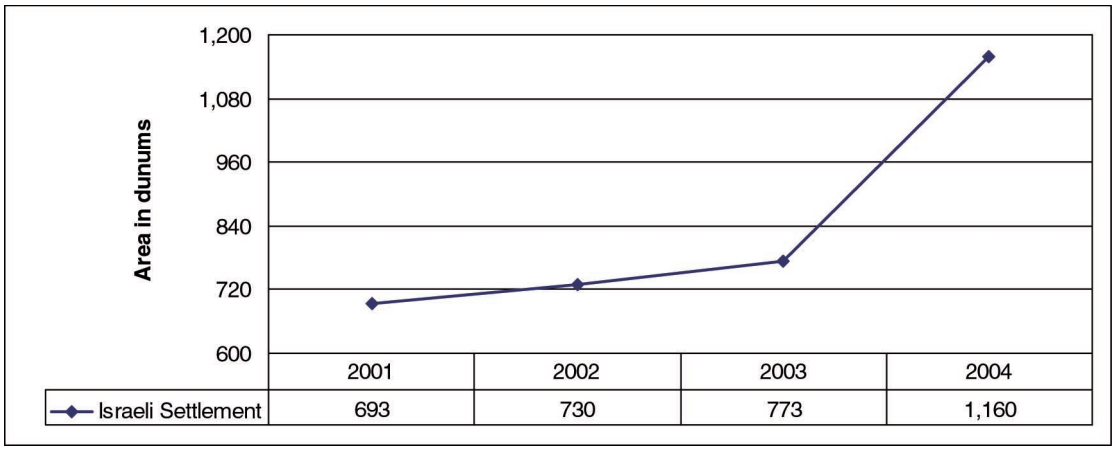


Figure (2-7): Expansion of Israeli colonies in Deir al Balah Governorate during 2001-2004

In 2004, Israel intensified its activities in the Gaza Strip Governorates since more lands in the Palestinian agricultural areas and open spaces were bulldozed and confiscated. The shaved area in Deir al Balah Governorate reached 3,167 dunums in 2004 which was an increase of 160% from 2001. The shaved areas were mainly agricultural fields which belonged to Palestinian residents who were no longer allowed to cultivate it under Israeli security pretexts.

In 2004, the agricultural area shaved by the Israeli Occupation Forces (IOF) was about 2,735 dunums and the area shaved from the open spaces was equal to 517 dunums, while the built-up area shaved (demolished houses) was 85 dunums in addition to 1,806 dunums of different land uses that were shaved in 2001, see figure (2-8). The majority of the land leveling occurred around the Israeli colony of Kfar Darom to construct a "Security Wall" around it, which resulted in the confiscation of about 1,140 dunums of Palestinian land in 2004. This also includes leveling along Israeli colony by-pass roads in the area. Additional areas were also cleared along the eastern border as part of the Israeli controlled "buffer zone" and along the southern border of the Governorate.

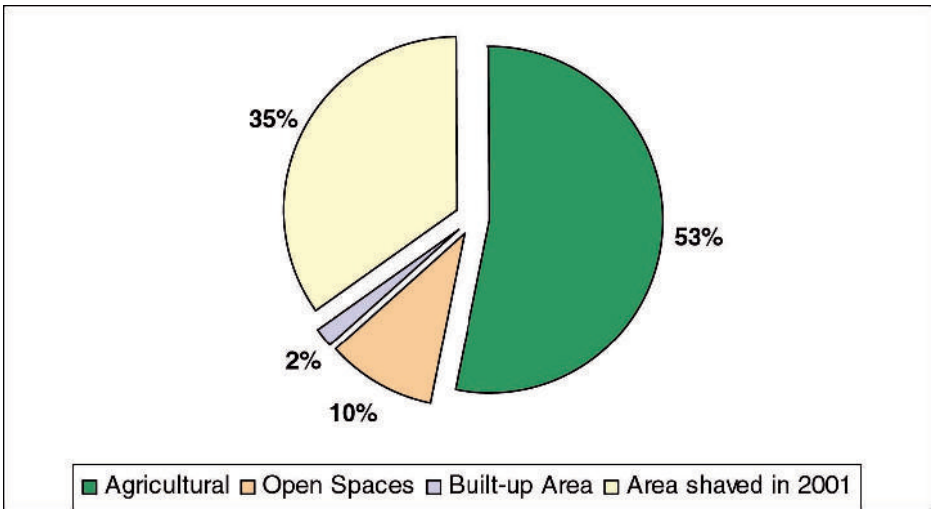
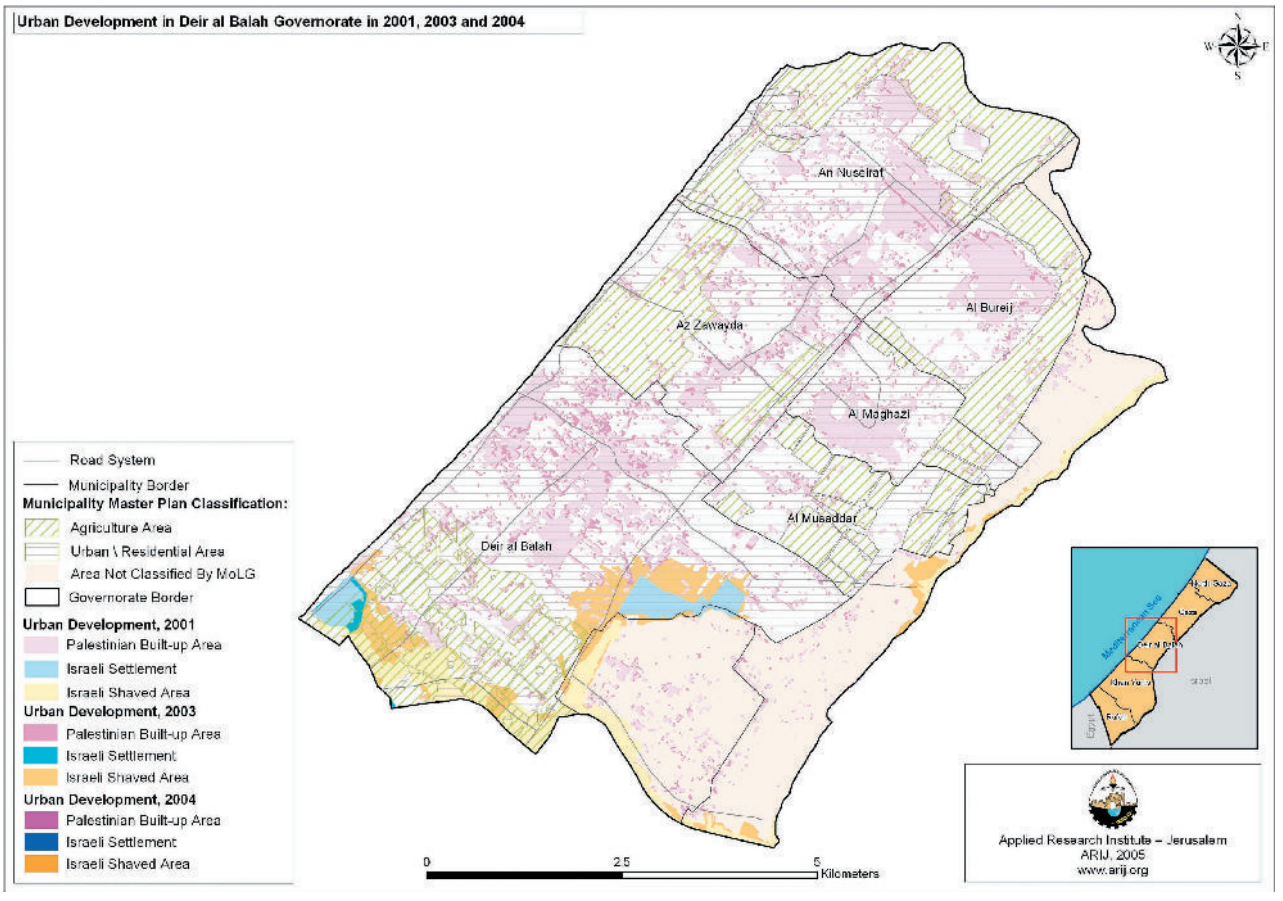
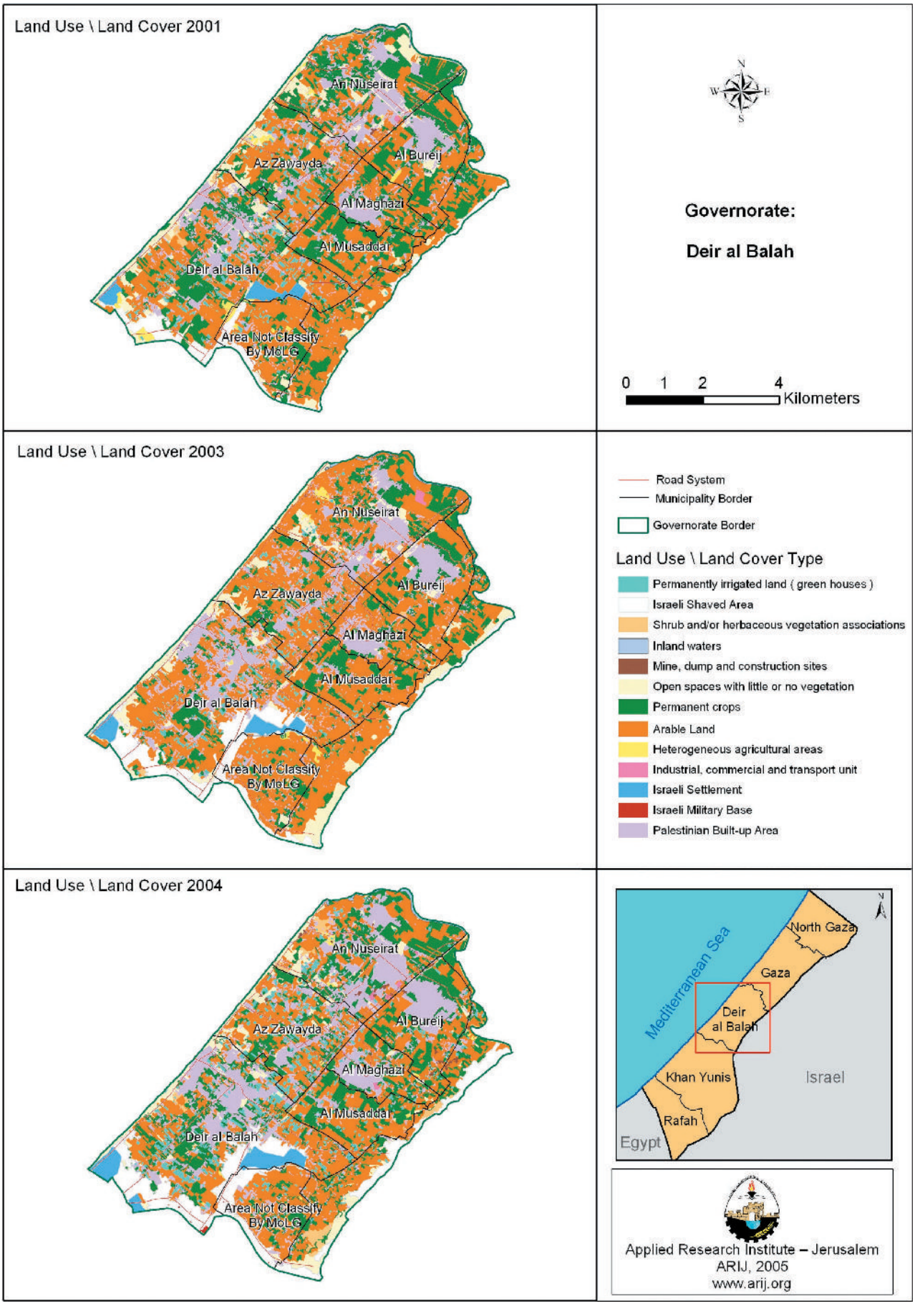


Figure (2-8): Distribution of different land uses within the shaved area in Deir al Balah Governorate in 2004



Map (2-6): Urban development during 2001-2004 in Deir al Balah Governorate



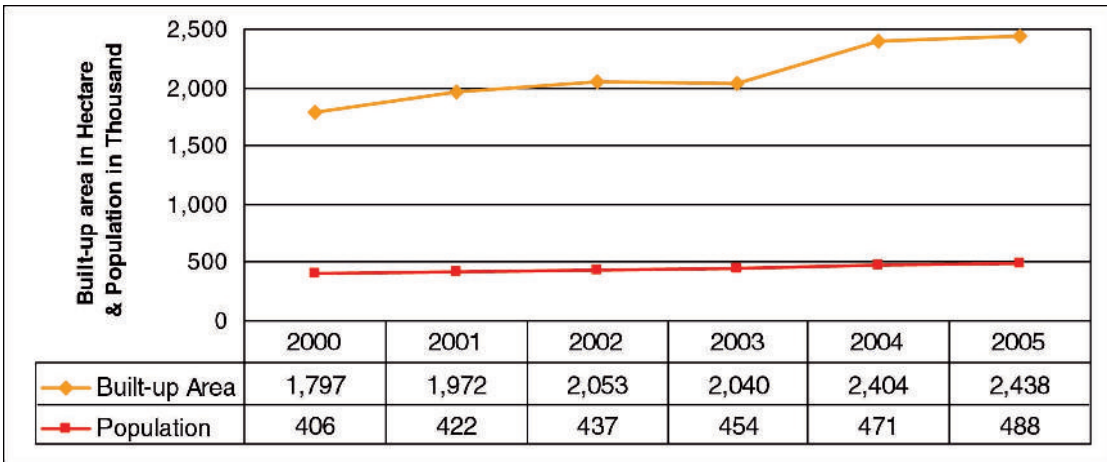
Map (2-7): Land use / land cover changes during 2001-2004 in Deir al Balah Governorate

2.3.2. Gaza Governorate

Gaza Governorate is in the northern part of the Gaza Strip, bound by North Gaza Governorate in the north (5 km distance between Gaza and North Gaza cities) and Deir al Balah Governorate to the south (14.5 km distance between Gaza and Deir al Balah cities). It covers an area of approximately 73,600 dunums (about 20 % of the Gaza Strip total area). Gaza Governorate is the largest among the other Palestinian Governorates in terms of its population, which had reached 488 thousands by 2005.

PALESTINIAN URBANIZATION

The satellite image analysis showed that the Palestinian built-up area in Gaza Governorate increased from 19,720 dunums to 24,040 dunums in the years 2001 and 2004 respectively, with a total increase of 22%. According to PCBS the population projection indicated an increase in the total population of Gaza Governorate from 421,507 in 2001 to 470,605 in 2004. Therefore, the built-up area in relation to population has increased from 47m^2/capita in 2001 to 51m^2/capita in 2004. Figure (2-9) shows the relation between the built-up area and the population in Gaza Governorate between 2000 and 2005, where the R^2 of the built-up line is 0.90. The trend line shows that the annual increase in built-up area in the period 2000-2003 is 810 dunums/year, while it is 1,990 dunums/year in the period 2003-2005. Thus, the percentages of increase in the built-up area during the same periods are 13.5% and 19.5% respectively.



	2000	2001	2002	2003	2004	2005
Built-up Area	1,797	1,972	2,053	2,040	2,404	2,438
Population	406	422	437	454	471	488

Figure (2- 9): Actual and projected Palestinian built-up area vs. projected population between years 2000-2005 in Gaza Governorate

The analysis showed that the annual increase in the built-up area in Gaza Governorate was 340 dunums/year in the period between 2001and 2003 (an increase by 3.5%), while it was 1,440 dunums/year during 2001-2004 (an increase of 21.9%), indicating that there was a dramatic increase in the built-up area in the year 2004. This increase in the built-up area was at the expense of open spaces where their areas decreased from 6,831 and 5,880 to 4,499 dunums in years 2001, 2003 and 2004 respectively as illustrated in figure (2-10).

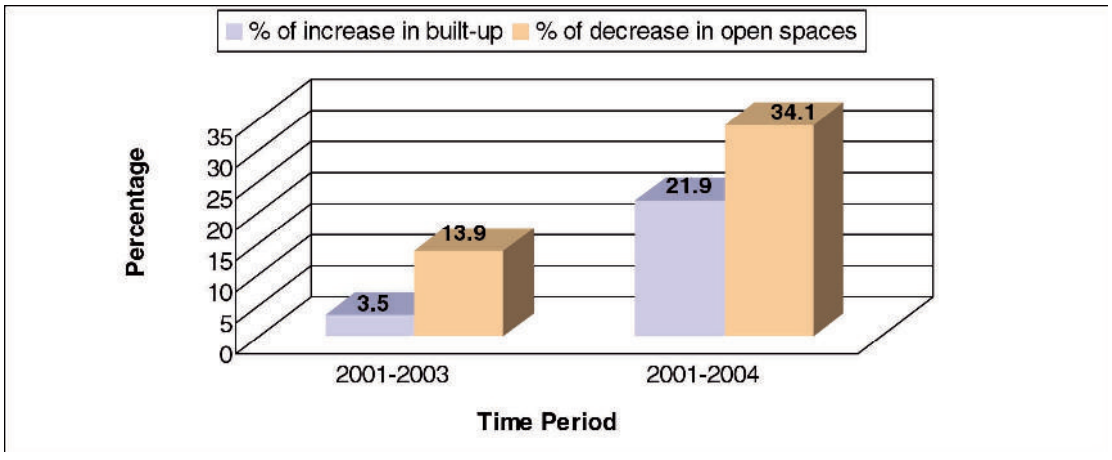


Figure (2-10): Percentage of change in built-up area and open spaces in Gaza Governorate

Furthermore, map (2-8) shows that the urban development of Gaza city occurred within the area designated by the master plans for the city, but the locality of Al Mughraqa is expanding into the agricultural designated area, classified within its municipality border. However, table (2-5) shows the areas of land use / land cover classes of Gaza Governorate, as derived from the SPOT 5 image in 2004, while map (2-9) illustrates the land use changes in the Governorate in 2001, 2003 and 2004. Conversely, the projections of future urban development would rely on future population scenarios and land suitability assumptions that will be presented and discussed in chapter three

.

Table(2-5): Area of land use / land cover types in Gaza Governorate in 2004

Land Cover Type	Area (dunums)
Arable Land	13,828
Heterogeneous Agricultural Area	197
Permanent Crops	14,852
Greenhouses	739
Industrial, Commercial and Transport Unit	1,105
Mine, Dump and Construction Sites	695
Israeli colonies	1,929
Israeli Military Base	14
Palestinian Built-up Area	24,039
Open Spaces with little or no Vegetation	4,499
Inland Waters	256
Shrub and/or Herbaceous Vegetation Associations	921
Shaved Area	10,529
Total	**73,603**

ISRAELI COLONIZATION ACTIVITIES

In Gaza Governorate, Netzarim is the only Israeli colony - established in 1972 - which is located in the southwest of the Governorate. The total colony area equals 1,930 dunums, while the colony total population is 496 colonists (ICBS, 2004) in year 2004.

Figure (2-11) shows the increase in the Israeli colony area in Gaza Governorate during the period 2001-2004; the Israeli colony in 2001 occupied an area equals 1,546 dunums which increased in 2004 to reach 1,930 dunums, whereas the Israeli population in the colony increased from 386 to 496 colonists (ICBS, 2004)

during the period 2001-2004. Thus, the population density increased from 250 capita/km^2 in 2001 to 257 capita/km^2 in 2004. The annual increase in the colonies areas in 2003 was about 30 dunums/year, while it was about 128 dunums/year in 2004 with an increase rate of 3.8% and 24.8% in 2003 and 2004 respectively, from 2001. The percentage of total Governorate land occupied by this colony increased from 2.1% in 2001 to 2.6% in 2004. Additionally, 14 dunums of the Governorate area is occupied by an Israeli military base. Map (2-8) shows the location and expansion of the Israeli colony in Gaza Governorate from 2001 to 2004.

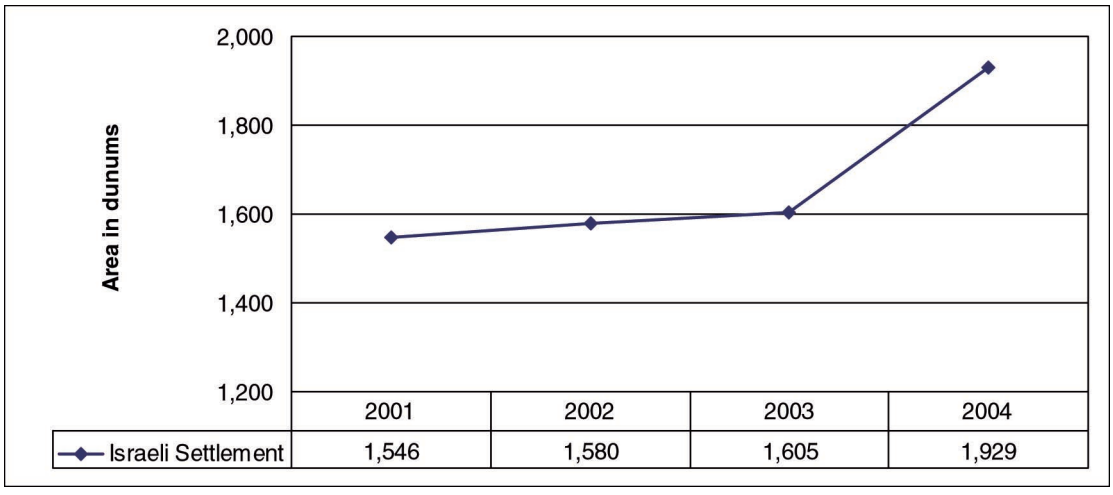


Figure (2-11): Expansion of Israeli colonies in Gaza Governorate during 2001-2004

After the announcement of the "Disengagement Plan" in August 2004, the Israeli Authorities in Gaza issued land seizure documents and demolition orders to Palestinian families near Netzarim colony and other colonies in the Gaza Strip. The seizures and demolitions were justified on the basis of "military necessity" and the order for the Netzarim actions stated that "*the seizure of land is carried out in light of the current security situation and for absolute military needs to establish security facilities*".

The Israeli shaving operations in Gaza Governorate increased by 198% (7,001 dunums) between 2001 and 2004. The IOF bulldozed 6,661 dunums of Palestinian agricultural lands in 2004 and the area shaved from the open spaces was 313 dunums, while the built-up area shaved (demolished houses) was 59 dunums and other areas shaved equalled 419 dunums as well as 3,074 dunums of different land uses were shaved in 2001, see figure (2-12). Portions of the shaved areas in Gaza Governorate were located along Israeli's buffer zone on the eastern border. The majority, however, were located around the illegal Israeli colony of Netzarim and its by-pass road, where the IOF bulldozed large areas to the north, west, south and east of the colony. The cleared land forms a security passageway serving Israeli colonists as an access strip to the seashore of Gaza.

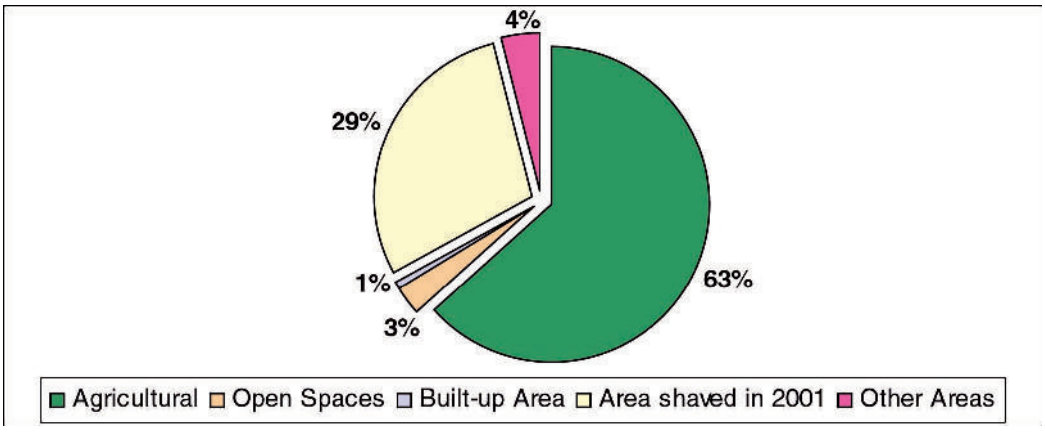
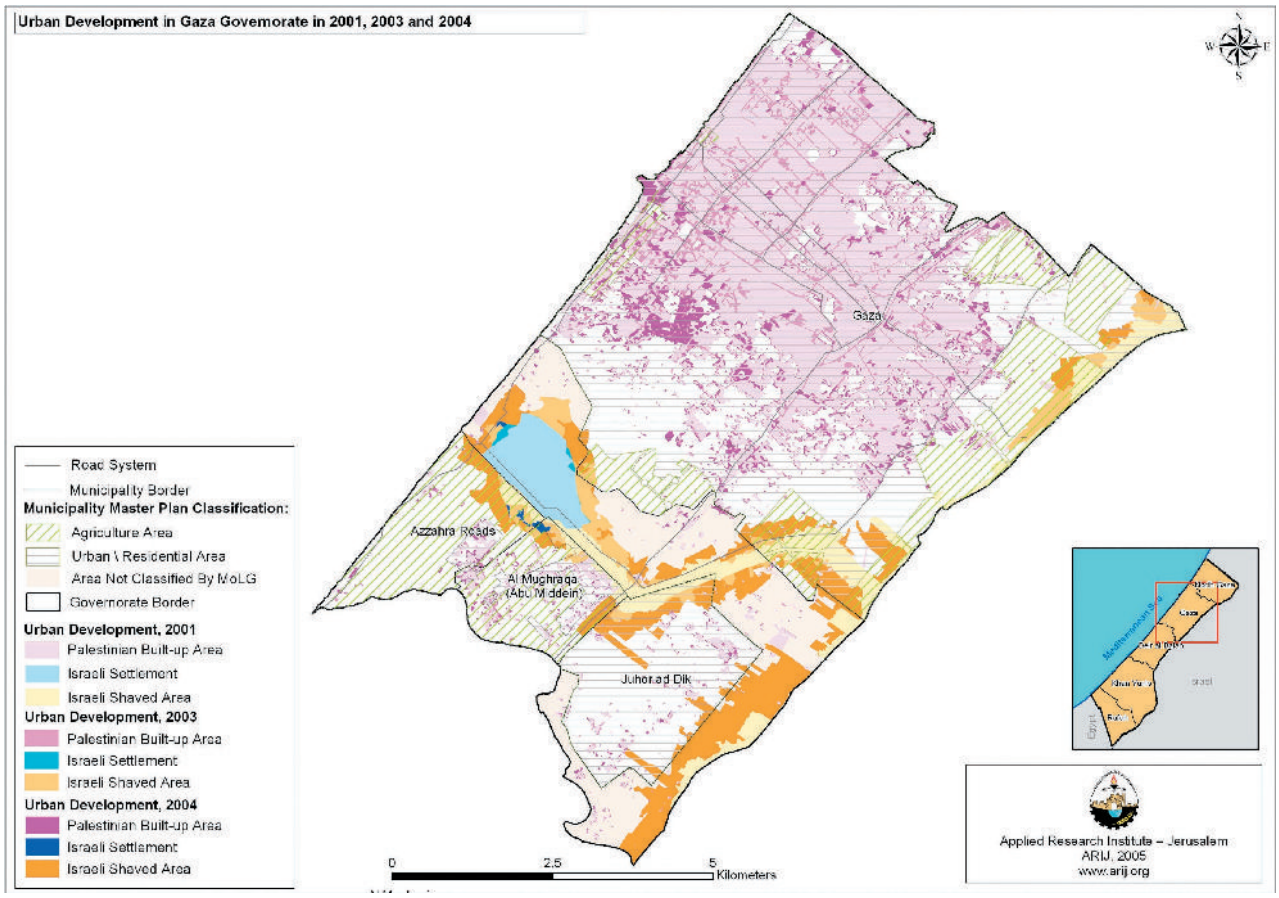
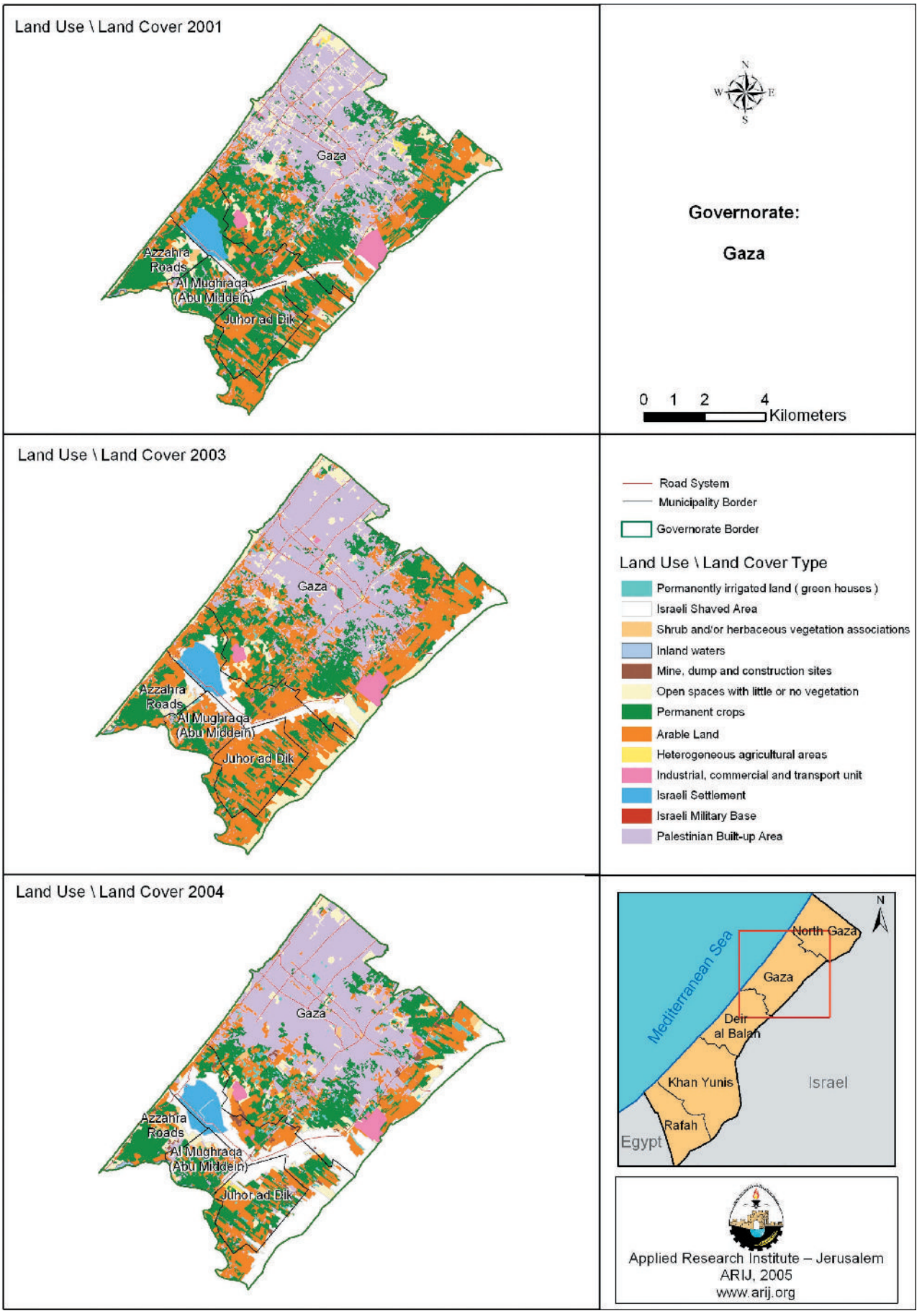


Figure (2-12): Distribution of different land uses within the shaved area in Gaza Governorate in 2004



Map (2-8): Urban development during 2001-2004 in Gaza Governorate



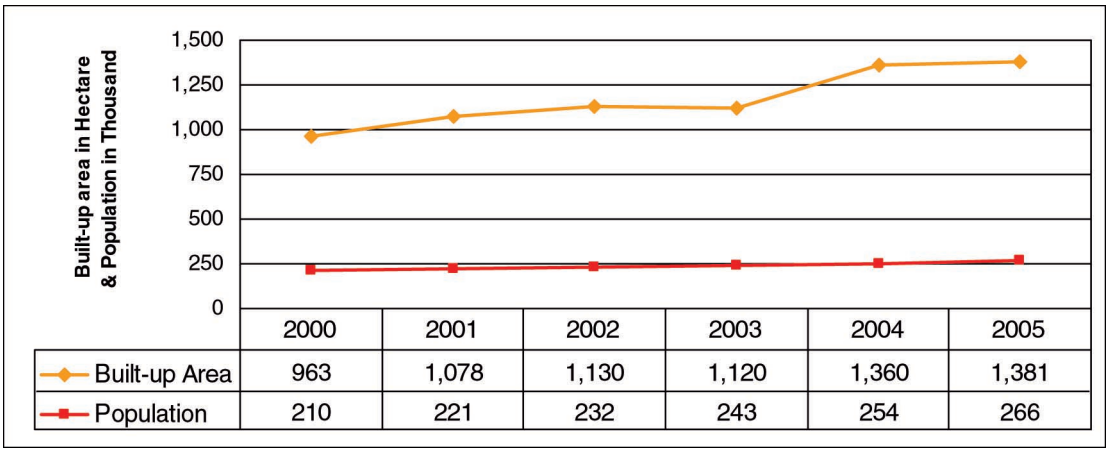
Map (2-9): Land use / land cover changes during 2001-2004 in Gaza Governorate

2.3.3. North Gaza Governorate

North Gaza Governorate is located in the north of the Gaza Strip - above Gaza Governorate - It covers a total area of approximately 60,390 dunums (17 % of the Gaza Strip total area). North Gaza is bound by Israel to the northeast, the Mediterranean Sea in the west and Gaza Governorate from south (about 5 km distance between Gaza and North Gaza cities)

PALESTINIAN URBANIZATION

The analysis of the satellite image showed that the Palestinian built-up area increased from 10,780 dunums to 13,600 dunums, a total increase of 26% in the period between 2001-2004. At the same time, the population projection indicated an increase in the population of North Gaza Governorate from 220,772 to 254,093 in 2001 and 2004 respectively (PCBS, 2005). Accordingly, the built-up area in relation to population has increased from 49 m^2/capita in 2001 to reach 54 m^2/capita in 2004. Figure (2-13) shows the relation between the built-up area and the population in the period 2000-2005, where the R^2 of the built-up area line is 0.89. The trend line shows that the annual increase in built-up area in the period 2000-2003 is 523 dunums/year, while it is 1,305 dunums/year in the period 2003-2005. Thus, the percentages of increase in the built-up area during the same periods are 16.3% and 23.3% respectively.



	2000	2001	2002	2003	2004	2005
Built-up Area	963	1,078	1,130	1,120	1,360	1,381
Population	210	221	232	243	254	266

Figure (2-13): Actual and projected Palestinian built-up area vs. projected population between years 2000-2005 in North Gaza Governorate

The analysis showed that the annual increase in the built-up area in North Gaza Governorate was 210 dunums/year in the period between 2001 and 2003 (an increase of 3.9%), while it was 940 dunums/year between 2001 and 2004 (an increase of 26.2%). This increase in the built-up area was at the expense of open spaces which decreased from 11,095 and 6,669 to 5,018 dunums in 2001, 2003 and 2004 respectively, as illustrated in figure (2-14).

