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Urbanization and Environment: The Nature of the Conflict

A Study of Sustainable Urban Development in Ramallah and Al-Bireh Governorate

By

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List of Abbreviations

Abbreviation	Full Name
ARIJ	Applied Research Institute-Jerusalem
GIS	Geographic Information Systems
MLG	Ministry of Local Government
MOPIC	Ministry of Planning and International Cooperation
PCBS	Palestinian Central Bureau f Statistics
PNA	Palestinian National Authority
UNEP	United Nations Environment Program
UNRWA	United Nations Relief and Works Agency
WHO	World Health Organization

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Palestinian Ministry of Local Government

Palestinian Ministry of Planning and International Cooperation

Palestinian Environmental Quality Authority

Al-Bireh Municipality

Ramallah Municipality

Dedication

To faithful Ruba and lovely Basel...

ملخص الدراسة

يتبنى هذا البحث مبدأي الوصف والتحليل لوصف وتقييم الوضع الحالي للبيئة العمرانية في محافظة رام الله والبيرة لوضع نظام متاكمل لإدارة وتخطيط البيئة العمرانية بالاعتماد على مجموعة من المعايير التي تم اختيارها للمساعدة في وضع خطة لتحقيق التنمية الحضرية المستدامة من ناحية بيئية، وصولا إلى سنة الهدف المتمثلة بالعام 2020.

تعتبر الزيادة المتسارعة في أعداد السكان ونسبة التحضر في محافظة رام الله والبيرة عموما، وفي مدينتي رام الله والبيرة على وجه الخصوص، أهم القضايا التي يتضمنها هذا البحث، وذلك نظراً لأن ما تشهده المدينتان من زيادة في هذا المجال قد أدى إلى زيادة الكثافة السكانية التي بلغت نحو 1800 شخص/كم^2 إلى جانب ارتفاع نسبة التحضر بشكل لا تستطيع البنى التحتية المتوفرة مواجهته أو التأقلم معه.

تم في هذا البحث تقدير أعداد السكان في محافظة رام الله والبيرة في العام 2020 بما يزيد عن نصف مليون شخص، في حين بلغت المساحة المبنية المطلوبة لملائمة احتياجات هذا العدد من السكان حوالي 158 كم^2.

لاحقا لذلك تم عمل التحليلات اللازمة باستخدام برمجيات نظم المعلومات الجغرافية حيث تم حساب مساحة الأرض المتوفرة ضمن حدود المحافظة والملائمة لأغراض التنمية الحضرية المستدامة من ناحية بيئية فكانت حوالي 297 كم^2، واستناداً إلى هذه النتيجة خلص البحث إلى عدم جدوى تركيز السكان والخدمات في مدينتي رام الله والبيرة وتم اقتراح التوجه نحو التجمعات والمراكز الفرعية بحيث يتم توزيع السكان والخدمات عليها.

Abstract

This research considers both analytical and descriptive procedures to describe and evaluate the current urban environmental condition in Ramallah and Al-Bireh Governorate in order to introduce an integrated approach of urban environmental planning and management based on a set of evaluation criteria that have been formulated in order to set a basis for the sustainable urban development in the target year of the study; 2020.

The main issue emerging in this research is that population counts and urbanization level are increasing excessively in Ramallah and Al-Bireh Governorate, mainly Ramallah and Al-Bireh cities, which led to high population densities and urbanization rates that cant cope with the existing infrastructure utilities in the two cities where the population density was almost about 1800 person/km^2.

In this research it has been projected that the population in the governorate will exceed 500,000 inhabitants by the year 2020 and it was estimated that the required built-up area in the target year is about 158 km^2.

So far, GIS analysis based on subjectively selected factors has been performed and revealed that there are about 297 km^2 of suitable land for sustainable urban development in Ramallah and Al-Bireh Governorate. Hence, it was stated that there is no meaning for concentrating people and services in Ramallah and Al-Bireh cities and it was suggested to go towards the sub-centers where population and services can be distributed.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Urbanization is referred to as an "increase in the number of a given population inhabiting areas designated as urban". Urbanization has been the dominant demographic trend during the last half century. In 1950, some 750 million people lived in urban areas while by the end of the 20th century there were about three billion inhabitants, close to 50 percent of the world's population, living in urban centers, compared to less than 15 percent in 1900. Moreover, most of the world's growth in population between 2000 and 2020 is expected to be in urban areas (World Commission, 1987; Walsh, 2004).