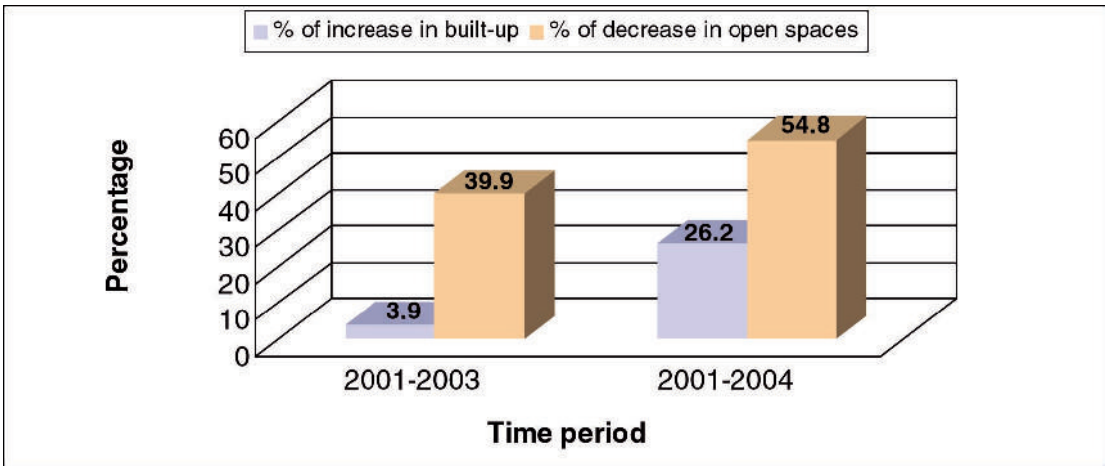


Figure (2-14): Percentage of change in built-up area and open spaces in North Gaza Governorate

Furthermore, map (2-10) shows that the urban development occurred mostly within the boundaries of the designated master plans residential areas in the Governorate, but started to expand within the border of agricultural areas west of the Governorate. However, the areas of land use / land cover classes of North Gaza Governorate - as derived from the SPOT 5 image for 2004 - are shown in table (2-6), while map (2-11) illustrates the land use changes in the Governorate in 2001, 2003 and 2004. Nevertheless, the projections of future urban development would rely on future population scenarios and land suitability assumptions that will be presented and discussed in chapter three

.

Table(2-6): Area of land use / land cover types in North Gaza Governorate in 2004

Land Cover Type	Area (dunums)
Arable Land	9,948
Heterogeneous Agricultural Area	10
Permanent Crops	7,898
Greenhouses	988
Industrial, Commercial and Transport Unit	519
Mine, Dump and Construction Sites	236
Israeli colonies	2,715
Israeli Military Base	96
Palestinian Built-up Area	13,595
Open Spaces with little or no Vegetation	5,018
Inland Waters	254
Shrub and/or Herbaceous Vegetation Associations	1,397
Shaved Area	17,717
Total	**60,391**

ISRAELI COLONIZATION ACTIVITIES

There are 4 Israeli colonies in North Gaza Governorate, these colonies are: Dugit, Elei Sinai, Erez and Nisanit. Erez, the first colony established in the Gaza Strip in 1968, is an industrial colony located in the northwest of the border of North Gaza. Most of the colonies in North Gaza are concentrated at the border between the Gaza Strip and Israel. The colonies in North Gaza occupied an area that equalled about 2,715 dunums in 2004 with a total population of 1,550 colonists.

In 2001, the Israeli colonies in North Gaza Governorate occupied an area of 2,298 dunums, whereas the Israeli population in the colonies increased from 1,342 colonists in 2001 to 1,550 colonists in 2004 (ICBS,

2004). This has lead to a change in population density from 584 capita/km^2 to 571 capita/km^2 in 2001 and 2004 respectively. Figure (2-15) shows the increase in the colonies area in the Governorate in the period between 2001 and 2004. The annual increase in the colonies' area in 2003 was about 108 dunums/year, while in 2004 it was about 139 dunums/year with an increase rate of 9.4% and 18.2% in 2003 and 2004 respectively from 2001. The total percentage of Governorate land occupied by the Israeli colonies increased from 3.8% to 4.5% during 2001-2004. In 2004, the Israeli military base occupied an area of approximately 96 dunums of the Governorate. Map (2-10) shows the location and expansion of the Israeli colonies in North Gaza Governorate from 2001 to 2004.

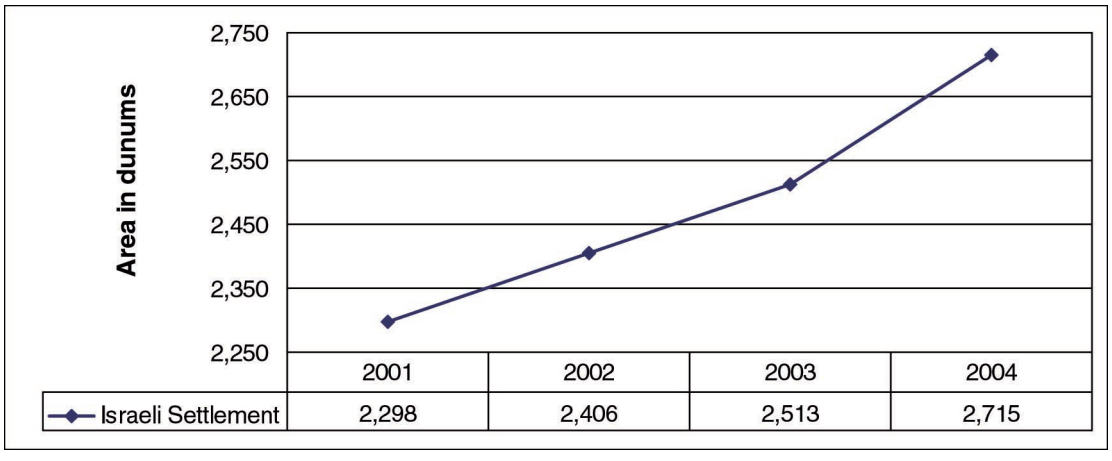


Figure (2-15): Expansion of Israeli colonies in North Gaza Governorate during 2001-2004

The land leveling is part of an Israeli project to create "buffer zones" and extend Israeli authority along Gaza's borders and around its colonies. The Israeli shaving operation in North Gaza Governorate increased by 778% (15,698 dunums) between the period 2001-2004. The IOF bulldozed 11,901 dunums of Palestinian agricultural lands in 2004 and the area shaved from the open spaces was equal to 2,537 dunums, while the built-up area shaved (demolished houses) was 395 dunums and other areas of about 881 dunums, as well as other areas shaved 2,003 dunums of different land uses in 2001, see figure (2-16). The shaving operation was widespread along the northern and eastern borders of the Governorate and around illegal Israeli colonies located in the northwest of the area. Large areas were cleared as "buffer zones" adjacent to Israel's Segregation Wall in the north of the Gaza Strip. Israeli bulldozers also cleared significant areas around the town of Beit Hanoun in the northeast of the Governorate.

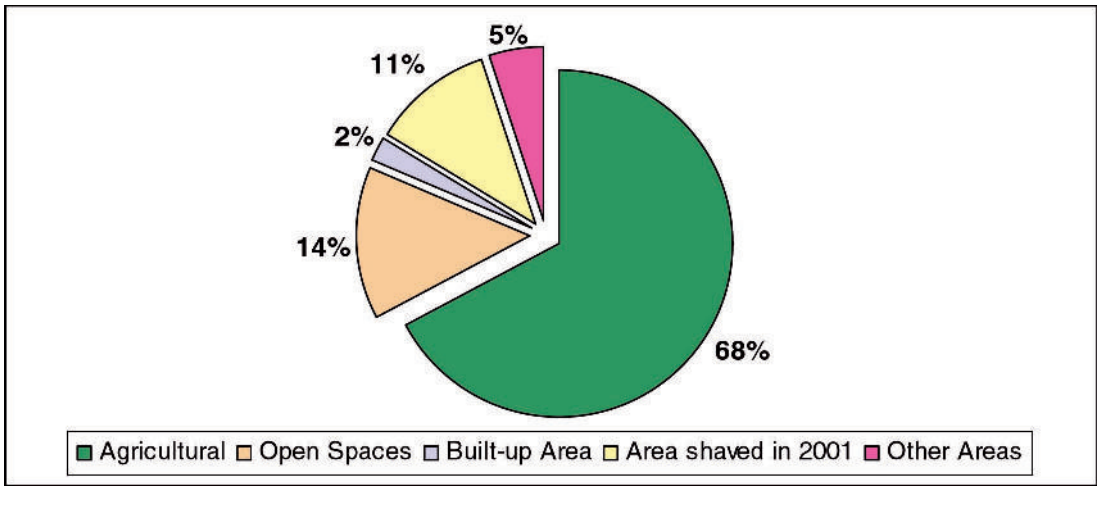
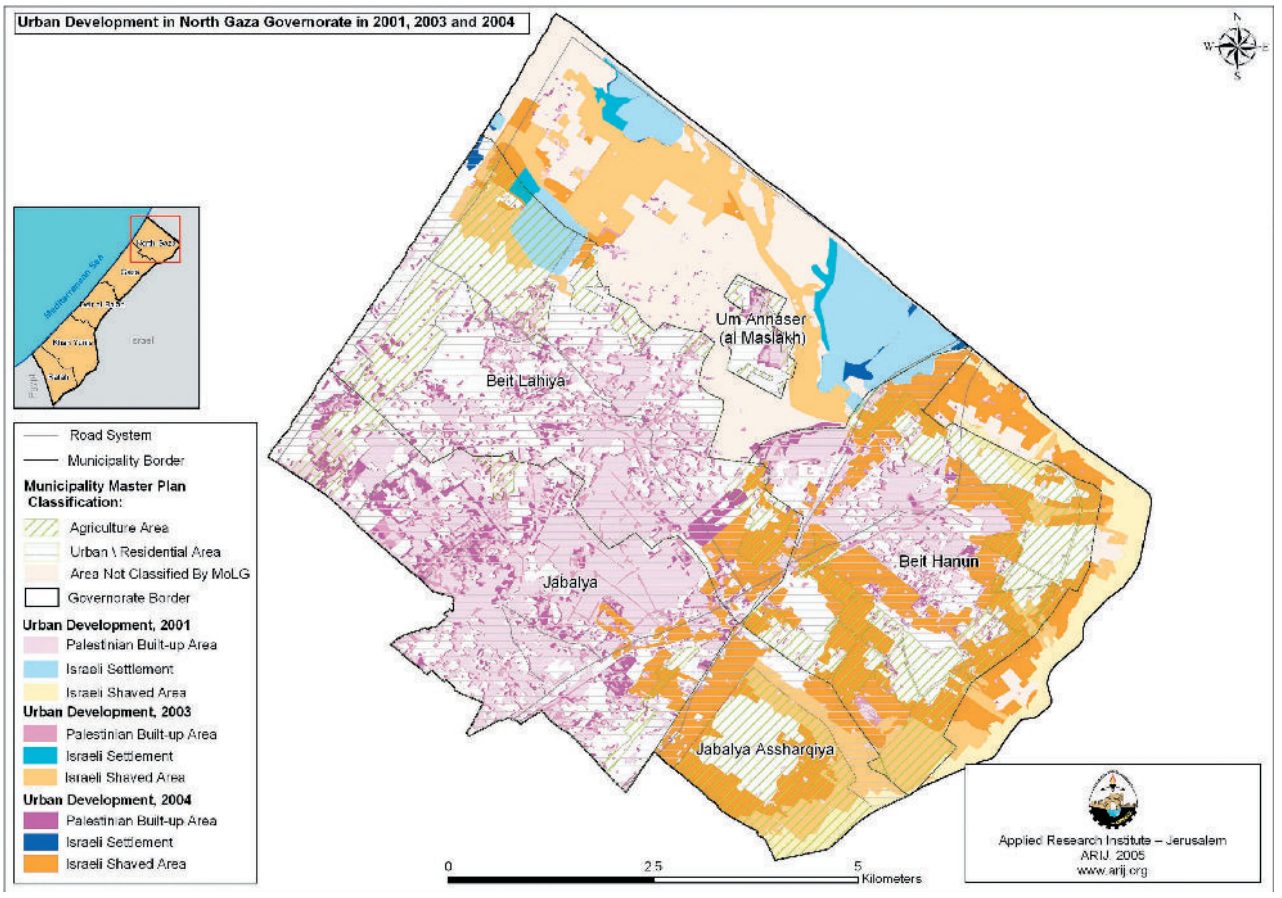
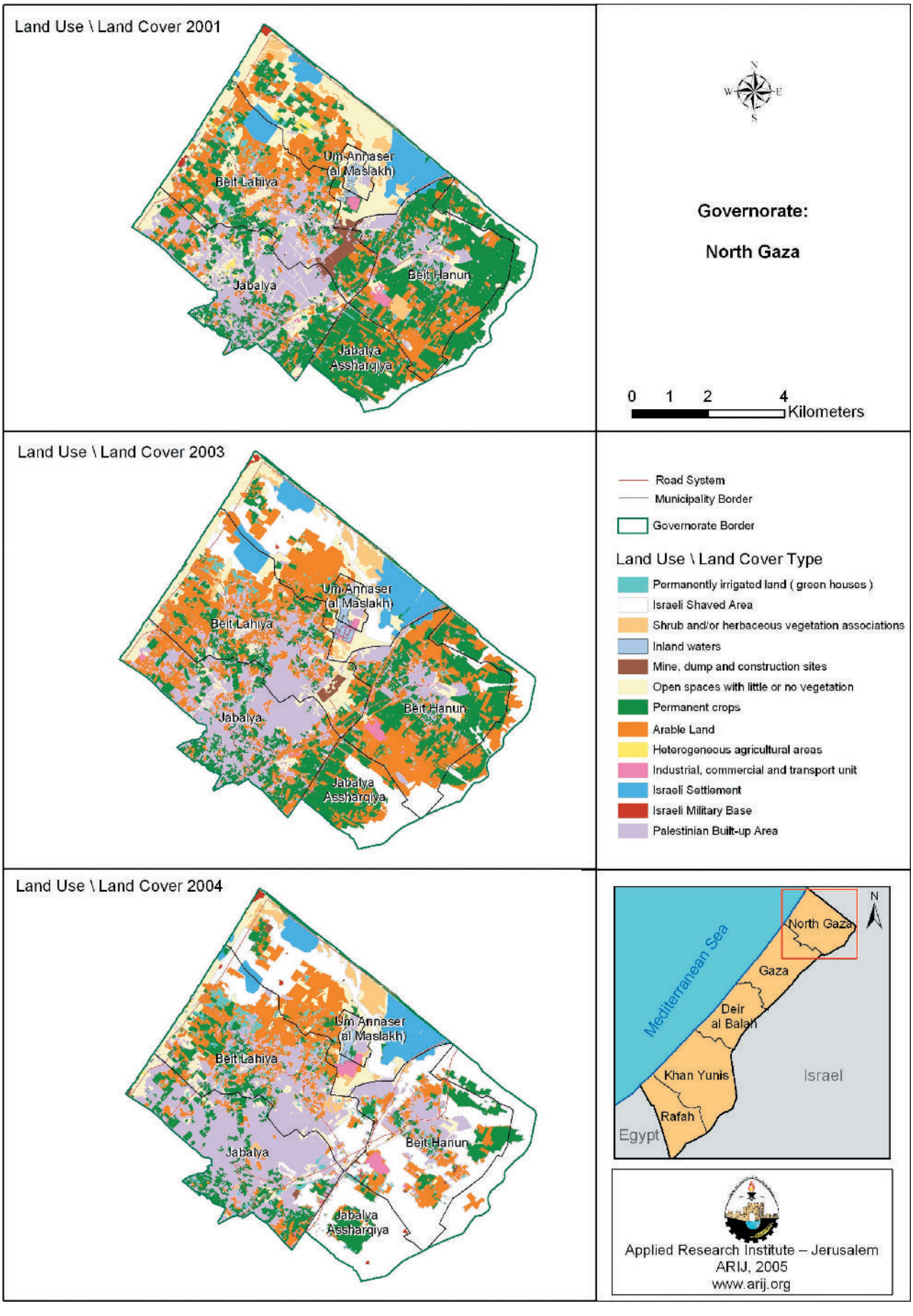


Figure (2-16): Distribution of different land uses within the shaved area in North Gaza Governorate in 2004



Map (2-10): Urban development during 2001-2004 in North Gaza Governorate



Map (2-11): Land use / land cover changes during 2001-2004 in North Gaza Governorate

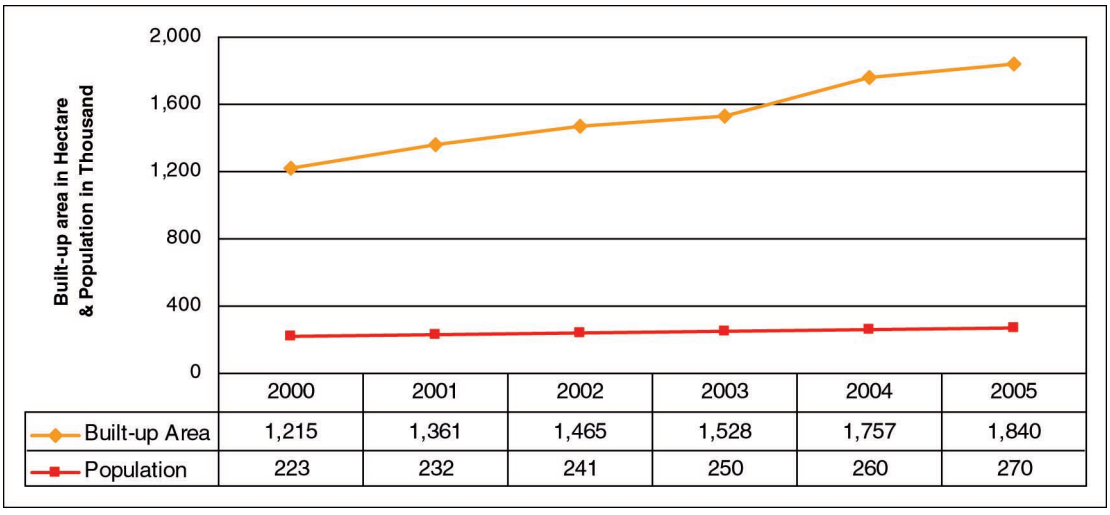
2.3.4. Khan Yunis Governorate

Khan Yunis Governorate is located in the south of the Gaza Strip, bound by Deir al Balah to the north (9 km distance between Khan Yunis and Deir al Balah cities) and Rafah in the south (9 km distance between Khan Yunis and Rafah cities). It covers an area of about 111,600 dunums (about 31% of the Gaza Strip total area).

PALESTINIAN URBANIZATION

The analysis of the satellite image showed that the Palestinian built-up area increased from 13,611 dunums to 17,568 dunums with a total increase of 29% in the period between 2001 and 2004. At the same time, the population projection according to PCBS indicated an increase in the total population of Khan Yunis Governorate from 231,553 to 259,640 in 2001 and 2004 respectively. Consequently, the built-up area in relation to population has increased from 59 m^2/capita to 68 m^2/capita in the period between 2001 and 2004.

Figure (2-17) shows the relation between the built-up area and the population in the period 2000-2005, where the R^2 of the built-up area line is 0.98. The trend line shows that the annual increase in the built-up area in the period 2000-2003 is 1,042 dunums/year, while it is 1,561 dunums/year in the period 2003-2005. Thus, the percentages of increase in the built-up area during the same periods are 25.7% and 20.4% respectively.



	2000	2001	2002	2003	2004	2005
Built-up Area	1,215	1,361	1,465	1,528	1,757	1,840
Population	223	232	241	250	260	270

Figure (2-17): Actual and projected Palestinian built-up area vs. projected population between years 2000-2005 in Khan Yunis Governorate

The analysis showed that the annual increase in built-up area in Khan Yunis Governorate was 835 dunums/year in the period 2001-2003 (an increase by 12.3%), while it was 1,319 dunums/year during 2001-2004 (an increase by 29.1%). This increase in the built-up area was on the account of open spaces which decreased from 6,236 and 5,585 to 5,134 dunums in 2001, 2003 and 2004 respectively as illustrated in figure (2-18).

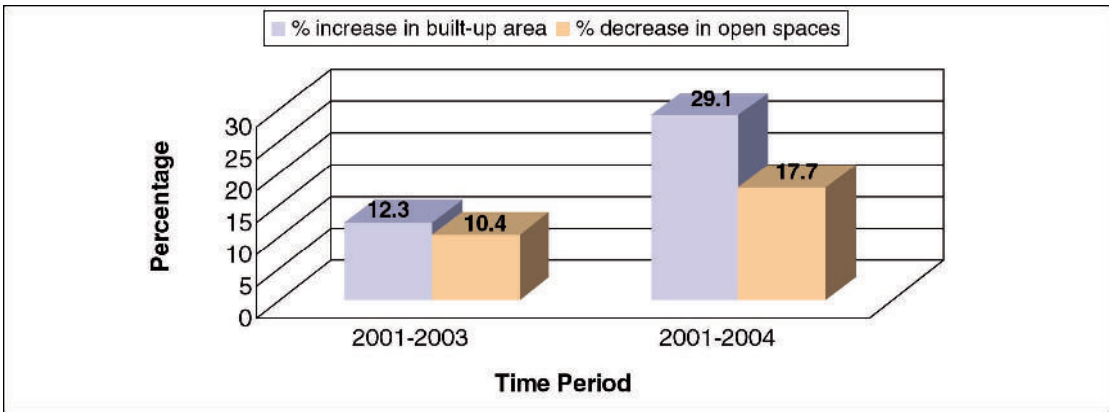


Figure (2-18): Percentage of change in built-up area and open spaces in Khan Yunis Governorate.

Furthermore, map (2-12) shows that urban development occurred mostly within the designated urban area of the Governorate master plan, but it is expanding within the agricultural area of Al Qarara, Bani Suheila and 'Abasan al Jadida. However, the areas of land use / land cover classes of Khan Yunis Governorate - as derived from SPOT 5 image for 2004 - are shown in table (2-7), while the land use changes during 2001-2004 are illustrated in map (2-13). Nevertheless, the projections of future urban development would rely on future population scenarios and land suitability assumption that will be presented and discussed in chapter three.

Table (2-7): Area of land use / land cover types in Khan Yunis Governorate in 2004

Land Cover Type	Area (dunums)
Arable Land	44,811
Heterogeneous Agricultural Areas	104
Permanent Crops	14,693
Greenhouses	3,301
Industrial, Commercial and Transport Unit	322
Mine, Dump and Construction Sites	278
Israeli colonies	15,842
Israeli Military Base	1,888
Palestinian Built-up Area	17,568
Open Spaces with little or no Vegetation	5,134
Inland Waters	13
Shrub and/or Herbaceous Vegetation Associations	1,245
Shaved Area	6,417
Total	**111,616**

ISRAELI COLONIZATION ACTIVITIES

There are 10 Israeli colonies inside Khan Yunis Governorate border. Most of the colonies are situated to the northwest and southwest of the Governorate. The colonies are: Bedolah (part of it inside Deir al Balah Governorate), Gadid, Gan Or, Ganei Tal, Katif, Kfar Yam, Morag, Netzar Hazani (part of it inside Deir al Balah Governorate), Neve Dekalim and Shirat Hayam. The total area of the colonies (including those which overlap the governorate boundary) is about 16,649 dunums.

The Israeli colonies in Khan Yunis Governorate occupied an area equals 14,822 dunums in 2001 which increased to 15,842 dunums in 2004, whereas the Israeli population in the colonies increased from 4,184

colonists in 2001 to 5,128 colonists in 2004 (ICBS, 2004). Consequently, the population density increased from 268 capita/km^2 to 308 capita/km^2 in 2001 and 2004 respectively[15]. Figure (2-20) shows the dramatic expansion of Israeli colonies in the Governorate in the short period between 2001 and 2004. The annual increase in the colonies areas in 2003 was about 367 dunums/year and about 340 dunums/year in 2004 with an increase rate of 4.9% and 6.9% in 2003 and 2004 respectively from 2001. Thus, the percentage of total Governorate land occupied by Israeli colonies increased from 13.3% in 2001 to 14.2% in 2004. In 2004, the Israeli military base occupied an area of approximately 1,888 dunums. Map (2-12) shows the distribution and expansion of the Israeli colonies in Khan Yunis Governorate between 2001 and 2004.

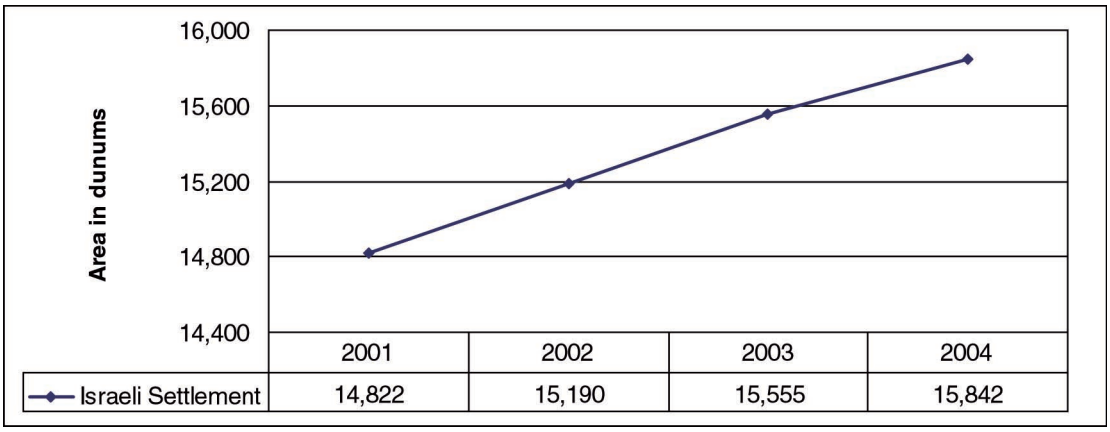


Figure (2-20): Expansion of Israeli colonies in Khan Yunis Governorate during 2001-2004

Land clearing operations are the most severe in the Gaza Strip where the IOF used armoured caterpillar bulldozers to clear massive amounts of land and demolish Palestinian homes along the borders and close to illegal Israeli colonies and by-pass roads. The shaving served to expand Israeli controlled "buffer zones" around Israeli colonies in the Gush Katif colony block west of Khan Yunis and Morag colony to the south. Other bulldozing operations cleared agricultural land and homes adjacent to the colony by-pass roads accessing the colony and in the northeast, east and southeast to the border in Khan Yunis Governorate.

The shaved area in Khan Yunis Governorate increased from 903 dunums to 6,417 dunums between 2001 and 2004 with a percentage of change equals to 611 % (5,514 dunums). As mentioned before, the shaved areas are mainly agricultural fields in the Gaza Strip Governorates. Where in 2004 the agricultural area shaved by IOF was about 3,940 dunums (about 60% of the shaved area) and the area shaved from the open spaces was about 1,286 dunums, while the built-up area shaved (demolished houses) was 72 dunums and other areas shaved equalled 277 dunums, as well as 842 dunums of different land uses that were shaved in 2001. Figure (2-21) shows the distribution of different land uses that were shaved in 2004.

[15] The area used to calculate population density is the sum of the 10 settlements area inside and outside Khan Yunis Governorate border.

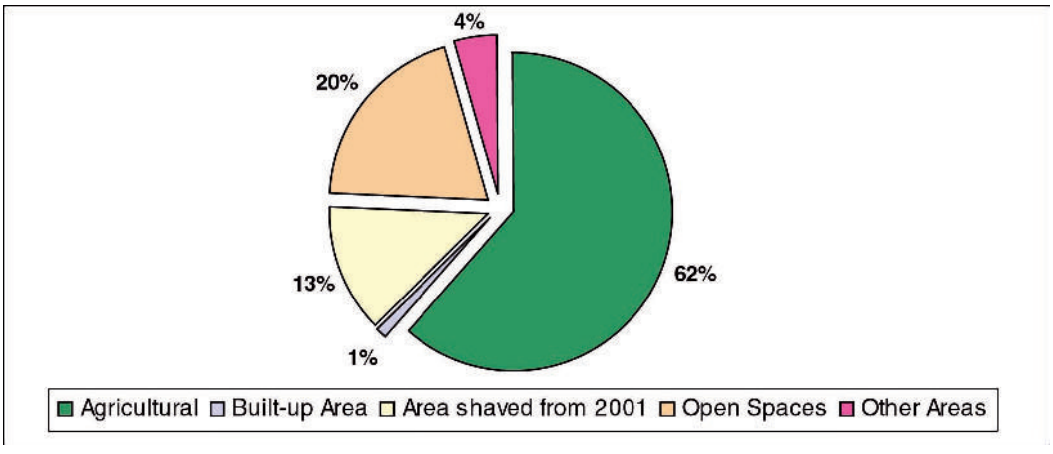
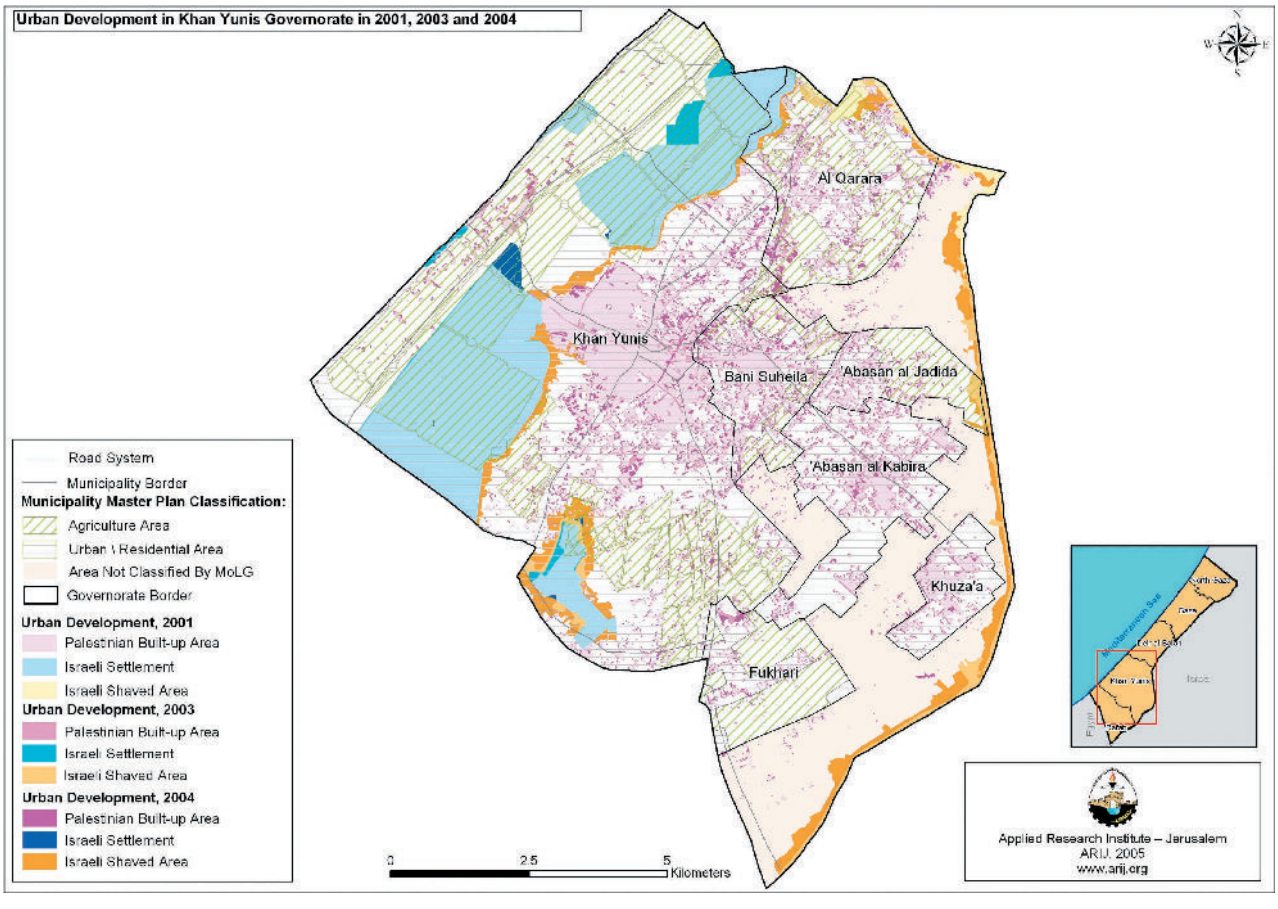
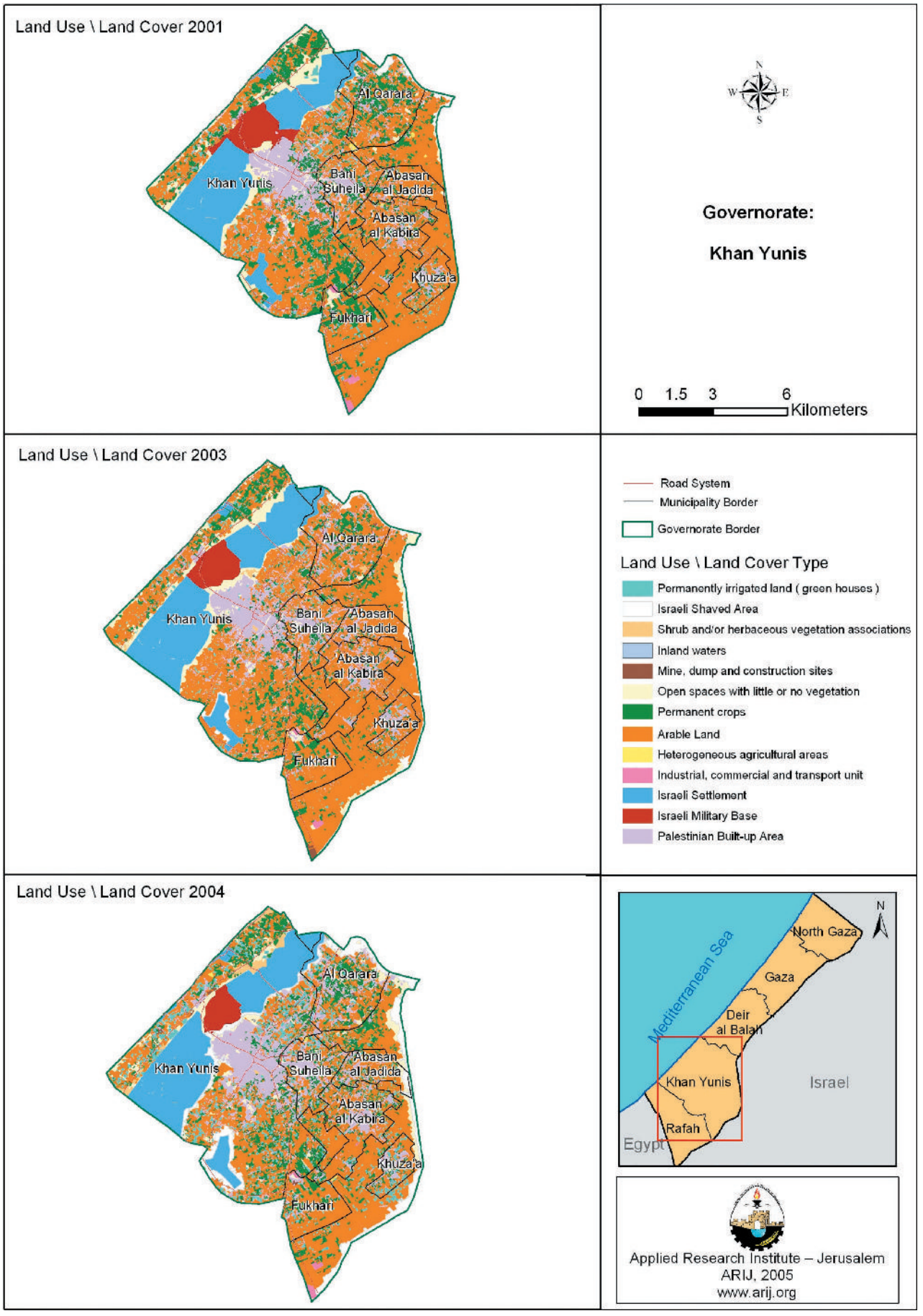


Figure (2-21): Distribution of different land uses within the shaved area in Khan Yunis Governorate in 2004



Map (2-12): Urban development during 2001-2004 in Khan Yunis Governorate



Map (2-13): Land use / land cover changes during 2001-2004 in Khan Yunis Governorate

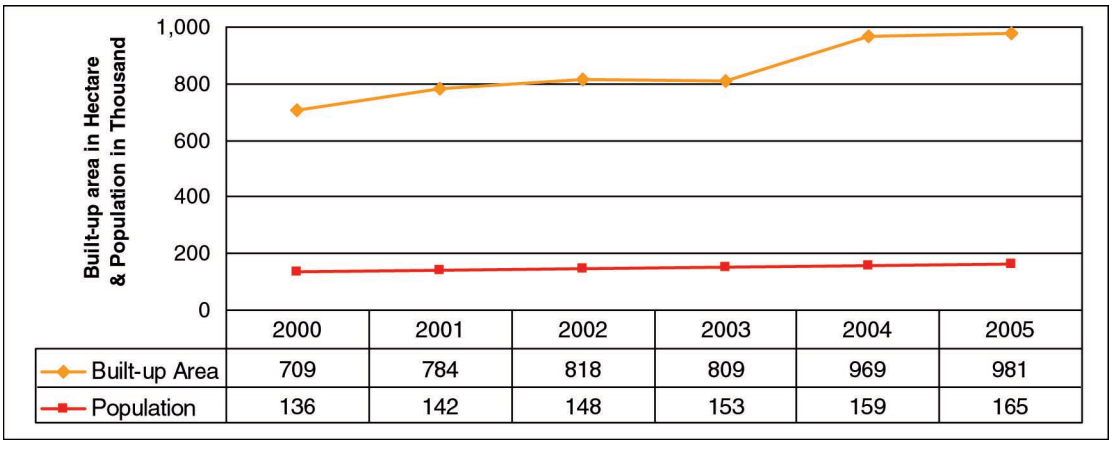
2.3.5. Rafah Governorate

Rafah Governorate is located in the southern tip of the Gaza Strip and is bound by Khan Yunis Governorate to the north (about 9 km distance between Rafah and Khan Yunis cities), the Mediterranean Sea in the northwest, Egypt in the southwest and Israel in the southeast. It covers an area of about 59,980 dunums (about 17% of the Gaza Strip total area).

PALESTINIAN URBANIZATION

The analysis of the satellite image showed that the Palestinian the built-up area in Rafah Governorate increased from 7,842 dunums to 9,685 dunums in the period between 2001 and 2004 with a total increase of 24%. According to PCBS, the population projection indicated an increase in the total population in Rafah Governorate from 142,108 to 159,250 in the same period (2001-2004). Hence, the built-up area in relation to population had increased from 55 m^2/capita in 2001 to 61 m^2/capita in 2004.

Figure (2-22) shows the relation between the built-up area and the population in Rafah Governorate between 2000 and 2005, where the R^2 of the built-up line is 0.89. The trend line shows that the annual increase in built-up area in the period 2000-2003 is 333 dunums/year, while it is 861 dunums/year in the period 2003-2005. Thus, the percentages of increase in the built-up area during the same periods are 14.1% and 21.3% respectively.



	2000	2001	2002	2003	2004	2005
Built-up Area	709	784	818	809	969	981
Population	136	142	148	153	159	165

Figure (2-22): Actual and projected Palestinian built-up area vs. projected population between years 2000-2005 in Rafah governorate

The analysis showed that the annual increase in the built-up area in Rafah Governorate was 122 dunums/year in the period during 2001-2003 (and increase of 3.1%), while it was 614 dunums/year during 2001-2004 (an increase of 23.5%), which reflects the dramatic increase in built-up area in 2004. This increase in the built-up area was at the expense of open spaces which decreased from 6,337 and 3,256 to 1,864 dunums in years 2001, 2003 and 2004 respectively as illustrated in figure (2-23).

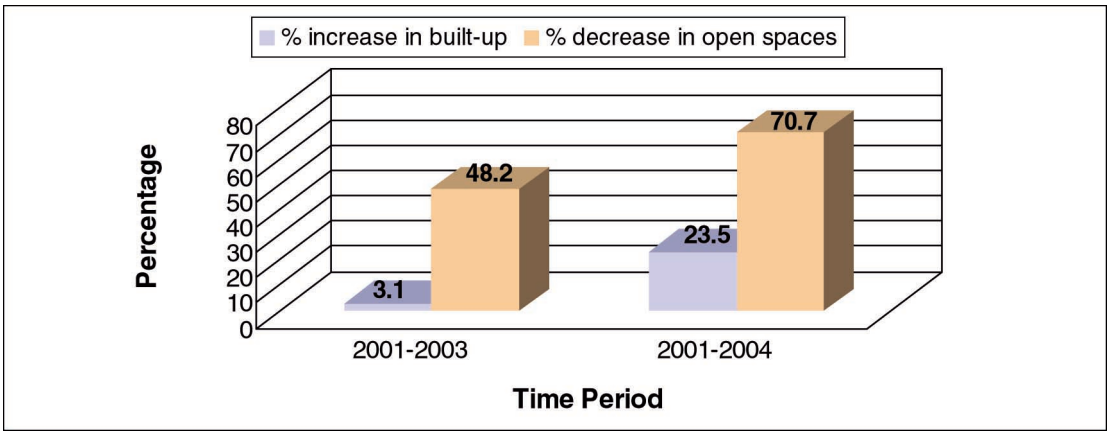


Figure (2-23): Percentage of change in built-up area and open spaces in Rafah Governorate

Furthermore, map (2-15) shows that the urban development occurred mainly within the designated urban areas of the Governorate master plan, but started to expand beyond the residential area northeast of Rafah city. Table (2-8) shows the areas of land use / land cover classes of Rafah Governorate - as derived from the SPOT 5 image in year 2004 - while map (2-16) illustrates the land use changes in the Governorate during 2001-2004. Conversely, the projections of future urban development would rely on future population scenarios and land suitability assumption that will be presented and discussed in chapter three.

Table(2-8): Area of land use/ land cover types in Rafah Governorate in 2004

Land Cover Type	Area (dunums)
Arable Land	23,366
Heterogeneous Agricultural Areas	0
Permanent Crops	6,133
Greenhouses	4,925
Industrial, Commercial and Transport Unit	2,222
Mine, Dump and Construction Sites	141
Israeli colonies	6,772
Israeli Military Base	114
Palestinian Built-up Area	9,685
Open spaces with little or no Vegetation	1,864
Inland Waters	46
Shrub and/or Herbaceous Vegetation Associations	227
Shaved Area	4,485
Total	**59,980**

ISRAELI COLONIZATION ACTIVITIES

There are four Israeli colonies in Rafah Governorate, these colonies are: Pe'at Sade, Atzmona (and Kerem Atzmona colony which is an expansion of Atzmona colony), Silav and Rafih Yam. The total area occupied by these colonies in 2004 was equal to 6,772 dunums, while the total colonies population according to the ICBS was approximately 967 colonists in 2004. In addition, the southern part of Bedolah colony (869 dunums) is within the border of Rafah Governorate.

Figure (2-24) shows the increase in the Israeli colonies in Rafah Governorate during the period between 2001 and 2004; the Israeli colonies in 2001 occupied an area that equaled 6,749 dunums which increased in 2004 to reach 6,772 dunums, whereas the total Israeli colonies population in 2001 was about 800 colonists and increased in 2004 to reach 967 colonists (ICBS, 2004). This has led to an increase in population density that

equalled 119 capita/km^2 and 143 capita/km^2 in 2001 and 2004 respectively. The annual increase in the colonies area in 2003 and 2004 from 2001 was about 7.5 dunums/year and 7.7 dunums/year with an increase of about 0.22% and 0.34% in 2003 and 2004 respectively. The percentage of total Governorate land occupied by the colonies was approximately 11.3% during the period 2001-2004. While, the Israeli military base occupied an area equal to 114 dunums in 2004.

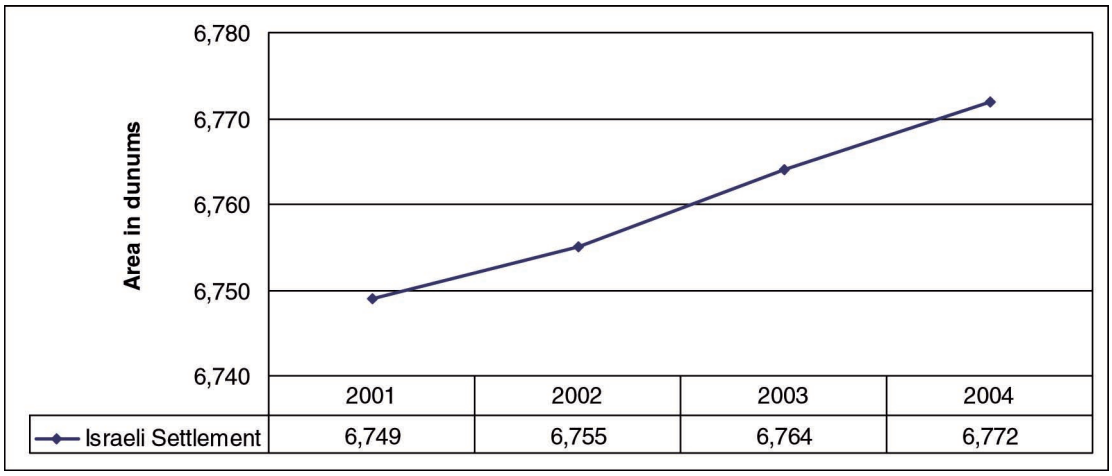
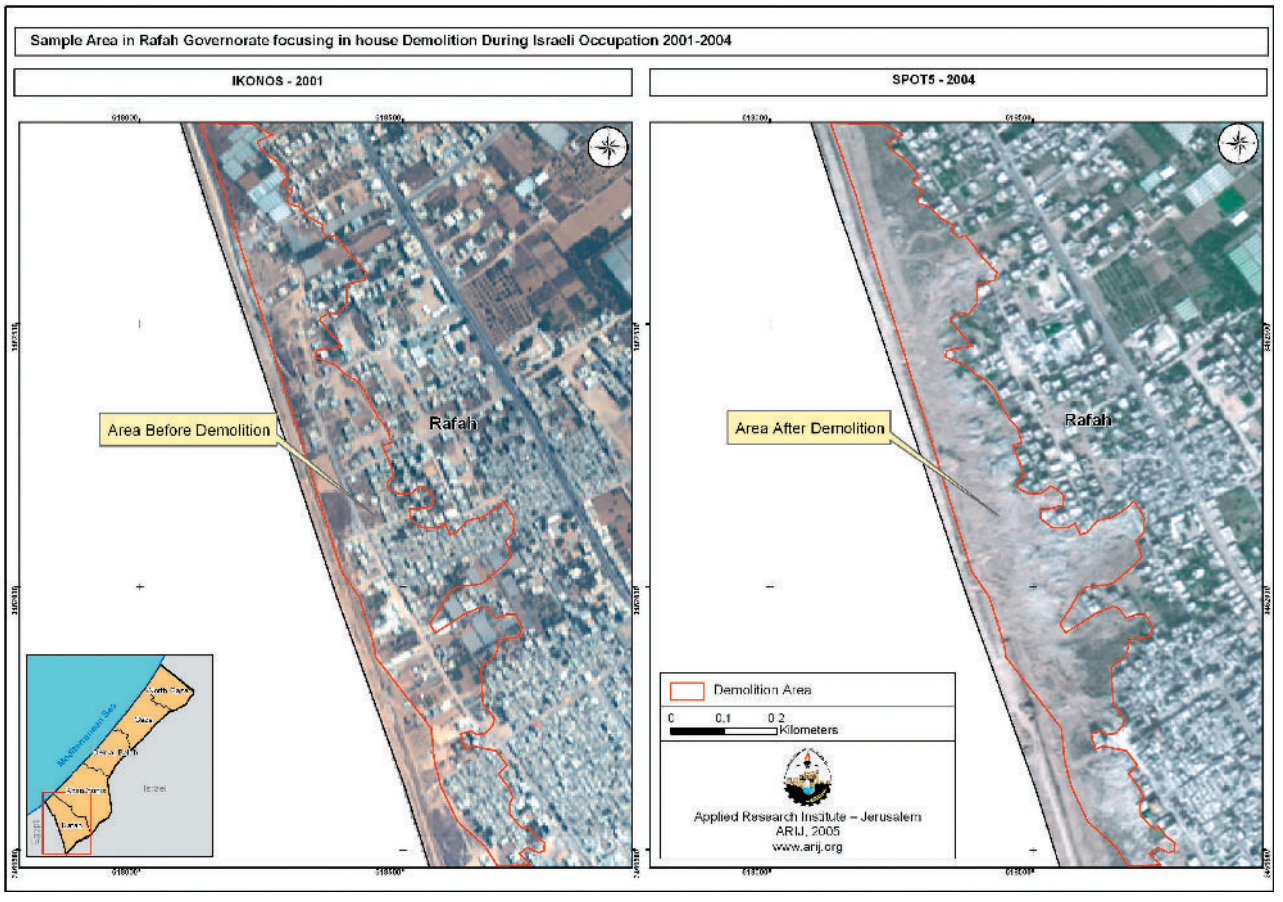


Figure (2-24): Expansion of Israeli colonies in Rafah Governorate during 2001-2004

In the Gaza Strip, most Palestinian agricultural lands are located adjacent to colonies or colonies' bypass roads network and are often under the threat of confiscation by the IOF. In Rafah Governorate, the IOF started constructing a Segregation Concrete Wall similar to the Wall that Israel is currently constructing in the West Bank. This Wall is located along Gaza's southern border with Egypt and the colony of Rafia Yam in the south. The Wall was originally constructed on Palestinian land adjacent to the Rafah refugee camp where the Wall was constructed at the expense of expropriation and destruction of Palestinian land and private properties and destruction of a number of greenhouses which resulted in the complete destruction of the agriculture sector in the Rafah Governorate.

Between October 2000 and the end of May 2004, Israel demolished at least 1,476 buildings (mainly homes), causing approximately 14,700 people to be displaced and made homeless. Israel has continued its policy of mass home demolitions in Rafah following May 2004, causing the displacement of many more Palestinian residents, (ARIJ, 2004), see map (2-14)



Map (2-14): Destruction of Palestinian agricultural land, greenhouses and private properties and houses

The shaved area by the IOF in Rafah Governorate increased by 120% in 2004 (2,442 dunums) from 2003. The IOF bulldozed 968 dunums of Palestinian agricultural lands in 2004 and the area shaved from the open spaces was equal to 3,010 dunums, while the built-up area shaved (demolished houses) was 316 dunums besides other areas shaved that were equal to 191 dunums, see figure (2-25). Most of the destruction occurred adjacent to Israel's Segregation Wall along the southern border with Egypt in addition to the shavings that occurred around the Israeli colonies of Gush Katif block.

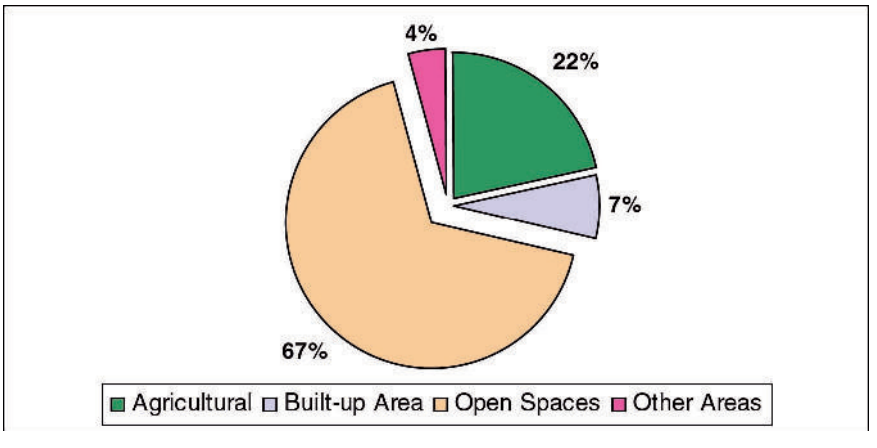
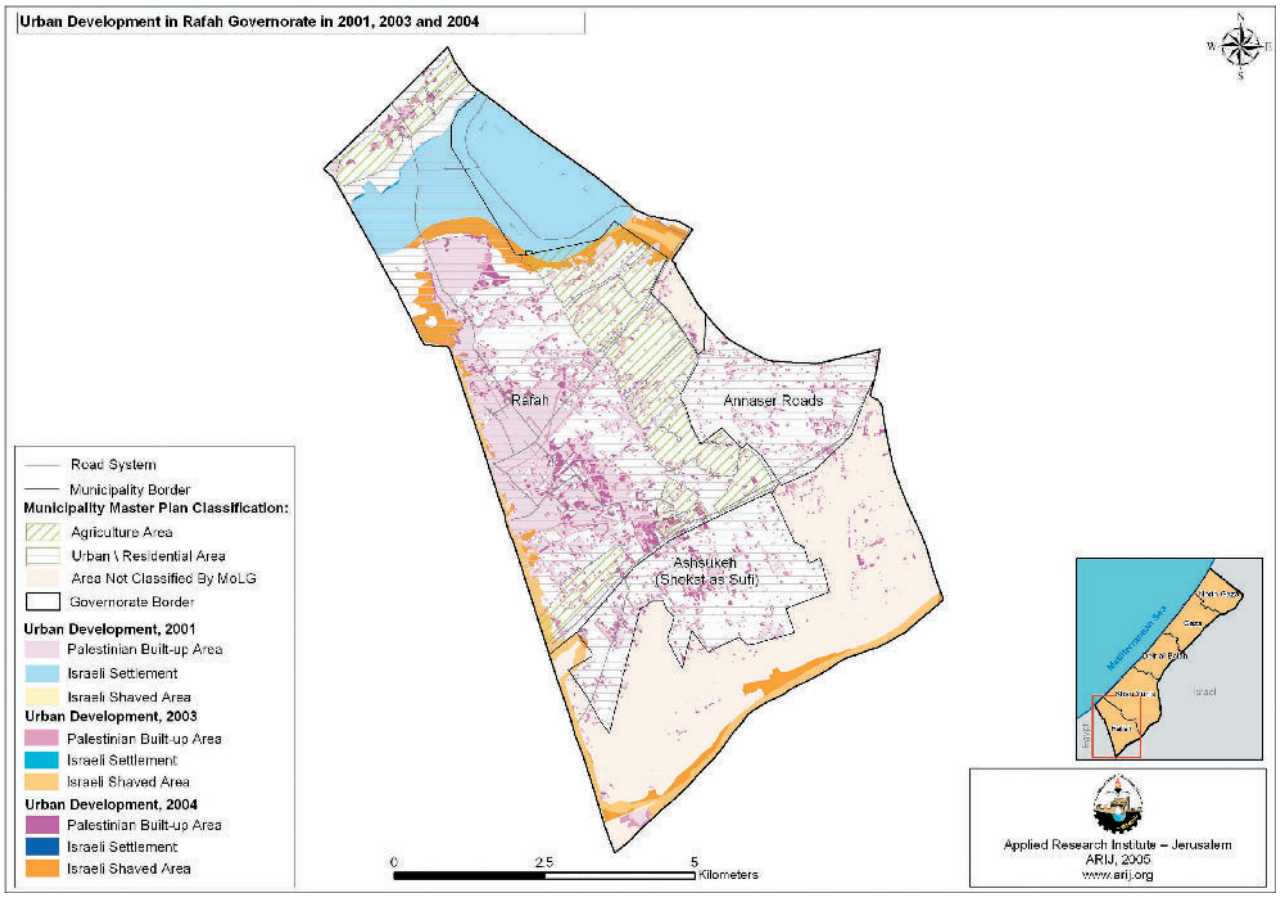
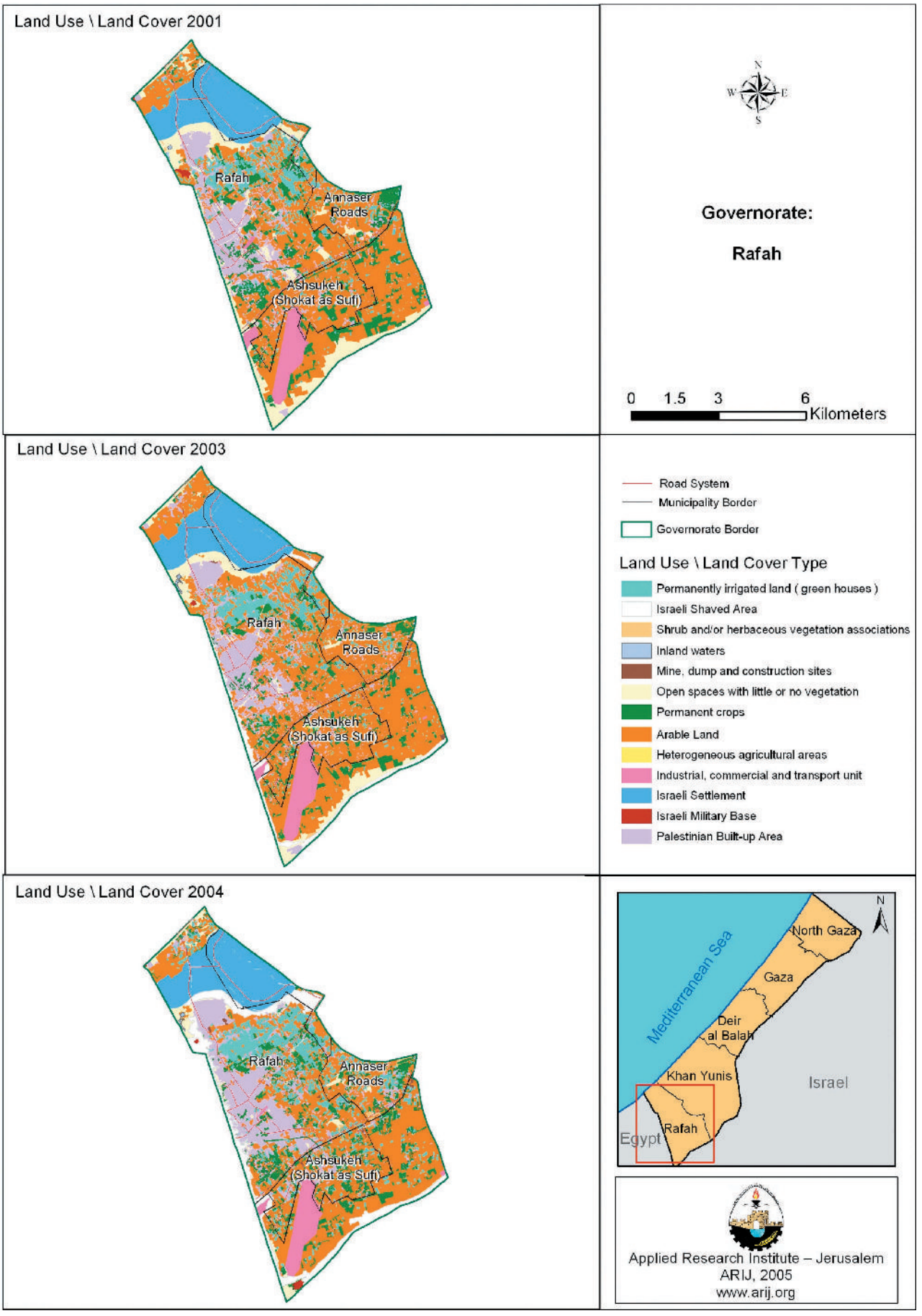


Figure (2-25): Distribution of different land uses within the shaved area in Rafah Governorate in 2004



Map (2-15): Urban development during 2001-2004 in Rafah Governorate



Map (2-16): Land use / land cover changes during 2001-2004 in Rafah Governorate

2.4. Conclusion

Over the past 5 years urban expansion in the Gaza Strip Governorates has been significant. Within the defined target area of the Gaza Strip, the area of urban land use increased by 25% between 2001 and 2004 to cover 21.1% of the Gaza Strip total area in 2004 (from 16.9% in 2001). Table (2-9) shows the percentages of the Governorates lands covered by built-up areas in years 2001 and 2004. Such an observed phenomenon indicates that the demand for new urban development is high in Palestinian Territory. Nevertheless, if not well managed, this growth is likely to cause many problems in the future given the upgrading of urban infrastructure needed to accommodate the new development. Therefore, more focus on urban planning and management is needed to accommodate the expected future development. The potential costs will be high if the existing absence of urban planning issues is not addressed soon enough.

Table(2-9): Percentage of the Governorates' areas covered by net built-up area in year 2001 and 2004

Governorate	Percentage of Governorate area	
	2001	2004
Dier al Balah	16.2	20.3
Gaza	26.8	32.7
North Gaza	17.9	22.5
Khan Yunis	12.2	15.7
Rafah	13.1	16.2
Total	**16.9**	**21.1**

The research findings - as analyzed from satellite SPOT 5 and IKONOS images - indicate that there have been two phases of urban development in the Gaza Strip Governorates, from 2000 to 2003 and from 2003 to 2005. The second phase was characterized by a boost in the rate of urban growth. The reason for this transition is believed derive from the social and economic conditions of the Palestinians living in the Strip which have encouraged the horizontal typology of urban expansion rather than vertical typology. Moreover, different financing institutions participated in urban development through providing loans to Palestinians who needed to build new houses or for investment purposes. In addition, international institutions, especially the Governments of Saudi Arabia and United Arab Emirates, assisted in building new housing units for those who lost their houses through the aggressive house demolition process carried out by the IOF.

The political situation has had a major influence on urban development in the Gaza Strip. Israeli actions of land confiscation, house demolition and tree uprooting for building colonies, security buffer zones and walls, have been highly significant. Furthermore, Israeli control over parts of the Occupied Territory has limited integrated planning throughout the region, and the formulation and implementation of comprehensive developmental plans. The instability of political conditions and intermittent political crises has added to this lack of planning.

The research has depicted the trends of the Israeli colonizing activities in the Gaza Strip Governorates. The Palestinian built-up area will be doubled to comprise approximately 48% of the Gaza Strip total area from 2004 to 2025. The findings indicate that the growth rate in colonizing activities - especially in Israeli colonies, military bases and area shaved - has increased since the year 2001 to occupy about 32% of the Gaza Strip total area in 2004. However, In August 2005, the IOF have withdrawn from the areas in the Gaza Strip that were under Israeli control. Chapter four provides detailed information about the "Unilateral Disengagement Plan", its implementation, the issue of border crossings and the impact of the plan on the natural resources and the socio-economic conditions in the Strip, and highlights the future of the Strip after the Israeli withdrawal. On the other hand, chapter three presents the predictions of possible future directions of Palestinian urban development and population scenarios in figures and offers models of the area suitable for future urban development, under current situation and under peace scenarios.

CHAPTER THREE

FUTURE DIRECTION OF URBAN GROWTH (DEVELOPMENT) ANALYSIS AND PERSPECTIVES

So far this research has given an indication of the significant changes which have been brought about by urban growth over the last five years. An investigation of the land cover in the Gaza Strip Governorates has been qualified and quantified.

In the future there will, undoubtedly, be further urban expansion in the study area. Hence, the future urban development has been estimated taking into consideration future population scenarios which are also projected until 2025. The purpose of this chapter is to make realistic projections of the possible future directions of urban growth and to model how this development could be best accommodated in a spatial manner in the Gaza Strip. In particular, the aim here is to locate those areas that are most suitable for urban growth using a spatial GIS-based model. However, from the urban planning point of view, the aim is not to design individual buildings within a city, nor to seek to create a "perfect city". Rather, this modeling is proposed to help the decision makers who shape the urban and regional fabrics of society to pursue their own plans, according to their own sets of criteria, whilst, trying to avoid unwanted side-effects of unplanned development.

3.1. Population Projections

Future population projections including births, deaths and the net migration for each Governorate in the Gaza Strip were obtained from the Palestinian Central Bureau of Statistics (PCBS) till year 2015. Data from the 1997 mid-year population was used as a base year in the population projections where actual census data was collected. The updated assumption of births, deaths and net migration[16] rates from 1997 to 2015 for the Gaza Strip was adapted into a linear regression (linear interpolation) model to project them up until 2025. The demographic equation[17] has been adapted to measure the population growth and change in terms of the two essential components - natural increase and net migration, where natural increase refers to the births and deaths in population growth.

Figure (3-1, a & b) shows the total population projections for the medium growth scenario in the Gaza Strip from 1997 to 2025. For convenience and a better illustration the years: 2000, 2005, 2010, 2015, 2020 and 2025 were used for the analysis. Three future population projection scenarios were put forward by using different assumptions on the future direction of birth, death and net migration rates[18], to project the population in the Gaza Strip and its Governorates. The scenarios are:

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[16] According to PCBS definitions, the net migration is the net effect of immigration and emigration on an area's population in a given time period, expressed as on increase or decrease.

[17] **The Demographic Equation is as follows:**

$\text{Population}_{\text{Time 2}} = \text{Population}_{\text{Time 1}} + \text{Natural Increase} + \text{Net Migration}$

where: $\text{Natural Increase} = \text{Births}_{\text{between Time 1 and Time 2}} - \text{Deaths}_{\text{between Time 1 and Time 2}}$

$\text{Net Migration} = \text{Immigration}_{\text{between Time 1 and Time 2}} - \text{Emigration}_{\text{between Time 1 and Time 2}}$

Immigration: the process of entering one country from another to take up permanent or semi permanent residence

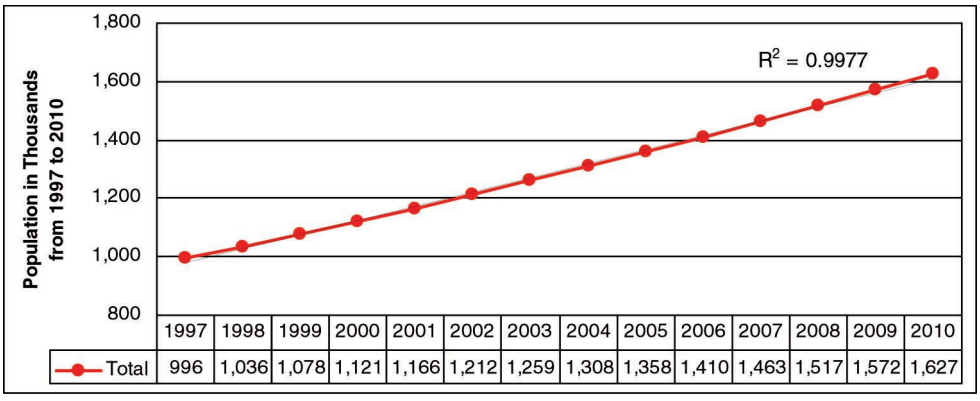
Emigration: the process of leaving one country to take up permanent or semi permanent residence in another.

[18] The birth, death and net migration rates used in the projections are based on the PCBS data published in July 200, http://www.pcbs.gov.ps/Portals/_pcbs/populati/demd4.aspx

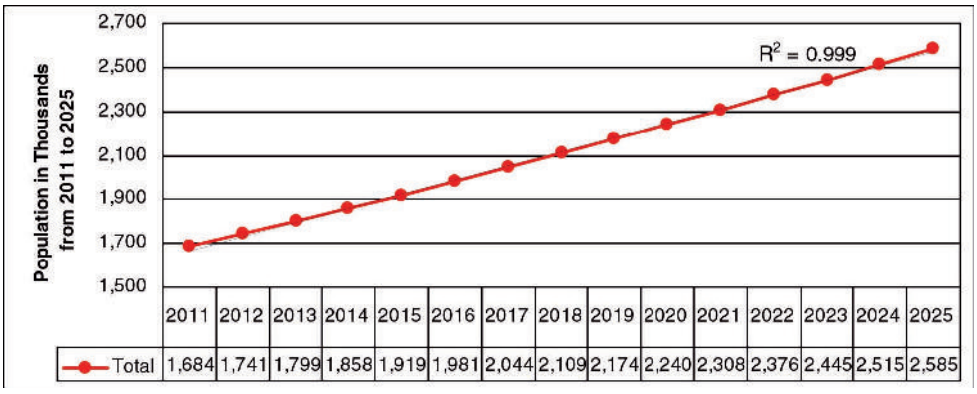
- **Low Growth Scenario**: This scenario assumes that the growth in the population will slow down as a result of long-term trends such as declining birth rates (*the birth rate is assumed to decrease by 0.5% from 2005 to 2025),* increasing death rates (*the death rate is assumed to increase by 0.33% from 2005 to 2025)*, and no change in net migration rates from 2000 to 2025.

- **Medium Growth Scenario:** This scenario assumes that the population growth rates will remain constant in the future; and that the decline in birth rates will offset with the increase in the death rates, and the flow of a limited number of people from outside the Palestinian Territory.

- **High Growth Scenario:** This scenario assumes that population growth will be faster in the future. The scenario is based on the assumption that a large number of refugees will return to the Gaza Strip between 2005 and 2025 after the Israeli withdrawal, and also assumes a very low rate of out-migration as a result of improved economic conditions. This scenario assumes that about 7 per 1,000 of the Palestinian Diaspora will return to the Gaza Strip yearly. On the other hand, the natural population increase will remain constant as in the case of the medium growth scenario.



(a)



(b)

Figure (3-1): Population projection in the Gaza Strip according to the medium growth scenario: (a) from 1997 to 2010, (b) from 2011 to 2025

According to figure (3-1 a & b), the total population projection in the medium growth scenario in the Gaza Strip has an R-squared[19] (R^2) value equals 0.997 in the period 1997-2010 and 0.999 in the period 2011-2025, illustrating the linear growth in the total population of the Gaza Strip.