As cities have grown to enormous size, their inhabitants' consumption and production patterns have generated environmental stresses due to limitations on the land, water and other natural resources required to feed, clothe and shelter them. In addition, there is a need for schools, health facilities, transport and jobs, as well as open spaces in which to enjoy nature, including clean air and water. Those most negatively affected by the impact of overstressed and overstrained urban resources, especially in developing countries, but although rapid urban growth is often seen as "a problem", it is generally considered the nations' best. However, the increasing world's level of urbanization and the size of its urban population may lead to many dramatic urban changes (Haughton and Colin, 1994).

Given the fact that Palestinians further land use development is likely to accelerate, it is very important to understand the nature and functional relationships between the built-up areas needed and the amount of land available, so as to stop uncontrolled urban growth since sustainable urban development will not be attained unless efficient urban planning is imposed to reduce the conflict of urban development with environment and natural resources. Thus; the question that jumps to the mind now is

how can this development be channeled and shaped to meet the demand for urban development but to preserve as much as possible the amount of natural reserves and fertile land for agriculture in Ramallah and Al-Bireh Governorate?

This requires preparing a framework for assessing and directing development in a manner that sustains environment and needs a high perception of Palestinian community leaders besides a rise in households and public awareness and concern regarding the impact of urban development on environment.

In this context, more focus on the urban planning and management concepts is needed to accommodate the expected future growth and the up-to date planning tools and technologies should become the dominant factor in shaping the future urban development. This will allow the Palestinians to increase the efficiency in land use management and help to overcome the complex problem of land development.

This Research aims to study the urban trends and environmental problems in Ramallah and Al-Bireh Governorate and to maximize the benefits for Palestinian communities and to minimize the negative impacts of urban development on Palestinian environment and natural resources; thus being able to mange the urban development in the governorate through putting a land suitability map which shows most suitable areas that meet sustainable urban development.

1.2 Research Framework

1.2.1 The Urban Context

The West Bank governorates, which are defined as the Palestinian Land occupied by Israel in the year 1967, contain a natural and cultural landscape of high importance; an outstanding diversity of climate and topography, a wide range of biodiversity, and limited but valuable set of natural resources. Among these governorates, Ramallah and Al-Bireh Governorate is located in the middle of the West Bank with an area of

about 855 km^2, and contains 76 Palestinian built up areas that comprise about 10% of its total area, besides 27 Israeli colonies occupying almost about 28.5 km^2 of the governorate's area (PCBS, 2004 *a*; ARIJ, 1996).

Demographic trends in Ramallah and Al-Bireh Governorate, as is the case of other governorates in the West Bank, have been closely related to the political situation. By the end of 1994, the estimated population of Ramallah and Al-Bireh Governorate was 176,154 inhabitants (ARIJ, 1996).

In 1997, the population census performed by the Palestinian Central Bureau of Statistics (PCBS) for the Palestinian territories revealed that the population of Ramallah and Al-Bireh Governorate was 205,448 inhabitants while in the year 2006 the estimated population in the governorate was 295,365 inhabitants (PCBS, 2006).

The twin cities Ramallah and Al-Bireh are the largest Palestinian communities in the governorate, and since Ramallah city is in the center of the governorate, most governmental, managerial, health and social services lie within the municipal boundaries of the city that is still going through different phases of urban development driven mainly by the peace agreements between the Palestinians and Israel. Moreover, there are many Palestinian built up areas in Ramallah and Al-Bireh Governorate that are moving quickly towards urbanization, but actually the largely fluctuating political situation affects the urbanization process and makes it really difficult to draw a clear distinction between rural and urban communities in the Governorate (MLG, 2004).

1.2.2 The Conceptual Framework

At the same time that rapid urban growth is making a major contribution to the economy of the West Bank, it is placing a major burden on the physical, environmental, and social infrastructure. The shortage of administrative, legislative,

and technical planning expertise even increases the threat of damaging environment; pollution is increasing rapidly and the traffic congestion in Ramallah and Al-Bireh Governorate is among the worst in the West Bank. (ARIJ, 1996).