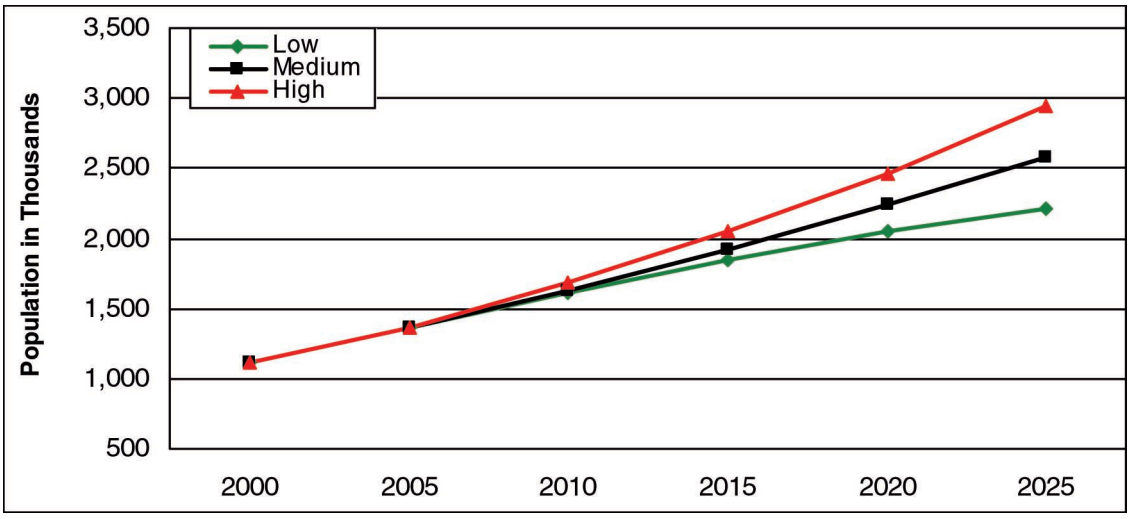


Figure (3-2): Projected total Palestinian population in the Gaza Strip till 2025

Although 1997 was the base for the projection, 2005 will be used as a base year for analyzing the results. The analysis for the three scenarios prepared is based on the assumptions of birth, death and international migration[20] rates. In the low growth scenario, the population in the Gaza Strip is projected to increase by 18.4%, 35.8%, 50.9% and 62.4% in 2010, 2015, 2020 and 2025 respectively from 2005 onwards. However in the medium growth scenario, population is projected to increase by 19.8%, 41.2%, 64.9% and 90.3% in 2010, 2015, 2020 and 2025 respectively from 2005 onwards. While in the high growth scenario, the population is projected to increase by 23.6%, 50.5%, 81.6% and 116.7% in 2010, 2015, 2020 and 2025 respectively from 2005 onwards. R^2 values for the three scenarios (regression lines) were noticeably very high and approximately 0.99, see figure (3-2).

3.2. Built-Up Area Projections: Land Needs for Population Growth Scenarios

The three scenarios of low, medium and high growth were also used in projecting the future built-up area. To study the trend of urbanization in the Gaza Strip Governorates, built-up area data was calculated from IKONOS and SPOT 5 images and plotted against the years from 2000 to 2005. The data that resembled a linear equation was used to project the future built-up area for the medium growth scenario, see figure (3-3).

[19] If R-squared =1 then this indicates that the model accounted for almost all of the variability with the variable specified in the model.

[20] International migration is affected by political and economic factors operating inside and outside of the Palestinian Territory.

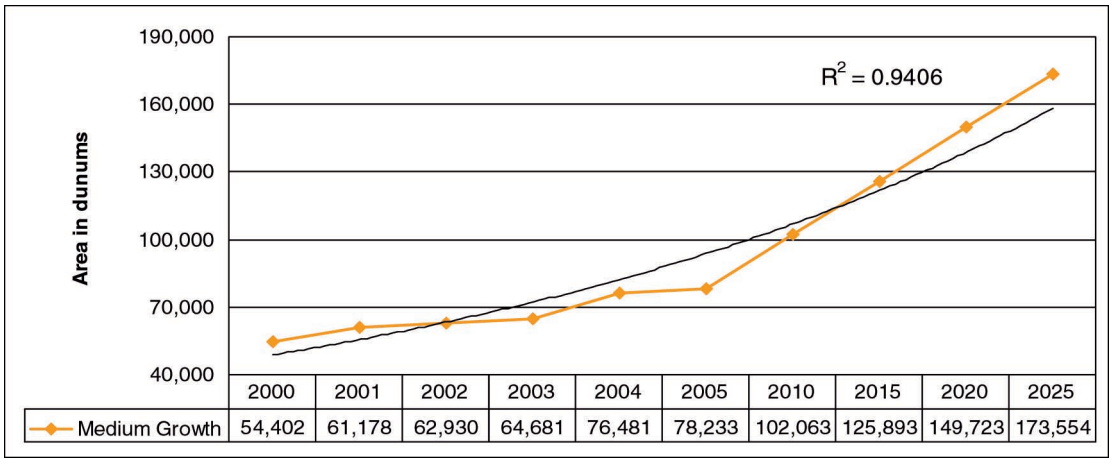


Figure (3-3): Actual and projected built-up area of medium growth scenario in the Gaza Strip from 2000 to 2025

The projected built-up area up until the year 2025 in the medium growth scenario was used to project the built-up area for the low and high growth scenarios and calculate the future directions of urban growth which had an R^2 value of about 0.94, see figure (3-4).

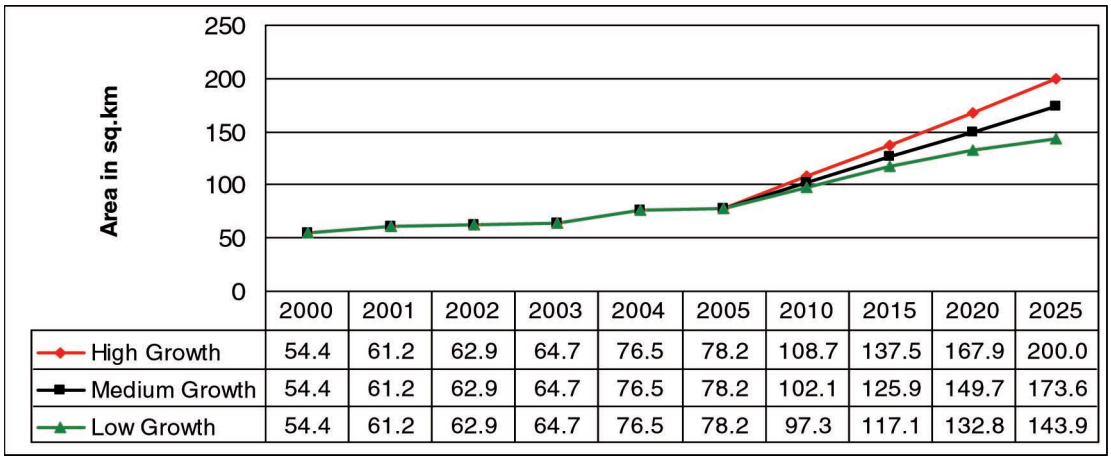
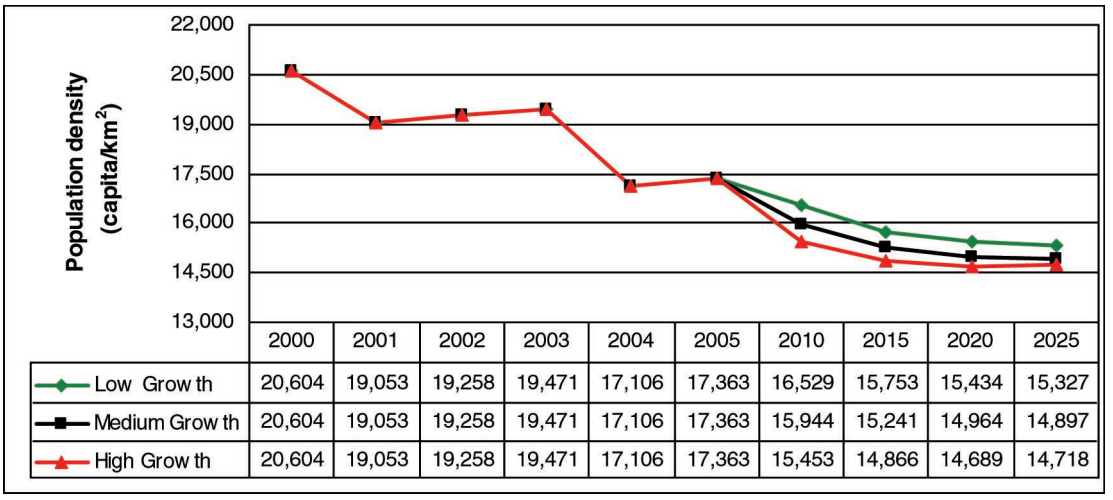


Figure (3-4): Actual and projected total built-up area of the three scenarios in the Gaza Strip from 2000 to 2025

Based on the population and built-up area projections for the three different scenarios, the land needed for the built-up area per capita was calculated as follows:

- **Low Growth Scenario:** It was assumed that the economic situation will decelerate as a result of long-term trends in declining birth rates, and slow economic growth with no change in net migration rates. Thus, the vertical expansion housing typology will continue to control; and will lead to a decrease in the built-up area and an increase in population density since the increase in population is higher than the increase in built-up area, see figure (3-5).
- **Medium Growth Scenario:** It was assumed that the existing economic situation will remain the same with a parallel growth of population and built-up area.
- **High Growth Scenario:** It was assumed that under peace the economic situation will be improved where foreign investment will be encouraged especially from Palestinians living abroad and

returnees. Housing finance institutions will function more effectively for construction and housing projects. On the other hand, investors and developers will support single households by providing loans, or on their own affordability, to build in a horizontal expansion typology in order to meet the population growth and housing needs. Therefore, the population will increase at a slower rate when compared with the increase in the built-up area, leading to a decrease in population density, see figure (3-5).

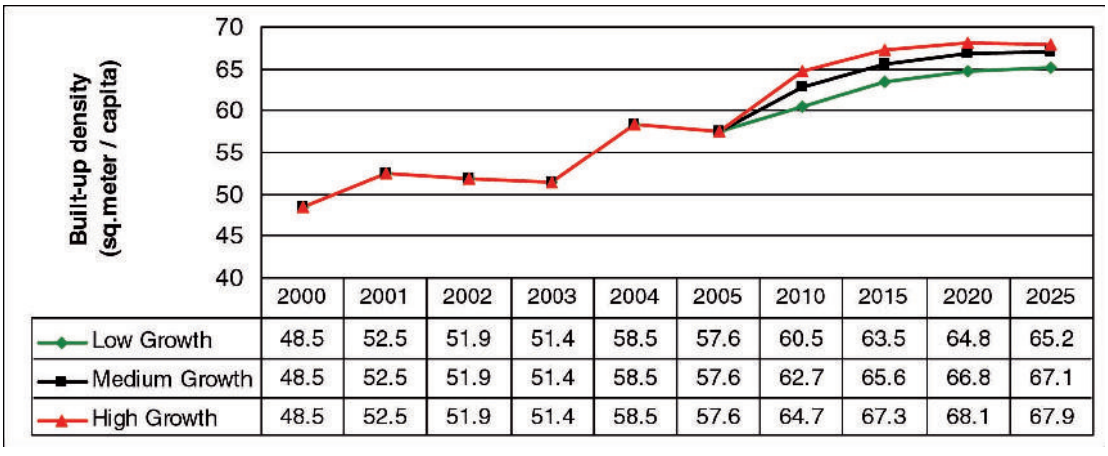


	2000	2001	2002	2003	2004	2005	2010	2015	2020	2025
Low Growth	20,604	19,053	19,258	19,471	17,106	17,363	16,529	15,753	15,434	15,327
Medium Growth	20,604	19,053	19,258	19,471	17,106	17,363	15,944	15,241	14,964	14,897
High Growth	20,604	19,053	19,258	19,471	17,106	17,363	15,453	14,866	14,689	14,718

Figure (3-5): Average of projected net population density in the Gaza Strip until 2025

It has been observed, from the projected population density chart, see figure (3-5), that in the low growth scenario the population density is high in the year 2005 before it drops. This is because of the financial conditions which put constraints on building and the increase in the population density by more than it is in the medium growth in the years 2010, 2015, 2020 and 2025. In the medium growth scenario, the population density is projected to decrease from the year 2005, however, it will be more than the population density of the high growth scenario till 2020, while it starts to become close to the value of the high growth scenario in 2025. In the high growth scenario the population density is projected to drop in the year 2005, this is because of the increase in the built-up area due to the projected good financial conditions and investment. The transformation in the typology of buildings from mainly vertical to horizontal causes the population density to decrease in the years 2010, 2015, 2020 and 2025, see figure (3-5).

The projected built-up area required per capita was calculated for the three growth scenarios. In the low growth scenario, the built-up area per capita in 2000 was 48.5 m^2/capita which dramatically rose to 57.6 m^2/capita in 2005 and gradually increased to 60.5, 63.5, 64.8 and 65.2 m^2/capita in years 2010, 2015, 2020 and 2025 respectively. In the medium growth scenario it was projected that the built-up density will rise to 57.6, 62.7, 65.6, 66.8 and 67.1 m^2/capita for the years 2005, 2010, 2015, 2020 and 2025 respectively. The analysis revealed that in the high growth scenario, the built-up area per capita is projected to increase noticeably compared with year 2005 to reach 64.7, 67.3, 68.1 and 67.9 m^2/capita in years 2010, 2015, 2020 and 2025. This increase in the m^2/capita indicates that more of the horizontal expansion is taking place or, on the other hand, that the rate of increase in the population is becoming less than the rate of increase in the built-up area. Thus, in the low growth scenario, the population growth is becoming larger than the rate of increase in the built-up area as a result of the vertical expansion in the built-up area, see figure (3-6).



	2000	2001	2002	2003	2004	2005	2010	2015	2020	2025
Low Growth	48.5	52.5	51.9	51.4	58.5	57.6	60.5	63.5	64.8	65.2
Medium Growth	48.5	52.5	51.9	51.4	58.5	57.6	62.7	65.6	66.8	67.1
High Growth	48.5	52.5	51.9	51.4	58.5	57.6	64.7	67.3	68.1	67.9

Figure (3-6): Average of projected built-up density in the Gaza Strip until 2025

According to UNRWA reports in 2005, there are 961,645 registered refugees in Gaza Strip; where 471,555 registered refugees are living in eight camps in the Gaza Strip. (UNRWA, March 2005) The registered refugees form about 69% of the total Palestinian population in the Gaza Strip (the registered refugees in camps is about 40% of the total Palestinian population in the Gaza Strip) and the growth rate of the population in the camps is about 2%. This low growth is resulted from continues leaving of people which are forced to leave the camps due to overcrowding and the lack of space to build new housings. The built up areas in the camps are approximately 8,730 dunums which create a population density equal to 54,015 capita/km^2 of the total refugee camps built-up area compared with 17,485 capita/km^2 for the Gaza Strip built-up area. In addition to the overcrowding in the camps, the living standards, infrastructure and the level of services in the camps is extremely poor.

Table (3-1) shows the population density in the Gaza Strip Governorates and its camps, the table illustrates that the population density in camps is high compare with the population density in the Governorates. For example, in Gaza Governorate there is one camp (Beach camp) with a built-up area equal 825 dunums (ARIJ, 2005) and with a registered refugee population equaling 78,768 persons. This creates a population density equal 95,476 capita/km^2 while the population density in Gaza Governorate equal 19,577 capita/km^2. This level of urban density doesn't fit with any living standards all over the world and totally unsustainable. If the situation remains unchanged, it could lead to disaster in camps in terms of living standards.

Table (3-1): Population density for the Gaza Strip Governorates and its camps

Governorate	Population density/ Governorates	Population density/camps
North Gaza	18,690	49,926
Gaza	19,577	95,476
Deir al Balah	16,702	55,931
Khan Yunis	14,779	35,757
Rafah	16,443	55,438
Gaza Strip (average)	17,485	54,015

3.3. The Housing Units Needed by the Year 2010 Based on Households Projections

Table (3-2) shows the projected number of households and housing units in the Gaza Strip from 2000 to 2010 which was done by the PCBS in 2005. Figure (3-7) shows the existing households by housing density (i.e. number of household / housing units) in year 2004. The households and housing unit projections assume that the average size of a household is decreasing yearly by 0.05 person. It is noticed from the table that in year 2005 the number of households and the number of housing units is around 213,814 and 237,963 respectively and in year 2010 the projected number of households and the number of housing units is about 267,646 and 297,875 respectively. The data shows that from 2000 to 2005, about 50,330 new housing units were needed; projections show that in the next five years (from 2006 to 2010) about 48,745 new housing units will need to be constructed. So, if the current socio-economic conditions continue to negatively prevail and the number of households continues to increase, a deficit in the housing units will definitely be encountered, and this will lead to deteriorating living conditions for Palestinian households.

Table (3-2): Projected number of Households and Housing Units in the Gaza Strip from 2000 to 2010

Year	Number of Households	Number of Housing Units
2000	168,591	187,633
2001	177,333	197,362
2002	185,921	206,920
2003	194,865	216,874
2004	204,158	227,217
2005	213,814	237,963
2006	223,847	249,130
2007	234,276	260,737
2008	245,071	272,751
2009	256,193	285,130
2010	267,646	297,875

Source: PCBS, 2005

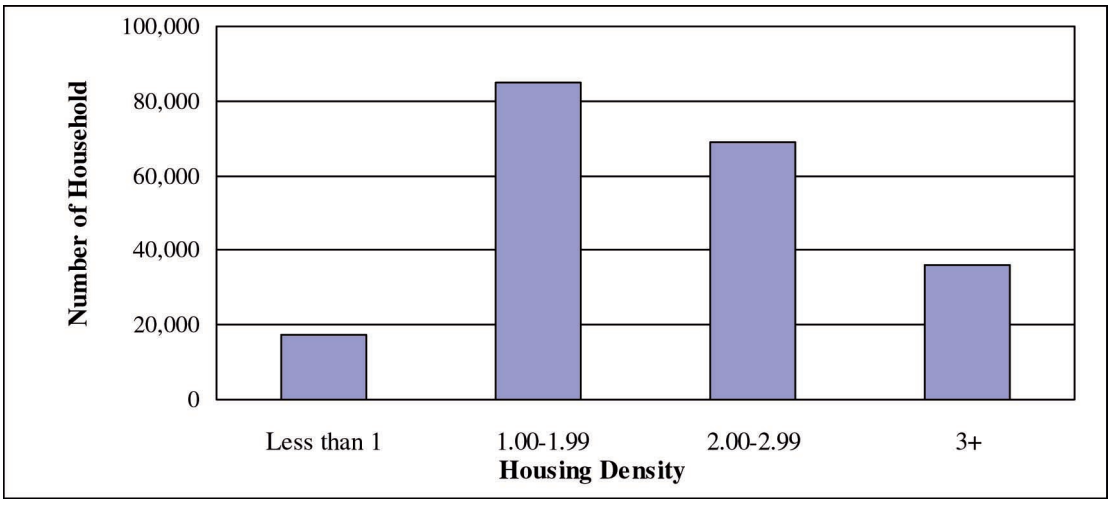


Figure (3-7): Existing households by housing density (Number of household / housing unit) in the Gaza Strip for year 2004

3.4. Future Projection at Governorate Level

Projections of built-up area and population were created for each Governorate in the Gaza Strip for the three scenarios: low, medium and high growth, by using the linear trend (linear interpolation) in the projections. Projections of population with the assumptions of birth, death and international migration rates were performed for each Governorate in the Strip for the three scenarios. The built-up area was projected based on the population projections so as to fit the built-up area with the increase in the population of the Gaza Strip. In analyzing the three scenarios and their projected values performance and correlation by Governorate it was noticed that the Governorates' performance in the low, medium and high growth scenarios had the same trend direction. It was chosen that the high growth scenario will be used in the following analysis since it is the most extreme case, see figure (3-8). However, table (3-3) shows the projected population according to the

three different scenarios in the years 2000, 2005, 2010, 2015, 2020 and 2025 by Governorate, while table (3-4) summarizes the built-up area development estimations for the three different scenarios in the same time span by Governorate.

Table (3-3): Projected population according to the three different scenarios by Governorate in the Gaza Strip

Governorate	2000	2005	Population in thousands											
			2010			2015			2020			2025		
			Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Deir al Balah	162	197	233	235	243	267	278	296	297	324	357	319	374	426
Gaza	403	488	578	585	603	663	690	735	737	805	887	793	929	1,058
North Gaza	201	244	289	292	301	331	344	367	368	402	443	396	464	528
Khan Yunis	220	267	316	320	330	362	377	401	403	440	484	433	508	578
Rafah	135	163	193	196	202	222	231	246	246	269	297	265	311	354
Total	**1,121**	**1,358**	**1,608**	**1,627**	**1,679**	**1,845**	**1,919**	**2,044**	**2,050**	**2,240**	**2,467**	**2,205**	**2,585**	**2,944**

Table (3-4): Built-up area development estimations according to the three different scenarios by Governorate in the Gaza Strip

Governorate	2000	2005	Built-up area in dunums											
			2010			2015			2020			2025		
			Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Deir al Balah	8,166	11,838	14,788	15,510	16,571	17,846	19,183	21,105	20,273	22,855	25,935	21,994	26,528	31,059
Gaza	17,731	24,378	29,580	31,025	33,147	35,046	37,671	41,445	39,312	44,318	50,291	42,254	50,964	59,670
North Gaza	9,474	13,807	17,295	18,140	19,381	20,907	22,473	24,725	23,778	26,806	30,419	25,817	31,139	36,458
Khan Yunis	12,050	18,403	23,603	24,756	26,449	28,941	31,109	34,226	33,231	37,462	42,511	36,327	43,815	51,299
Rafah	6,981	9,807	12,044	12,632	13,496	14,380	15,457	17,006	16,217	18,282	20,746	17,500	21,108	24,714
Total	**54,402**	**78,233**	**97,310**	**102,063**	**109,043**	**117,120**	**125,893**	**138,506**	**132,811**	**149,723**	**169,901**	**143,892**	**173,554**	**203,200**

The future population projections showed that Gaza Governorate recorded the highest number of population with 488,172 persons, which is projected to increase by 117% by 2025 of an annual increase of about 28,497 capita/year in 2025 from 2005 see table (3-5) and figure (3-9). Gaza Governorate was followed by Khan Yunis, North Gaza, Deir al Balah and Rafah Governorates, see figure (3-8). Nevertheless, Rafah Governorate has the lowest number of population with 163,274 persons, which is projected to increase by 2025 to reach 353,895 persons, with an annual increase of 9,531 capita/year in 2025 as shown in figure (3-9).

Table (3-5): Projected built-up area and population in 2005 by Governorate in the Gaza Strip

Governorate	Year 2005	
	Built-up (dunums)	Population
Deir al Balah	11,838	196,507
Gaza	24,378	488,172
North Gaza	13,807	243,705
Khan Yunis	18,403	266,724
Rafah	9,807	163,274
Total	**78,233**	**1,358,382**

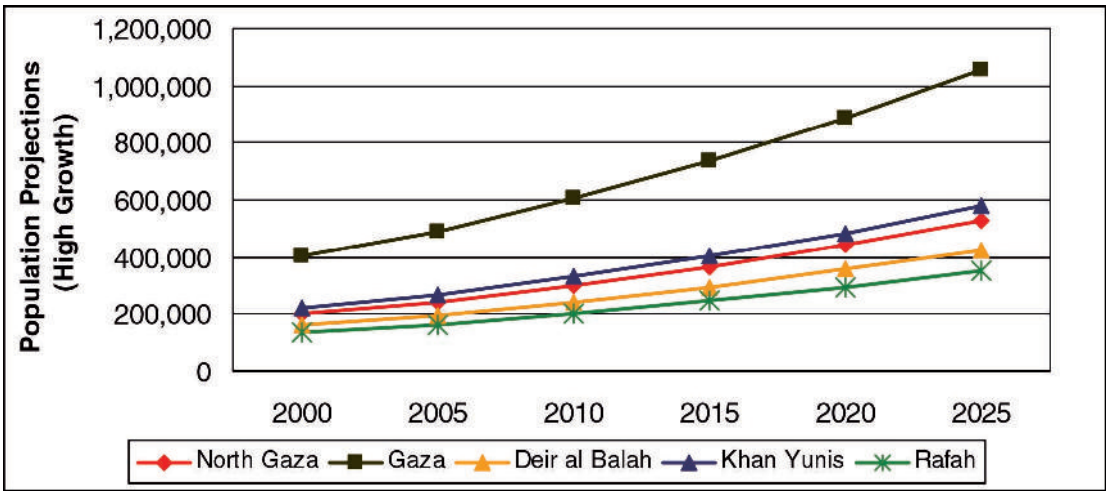


Figure (3-8): Projected population of high growth scenario by Governorate

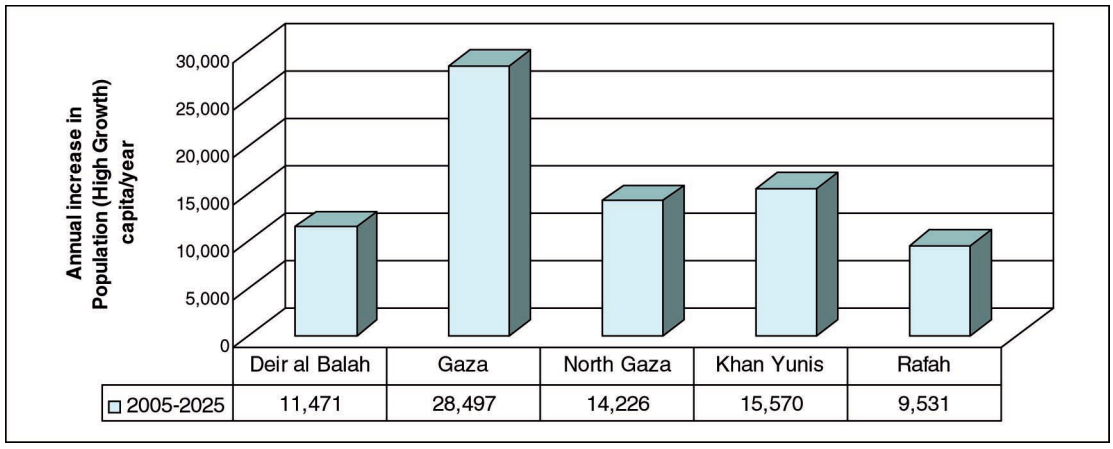


Figure (3-9): Projected annual increase in population from 2005 to 2025 of high growth scenario by Governorate

The result of the future projections of the built-up area revealed that Gaza Governorate also has the highest amount of built-up area with 24,378 dunums in 2005 with an annual increase in built-up area equal to 1,765 dunums/year to reach 59,670 dunums in 2025, see table (3-4) and table (3-5). The other Governorates are descending in an order starting from Khan Yunis, North Gaza, Deir al Balah and Rafah Governorates with 1,645, 1,133, 961 and 745 dunums/year respectively, see figure (3-10). It has been observed that Rafah Governorate has the lowest amount of built-up area (i.e. 9,807 dunums) and the lowest amount of annual increase in built-up area (i.e. 745 dunums/year) in the period between 2005 and 2025.

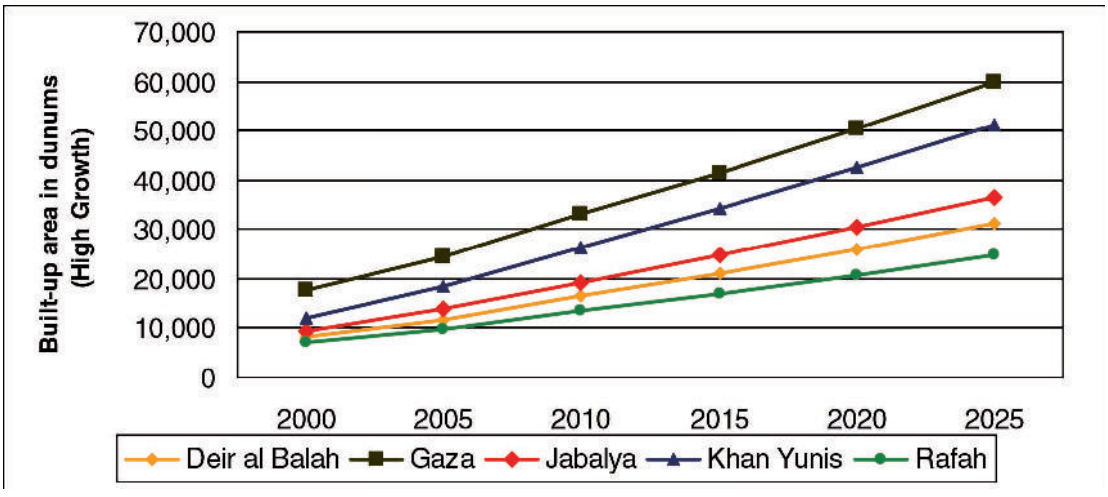


Figure (3-10): Projected built-up area of high growth scenario by Governorate

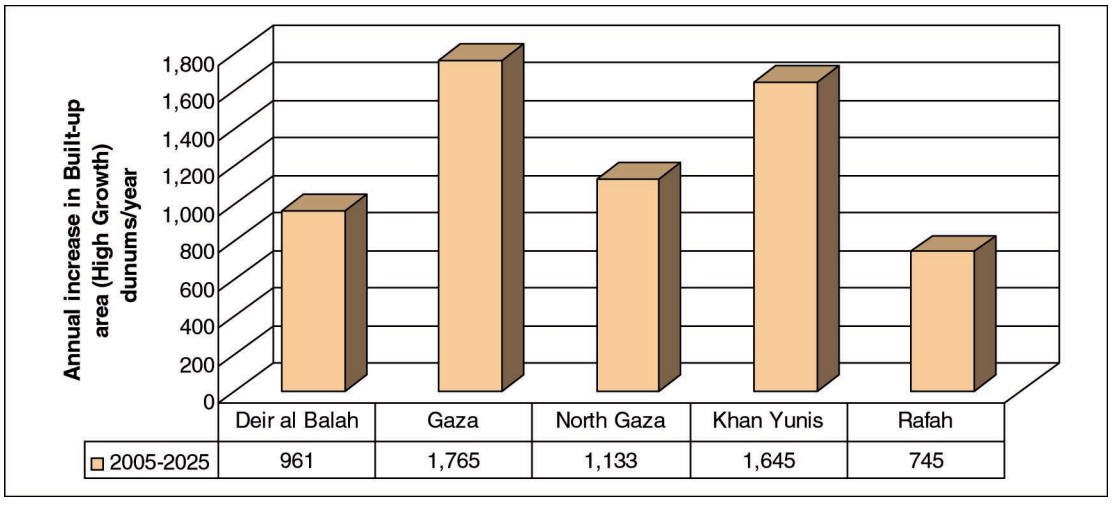


Figure (3-11): Projected annual increase in built-up area from 2005 to 2025 of high growth scenario by Governorate

Figure (3-12) shows that Khan Yunis Governorate has the highest percentage of built-up area growth with a value of 179% in the period between 2005 and 2025, and Gaza Governorate has the lowest percentage of built-up area growth with value of 145% while it has the highest amount of built-up area. North Gaza has the second highest percentage of built-up area growth with a value of 164% followed by Deir al Balah and Rafah Governorates with the values of 162% and 152% respectively in the same period.

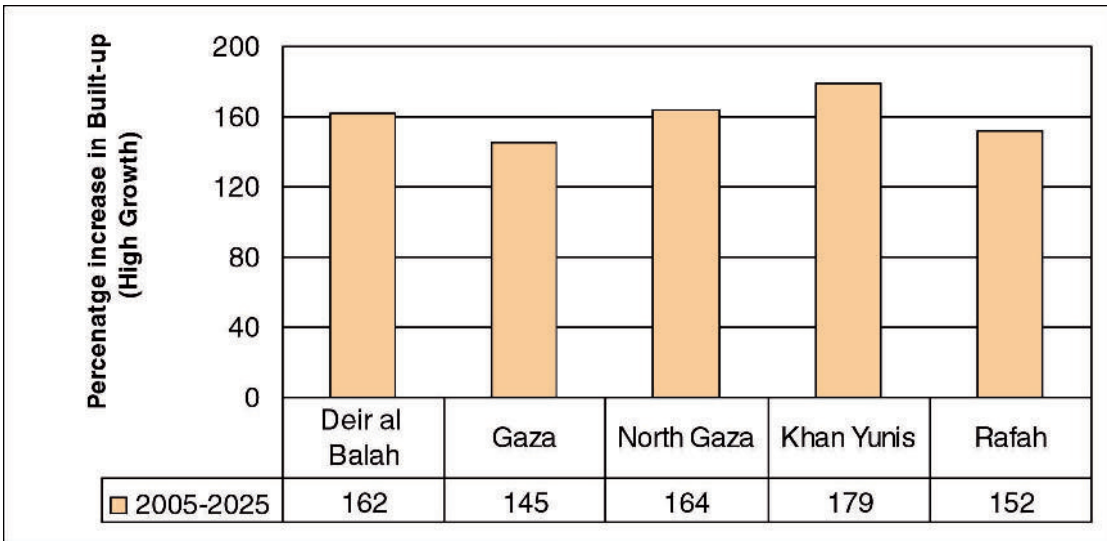


Figure (3-12): Projected percentage of increase in built-up area in 2025 compared with year 2005 of high growth scenario by Governorate

Figure (3-13) illustrates the projected population densities for the high growth scenario in capita/km^2 from 2000 to 2025 by Governorate. Gaza has the highest population density which means that the population growth rate is greater than the growth rate of built-up area or that the people are tending to build more vertical buildings. However, due to the urban nature of Gaza Governorate - which is considered the urban center of the northern region - it is more likely that the second reason might be more valid. North Gaza Governorate comes second in regard to the population density, followed by the Governorates of Rafah, Deir al Balah and Khan Yunis which has the lowest population density, in contrast to its large area among the Gaza Strip Governorates, see figure (3-13).

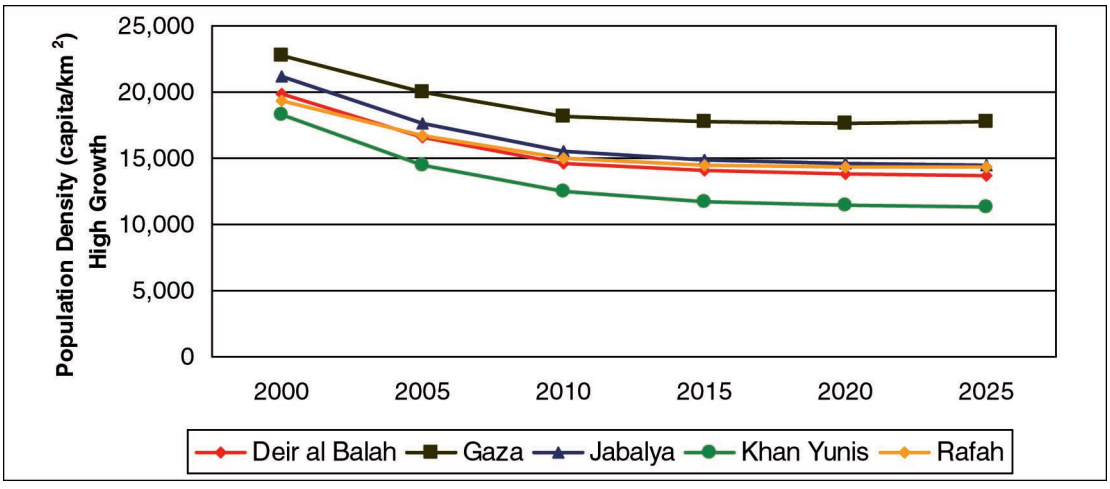


Figure (3-13): Projected population density of high growth scenario by Governorate

3.5. Land Available for Future Urban Development

Given that it was a primary goal of this study to model future urban development in the Gaza Strip, by trying to locate those areas that are most suitable for urban expansion, a suitability map was prepared using a GIS-based model. GIS, as the basis of a planning support system, can assist in the identification of suitable land for urbanization, given a number of GIS layers. Each of these layers reflects a certain criteria advised by the

planner that is thought to have a direct influence on the potential site for urban development. Therefore, the site (defined as a pixel in space) of urban activity is thought of as a function of a number of factors, each of which has its own influence (weight) on the importance of the site to become a potential urban area (Kuiper 1999). Thus some factors may prevail and others may fail to influence the sites selection; the balance of these factors will define the overall importance of a site for urban development.

The approach carried out was the sum weighted modeling approach, using the spatial analyst module in ArcGIS 9. Here, factors which contribute to the suitability of sites for urbanization were carefully selected. The factors were limited to those which could be represented both spatially and as quantitative values that could be weighted. Hence, for example, demographic change could not be included. The factors were assigned a weighting from 1 to 4 based on the extent to which they indicated suitability for urban development. A value of *one* indicates a high suitability for urban development, while a value of *four* is not suitable for urban development. The key factors selected were re-sampled to 90 meters, the pixel size of the DTM[21] used in the analysis, was as follows:

1. The Geopolitical Classification of Land

This classification reflects the political constraints on urban development. Therefore, the areas under complete Palestinian control were defined as the area most desirable for Palestinian expansion and assigned a low weighting (value of 1). However, the remaining area of the Gaza Strip was assigned a high rating (value of 4) indicating its unsuitability for Palestinian urban development since this area is under Israeli control, which comprises of Israeli colonies, Israeli colony area, yellow area, Israeli military bases and security zone.

2. Water Quality

Water quality - in terms of nitrate and chloride concentrations - was utilized in the model and was calculated for the Gaza Strip identifying the areas of good and bad water qualities. Water quality is a crucial factor in locating new sites for development. The presence of such a variable in the model will enable wise planning of new urban areas, so that they are developed in a way that will not have a destructive influence on surface and ground water and the quality of water in the region in general. This layer was created by interpolating the data of water quality on nitrate and chloride concentrations of wells in the Gaza Strip as published in the Palestinian Water Authority report in 1999 (see map (4-6) in chapter 4). The produced grid layers of nitrate and chloride concentrations were re-sampled to 90 meters.

3. Land use / Land cover (LULC) (as derived from IKONOS Scenes)

Land use / land cover (LULC) depicted from SPOT 5 image in 2004 is a further important factor in the model. The output was grided to 90 meters and coded from 1 to 4 based on the suitability of land for urban development. Designated agricultural land was coded with a high weight whilst those of less importance were coded with low weight values.

When the built-up area was delineated from the SPOT 5 image, the whole area which includes the built structures and the surrounding open spaces was considered within the already existing built-up area. It is worth mentioning that built-up area land use was assigned a low weight (most suitable for urban development) because the priority in urban development was given to this area in the form of infill and vertical expansion above and among the existing structures. In this context, the suitable area modeled will be the very first option for the future urban growth of the Palestinian communities.

4. Master Plan (Land Zoning Restrictions)

The master plan boundaries (municipal borders) of Palestinian localities in the study area were obtained from the Ministry of Local Government (MoLG) in the Gaza Strip as AutoCad files. These were georeferenced to UTM WGS84 and transformed into a grid layer. The classification of the obtained master plans included

[21] DTM: Digital Terrain Map

urban, agricultural urban and agricultural areas where low grid value was assigned to those located within the urban designated areas, while high value was assigned to the agricultural and urban agricultural regions discouraging Palestinian urban development. The presence of this variable will promote urban development in areas which are already classified as urban areas according to the master plan boundaries.

5. SOIL TYPE

Soil type was included in the model in an attempt to define the boundaries of the fertile soil required for agricultural purposes so as to prevent it from being exposed to urban development. On the other hand, areas with poor soil types were assigned a low grid value so as to promote urban development on these surfaces. Soil cover was resampled to 90 meters grid size to be compatible with the rest of the datasets.

6. PROTECTED AREA

It was crucial to include the designated nature reserves in the model due to the influence which they have upon the sustainability of the natural resources in the region. On-screen digitizing was applied to a map produced by the Ministry of Planning (MoP) to extract the data on nature reserves in the Strip and create a grid layer – re-sampled to 90 meters for compatibility – where a high grid value was assigned to the cells located within the nature reserves boundaries and low value for the outer cells.

7. REGIONAL ROADS

The regional road GIS layer was taken into consideration and buffered to 80 meters in order to hinder urban development within the assigned buffer zone while promoting it outside the zone.

8. SECURITY BUFFER ZONE

A security buffer zone grid layer of one kilometer which extends along the northern, eastern and southern borders of the Gaza Strip was created and resampled to 90 meters where Palestinian urban development would be encouraged in the area outside the buffer zone. This factor was considered for a proposal under peace scenario.

3.5.1. Suitability Scenarios

Although the model is fairly simple and weighting factors were subjectively assigned, the results are useful starting points from which to identify the most appropriate sites for future urban expansion and development. Three suitability scenarios were generated for the Gaza Strip. The first scenario refers to the **previous settings (under occupation)** and reflects the geopolitical situation before the Israeli withdrawal from the Strip, considering the classification of it to areas under Israeli control (116.7 km^2) and Palestinian Authority control (246 km^2). It is worth noting that the weighting procedure of the land use / land cover types in the Gaza Strip took into account the shaved area by Israel in 2004 as a constraint adding limitations to Palestinian urban development.

However, the second scenario developed is the **current status quo (Israeli Unilateral Disengagement)** which presents the situation of the Gaza Strip after the Israeli withdrawal from the occupied areas including the Israeli colonies, military bases and other areas which used to be under Israeli control. In this scenario the Israeli colonies and military bases were assigned a low weight to become suitable for urban development. A security buffer zone of one kilometer along the borders between the Gaza Strip and Israel was also considered and included in this scenario to hinder urban development within its border[22]. Although political constraints were eliminated in this scenario, the impact of other environmental factors such as land use / land cover and natural reserves as well as the influence of master plans were increased in this suitability scenario.

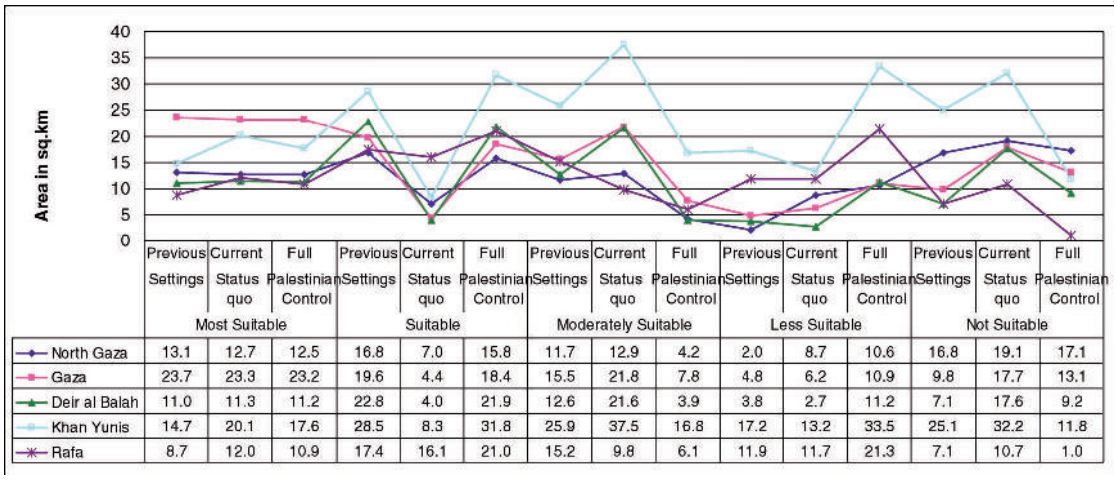
[22] Refer to chapter four for more information about the "Unilateral Disengagement Plan"

Since the Gaza Strip has a small area with limited suitable areas for urban expansion, a third urban scenario which assumes the restoration of Palestinian rights was developed. This scenario is referred to as **full Palestinian control (over the whole Gaza Strip)**. This scenario attempted to reduce restrictions over agricultural areas which were otherwise marked as not to be used future urban development. Therefore, the results of the three scenarios were translated into maps where suitability for urban development was sorted into five categories as follows: most suitable, suitable, moderately suitable, less suitable and not suitable areas.

The maps of the three scenarios (see maps (3-1, 2, 3, 4 & 5) generated indicate that the spatial distribution of the sites suitable for development is compatible with most of the sites where development has already taken place. This shows that the various factors used in the modeling process had an influence which has already encouraged urban development in the built-up area region to become a potential urban area considering vertical and infill expansion.

The superimposition of the built-up area over scenario 1 (previous settings) also indicates that most of the Israeli colonies have been established in areas with a low suitability for urbanization. The majority of the Israeli colonies are built over areas with grid values of 3 and/or 4, which represent highly sensitive regions especially for water quality, soil and agriculture, see maps (3-1, 2, 3, 4 & 5). Hence, building in these regions may have a negative impact on the natural land and water resources.

The following paragraphs analyze the results of the scenarios in relation to the future urban trends projected above under different population scenarios (in section 3.4). This is in order to evaluate what practical information the scenarios can provide for planning purposes. Figure (3-14) plots the areas available for urban development in the different suitability scenarios in km^2 by Governorate.



	Most Suitable			Suitable			Moderately Suitable			Less Suitable			Not Suitable		
	Previous Settings	Current Status quo	Full Palestinian Control	Previous Settings	Current Status quo	Full Palestinian Control	Previous Settings	Current Status quo	Full Palestinian Control	Previous Settings	Current Status quo	Full Palestinian Control	Previous Settings	Current Status quo	Full Palestinian Control
North Gaza	13.1	12.7	12.5	16.8	7.0	15.8	11.7	12.9	4.2	2.0	8.7	10.6	16.8	19.1	17.1
Gaza	23.7	23.3	23.2	19.6	4.4	18.4	15.5	21.8	7.8	4.8	6.2	10.9	9.8	17.7	13.1
Deir al Balah	11.0	11.3	11.2	22.8	4.0	21.9	12.6	21.6	3.9	3.8	2.7	11.2	7.1	17.6	9.2
Khan Yunis	14.7	20.1	17.6	28.5	8.3	31.8	25.9	37.5	16.8	17.2	13.2	33.5	25.1	32.2	11.8
Rafa	8.7	12.0	10.9	17.4	16.1	21.0	15.2	9.8	6.1	11.9	11.7	21.3	7.1	10.7	1.0

Figure (3-14): Areas available for urban development for the three suitability scenarios by Governorate

Under the suitability 'previous settings' scenario, it was calculated that the total area suitable for urban development in the Gaza Strip equals 176.3 km^2, taking the first two classes (i.e. most suitable and suitable) as the optimum locations for urbanization, see table (3-6). Nevertheless, almost all of the projected *most suitable* sites were already utilized by the urban land use in 2004. In fact, the total built-up area in the Gaza Strip uses more than the most suitable area modeled under previous setting and full Palestinian control scenarios with 107% and 102% respectively, whilst 96% is covered under current status quo scenario. This limits the area available for future urbanization to around 99 km^2 when compared to the previous settings scenario. Unexpectedly, the analysis showed that the total area suitable for urban development (i.e. most suitable and suitable) in the Gaza Strip equals 119.2 km^2 under current status quo scenario decreasing the land suitable for expansion by 32.4% (57.1 km^2). However, the scenario under full Palestinian control, shows that

the area suitable for future urban development reached to 184 km^2 adding 107 km^2 of suitable area to be used for urban expansion, see table (3-6). A comparison between the Palestinian built-up area in 2004 and the suitable areas modeled for the three scenarios is illustrated in figure (3-15)

Table (3-6): Suitability Range for urban development in the Gaza Strip by scenario developed

Scenario	Area in Km^2				
	Most Suitable	Suitable	Moderately Suitable	Less Suitable	Not Suitable
Previous Settings	71	105	81	39	66
Current Status Quo	79	40	104	43	97
Full Palestinian Control	75	109	39	88	52

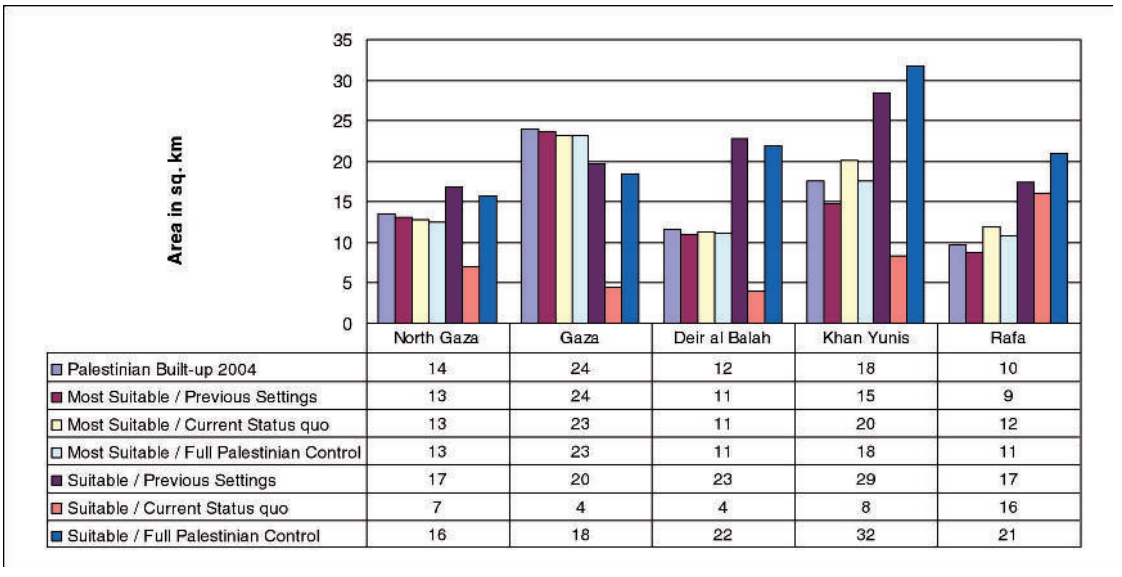
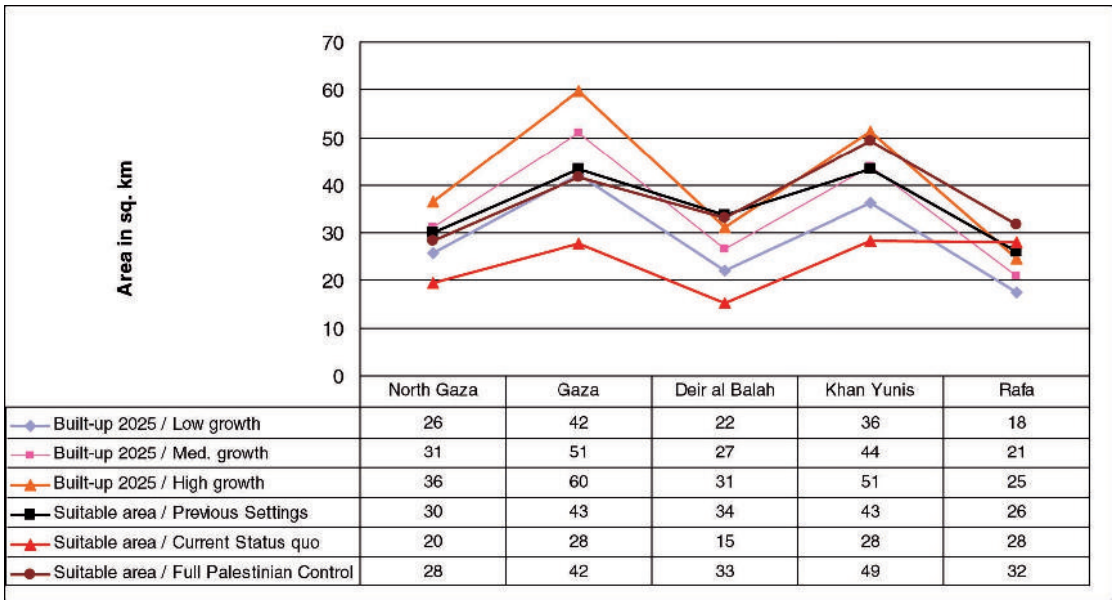


Figure (3-15): Palestinian built-up area in 2004 vs. modeled suitable area in the three scenarios

Under the low growth scenario of the Palestinian built-up area, the projected built-up areas in 2025 were less than the projected suitable area under previous settings scenario for all Governorates, but more than the suitable area under current status quo scenario in North Gaza, Gaza, Deir al Balah and Khan Yunis Governorates. In addition, the built-up area projected under this scenario is less compared to the suitable area projected under full Palestinian control scenario for all of the Gaza Strip Governorates, see figure (3-16).

Under the medium growth scenario, the projected built-up area in 2025 in North Gaza and Gaza Governorates exceeds the suitable area projected under the three scenarios but is less than the suitable area projected for Deir al Balah, Khan Yunis and Rafah Governorates considering the full Palestinian control scenario. On the other hand, the built-up area estimations of high growth till 2025 for the North Gaza, Gaza and Khan Yunis Governorates exceed the modeled suitable area for urbanization under the three suitability scenarios, while the built-up area in Deir al Balah Governorate is less than the suitable area under previous settings and full Palestinian control. However, it is worth noting that the built-up area estimations for Rafah Governorate in the low, medium and high growth scenarios are less than the modeled suitability values under the three suitability scenarios see figure (3-16).

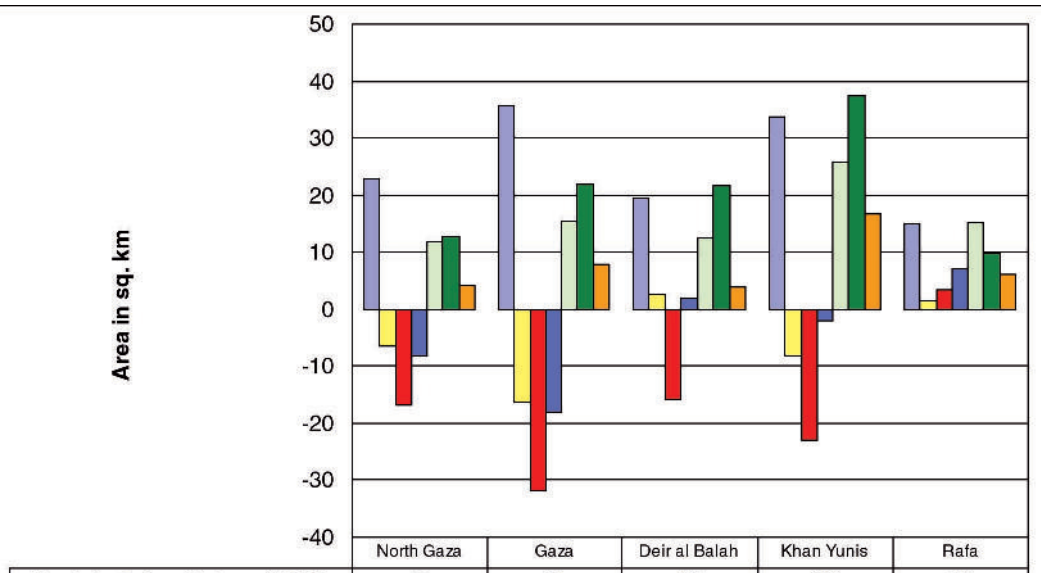


	North Gaza	Gaza	Deir al Balah	Khan Yunis	Rafa
Built-up 2025 / Low growth	26	42	22	36	18
Built-up 2025 / Med. growth	31	51	27	44	21
Built-up 2025 / High growth	36	60	31	51	25
Suitable area / Previous Settings	30	43	34	43	26
Suitable area / Current Status quo	20	28	15	28	28
Suitable area / Full Palestinian Control	28	42	33	49	32

Figure (3-16): Projected built-up area in the Gaza Strip in 2025 vs. the three suitability scenarios

Apparently and based on the suitability scenarios developed, the Gaza Strip is in a critical condition with regards to future Palestinian urban expansion. Regardless of which of the three suitability scenarios is applied, it does not make a significant difference to the area available for future urban development. This is due to several factors including the small size of the Gaza Strip and the limited areas of open space that might be utilized as built-up area. Surprisingly, the under current status quo scenario which proposed that the suitability of the lands used for Israeli colonies could mean that they too could be used for Palestinian urbanization, was the worst among the three proposed scenarios. Although the Palestinian Authority (PA) now controls the lands which were under Israeli control, this has not improved the situation of increasing the lands available for urban development to meet the projected future urban trends in the Strip. It is important to mention that this scenario has increased the urgency of the concept that the agricultural lands and natural resources must be preserved and not used for urban development. This has been deduced for several reasons. The agricultural areas are considered the main 'food basket' of the Strip; also, the agricultural sector is a very important source of employment opportunities. These factors combined are significant for reducing the Palestinian dependency on exporting agricultural products whilst also increasing Palestinian food security (http://withdraw.sis.gov.ps/arabic/gover_plane_6.html). However, the third scenario, under full Palestinian control, assumed that the agricultural areas in the Strip were moderately suitable for urban development, in order to overcome the problem of the limited area available, with great consideration for the natural resources and agricultural land use in the Gaza Strip.

Further analysis was conducted using the extreme case of future expansion (high growth scenario) to calculate the suitable area remaining for built-up area expansion till 2025 after removing the already existing built-up area in 2004, see figure (3-17). The results revealed that North Gaza, Gaza, Deir al Balah and Khan Yunis Governorates need 17, 32, 16 and 23 km^2 respectively of suitable area till year 2025 to accommodate the future urban expansion under current status quo scenario. Moreover, North Gaza, Gaza and Khan Yunis Governorates need 7, 16 and 8 km^2 respectively of suitable area till year 2025 to accommodate the future urban expansion under previous settings, and 8, 18 and 2 km^2 respectively under full Palestinian control scenario. The results, however, suggest that Rafah Governorate is less sensitive to the availability of future land for urban development than the other Governorates since it has 1, 3 and 7 km^2 of suitable land which would accommodate its future urban expansion, see figure (3-17).



	North Gaza	Gaza	Deir al Balah	Khan Yunis	Rafa
Remaining Built-up (high growth) 2025-2004	23	36	19	34	15
Additional area needed / Previous Settings	-7	-16	3	-8	1
Additional area needed / Current Status quo	-17	-32	-16	-23	3
Additional area needed / Full Palestinian Control	-8	-18	2	-2	7
Moderately Suitable / Previous Settings	12	16	13	26	15
Moderately Suitable / Current Status quo	13	22	22	37	10
Moderately Suitable / Full Palestinian Control	4	8	4	17	6

Figure (3-17): Needs of area suitable for future urban development (high growth) till 2025 vs. area moderately suitable for urban development by suitability scenarios and Governorate

Since four of the Gaza Strip Governorates would lack the necessary area available for future urban development, the analysis has included the areas categorized as moderately suitable for urban development as an alternative but crucial solution to the lack of area available, see figure (3-17). This implies forcing Palestinian urban development to be allowed to utilize areas classified sensitive for built-up land use. As a result, this situation is expected to cause a decline in valuable agricultural areas and fertile land within Governorates adding to the already significant impact on environmental sustainability, ecosystems and water resources. However, in order for future cities to grow on land that is suitable for development, by minimizing the amount of land consumed, urban planners should start to develop new strategies which will optimize the areas of developed land in an attempt to preserve the sustainability of natural resources and open spaces.

This was in relation to the built-up area alone. It does not take into consideration the green networks, parks, transportation networks, etc, which are an absolutely crucial need for the communities to function properly. It is important to emphasis that issues of where and how to build in addition to the lifestyle of the people affects the sustainability and well being of the Gaza Strip areas as a whole.

This model, therefore, highlights the impact of the Israeli presence on the restriction of the areas suitable for Palestinian urban expansion as well as the impact on the environmental status of the strip. Under pressure from the high population growth rates, the area available for urbanization is decreasing every year. Thus, the increase in the area of land that is suitable for urbanization projected in this scenario offers considerable potential for Palestinian expansion in order to accommodate future population growth, but at the expense of areas that would other wise be considered undesirable for development.

Nevertheless, future urban planning should not utilize the total amount of the projected suitable land for urbanization but should consider longer term sustainability, and how urban development can be achieved that will cope with rapid population growth over longer time periods.

The models and maps produced to study the suitability of Palestinian urban development provide a good opportunity to re-evaluate and assess Palestinian urban land use growth in relation to the locality master plans, providing the possibility of sketching new master plans which will accommodate future urban expansion. In addition, the generated models have the power to depict the areas with high potential for urban development taking into account environmental and natural resources restrictions. Furthermore, the generated maps of the three suitability scenarios should be considered as a powerful planning tool used by decision makers and urban specialists for future Palestinian urban development in the Gaza Strip.

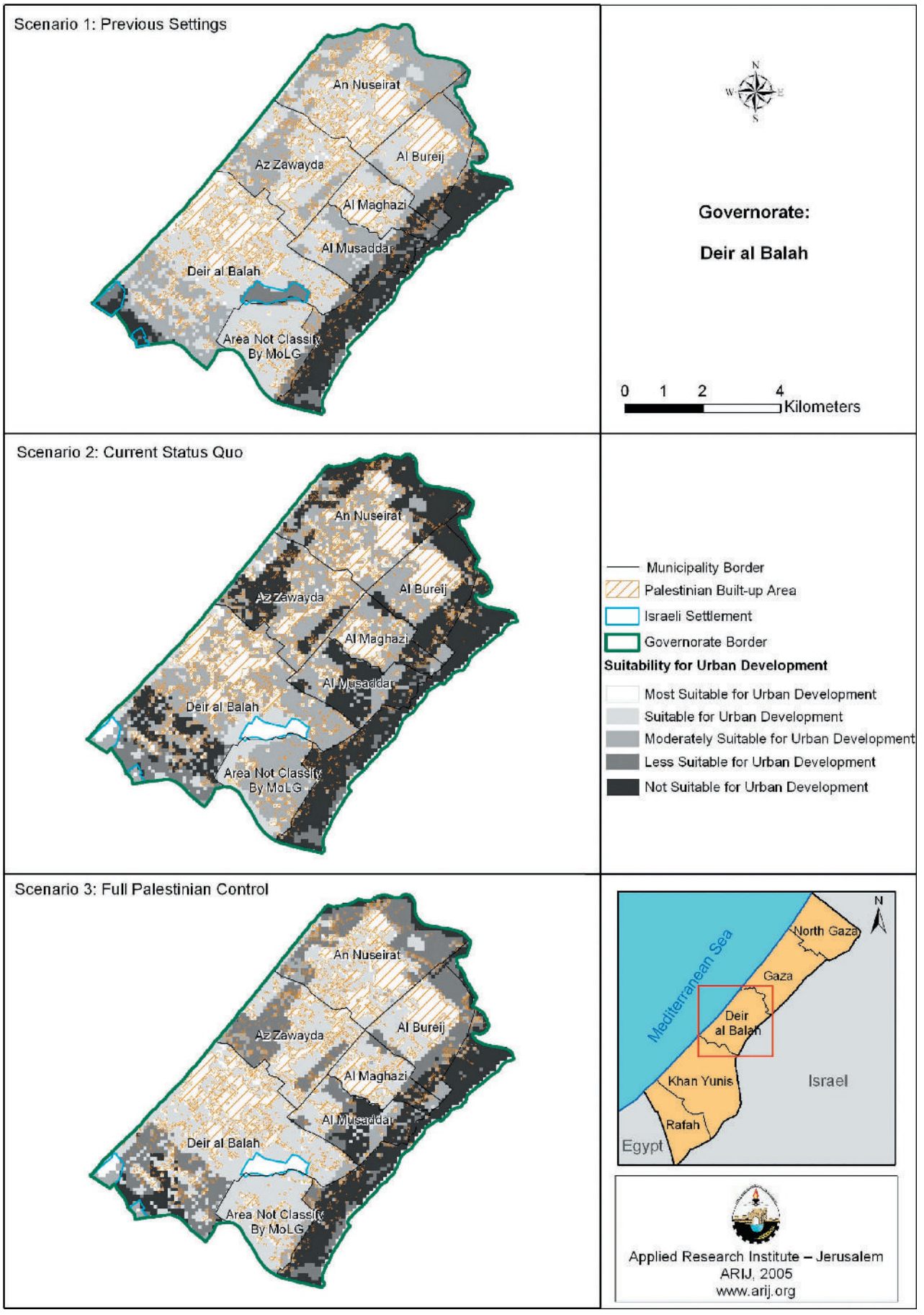
3.6. Conclusion

It is unlikely that the dramatic urban expansion witnessed over the past years will decline in the near future, since the population growth estimation indicates a large population increase in the future, which will in turn increase the pressure on land needs for future urban development. Urban development is highly correlated to population growth. The results indicate that urban development will be high under any of the projected population growth scenarios - high, medium or low. In the next 20 years it is estimated that urban development could increase from covering 21% of the Gaza Strip in year 2004 to covering 40%, 48% and 56% in 2025 under the low, medium and high growth scenarios respectively.

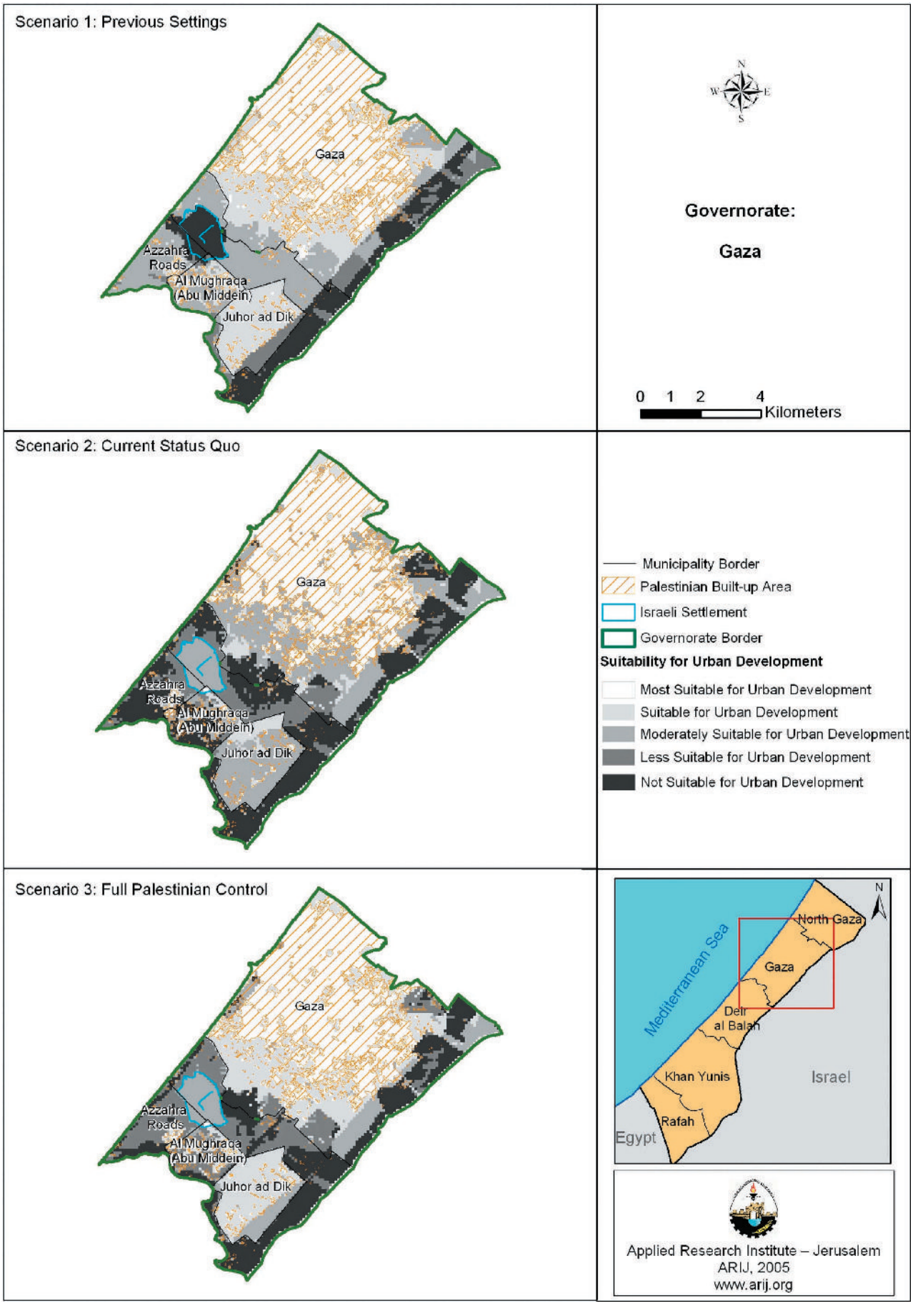
High population growth rates are likely to lead to the creation of new urban centers with most of the functional activities. This phenomenon can already be perceived in large localities and the newly declared municipalities. This implies that large cities such as the Governorates' main cities are the most likely to expand at the city suburbs. On the other hand, the villages around the main cities are also being transformed into smaller urban centers, since they are growing rapidly and starting to form agglomerations of Palestinian localities which contain the basic urban services and facilities.

The outcome of the suitability models for urban expansion show the most appropriate patterns of geographical extension of the Palestinian localities for future development. The results also indicate that the illegal presence of Israelis has a big impact on restricting the land available for development as well as other environmental and planning factors that were considered in setting the models. This implies that Palestinians have limited choice but to keep building within already exiting urban areas in the form of infill or vertical forms, building on water sensitive areas and exploiting agricultural land and the remnants of the limited open spaces. From an urban planning point of view, doing so will contradict any proper urban planning schemes and violate the standards of urban development at the expense of valuable land.

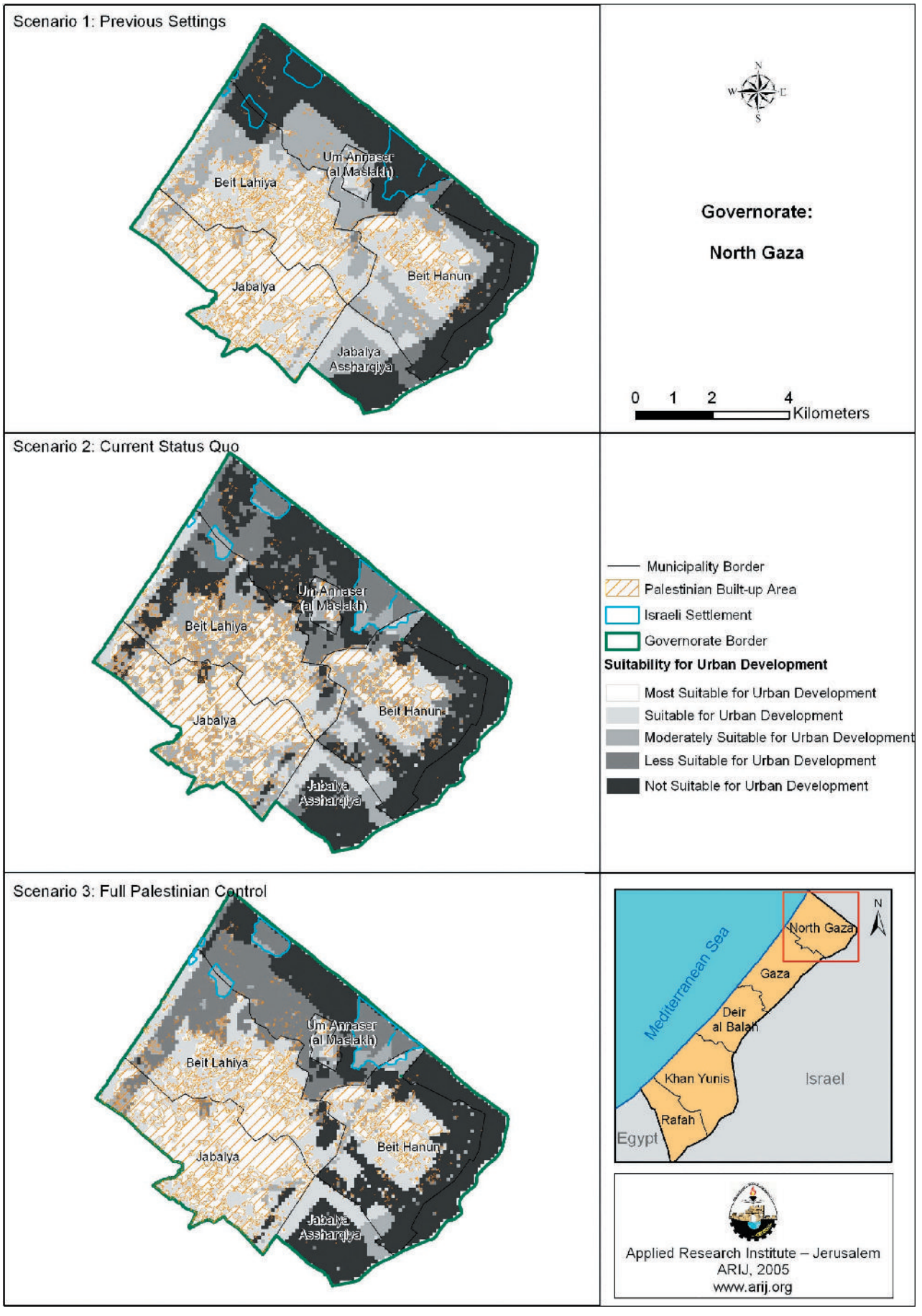
The large scale development and the projected expansion of built-up areas for the years 2010, 2015 and 2025, as forecasted in sections 3.2 and 3.4, indicates a serious threat to the natural resources. Therefore, careful planning for urban and rural expansion is needed to regulate these developments and to minimize the damage to the environment, with taking into consideration the Regional Plan for the southern Governorates 2005-2015 which was developed by Ministry of Planning and in cooperation with other Ministers and stakeholders so as to analyze the changes in the urban and population growth and optimize the utilization of available open space.



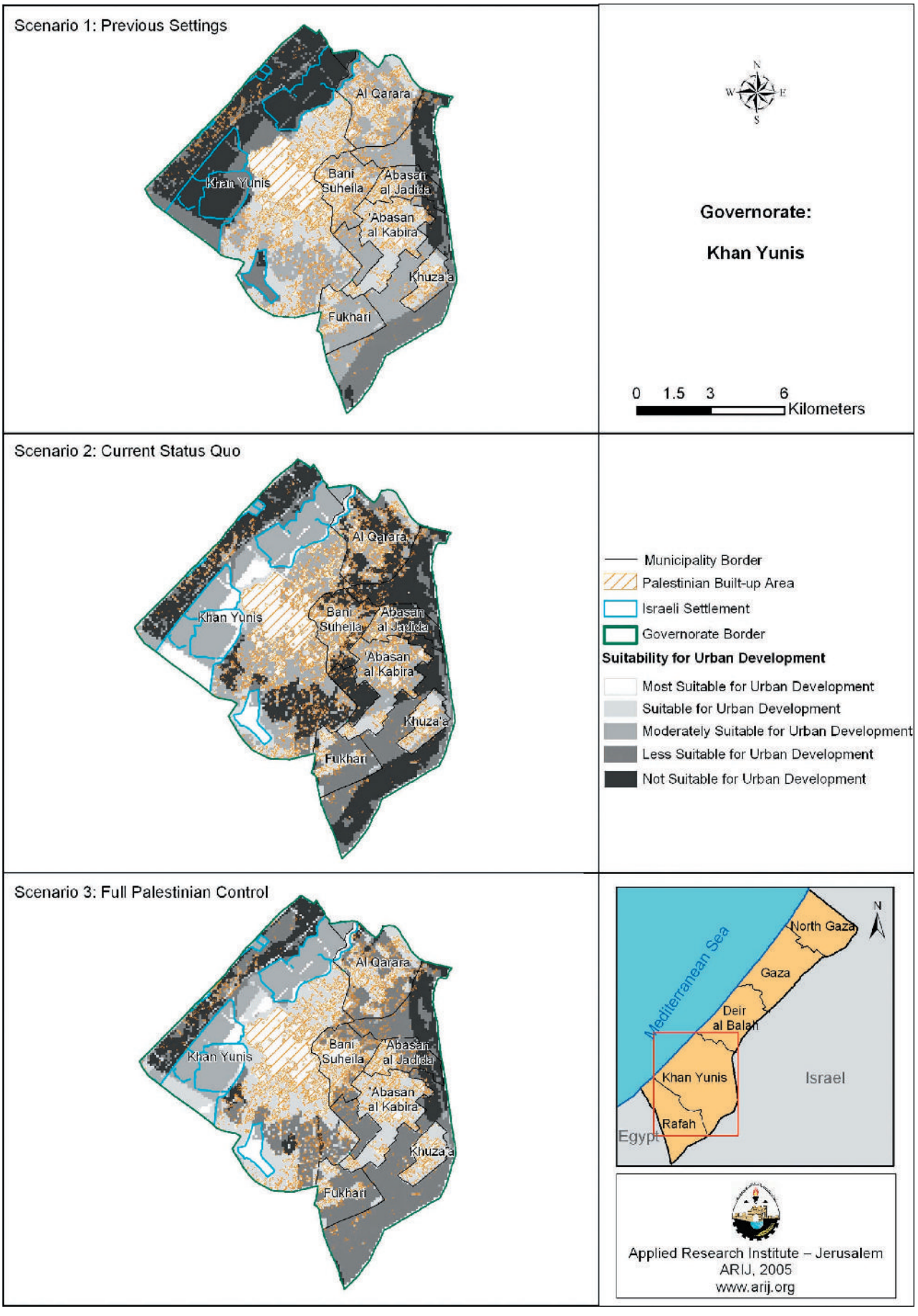
Map (3-1): Suitability scenarios for Palestinian urban development in Deir al Balah Governorate



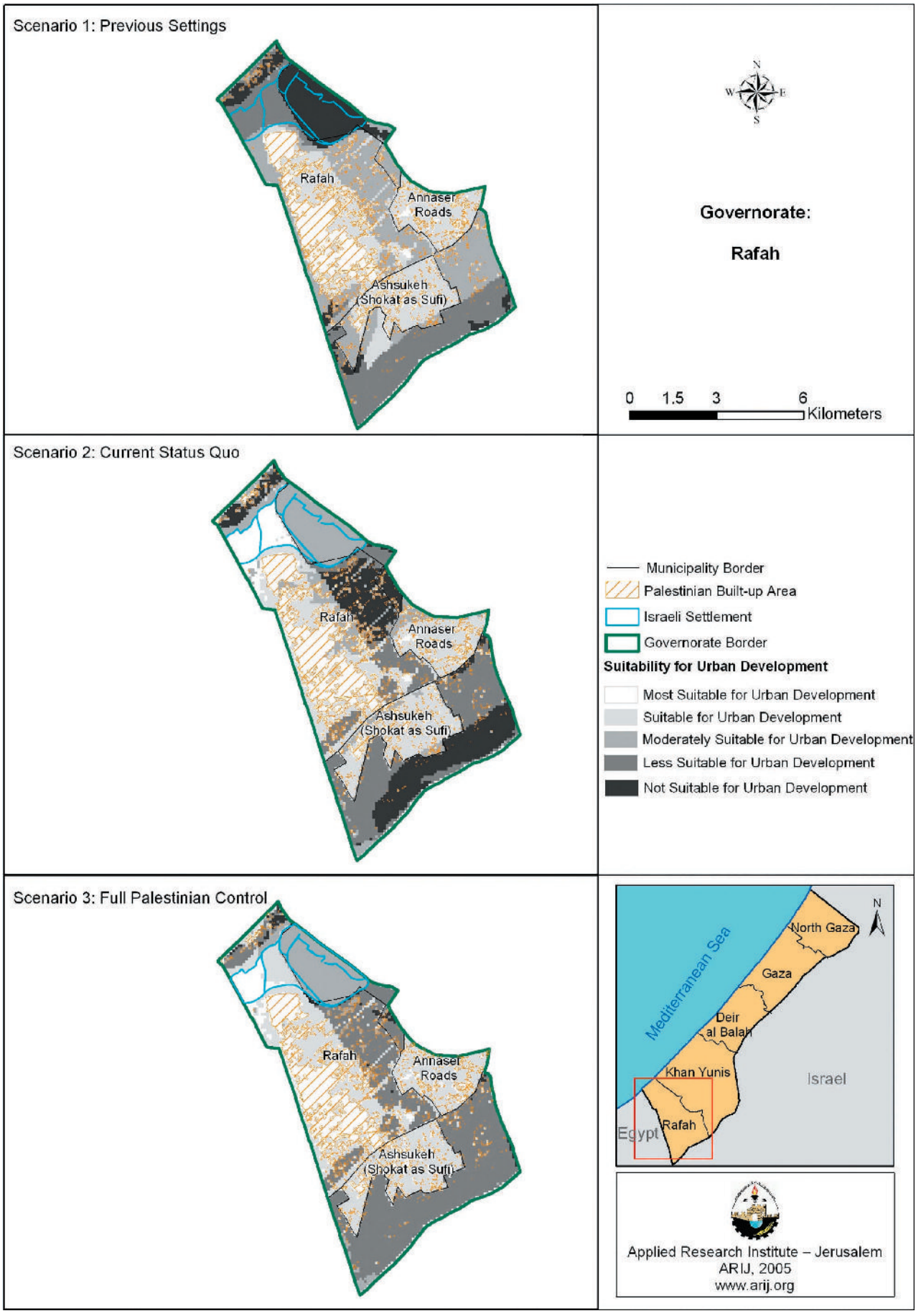
Map (3-2): Suitability scenarios for Palestinian urban development in Gaza Governorate



Map (3-3): Suitability scenarios for Palestinian urban development in North Gaza Governorate



Map (3-4): Suitability scenarios for Palestinian urban development in Khan Yunis Governorate



Map (3-5): Suitability scenarios of Palestinian urban development in Rafah Governorate

CHAPTER FOUR

THE GAZA STRIP DISENGAGEMENT PLAN

In 2004, Israel's Prime Minister Ariel Sharon announced the "Unilateral Disengagement Plan", by which the Israeli Occupation Forces (IOF) will withdraw from and dismantle the 21 colonies present in the Gaza Strip and four remote colonies in the northern West Bank. Under this Plan, Israel will continue to control Gaza's coastline, airspace, and reserves the right to undertake military operations at will (Art 3.1). Gaza will also remain dependent on the Israeli water, communication, electricity, and sewage networks (Art 8); existing customs arrangements with Israel (whereby imports from Israel to Gaza are not taxed, exports from Gaza to Israel are taxed, and Israel collects customs duties on foreign products entering Gaza) will remain in force and the Israeli currency will continue to be used (Art 10)"[23] The following is a chronology of events in the "Unilateral Disengagement Plan":

1. December 18th, 2003: Prime Minister 'Ariel Sharon' revealed his intention to develop a "Unilateral Disengagement Plan" to partially withdraw from the Gaza Strip, evacuating Israeli colonies in the area whilst annexing vast areas of the Occupied West Bank (Al Quds newspaper August 10, 2005).
2. February 3rd, 2004: Sharon declared his intention to evacuate 17 colonies with their 7,500 residents from the Gaza Strip and move them to Israel (Ha'aretz, English Ed. February 3, 2004).
3. June 6th, 2004: The amended Plan, which was approved by the Israeli Government, included evacuation from 21 Israeli colonies in the Gaza Strip as well as four remote colonies in the northern West Bank.
4. October 26th, 2004: The Plan was approved, for the first time, by the Israeli Parliament (Knesset) (Al Quds newspaper August 10, 2005).
5. February 16th, 2005: The Knesset approves the "Disengagement Implementation Law" empowering the Israeli Government to compensate over 9,000 colonists of the Gaza Strip and the northern West Bank with approximately 930 million USD (http://www.jpost.com, Al Quds newspaper August 10, 2005).
6. May 9th, 2005: Announcement that the withdrawal from the Israeli colonies in the Gaza Strip was postponed from July 2005 to the mid of August 2005(Al Quds newspaper August 10, 2005).
7. June 9th, 2005: The High Court of Justice deems the plan legal (http://www.jpost.com).
8. August 15th-24th, 2005: The withdrawal process from the Gaza Strip colonies and the four remote colonies in the northern West Bank begins.
9. August 24th - September 11th, 2005: House demolition process of the colonies along with all Israeli military installations begins. Transfer of the greenhouses from the Strip to Israel.
10. September 1st, 2005: An agreement was signed between Israel and Egypt to deploy 750 Egyptian border guards along the Philadelphi route between the Gaza Strip and the Sinai peninsula. Starting to construct a new border crossing terminal at Kerem Shalom on the Gaza-Egypt-Israel borders (www.haaretz.com).
11. September 12th, 2005: All Israeli soldiers left the Strip and the Palestinian Authority assumed full responsibility for the Gaza Strip (www.haaretz.com).
12. November 15th, 2005: An agreement was signed between the Palestinians and Israel over the border crossing of the Gaza Strip.

[23] http://www.pmo.gov.il/PMOEng/Communication/DisengagemePlan/displan060604.htm

4.1. Evacuation of Israeli Colonies

4.1.1. The Gaza Strip

The spatial analysis of the satellite image (i.e. SPOT 5, November 2004) for the Gaza Strip showed that there are 21 Israeli colonies, with a total area of 28,418 dunums, concentrated in the northern and southern parts of the Strip. Table (4-1) lists the Israeli colonies evacuated from the Gaza Strip and their locations, their date of establishment, their total land areas, their population, the number of families which used to reside in each colony and the type of land in each colony. While map (4-1) shows the distribution of the colonies evacuated from the Strip, which in total comprised 7.8% of the Gaza Strip's total area. Further evacuated areas, formerly under Israeli control, include Israeli military bases, Israeli colonies area, yellow area, Israeli military installation areas and Israeli security zone. These areas comprise 19.7% of the Gaza Strips total area.

A number of Israeli colonists in the Gaza colonies started to evacuate their houses early on August 10th, 2005 and moved to reside in previously prepared hotels and schools near 'Ashkelon "Asqalan" on the Mediterranean Shores. This evacuation was followed by another voluntary one in August 16th-18th, 2005, see figure (4-1). It was proposed that the evacuation process was to be completed on August 17th. However, a number of colonist families refused to evacuate their houses which forced the Israeli soldiers to take actions to complete the evacuations on August 22nd, 2005.

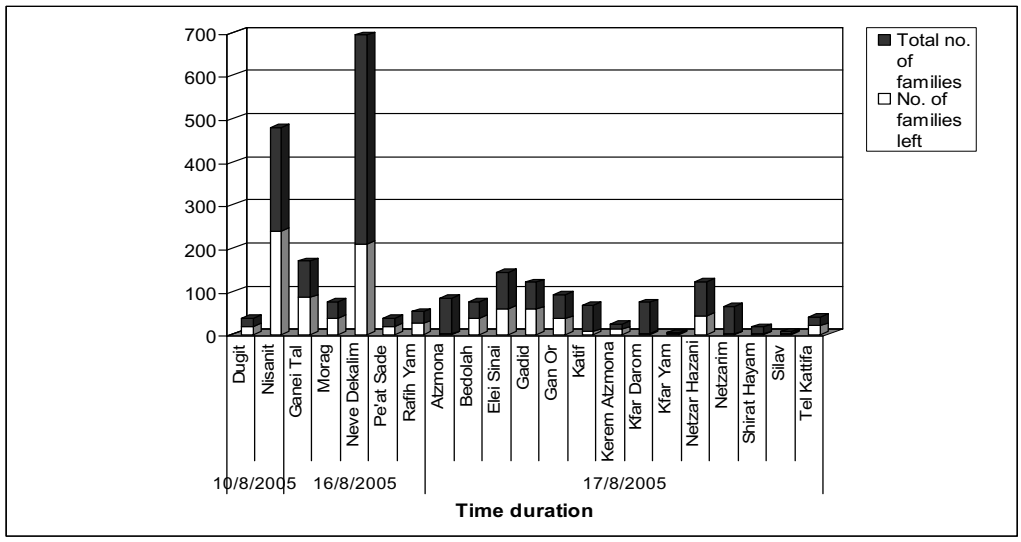


Figure (4-1): Number of Israeli families evacuated the colonies in the Gaza Strip in the period from August 10 to 17, 2005

Table (4-1): Evacuated Israeli colonies from the Gaza Strip

Colony Name	Governorate	Establishment Date*	Area (dunums)**	Population***	No. of Families#	Land Use TYPE##
Atzmona	Rafah	1979	450.2	646	83	Agricultural
Bedolah	Khan Yunis	1986	3,050.0	219	38	Agricultural
Dugit	North Gaza	1982	346.5	79	19	Urban
Elei Sinai	North Gaza	1983	557.9	407	85	Urban / agricultural
Erez	North Gaza	1968	586.3	0	0	Industrial
Gadid	Khan Yunis	1982	3,158.5	351	63	Urban / agricultural
Gan Or	Khan Yunis	1983	993.8	351	57	Agricultural / military
Ganei Tal	Khan Yunis	1979	1,941.6	400	85	Agricultural
Katif	Khan Yunis	1978	1,315.9	404	61	Agricultural
Kerem Atzmon###	Rafah	2001	2,868.0	24	12	Agricultural
Kfar Darom	Deir al Balah	1970	631.7	491	73	Urban / agricultural
Kfar Yam	Khan Yunis	1983	96.1	10	2	Agricultural / tourism
Morag	Khan Yunis	1972	1,221.2	221	38	Agricultural
Netzar Hazani	Khan Yunis	1973	2,562.7	461	80	Urban /industrial /agricultural
Netzarim	Gaza	1972	1,930.1	496	64	Urban / military / agricultural
Neve Dekalim	Khan Yunis	1983	2,197.2	2,671	485	Urban / agricultural
Nisanit	North Gaza	1982	1,010.6	1,064	240	Urban / agricultural
Pe'at Sade	Rafah	1989	450.2	104	19	Agricultural / military
Rafih Yam	Rafah	1984	1,111.5	143	27	Urban / tourism
Shirat Hayam	Khan Yunis	2000	111.5	40	16	Agricultural
Silav	Rafah	1989	1,476.6	50	5	Agricultural
Tel Kattifa	Deir al Balah	1992	400.7	60	20	Tourism
Total			**2,8468.9**	**8,692**	**1,572**	

** Source: ARIJ GIS database, 2004 and Peace-Now, 2004*

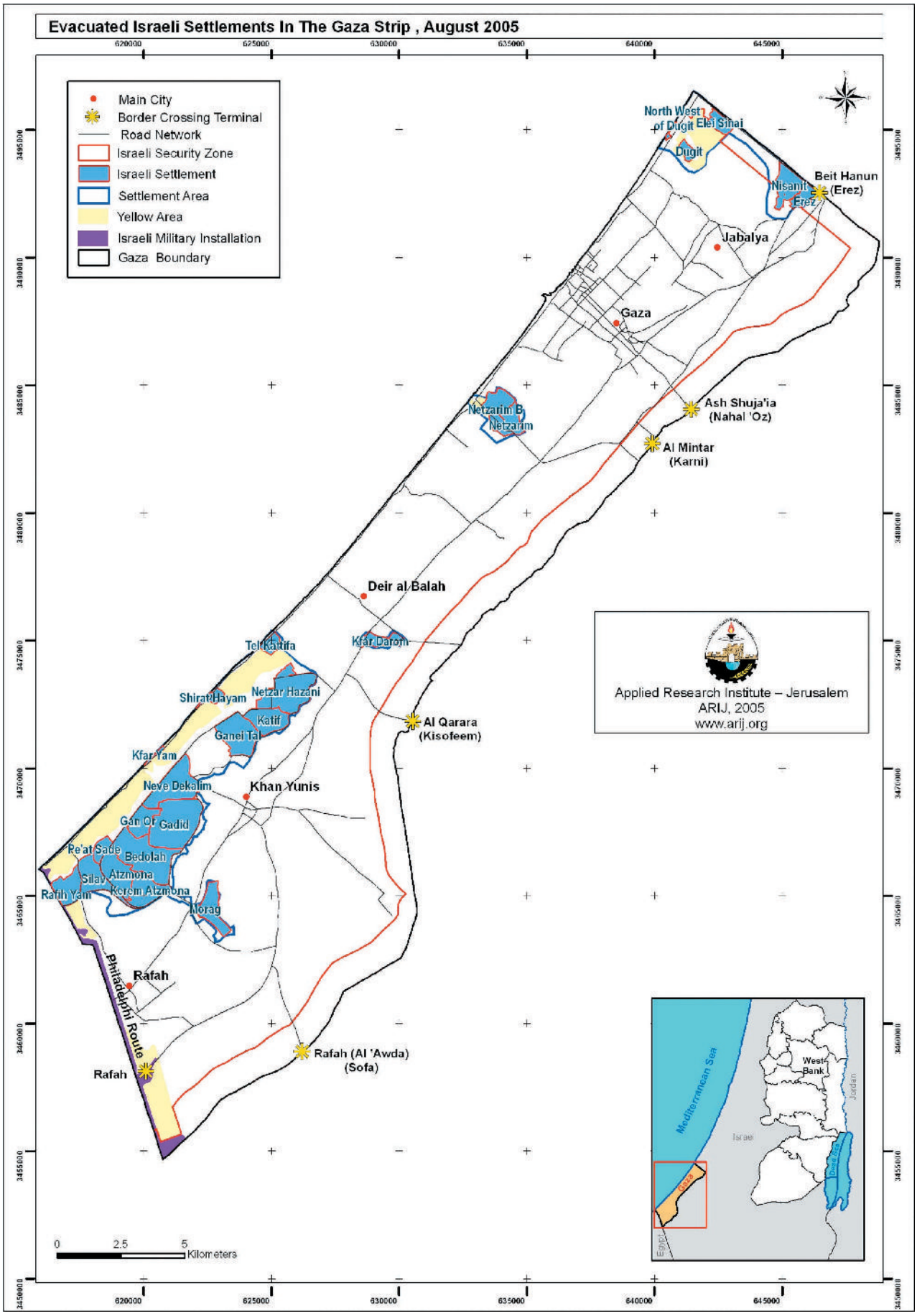
*** Source: ARIJ GIS database, November 2004*

**** Source: Peace-Now, 2004 (http://www.peacenow.org.il/site/Windows/settlementPOPUP.asp?pi=51)*

 # Source: Al Quds newspaper, August 11, 2005

Source: ARIJ GIS database, 2004 and PNA, July 2005

Kerem Atzmona is an expanded colony of Atzmona colony in Rafah Governorate



Map (4-1): Distribution of evacuated Israeli colonies in the Gaza Strip

4.1.2. The West Bank

In addition to the pullout from Israeli colonies in the Gaza Strip, the "Disengagement Plan" also comprised of the evacuation of Israeli colonists from a further four Israeli colonies in the northern West Bank. These colonies have a total area of 1,896 dunums (0.03% of the West Bank total area) (ARIJ GIS database, 2004) with a total population of 674 colonists (ICBS, 2004), see table (4-2) and map (4-2).

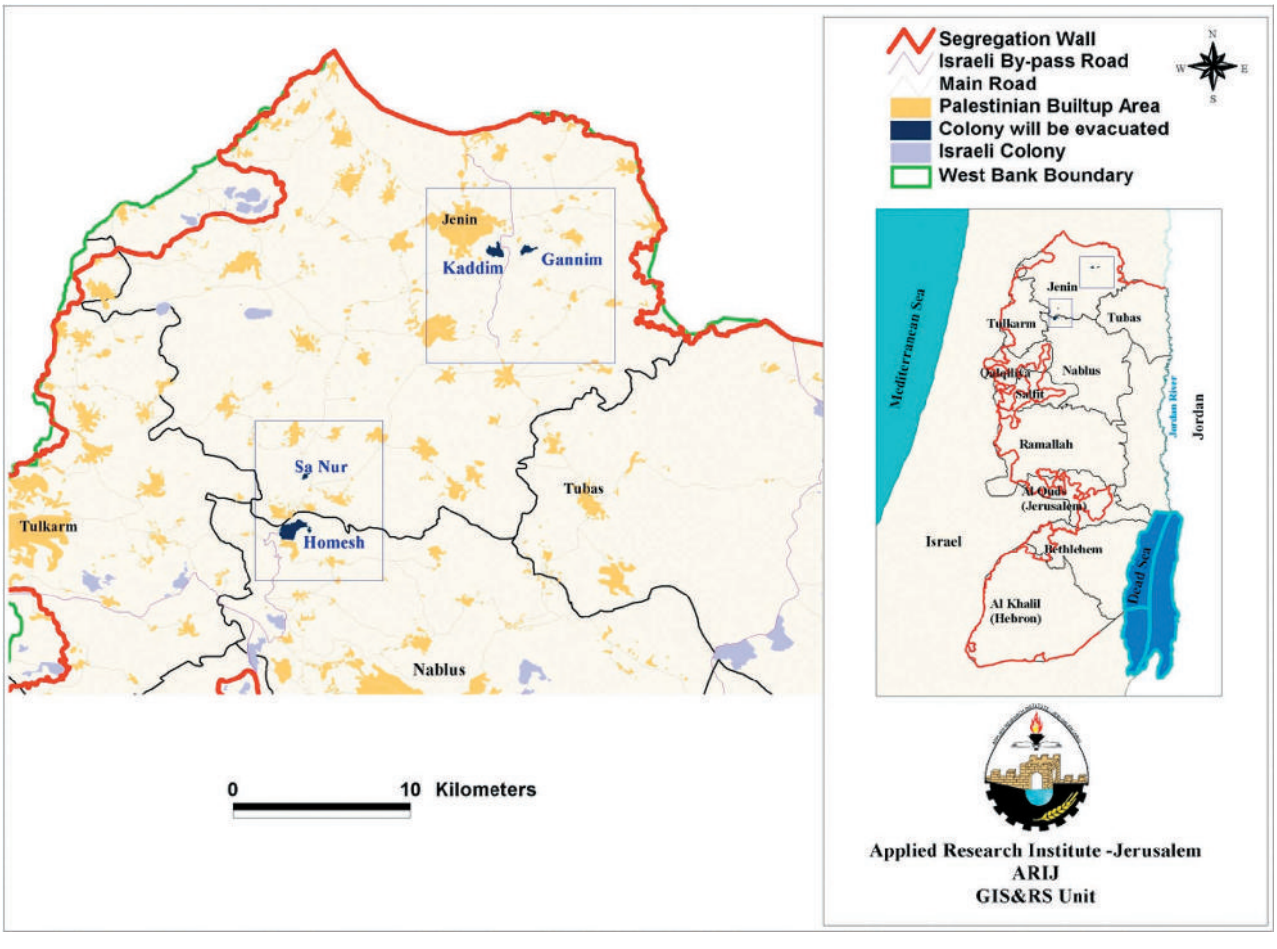
Table (4-2): Israeli colonies slated for evacuation from the northern West Bank

Colony Name	Governorate	Establishment Date***	Population***	No. of Families**	Area (dunums)*
Sa Nur	Jenin	1982	105	14	83
Gannim	Jenin	1983	172	20	262
Kaddim	Jenin	1983	169	43	501
Homesh	Nablus	1980	228	47	1,050
Total			**674**	**124**	**1,896**

**Source: ARIJ GIS database, August, 2004*

***Source: Al Quds newspaper, August 11, 2005*

**** Source: Pease-Now, 2004 (http://www.peacenow.org.il/site/en/peace.asp?pi=62&docid=1369&pos=8)*



Map (4-2): Distribution of evacuated Israeli colonies in the northern West Bank

4.2. Implementation of the "Disengagement Plan"

Israel considered the "Disengagement Plan" to be a complicated and comprehensive operation in terms of logistic and security levels. Therefore, the Israeli Government considered it necessary to mobilize a force of 40,000 soldiers and policemen to implement the "Disengagement Plan". Approximately 30,000 of them formed a security belt around the colonies whilst a further 6,500 policemen, in 400 groups, went from house to house to evacuate the colonists. Moreover, 5,000 troops from the Palestinian security forces provided support to insure the successful implementation of the withdrawal operation.

The Israeli Government has allocated three billion New Israeli Shekels (NIS) to compensate the Israeli colonists in the Gaza Strip. The Israeli Ministry of Finance estimated that the average claim of each family would be approximately NIS 2 million (USD 445,000), so as to leave Gaza willingly. This was in addition to all the various logistic services offered by the Israeli Army to smooth the transition, including funds for renting accommodation for two years ahead. James Wolfensohn the Quartet's Special Envoy for the Gaza Disengagement, along with other private investors, have purchased around 1,000 colonist greenhouses at a cost of 14 million USD. Furthermore, the Israeli Government has provided approximately 1,000 housing units for the evacuated colonists from the Gaza Strip colonies (e.g. roughly 100 housing units in Nitsan near 'Ashkelon and around 60 housing units in three villages adjacent to the Gaza Strip) (Al Quds newspaper, August 22, 2005). In general, the Israeli pullout operation from the Gaza Strip will cost was 1.8 billion USD (Al Quds newspaper, August 13, 2005: page: 15).

Following the pullout from the Gaza Strip, on August 23rd 2005, Israel started the evacuation process of the four colonies in the northern West Bank (i.e. Gannim, Kaddim, Sa Nur and Homesh), at the same time as commencing the demolition of the evacuated colony houses in the Gaza Strip. The house demolition process in the Strip was completed by the second week of September. In addition, the IOF destroyed all the Israeli military installations in the Gaza Strip. In September 2005, Palestinian Security Forces assumed responsibility over the evacuated areas in the Gaza Strip to contribute in the maintenance of security during the withdrawal period.

On August 24th, 2005, Israeli environmental specialists began uprooting hundreds of trees from the evacuated Israeli colonies in the Gaza Strip so that they could be moved to Israel for replanting. They earmarked roughly 1,100 trees which can live after being moved. From which olive, palm and oak trees were replanted in a field in the south of Israel and will be returned to the colonists after they have relocated to permanent houses in Israel.

4.3. Gaza Border Crossings

There are five crossing points along the Gaza Strips boundary. The first is the Beit Hanun (Erez) crossing located in the north of the Strip, which is considered the entry point from the Strip to Israel, the West Bank and other countries to the North and East of Palestine. Two further commercial crossing points are located to the East of the Gaza Strip; Al Mintar (Karni) border terminal which is located to the southeast of Gaza city and is designated for moving merchandise, supplies and materials, and Ash Shuja'ia (Nahal 'Oz) border terminal which was established just to the north of the Karni border terminal and is designated for the transportation of fuel between the Gaza Strip and Israel. A fourth crossing point is Rafah-Al 'Awda (Sofa) which is a commercial crossing located in the southern part of the Gaza Strip. The last border crossing terminal is Rafah which is located on the border between the Gaza Strip and Egypt. Despite opposition from the Palestinian Authority (PA) and Egypt, Israel has started constructing a sixth border crossing terminal at Kerem Shalom to the south east of the Gaza Strip so that it can transfer the Rafah border crossing to it after the withdrawal from the Philadelphi Route, see map (4-1).

The only airport in the Gaza Strip, which is located to the south of Rafah city, was destroyed by Israeli Forces in 2002 as a result of the continuous incursions into the Strip. On the other hand, although the Sharm Esh

Sheikh agreement between the Palestinian Liberation Organization (PLO) and Israel in 1999, agreed upon the construction and operation of a Seaport for exclusive Palestinian use, the building of the port was unofficially halted by Israel in 2000 due to restrictions imposed by Israeli Authorities which prevented the transportation of construction materials. However, the PA seeks to reconstruct and operate a Seaport (Gaza Seaport) opposite to Netzarim colony in Gaza Governorate, see map (4-3). (http://www.arabs48.com/display.x?cid=11&sid=19&id=30711).

Negotiations are taking place between the PA and the Israeli Government about control over Philadelphi Route which is located along the border between the Gaza Strip and Egypt. The Route passes along the Egyptian border from the Mediterranean Sea to Eilat; however, the current issue is related to the section of this Route which extends along the border between the Gaza Strip and Egypt. The route has a width of about 100 meters and ends at the Kerem Shalom border crossing.

Accordingly, an Egyptian-Israeli agreement was signed on September 1st, 2005 to deploy Egyptian Forces along the border between Egypt and the Gaza Strip in Rafah. The agreement states that 750 soldiers of the Egyptian Border Guards will be deployed opposite the Philadelphi Route in the Rafah area between the Sea Shore and the border meeting point with Israel in Kerem Shalom along a 14 km front. The agreement included the deployment of Egyptian soldiers in September and the withdrawal of the IOF after completion of the Israeli colony withdrawal process from the Gaza Strip.

The agreement intended to solve the raised issues of disagreement between Israel and Egypt, mainly the responsibility issue. In this context, Israel has requested that Egypt clearly undertake the responsibility to prevent weapons' smuggling from its lands. Also, the agreement assured that each part will be responsible of the area under its control; however, Israel considered this point to be unreasonable since the IOF will abandon the responsibility of protecting the borders after the withdrawal from the Philadelphi Route. Based on the Egyptian-Israeli agreement, it was stated that Egypt is prevented from deploying tanks, antitank weapons or establishing a permanent military infrastructure. Furthermore, Egyptian soldiers will only be armed with light weapons, monitoring devices and light armored vehicles. (Al Quds newspaper, August 3, 2005).

On the 15th of November 2005, an agreement[24] was signed between the Palestinian National Authority (PNA) and Israel over the border crossings of the Gaza Strip. Under the agreement, Rafah will be the only crossing point between the Gaza Strip and Egypt (with the exception of Kerem Shalom). According to the agreement, the reopening of the Rafah crossing between the Gaza Strip and Egypt will be on November 25th, 2005 for civilian travel to Egypt and the rest of the world. They agreed on a third party mechanism - the EU Border Assistance Mission (EU-BAM) at the Rafah crossing point on the Gaza-Egypt border. The European Union (EU) will support the PA's management of the Rafah crossing within an active monitoring capacity, and will provide consultancy to the PA on capacity-building. It is important to note that the EU will not have law enforcement powers.

The agreement states that the Rafah crossing will allow the movement of all Palestinian ID card holders (and others by exception) and will also be used for the export of goods to Egypt, while imports to the Gaza Strip will come through Kerem Shalom and will be cleared by PA customs officials pending the completion of Rafah crossing's preparations for the processing of imports. According to the agreement, Israel has no power to restrict any Palestinian ID holders from using the Rafah crossing and the PA is the only party which may prevent the movement of any Palestinian goods or people through Rafah on the basis of security considerations. In addition, Israel will provide the PA with all the information required to update the Palestinian population registry, including all the information on Palestinian ID card holders who are currently outside the country, see map (4-4).

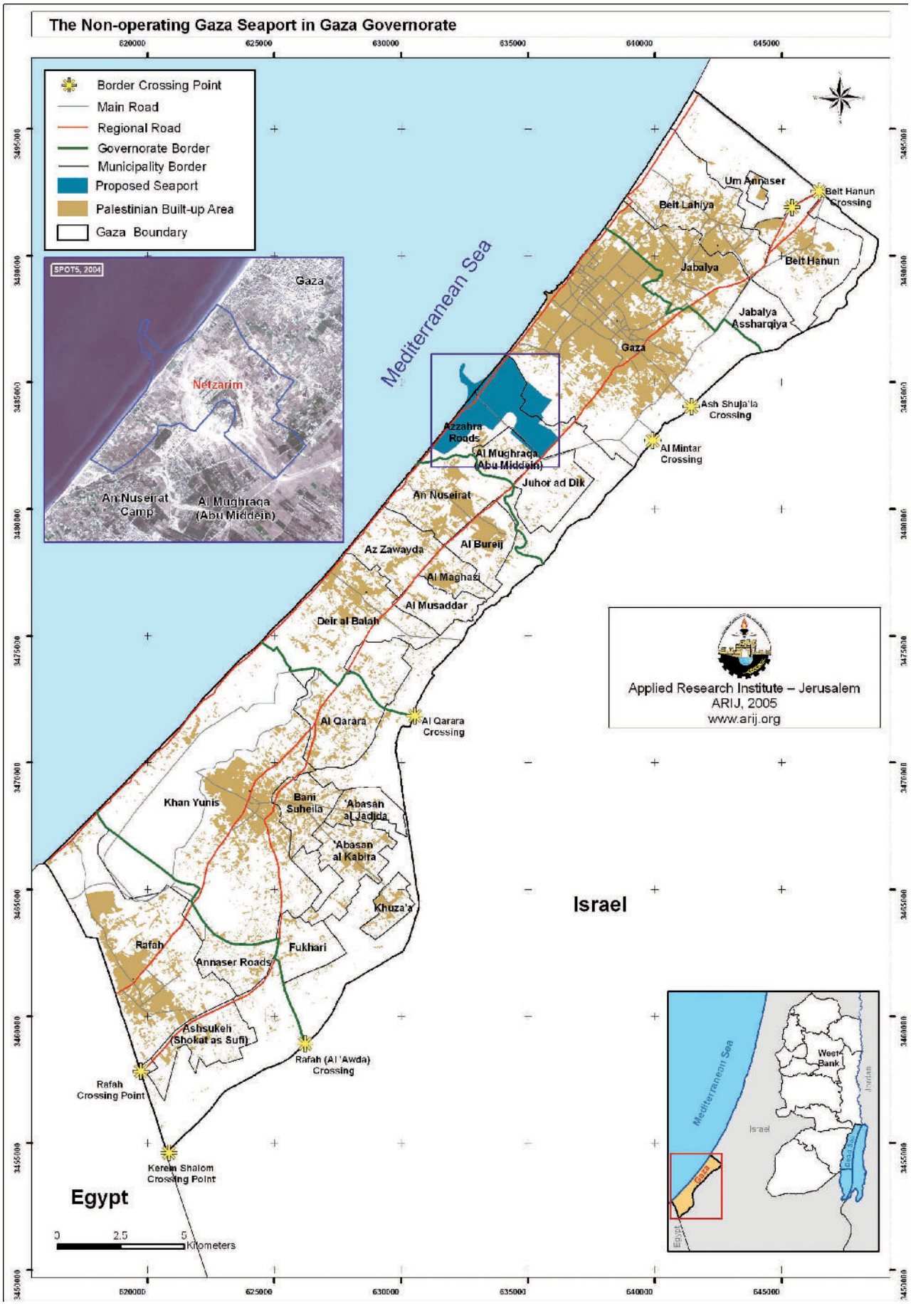
The two sides agreed to partially reinstitute the safe passage arrangement between the Gaza Strip and the West Bank through the establishment of bus convoys no later than December 15th, 2005, and truck convoys

[24] http://www.pchrgaza.org/files/PressR/English/2005/134-2005.htm,
http://www.thejerusalemfund.org/images/Rafah_Crossing_Principles.pdf,
http://www.thejerusalemfund.org/images/Rafah_Crossing_Agreement.pdf.

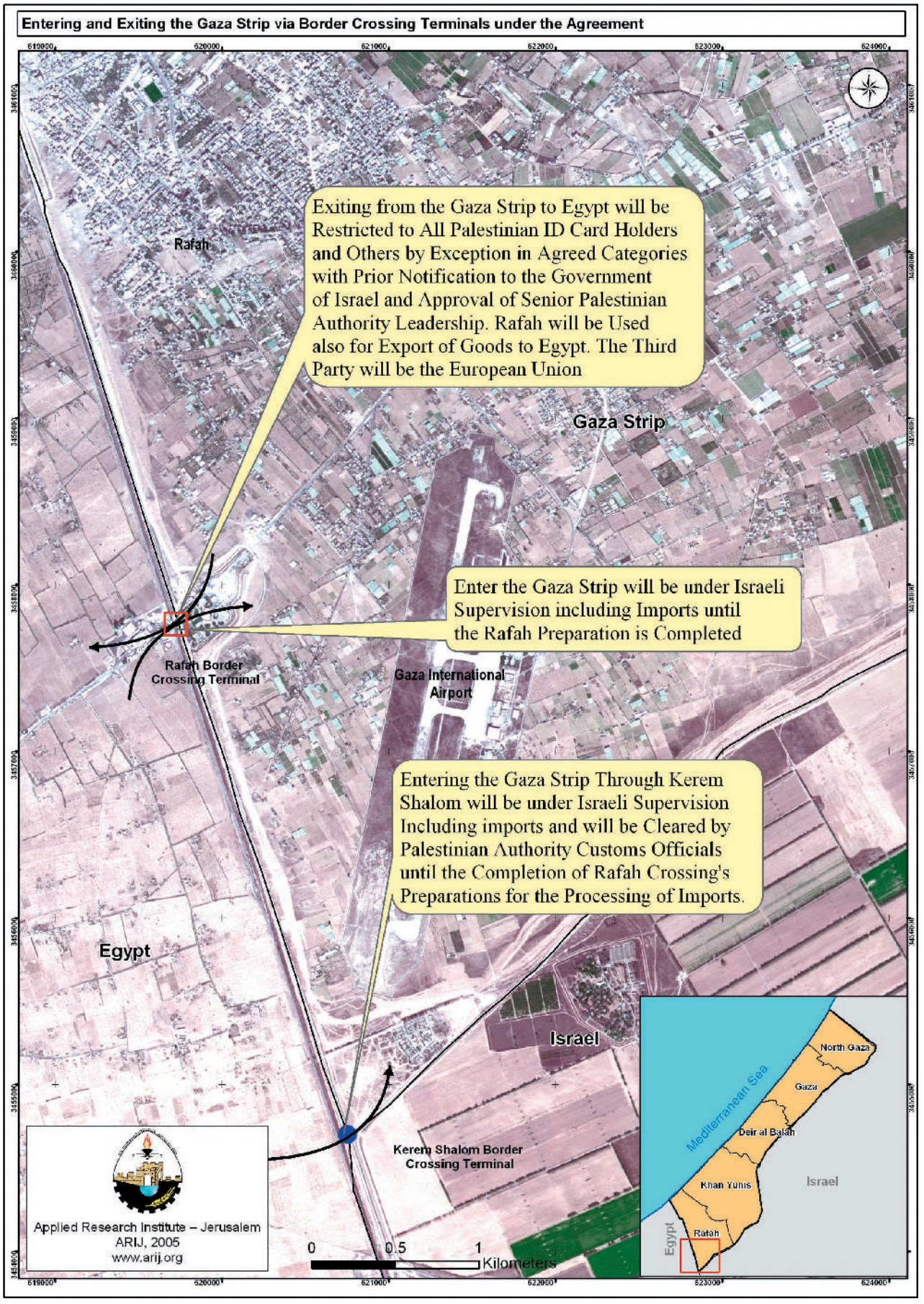
no later than January 15th, 2006. Also, Israel committed itself to immediately allowing the export of agricultural products from the Gaza Strip in addition to allowing 150 trucks per day to leave the Gaza Strip through El-Mintar (Karni) crossing point no later than December 15th, 2005. It was further agreed that at least 400 trucks per day will leave the Gaza Strip by the end of 2006.

The agreement stipulated the lifting of restrictions on Palestinian movement in and between the OPT and ensured that Israel will not obstruct the building of a Seaport on the Gaza Strip coastline. The construction of the Seaport will commence immediately and detailed discussions on the reopening of the Yasser Arafat International Airport in Gaza have also been tabled. In a further agreement with the US Administration, the Government of Israel agreed to reduce its internal closures in the West Bank to the maximum extent possible (including the illegal roadblocks and checkpoints) no later than December 31st, 2005, see map (4-5)

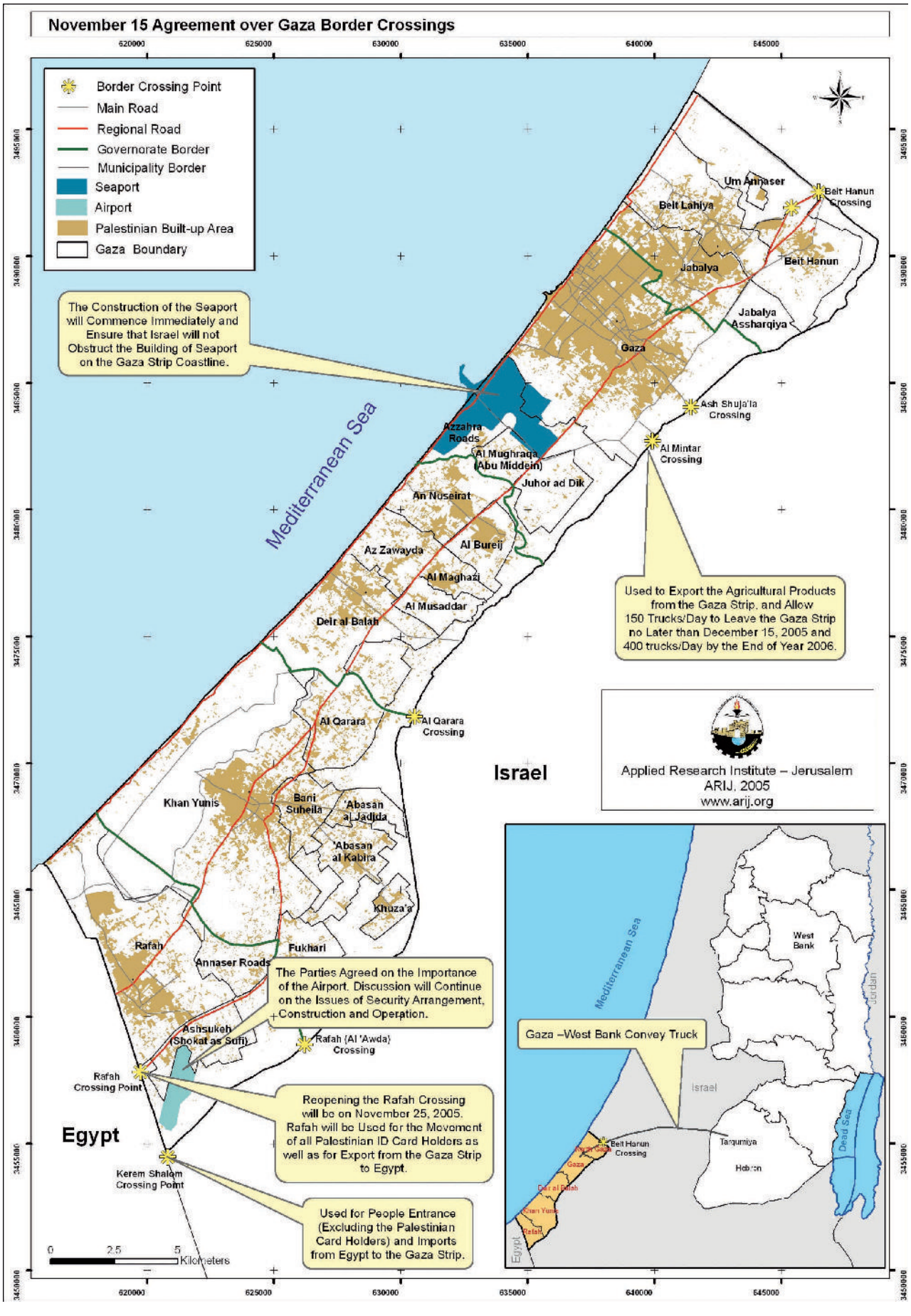
In order to develop the infrastructure of the Gaza strip crossing points, international support in the form of 50 million USD will be provided for the PA which has started already purchasing modern instruments for security checks at the crossing points. This financial support will be used to rehabilitate the infrastructure of four crossing points namely Rafah, Beit Hanon, Al Mintar and Tarqumiya in Hebron, where the development plans and programs were set by the technical and specialized committees arranged for the withdrawal process. A proposed plan was set by the PA to operate the crossing points 24 hours a day. Palestinians who lost their jobs at those points during the Second Intifada, which led to a (60%) decrease in the labor force at crossing points, will be reemployed in Rafah and the other crossing points (Al Quds newspaper, August 25, 2005).



Map (4-3): The Gaza Seaport in Gaza Governorate



Map (4-4): Current and proposed situation to enter and exit the Gaza Strip to Egypt via Rafah and Kerem Shalom crossing terminals



Map (4-5): The Gaza Strip border crossings agreement on November 15, 2005

4.4. The Impact of the Plan on the Natural Resources of the Gaza Strip

4.4.1. Water Resource

Water resources in the Palestinian Territory (PT) include both surface and ground waters. The only permanent river that can be used as a source of surface water in the PT is the Jordan River. Since the occupation began in 1967, Palestinians have had no access to the river and are forbidden from using its water.

Groundwater is the major source of fresh water supply in the West Bank and the Gaza Strip. The water consumption levels for Palestinians have been frozen by Israel's of 1967 policy of maintaining the level of water used by the non Israelis in the occupied territories. Limits were placed on the amount withdrawn from Palestinian wells, while new (often deeper) wells were drilled to provide water to Israeli colonies. The main difficulty for Palestinian water supply is the unequal distribution of water between Israel and Palestinians, which arises from the Israeli control over water resources.

In the Gaza Strip, the main source of groundwater comes from the Coastal Aquifer (shallow aquifer), which consists mainly of sandstone, sand, and gravel. The aquifer is an extension of the Coastal Plain Aquifer in Israel. The aquifer is highly permeable with a transmissivity of about 1,000 m^2/day and an average porosity of 25%. The depth to water ranges between 70 meters in the highly elevated area in the east and 5 meters in the low land area (PWA, 1999). The total annual recharge of the aquifer is estimated at 55 MCM[25]. A deficit with an average of 70 MCM/year is observed in the water balance due to over pumping (Al Quds newspaper, August 14, 2005). Therefore, the aquifer is replenished from the brackish or seawater which results in a deterioration of quality (PWA, 1999).

Israeli colonists in both the West Bank and the Gaza Strip consume huge amounts of the Palestinians scares water resources. About 8,500 colonists in the Gaza Strip consume more than 7 MCM/year for all purposes (about 875 CM/Capita/year), whereas more than one million Palestinians living in Gaza consume approximately 150 MCM/year (About 108 CM/capita/year) (PWA, 2005).
An average of 157 MCM/year is pumped from the groundwater aquifer and is distributed as follows (PWA, 2005):

1. 120 Domestic wells (drinking wells) which pump about 70 MCM/year
2. More than 4,000 agricultural wells which pump 80 MCM/year
3. About 40 Israeli wells which pump 7 MCM/year

Around 98% of the Gaza Strips population have piped water supply systems. The remainder depends mainly on cisterns and springs for their water use. The overall loss rate of water in the Gaza Strip through the system is estimated at 45% of which 35% is due to physical losses and 10% is due to unregistered connections (PWA, 1999).

4.4.2. Water Quality

The main quality problem is the increase in salinity and nitrate content. Nitrate concentration reaches more than 200 mg/l in the southern part of the Gaza Strip and salinity reaches more than 1,550 mg/l in the central and southern parts of the Strip (PWA, 2000), see map (4-6). This deterioration in the quality of water could be related to the unregulated disposal of various forms of waste including; domestic industrial solid and liquid, and agricultural waste (fertilizers & pesticides) in addition to seawater intrusion in the case of Gaza.
In this context, a report produced by the Palestinian Water Authority (PWA) mentioned that 70% of the Gaza Strip population obtains water with a high salinity and an chloride average of more than 500 mg/l to reach 2,500 mg/l. While a large number of drinking water wells contain an average nitrate level of more than 100

[25] MCM: Million cubic Meter

mg/l. Moreover, the average water supply per capita in the Gaza Strip reaches 80 liters/day, however, most of this water contains high salinity.

Based on the above, the withdrawal from the Gaza Strip is basically for the Israeli benefit taking into account the long term misuse of the natural resources in the area by Israel. It was stated that Israel has contributed to contaminating the sea water at 400 meters depth by the wastewater produced from Israeli colonies. In addition, the over pumping from the coastal aquifer by Israel contributed to the intrusion of the sea water into fresh water so as not to be utilized by Palestinian after the Israeli withdrawal. This situation has lead to the deterioration of the coastal groundwater aquifer and increase salinity percentage to a degree impossible to be utilized domestically or by agriculture (http://www.arabs48.com/display.x?cid=11&sid=19&id=30711).

4.4.3. Future Water Needs

According to the PWA report published on August, 2005, there is an urgent need to apply for the following:

- Provide additional amount of water from outside the Strip not less than 50 MCM till year 2010, its source could be from establishing projects for central stations to desalinate sea water.
- Reduce water consumption by the agricultural sector and use treated wastewater instead in an average of 50 MCM till 2015.
- Purchase additional amount of water with average of 5-10 MCM a year from Israel till year 2010.
- Develop two systems of domestic water use, where the first system deals with drinking, cooking and other uses, while the second one is for the water used in laundry, shower and similar cleaning activities. This aims to reduce the consumption of desalinated water in the future.
- Stop using and close water wells with high salinity and chloride concentration with more than 750 mg/l.
- Close all random water wells which were drilled without permits.
- Enforce health control on the production and sales of desalinated water through individual commercial desalination units.

A study was conducted into the feasibility of establishing a desalination station on the shores of the Gaza Strip. This desalination project is expected to produce about 60 CM/day (i.e. 21.6 MCM/year) of drinking water to cover 43% of daily needs for domestic use. In this context, electric energy can be produced using the desalination stations after being activated (http://www.pnic.gov.ps/arabic/Withdraw/reports-6.html#_ftnref13).

In order to develop water supply facility services, the Gaza Strip needs about 500 million USD for development to establish new water systems and networks in most of the Strip areas. Regarding the development of wastewater facilities in the Gaza Strip, it needs to construct sewage systems and to implement wastewater treatment for three of the main cities which are Khan Yunis, Deir Al Balah and Rafah cities and other small surrounding localities. Establishing such wastewater treatment plants will decrease the environmental and health impacts on Palestinians and supply relatively greater amounts of water needed for agriculture. The estimated cost for the needs planned for development is about 150 million USD (PWA report, Al Quds newspaper, August 14, 2005).

4.4.4. Environmental Situation

The Palestinian Environmental Quality Authority (PEQA) has warned of an environmental disaster which could have occurred as a result of the Israeli withdrawal from the Gaza Strip and the destruction related to this process. Although these accusations are yet to be conclusively substantiated, it was revealed that even during the withdrawal process, the Israeli Authorities continued to bury solid wastes, wastewater and toxic materials - in the land which was occupied by the Israeli colonies - at a depth of 3-6 meters in containers so that it would spoil the land and make it unusable after it is transferred to the Palestinian National Authority (PNA).

This is in addition to the contamination of well water and leakages of chemical wastes and spoiled medicine into the Palestinian land. If proven true, these actions would seriously and negatively affect future generations causing serious health problems such as cancer and other types of chronic and infectious diseases (Al Ayyam newspaper, August 24, 2005).

The Israeli colonists have also deliberately polluted the environment by discharging wastewater onto the agricultural lands of Palestinians in the Al Mawasi area to the west of Khan Yunis Governorate. This has resulted in the destruction of the water wells owned by Palestinian families (Al Ayyam newspaper, August 24, 2005). Hence, PEQA has tested the nitrate concentrations in water samples from eight wells in Al Mawasi area and it was revealed that only one well is suitable for domestic use, whilst most wells contain high concentrations of nitrate due to the absence of sewage systems for factories' waste disposals and other water uses (Al Quds newspaper, August 23, 2005). In addition, during the last decade, Israel had contaminated the Gaza Strip with toxic and solid materials of about 50,000 tones which were buried in Gush Katif colony (http://www.arabs48.com/display.x?cid=11&sid=19&id=30711).

It is worth mentioning that political conditions have also negatively affected the solid waste problem in the Gaza Strip. The amount of solid wastes produced in the Strip is approximately 1,155 tons/day in which 220 tons is collected daily from North Gaza Governorate. This situation has lead the Palestinian Authorities to develop a plan to establish a new dumping site in the northern part of the Strip as the only current dumping site, east of Gaza city (Juhur Ad Dik), will be overloaded in the near future (Al Quds newspaper, September 3, 2005, page: 15).

Before the commencement of the house demolition process in the Gaza Strip colonies, Israel has declared that the colonies' houses contain damaging building material (i.e. Asbestos) in their structure and announced its commitment to get rid of the harmful material. However, the Ministry of Foreign Affairs (MOFA) stated that the IOF have violated their obligation to remove damaging material produced from the demolition process such as fiberglass and asbestos, used in roofs and bricks, which are carcinogenic and prevented from use internationally. Furthermore, MOFA highlighted the responsibility of Israel in removing the remains resulting from the house demolition in the colonies according to the international law that obliges the occupation forces to restore the land to as it was before occupation (Al Quds newspaper, August 23 and 25, 2005).

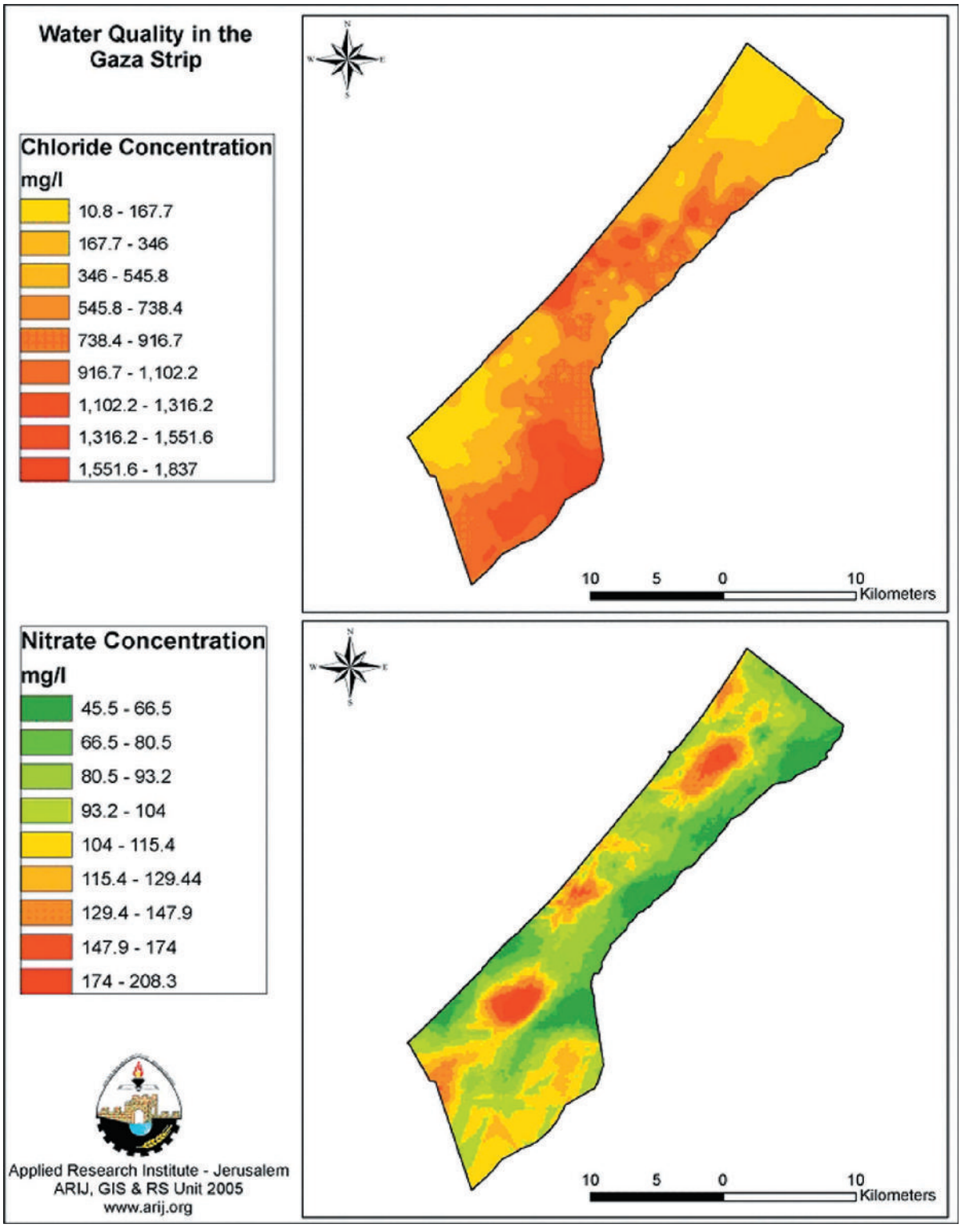
In this context, the estimated volume of the construction debris resulting from the Israeli withdrawal is about 1.5 million tons; discussions between PA and Egypt are taking place to dispose of the construction wastes in Sinai Desert using 80,000 trucks. This location was proposed due to the wide area of the Sinai Desert when compared with the very limited land area of Palestine. The project may be funded and implemented by the World Bank (WB) and the United Nations Development Programme (UNDP) respectively, if the necessary political agreements do not create a barrier to the scheme. Another potential plan proposed by the PA is to use the construction wastes for a land reclamation project in the fishing harbor and the hotel area of Gaza city, in order to compensate for the erosion occurring in that area. In addition, PEQA is intending to test the soil and groundwater after the completion of the Israeli withdrawal process with international assistance and experts from the WB (Al Quds newspaper, August 23 and 25, 2005).

PEQA revealed that large quantities of sand were illegally removed from the port area by colonists for use in their own areas. Therefore, in order to reconstruct Gaza Seaport, the Palestinians must pump a total of about 350,000 m^3/year of sand from the south of the Port to its north. This would cost two million USD. According to Israel this pumping process is necessary to protect the Port shores and preserve the sand banks in this area since, on one hand, it is a natural resource and, on the other hand, the project will recharge the groundwater aquifer and preserve the biodiversity of the region. Thus, Israel is leaving behind an environmentally devastated area which requires rehabilitation and considerable efforts to redevelopment it. (Al Quds newspaper, August 23, 2005).

Accordingly, environmental specialists have been called in to combat the negative environmental impact which has been a result of the Israeli withdrawal process from the Gaza Strip. This is in the light of concerns that the environmental problems are potentially devastating to Palestinian public health. Specialized authorities are being urged to utilize the latest technologies in dealing with the occupations waste and to disseminate environmental and social awareness within the Palestinian community regarding the potential

array of risks presented by the Israeli occupation wastes in the evacuated colony areas, as well as others. Therefore, Palestinians were warned of the possibility that they may be exposed to health and environmental problems as a consequence of the hazardous and (potentially explosive) waste left behind by Israel and the Israeli colonists in the evacuated areas.

It is important to clarify that most of the various situations outlined – with regards to possible environmental damage – are in the investigative stage. At this time, it is impossible to determine which of the above problems will fully materialize due to the relatively short period of time that has elapsed since the withdrawal.



Map (4-6): Chloride and Nitrate concentrations in the Gaza Strip

4.5. The Impact of the Plan on the Socio-Economic Condition of the Palestinian People

4.5.1. Social Situation

The socio-economic situation of the Gaza Strip is experiencing various problems resulting from Israeli policies and actions taken against the infrastructure of Gaza. A report produced by the Palestinian Central Bureau of Statistics (PCBS) highlighted the complicated situation of the Gaza Strip during the Israeli withdrawal and revealed that the rate of participation in the labor force for the Gaza Strip had reached 36.5% during the second quarter of year 2005. This is compared to 9.4% participation from females, while the percentage of unemployment persons reached to 30.2%. The average weekly work hours (not including workers in Israel and colonies) reached to 42.0per week, while the average monthly work days reached 24.2 with an average daily wage of 55.8 NIS, (PCBS, 2005).

Regarding the poverty indicators in the Gaza Strip under the current situation, the rates continued to be higher in than in the West Bank and in comparison with the period before the Second Intifada began. In 2004, the poverty rate reached 37.2% and 65% according to expenditure and income respectively, while the average monthly expenditure in Jordanian Dinars (JD) was 498.2 per household including an average of 184.1 JD spent on food (i.e. 67.8 JD/person/month including 25.1 JD/person/month spent for food).

It is worth mentioning that Israeli actions in the Gaza Strip have noticeably impacted the economic situation of Palestinian households since there has been a clear increase in the percentage of households whose income is now less than half of what it was before the start of the Second Intifada (65.6%). This has forced 43.7% of families to decrease their basic needs expenditure during the last twelve months. Moreover, 58.2% and 65.3% of households in the Gaza Strip received humanitarian aid during 1st and 2nd quarters of 2005 respectively.

The report also revealed that in the 2nd quarter of 2005, the United Nations Relief and Works Agency for Palestinian Refugees in the Near East (UNRWA) was the largest aid provider among others providing 42.0% of the total aid distributed. The second largest aid providers are the PNA institutions (including Ministry of Social Affairs) who distribute 24.3% of the aid. Also, 19.6% comes from the Labor Union, 7% from relatives and friends and 2.7% from charity institutions and committees. Furthermore, the results showed that 51.1% of the total aid was provided as food supplies whilst 18.0% of the aid was provided in the form of cash money (PCBS, 2005, http://www.pcbs.gov.ps/press_r/Measures13_e.pdf).

In reference to the health situation in the Gaza Strip, the total number of hospitals available reached 19 in 2004. These hospitals have 2,129 beds collectively (1.6 bed/1,000 person) with 2.4 doctors per 1,000 person, as well as 3 nurses per 1,000 persons. In addition, 93.7% of the population held health insurance (PCBS, 2005).

Generally, the Israeli checkpoints were a serious obstacle to 41.9% of the households when trying to obtain health services in both the West Bank and the Gaza Strip; while Israeli closures created an obstacle for 37.9% of the households. In addition, 52.5% of households were unable to obtain health services due to the increase in treatment cost, while the remoteness of health centers and the inaccessibility of medical staff prevented 32% and 25.5% of households from obtaining health services respectively (PCBS, 2005, http://www.pcbs.gov.ps/press_r/Measures13_e.pdf).

It was observed that the health care situation was confronted with many constraints during the Israeli withdrawal from the colonies. However, with the implementation of the withdrawal process complete, it will lead no doubt lead to greater freedom of movement inside the Gaza Strip. Therefore it will become easier for people seeking medical attention to access the health centers. For example, the inhabitants of Al Mawasi, Al Sefa, Al Mou'na and Abo Al Ajen localities, living in close proximity to the former colonies, will certainly benefit the most from the improvement in freedom of movement inside the Strip. On the other hand, people who seek treatment in other health centers outside the Strip won't be able to move freely to these hospitals due to the fact that they are prevented from traveling across the border (http://withdraw.sis.gov.ps/arabic/sr-10.html).

4.5.2. Economic Situation

The Palestinian economy has been in a critical condition since the Second Intifada began due to Israeli military policies in the OPT in terms of closures imposed on Palestinian cities and villages, 24 hour curfews and the destruction of infrastructure, including other violations of human rights. This destruction has affected the main elements of production with a deterioration of most economic activities and sectors contributing to the decline in Gross Domestic Product (GDP).

The aforementioned PCBS report stated that the number of working economic establishments in the private and non governmental organization sectors, and governmental companies, reached 30,620 establishments in 2004 in which totaled 83,778 workers employed by them. The establishments are distributed as follows according to the economic activity:

- Agriculture , farming of cattle and other animals, 965 establishments
- Mining and quarrying, 2 establishments
- Manufacturing, 3,732 establishments
- Electricity and water supply, 349 establishments
- Construction, 375 establishments
- Wholesale, retail trade and repairs, 17,696 establishments
- Hotels and restaurants, 1,200 establishments
- Transportation, storage and communications, 270 establishments
- Financial intermediation, 228 establishments
- Real estate, renting and business activities, 1,601 establishments
- Education, 646 establishments
- Health and social work, 1,133 establishments
- Other community, social and personal services, 24,523 establishments

According to figure (4-2), the service sector including; trade, hotels and restaurants, tourism, transportation and communications, electricity and water supply …etc form the largest participation percentage of persons engaged in employment with 68.2% of the total from the local economy. On the other hand, 16.6%, 8.9% and 6.3% of labor force work in agriculture and fishing; mining and manufacturing and construction respectively, see figure (4-2)
(http://www.pnic.gov.ps/arabic/Withdraw/reports-6.html#_ftnref13).

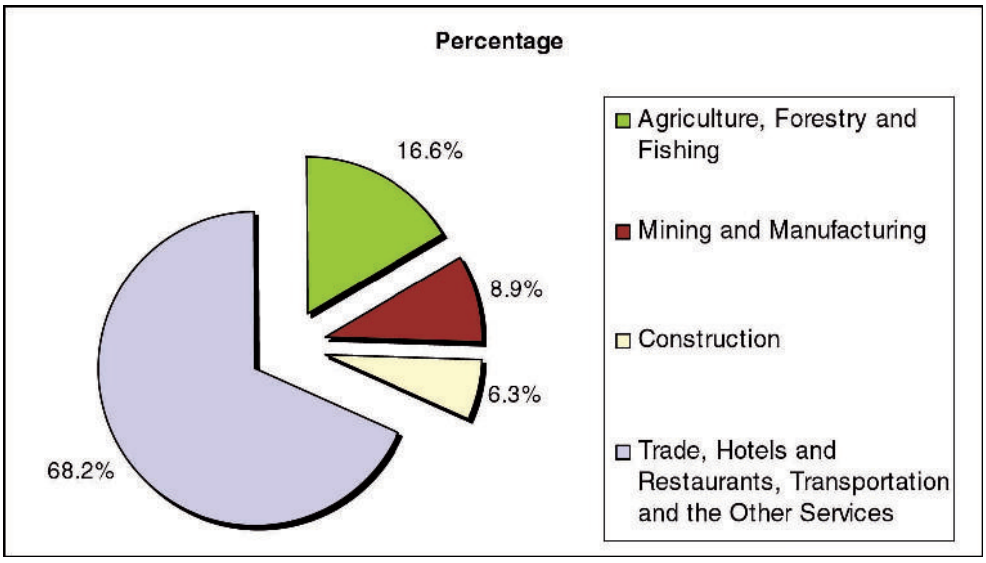


Figure (4-2): Participation percentage of economic activities in persons engaged in employment in the Gaza Strip in 2003. (Source: http://www.pnic.gov.ps/arabic/Withdraw/reports-6.html#_ftnref13)

Table (4-3) indicates that the first five major industries have the highest percentage among the different industrial activities. Thus, the required financial resources should be sought for new investments to establish new markets and/or try to overcome the problems encountered by such industries through establishing Partnerships, Joint Ventures and Industrial Public Stock Companies (http://www.pnic.gov.ps/arabic/Withdraw/reports-6.html#_ftnref13).

Another important economic activity is foreign trade which contributes by vitalizing the economy in the Strip. The value of exports and imports reached 38.4 and 410.5 million USD in 2001 respectively, with a deficit in the net trade balance equal to 372.1 million USD. A decrease in the trade exchange continued to occur in the Gaza Strip during the next years due to a decline in Palestinian imports which were affected by the complications imposed on them. These problems included security clearance processes in the ports as well as increasing the costs for the transportation of goods. Other reasons for the decrease in trade activities relate to declining living standards and a marked deterioration in the purchasing power of locals due to the increase in the unemployment rate and poverty (http://www.pnic.gov.ps/arabic/Withdraw/reports-6.html#_ftnref13).

Table: (4-3): The main branches in industrial sector in the Gaza Strip, 2003

Type of Industry	No. of persons engaged	Percentage of persons engaged
Manufacturing	18,907	97.3
Manufacture of food and beverages	2,272	11.6
Manufacture of wearing apparel	7,295	37.5
Manufacture of non-metallic products	2,450	12.6
Manufacture of metal products	2,448	12.6
Manufacture of furniture	1,759	9.5
Electricity and water supply	519	2.6

Source: PCBS, 2004

- AGRICULTURE IN THE GAZA STRIP

The Gross Domestic Product (GDP) of agricultural production in the Gaza Strip reached 550 million USD in which the gross income of plant production reached 319 million USD which formed 58% of the gross agricultural product. However, the livestock gross income product reached 231 million USD which formed 42% of the gross agricultural product (Ministry of Agriculture, 1997).

Chapter two illustrated the classification of the agricultural areas in the Gaza Strip as derived from the satellite image analysis in 2004. Table (4-4) lists the classified agricultural types in the Gaza Strip by Governorate.

Table (4-4): Agricultural types in the Gaza Strip by Governorate in 2004

	Area in Dunums					
Land Cover Type	Deir al Balah	Gaza	North Gaza	Khan Yunis	Rafah	Total
Arable land	20,100	13,830	9,950	44,810	23,370	112,050
Heterogeneous agricultural areas	160	200	10	100	0	8,470
Permanent crops	12,370	14,850	7,900	14,690	6,130	55,950
Greenhouses	1,790	740	990	3,300	4,930	11,750
Shrub and/or herbaceous vegetation associations	840	920	1,400	1,250	230	4,630
Shaved Area	5,140	10,530	17,720	6,420	4,490	44,240

Source: ARIJ database, satellite image analysis in 2004

It was estimated that the total direct and indirect losses of the agricultural sector during the period from 2000 to 2005 (i.e. during the Second Intifada and before the withdrawal from the Gaza Strip) equals 1,120,380 trees and 44,290 dunums of shaved areas in 2004 (ARIJ database, 2004) in which 24,262 dunums related to the irrigation networks which were leveled and 392 wells which were destroyed (PCBS, 2005). For example, 444,387 citrus trees were uprooted since the new wave of incursions in the Gaza Strip, thousands of dunums

of cultivated fields were razed and further thousands of fruit trees and orchards were destroyed, see table (4-5).

Table (4-5): Losses in Citrus trees and area in the Gaza Strip, from 2000 to 2005

Loss Type	Unit	Governorate					Total
		North Gaza	Gaza	Deir al Balah	Khan Yunis	Rafah	
Citrus	Tree	360,218	49,570	15,772	14,438	4,389	444,387
	dunum	8,990	1,235	394	359	108	11,086

Source: State Information Services, September 28, 2000 – January 31, 2005

According to the satellite image analysis, the Gaza Strip has a total area of greenhouses which equal 11,750 dunums. A private Institution of Israelis and Americans contributed 14 million USD to purchase greenhouses with an area of 3,162 dunums, which were formerly used by 200 Israeli colonist farmers, and handled over to Palestinians after the withdrawal. The 3,500 Palestinian farmers who used to work in these greenhouses will continue working there, whilst each Israeli farmer was compensated with 4,000 USD for a single greenhouse. This over generous compensation package was in response to Israeli colonist farmers threatening to destroy the houses so as to not allow the Palestinians to benefit from them.

According to the General Director of the Palestinian Economic Development Company (PED) (which was recently established in order to participate in the development of Palestine and the private sector), the efficient utilization of the greenhouses in the evacuated areas will generate revenues of 70 million USD per year for the Palestinian treasury. He assured the Palestinians that the company will supervise and manage the greenhouses without American or Israeli interference. In addition, he considers the management and development of the evacuated agricultural lands as a national challenge and the greenhouses to be a national resource which will be a valuable source of income to many Palestinian households (Al Quds newspaper, August 30, 2005).

- THE SEA AND FISHING IN THE GAZA STRIP

Although the Gaza Strips shore is on the Mediterranean Sea, the strip has suffered from a severe decrease in the potential economic resources which the proper utilization of the sea would provide. The period between (1967-1980) was considered the golden era for fishing in the Strip since fishermen were allowed to practice fishing in an area about 180 km from the Gaza Sea Shore as far as Al Bardaweel in the south near Al ‘Areesh city, where Palestinians were sometimes able to reach the Egyptian Port-Saed area. Hence, the amount of fishing in that period weighed in at 60 ton/day.

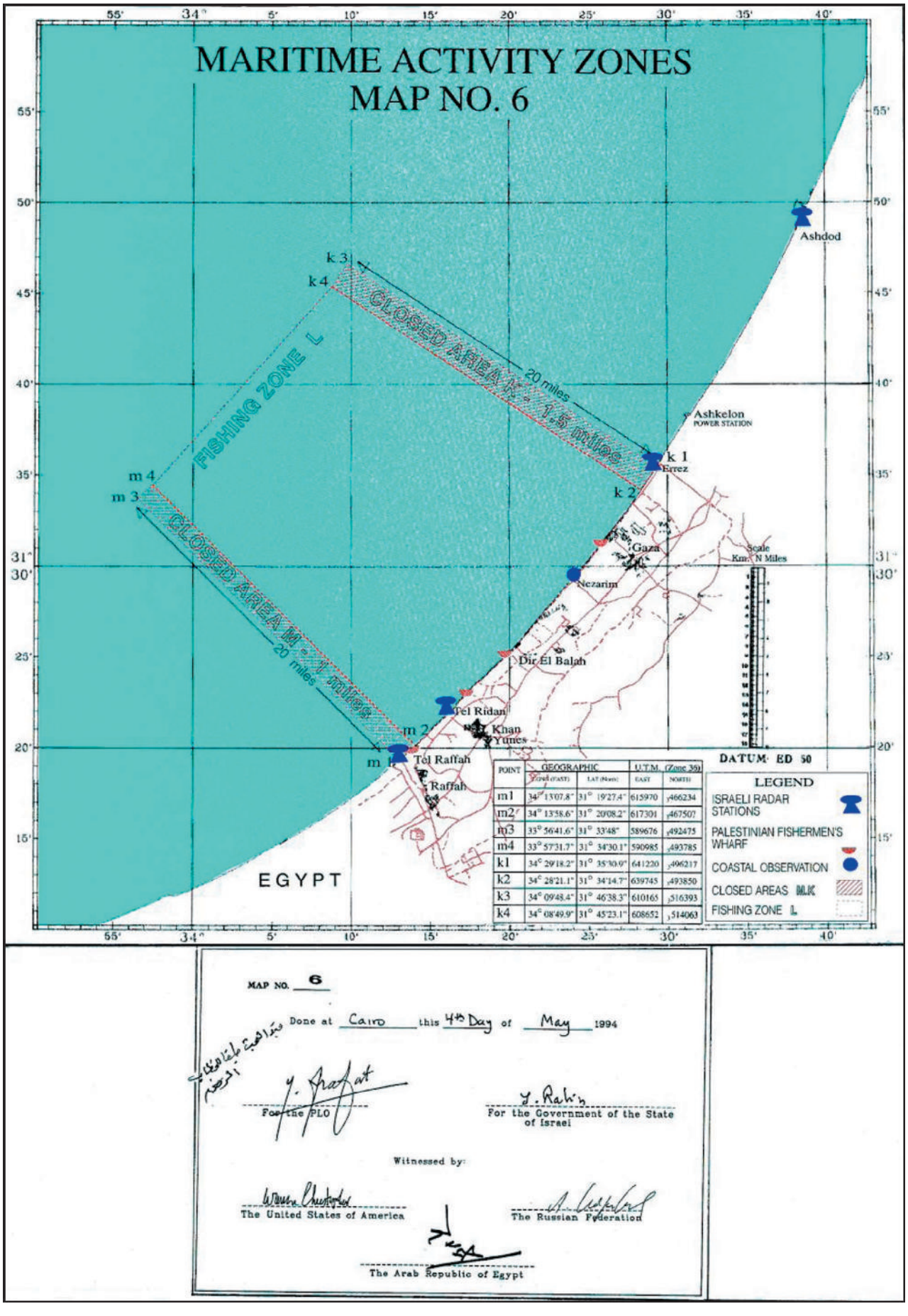
This situation has changed since the Israeli Occupation Authorities started to enforce restrictions on the Palestinian fishermen, limiting the area allowed for fishing to 82 km. Furthermore, after the Oslo Agreement in 1993, this area has decreased again to 35 km along the Sea Shore with a depth of 20 km only. Thus, this has resulted in the severe undermining this industry leading to a continuous decline in the amount of fishing.

From 1980 the Gaza Strip was also under siege from the Sea by the IOF. Currently, fishermen are not allowed to go further than 8 miles out (13 km) although, according to various the Palestinian-Israeli agreements, they were permitted to have a fishing zone of up to 20 miles (32 km), see map (4-7). In the Gaza Strip, about 3,500 Palestinians are employed and fully economically dependent upon the fishing sector which has been badly affected by Israeli violations. Specifically, hundreds of Palestinian families in As Shate’ refugee camp, Deir Al Balah and Al Mawasi area (in Rafah and Khan Yunis Governorates) depend on the fishing profession and its trade for their living.

The fishing industry continues to experience losses as the situation for Palestinian fishermen hasn’t improved for many years due to the blockade imposed by the Israeli military siege along the Gaza Strip Sea Shores. The Department of Fisheries stated that the direct losses for the fisheries have reach 41 thousand USD for each day of closure. Moreover, the industry also makes losses estimated at 25 thousand USD due to the fishermen not being able to market their fish products to the outside world, obliging them to freeze the fish which leads to a considerable drop in the original value of the stock if sold fresh (ARIJ, August 16, 2005). Generally, the

direct and indirect losses of the fishing sector during the Second Intifada are estimated to be 12 million USD due to the Israeli restrictions which are designed to destroy this sector.

The impact of the Israeli withdrawal on the fisheries in the Gaza Strip may be accurately examined under the assumption that the Israelis will keep control of most of the regional waters since it is the most probable outcome of the current situation. However, the fishery sector will directly benefit from the small increase in the size of the fishing zone under the PA. The fishing zone that will be under the PA's control is estimated to increase by 18 km to reach a total of 30 km from the shore. Thus, this will increase the number of boats used for finishing and will also increase the value of fishing to approximately 20 million USD per year. The number of workers in this sector will double and this will hopefully be accompanied by the developing of fishing equipment (http://www.pnic.gov.ps/arabic/Withdraw/reports-6.html#_ftnref13).



POINT	GEOGRAPHIC LONG (EAST)	GEOGRAPHIC LAT (North)	U.T.M. (Zone 36) EAST	U.T.M. (Zone 36) NORTH
m1	34° 13'07.8"	31° 19'27.4"	615970	3466234
m2	34° 13'58.6"	31° 20'08.2"	617301	3467507
m3	33° 56'41.6"	31° 33'48"	589676	3492475
m4	33° 57'31.7"	31° 34'30.1"	590985	3493785
k1	34° 29'18.2"	31° 35'30.9"	641220	3496217
k2	34° 28'21.1"	31° 34'14.7"	639745	3493850
k3	34° 09'48.4"	31° 46'38.3"	610165	3516393
k4	34° 08'49.9"	31° 45'23.1"	608652	3514063

Map (4-7): Fishing zone according to the agreement on the Gaza Strip and Jericho area in Cairo

4.6. The Gaza Strip after 38 Years of Occupation

The Israeli Government approved a decision to end its Military control over the Gaza Strip after 38 years of occupation. On Monday September 12th, 2005, the withdrawal process from the Gaza Strip ended with Israel surrendering 29.7% (107.8 km^2) of the Gaza Strip to Palestinian control, except for the 650 meter buffer zone which extends along the eastern border of Gaza from north to south. However, Israel still maintains control over Gaza's airspace, access to international water and border point access to Occupied West Bank area.

The legal aspects surrounding Israel's surrender of the areas of the Gaza Strip under its control to Palestinians has induced various legal arguments as to whether the Israeli occupation in the Gaza Strip is over or not with the realization of the "Disengagement Plan". The fact that Israel retains a fraction of the land which was under its control as a buffer zone area, combined with its full control of Gazas airspace, access to international waters and all points of border access to the Occupied West Bank area, was the essence of the argument which contests the status of the Israeli occupation; whether it has ended or just acclimatized to a new reality. However, other reasons which strongly support the abiding term, 'Israeli occupation', include the fact that the Gaza Strip and the West Bank (including East Jerusalem) are regarded as a single territorial unit; a fact which was formerly recognized by both the PLO and Israel. Furthermore, Israel has also reserved itself the right to re-enter the Strip at will under security pretext, which also includes control over Gazas water and other territorial rights within the strip (http://www.bitterlemons.org/previous/bl220805ed30.html).

4.6.1. The Proposed Future Plan for the Lands on which the Colonies were Built and the Properties within them

- **URBAN AREAS**

The Minister of Public Works and Housing stated that the PA intends to convert the Gaza Strip to one main city rather than the five existing main cities by the year 2020. Additionally, the Minister declared that the PA is aiming to construct new housing complexes along the Salah Ed Din road which extends from Beit Hanon (Erez) crossing in the north to the borders with Egypt in the south of the Strip. The Minister added that Gaza city will resemble Cairo city (i.e. population density is about 35,000 capita/km^2) in the future with regards to the high population density, which is expected to reach 24,000 capita/km^2, becoming one of the most crowded cities in the world. There are studies and plans prepared to construct 'Cornish Gaza' project along the coastal road which the Israeli colonies occupied 20 km^2 of its total area (i.e. 45km length). After the withdrawal process, it is supposed that the Ministry will integrate the evacuated areas with the Palestinian localities in the Gaza Strip (Al Quds newspaper, August 22, 2005).

- **AGRICULTURAL LANDS**

The agricultural lands in the evacuated areas were announced as Qualified Agriculture Zones which have acquired the Governments concern to rehabilitate them, facilitate and provide necessary exemptions to reuse them as soon as possible with special attention given to providing exports. As mentioned in section 4.6.2 the greenhouses will be managed by the recently established PED Company which will also guaranty the rights of persons who have legal ownership (PNA, 2005).

- **BEIT HANON INDUSTRIAL ZONE (EREZ)**

The Palestinian Ministerial Council took a decision to classify Beit Hanon (Erez) as a specialized industrial area according to the procedures in Law Number (10)[26] of 1998 regarding industrial cities and free industrial zones. The council was authorized to manage Beit Hanon industrial zone and to provide temporary contracts for projects to guaranty the continuation of the work after adjusting the zone. Furthermore, a necessity has emerged for the companies in the industrial zone to modify their legal status according to the rules in the PNA. The Palestinian Ministerial Council also assigned the Ministry of Public Works and Housing (MPWH) to coordinate with other Palestinian institutions in preparing technical studies and plans to integrate the

[26] http://www.moj.gov.ps/tashreaat/law146.htm

infrastructure of Beit Hanon's industrial zone (Erez) with the Gaza Strip's regional infrastructure. Moreover, the MPWH will be responsible for providing funds to cover the cost of the technical and engineering work for this purpose and then to later provide plans for the implementation according to the bid Governmental law (PNA, 2005).

4.6.2. The Proposed Future Plan for Border Crossings

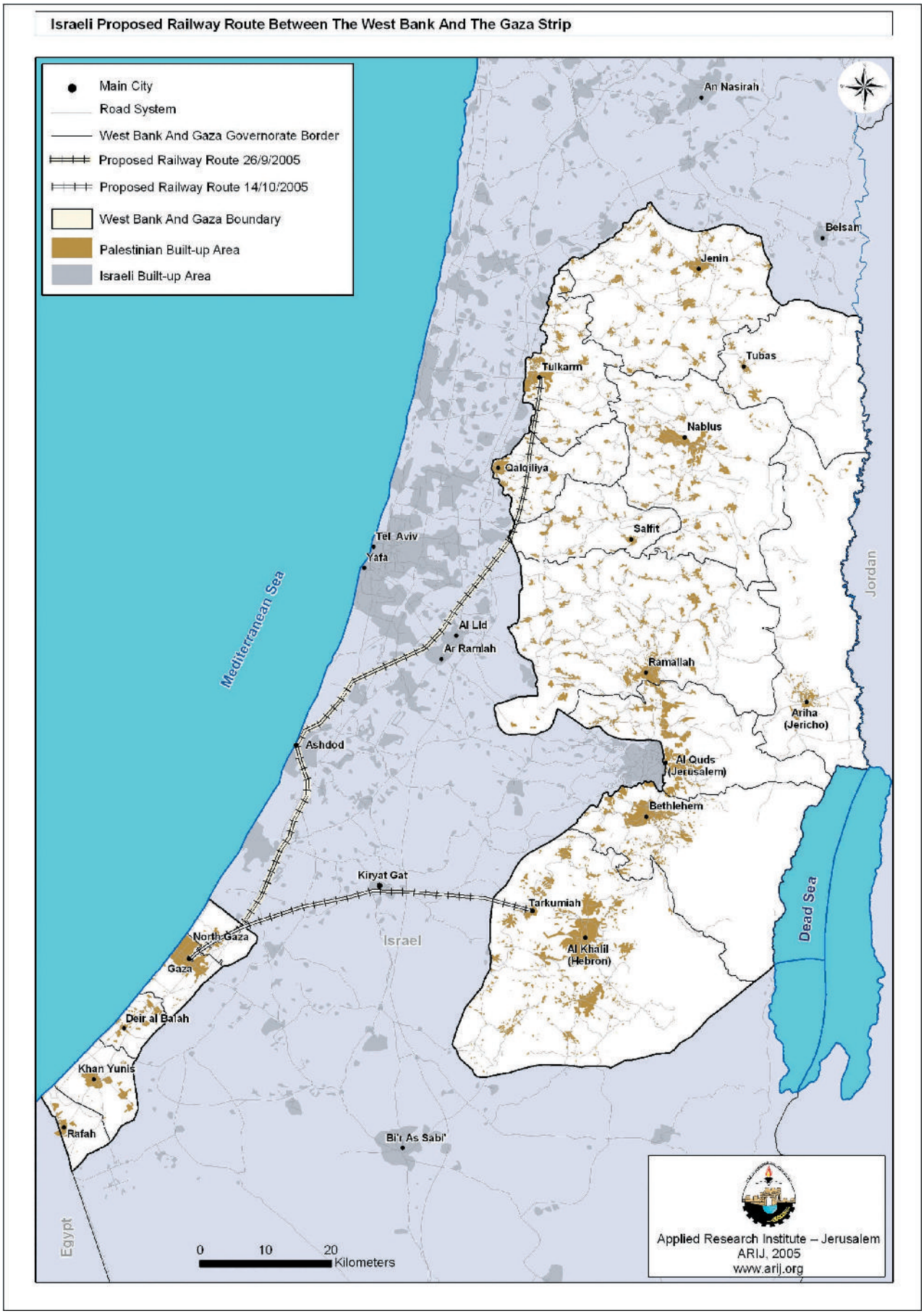
The border crossing issue is essential due to its economic importance for the future of the Palestinian lands. Ensuring the free entry and exiting of people, vehicles and goods to the external world without any restrictions is vital. Beyond the withdrawal of colonies from the Gaza Strip, three points should be considered and emphasized:

1. The reconstruction and operation of Gaza International Airport for people and goods.
2. The construction and full operation of an integrated Seaport in the Strip. This requires specifying the location of the Gaza Seaport to the south of the Sheikh 'Ejlin area and charging the related institutions to start working in securing the required funds (i.e. 88.5 million USD) to construct the Gaza port.
3. Full control over the Rafah border crossing which should operate for 24 hours for people and external trade movement. The MPWH, in cooperation with the ministries concerned, is responsible for the preparation of plans and the required designs to develop and rehabilitate the Palestinian side of the border crossing and provide the necessary funds for this purpose.

In reference to the border crossing allowing the transfer of goods and passengers between the West Bank and Gaza Strip; between Palestinian Territory (PT) and Israel and between the PT (via ports in Israel) to regional and international markets, it was agreed that it is necessary to replace the Back-to-Back System[27] applied at the border crossings with the new door-to-door system. Applying the new system will require the preparation of a written system, which is agreed upon by both sides, taking into account developing the infrastructure and installing the new technology at the border crossings to support the new system and its procedures. The technical team of Palestinian experts and professionals who are in charge of studying the Israeli withdrawal process have emphasized the importance of positioning all the border crossing terminals on the internationally recognized 1967 borders of the PT (PNA, 2005).

In this context, establishing a railway linking the Gaza Strip and the West Bank is a suggestion which is being studied in Israel. It appears that the idea of establishing the railway is a modification of the 'safe passage' arrangements as identified in the Palestinian-Israeli peace agreements of 1993. In January 2005, it was supposed that the railway will be at least 100 km long, starting from Gaza city, passing by the Israeli port 'Ashdud' which will provide the Palestinians with access to the sea for trade purposes, and finally reaching its last stop in Tulkarm in the West Bank (Al Quds newspaper, January 26, 2005). In October 2005, however, another train route which will pass through the Erez crossing in the northern Gaza Strip to the Tarqumiya village to the northwest of Hebron was proposed by Israel as a safe passage between the Gaza Strip and the West Bank. The suggested route of the train is currently under scrutiny by the Palestinian negotiating team (http://www.ynetnews.com/articles/0,7340,L-3154849,00.html), see map (4-8).

[27] This system implies to upload and unload goods at border crossings where registered vehicles from both Israeli and Palestinian sides are used for this process.



Map (4-8): The proposed railway between the West Bank and the Gaza Strip as identified by Israel (Source: Al Quds newspaper, January 26, 2005)

4.7. Conclusion

This chapter provides information about the Israeli withdrawal process from the Gaza Strip, highlighting the history and the implementation of the "Unilateral Disengagement Plan" and revealing that 87.5% (317.5 km^2) of the Strip, except for 650 meters buffer zone along the eastern border of the Gaza Strip from north to south with Israel, is currently under PA control. However several crucial issues are still under negotiation such as Gaza boundaries - as Israel did not withdraw to the 1949 Armistice Line - control over Gaza's borders, Gaza Airport, Gaza Seaport, the safe passage between the Gaza Strip and the West Bank, control over groundwater and control over the airspace and sea.

The chapter includes details about the current and future plans for managing the border crossing terminals of the Strip and identifying proposed solutions. Additionally, the impacts of the plan on the natural resources including water and environment as well as the impacts on the socio-economic situation of Palestinians were presented and discussed. One of the important parts of this chapter is the one representing the social and economic situations of the Strip before and after the withdrawal process for the different economic sectors (e.g. agriculture, fishing, industry and trade). Finally, the chapter showed the Palestinian perspective of the proposed future situation of the Gaza Strip after the 38 years of Israeli occupation.

Generally, Palestinians consider that the main standard by which to assess the success of the withdrawal process is clear and simple to identify. Success depends on the positive economic and political results of the process. On the other hand, if this process leaves behind imposed restrictions on movement (entering and exiting the Strip), then the PA will lose its credibility due to a continuous deterioration of the economic, political and security situations.

It has been observed from the Israeli scenarios of the "Disengagement Plan" that Israel is interested in implementing the withdrawal from the Gaza Strip not because it recognizes the legitimate rights of the Palestinian people, or because it feels the need to comply with international law; but simply because the Strips high population density has made the original Israeli target of colonizing the Strip very difficult. These factors have forced the colonies areas to be clustered in very limited spaces which are distributed in three separate colony blocs; In order to maintain their colonial project in Gaza - and protect only a few thousand colonists – the Israeli military had to establish military control over the entire Gaza Strip. An exercise which was almost as expensive as it was futile.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The analysis showed that over the past five years urban expansion in the Gaza Strip Governorates has been significant. The two different types of urban area in the Gaza Strip reflect the conflicting politics and have led to expansion without coexistence. Palestinian urbanization is characterized by high natural urban growth, unplanned urban structures and a lack of control, partly due to the occupation. The Israeli urbanization in the Gaza Strip is characterized by artificial urban growth, which is part of the Israeli colonization policy in Occupied Palestinian Territory.

The ecosystem of the strip has also been distinctly affected due to a loss of lands classed as agricultural and open space. The land area of the Israeli colonies in the Gaza Strip has increased by 8.9% between 2001 and 2004. Analysis of the satellite images, on a regional and local level, showed that Israeli colony expansion occurred at the expense of the available Palestinian fertile and valuable agricultural areas in the Gaza Strip. Also most of the loss of open spaces occurred due to continuous Israeli land confiscation in order to build new colonies or expand existing ones, which has negatively affected the ecosystem of the area.

Land confiscation together with building prohibition - in addition to many other obstacles and controlling measures by the Israeli Authorities, such as house demolitions, land bulldozing and the uprooting of trees - have impaired and hindered planned Palestinian urban development and expansion of the Palestinian communities. The Israeli colonies and military bases have strangled many Palestinian cities, towns and villages. Most of the areas designated for future growth or expansion, were confiscated for the construction or expansion of those Israeli colonies or for other activities as mentioned above. Many areas that are suitable or necessary for the urban functions and services were also confiscated and bulldozed by the Israeli Authorities. Therefore, land confiscation and bulldozing negatively impacted the Palestinian urbanization process and still continue to have negative implications for the Palestinian communities living in the Gaza Strip by hindering any possibility for its sustainable urban development.

The most alarming factor restricting urban development is the construction of the Israeli segregation wall, which does not take into consideration the continuity and development of the Palestinian communities.

Furthermore, it is unlikely that the dramatic urban expansion witnessed over the past decade will decline in the near future, since the population growth estimates indicate a large population increase in the future, which will in turn increase the pressure on land use. It is estimated that the built-up area development could increase from covering 15.0% of the Gaza Strip in 2000 to covering 47.9% in 2025. It is therefore likely that future urban growth will consume a high portion of scarce natural resources if it continues to grow at the same uncontrolled pace. However, the Palestinians have little choice but to keep building inside the area under their control, which means building on water sensitive areas and exploiting agricultural land. The projected expansion of built-up areas for the year 2025 indicates a serious threat to these natural resources. Therefore, careful planning for urban and rural expansion is needed to regulate these developments and to minimize the damage to the ecosystem. However, the increase in the area of land that is suitable for urbanization projected in the model scenario offers considerable potential for Palestinian expansion in order to accommodate future population growth.

5.2. Recommendations

In the future, it is very important to understand the nature of the functional relationships between the built-up areas needed and the amount of land available, so as to introduce sound urban planning that will pinpoint the potential areas for development. Sustainable urban development will not be attained unless efficient urban planning is imposed to reduce the conflict of urban development with the environment and natural resources.

Given the fact that Palestinians are gaining more control over their own urban peripheries, the growth of residential and commercial land use is likely to accelerate. The question which must be asked is; how can this development be channeled and shaped to optimize the amount of open space, nature reserves and fertile land for agriculture whilst also meeting the demand for urban development? In the Palestinian context, most cities still retain the monocentric urban form, where business is agglomerated in the central core. However, due to the rapid growth in population, many of the satellite villages are growing to form cities with sufficient functionalities. As a result of the lack of urban planning, the conversion of farmland to residential housing has accelerated lately, spurring sprawl to continue in these territories. In this context, planners must decide whether they want to encourage even greater centralization (known as compact cities) or to promote polycentric development patterns (known as multinucleation cities).

The first strategy would require decision makers to promote intensified development at the core of the cities and inner suburbs, through the construction of high rise buildings which could accommodate the growing population densities that are forecasted for the future. Nevertheless, such a strategy would not be appropriate for all the Palestinian cities, particularly those such as Rafah, where open space is very limited at the core. Therefore, strategic planning should first be tested via the proper Planning Information Technology (PIT) tools, which could inform the selection of the best solution given a number of alternative scenarios. Moreover, future planning should not only address the problem of available land but also should investigate the social implication of these plans and strategies on the local inhabitants. The second strategy of polycentric urban forms would create new nodes of commercial and residential development outside of the traditional core, leading to newly independent urban centers in the future.

Above all, more awareness of land use issues needs to be built at both the municipal and the national levels before land use planning can become an effective development tool. Urban planning concepts and up to date planning tools and technologies should become the dominant players in shaping future urban development. This will allow the Palestinians to increase their efficiency in land use management and prepare to tackle the complex problem of land development.

Lack of management will cause many problems in the future. Therefore, more focus on urban planning and management is needed to accommodate the expected future growth. These following recommendations aim at maximizing the benefits for Palestinian communities, whilst minimizing the negative impacts of urbanization on Palestinian nature:

1. Designate land for long term future urban development through developing the available well-designed master plans and the existing Regional Plan for the Southern Governorates 2005-2015 taking into consideration different urban growth scenarios.
2. To formulate a National Committee for Land Use Management (NCLUM) from all the ministries and organizations related to urban growth and land use, to assess the situation and available resources to develop a logical scenario in a participatory approach..
3. The planning process for urban development should take into consideration the exiting high population density in the refuges camps which reaches to 3 folds than the population density of the Gaza Stripper built-up area.
4. The planning process for future urban development should take into consideration the required infrastructure and facilitates along with the nature of land ownership.
5. Manage land use inside the withdrawn lands of the Gaza Strip for resource sustainability and regulate economic activities.

6. Study the land use / land suitability and redeploy area.
7. Study the environmental indicators for future development of both the Strip and the withdrawn lands.
8. Implement survey programs for the resources and residues of the occupation inside the withdrawn lands.
9. Develop Cadastral Maps for the basin and land ownership, especially for the withdrawn land.
10. Adopt legislations and polices which aim at preserving the natural recourses taking into consideration the pressure of the natural growth of the Palestinian population.
11. Develop an up to date information database to follow up the changes in land use and planning.
12. Perform detailed studies to explain the impact of the socio-economic situation on the urban development in the Gaza Strip.
13. Highly significant agricultural lands have to be protected and conserved. Therefore, it is important to specify areas of green cover, open space and green belts in which urban growth will not be permitted in order to reduce the negative impact of urbanization on the designated natural reserve areas.
14. The issuing of new permits should be regulated, so as to avoid new construction on water sensitive areas, which could interfere with the quality and quantity of the water resources. The community leaders stressed their worries regarding the future sustainability of water usage in urban areas.
15. Investigate thoroughly the issue of urban development and future strategic planning through further research in order to develop sound and effective future urban plans and land use management schemes.
16. The issuing of new permits should be regulated, so as to avoid new construction on environmental sensitive areas.
17. Consider meeting the needs of Palestinian people through an efficient delivery of both physical and social infrastructure facilities and services. Therefore, preserve enough space to construct and establish functional activities and social infrastructure facilities such as schools, universities, and hospitals.
18. The related Palestinian Authorities and ministries should encourage and develop financing and banking systems that give loans for urban development and suitable areas
19. Encourage the developers and housing cooperatives to build in a more compacted way in order to optimize the land used for urban development.
20. There is a need to develop a national urban observatory network.

ANNEXES

ANNEX 1

SPOT SATELLITE DATA

The SPOT satellite Earth Observation System was designed by the CNES (Centre National d'Etudes Spatiales), in France, and developed with the participation of Sweden and Belgium. The first SPOT satellite was launched in February, 1986. Since then, the launch pad Ariane, located in French Guiana, has put three more SPOT satellites into orbit to keep the SPOT system operational for nearly fifteen years.

The SPOT archive is composed of 152 images covering the whole of the British Isles from the early 1990s. The first SPOT satellite was launched in 1986 and this was followed in 1988 by SPOT2, in 1993 by SPOT 3, and in 1998 by SPOT 4. The latest addition to the series, SPOT 5 was launched on the 4th of May 2002 and has increased resolution and spectral capabilities.

The SPOT satellites have a repeat cycle of 26 days. However, their sensors can be tilted to view areas that are under different orbital tracks. This makes it possible to view specific points on the earth with a 5-10 day frequency. SPOT satellites have an onboard tape recorder, as well as a network of ground stations, so data can be acquired anywhere in the world.

We Use Spot 5 Level 2A scenes with standard cartographic projection (UTM WGS84 by default) not tied to ground control points. Allowing for possible differences in location. With 10 meter color resolution and 2.5 meter panchromatic resolution.

SPACE IMAGE IKONOS

The IKONOS satellite was successfully launched in November 1999 to give the highest resolution scenes available in the public domain. For this project The IKONOS images used are Multispectral with four-meter ground resolution having four bands distributed as true color (RGB) and near infrared (NIR) bands. . This imagery is ideal for urban mapping, cadastral mapping, and GIS applications, which require high positional accuracy. The four-meter resolution of multi spectral data allows the distinction of ground features with dimensions as small as four meters. The targeted image is captured with less than 10% cloud interference.

ANNEX 2

CORINE CLASSIFICATION SYSTEM

The CORINE land cover nomenclature was adopted for this research project in order to create a land cover database that provides information on the status of landscape. The CORINE classification was customized and tailored to fit the unique nature of the study area. The nomenclature classifies land uses into level I, level II and level III (with increasing degrees of detail) categories (see annex 2). Sensors with a minimum spatial resolution of (30 x 30) meters are required to obtain CORINE level I classes, while sensors with spatial resolution of four meters are required to obtain CORINE level II classes. Using higher resolution of IKONOS imagery with less than 4 meters spatial resolution (one meter panchromatic imagery) will help an analyst obtain CORINE level III classes. In this research project CORINE level II is basically adopted.

Before classifying the pre-processed georeferenced Images, four rules were assigned to control the process of digitizing so as to achieve optimum results:

(i) The scenes were displayed with different color combinations (true color and false color) in order to facilitate the accurate dissemination of land use features.
(ii) The scenes were displayed at scale 1:5000 so as to obtain a consistent and unified land cover scale.
(iii) The second level of CORINE land cover nomenclature was adopted.
(iv) The minimum spatial units to be identified would vary from 1 to 5 hectares in size, depending on the land use class.

In order to classify the land use/land cover using the satellite images, screen digitizing was carried out. Visual interpretation was found to produce better results, although it is tedious, laborious and time consuming. CORINE second level classification inventories were adopted to be derived out of the three images for the project, see table-2. A dictionary was developed using the CORINE nomenclature of levels I and II through the aid of special digitizing extension that was built into ArcView3.2. Digital processing assisted interpreters in revealing extra details and resolving ambiguities. The ancillary data such as the master plans obtained from the MoLG in Gaza showing the land use/land cover types at municipal level were essential in helping to identify and confirm the contents of certain land units, which had not been recognized on the images.

Table 1: CORINE classification types

Agricultural areas	Forests and semi-natural areas
Arable land	Forests
Heterogeneous agricultural areas	Open spaces with little or no vegetation
Pastures	Shaved Area, 2001
Permanent crops	Shaved Area, 2003
Permanently irrigated land (green houses)	Shaved Area, 2004
	Shrub and/or herbaceous vegetation associations
Artificial Surfaces	
Artificial non-agricultural vegetated areas	Water bodies
Industrial, commercial and transport unit	Inland waters
Mine, dump and construction sites	Marine waters
Urban fabric	
Animal Parkas	Wetlands
Israeli Colony	Coastal wetlands
Israeli Military Base	Inland wetlands
Palestinian Built-up Area	
Segregation Wall Buffer Zone	

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