Hence, it is required to accommodate the ever changing context of development in a way that makes the fact of becoming more urbanized -as a result of the accelerated economic, physical, and social developments- goes within a strategic plan to achieve sustainable development.

1.2.3 Research Objectives

The main objectives of this research are:

- ►Finding the best directions for expansion in order to achieve sustainable environmental urban development in the study area in the year 2020 under the current political situation.
- ►Assessment of the urbanization level and trends in Ramallah and Al-Bireh Governorate in a manner that allows establishing strategies, norms and guidelines to control urbanization directions in the governorate.
- ►Setting the guidelines for an action plan, policies and recommendations to be adopted by the regulatory responsible bodies to improve the environmental system and allow sustainable urban development.

CHAPTER TWO

LITERATURE REVIEW

2.1 An Urbanized World

Urbanization as defined by World Commission (1987) is “an increase in the number of a given population inhabiting areas designated as urban”.

Urban environment can be defined as the physical environment in urban areas, which is a complex mix of natural elements (including air, water, land and climate, flora and fauna) and the built environment (i.e. a physical environment constructed or modified for human habitation and activity encompassing buildings, infrastructure, urban open spaces and historical heritage…). The quality of the physical environment in urban areas is much influenced by its geographical setting, it is also influenced by and often intimately related to social components such as the values, behavior, laws and traditions of the residents, moreover, urban environmental problems are largely the result of the huge concentrations of decisions which in some way damage the urban, regional and global environment, because most of the activities which undermine sustainable development come down to the decision-making behavior of humans: individuals, communities, businesses and state. Hence, the extent of the environmental changes caused by any urban center should be managed and planned to drive decisions for long-term sustainability. During the 1990s, ideas about urban development and urban environment have been changing dramatically; the Earth Summit in Rio in 1992 powerfully established that environment and development must go forward together in balance, and the City Summit in Istanbul in 1996 emphasized the importance of this perspective for sustainable development of human communities and that urban environmental management is generally the key to achieving sustainable development (Burgess et. al., 1997).

2.2 Urban Bias

Rural-urban interaction in the developing world can be considered as an introductory illustration to the relationships between rural and urban places stating that rural-urban relations are complex and not all their aspects are as clear as migration from village to city (Lynch, 2005).

During the last three decades urban bias has been the most dominant theoretical framework for analyzing rural-urban relations among developing nations, as it involves many strategies which affect rural-urban interactions and have certain effect on the form and the spatial distribution of national development (Tacoli, 1998).

As cities have grown to enormous size, their inhabitants' consumption and production patterns have generated environmental stresses due to limitations on the land, water and other natural resources required to feed, clothe and shelter them. In addition, there is a need for schools, health facilities, transport and jobs, as well as open spaces in which to enjoy nature, including clean air and water. Those most negatively affected by the impact of overstressed and overstrained urban resources, especially in developing countries, but although rapid urban growth is often seen as "a problem", it is generally considered the nations' best. However, the increasing world's level of urbanization and the size of its urban population may lead to many dramatic urban changes (Haughton and Colin, 1994).

City and urban life took attention of many specialists in different fields of science like geography, anthropology, history, economy, engineering and planning. But it is really hard to find an ideal definition to be really considered as a full or complete definition of the city or urban area in any of these sciences, which made the word "city" just an abstract term that doesn't show any hardcore difference or distinction to be considered as the limit to separate between rural and urban areas (Egen, 1995).

Even though, the distinction between "rural" and "urban" is probably a must for descriptive purposes; the distinction of communities to rural and urban is considered as one of the basic statistical divisions within the statistical system of any state, where rural and urban populations are usually defined by residence in colonies above or below a certain size; agriculture is assumed to be the principal activity of rural populations whereas urban dwellers are thought to engage primarily in industrial production and services (PCBS, 2003 *a*; Tacoli, 1998).

The ways in which nations define what is urban and what is rural can be very different; however, distinguishing colonies to rural and urban within any country is based on a main assumption which indicates that urban areas, whatever is the definition, offer certain standards of life quality different than those in rural areas, however, this difference in life quality is becoming unclear and the main distinction between rural and urban areas tends to be based on the number of dwellers of the area (PCBS, 2003 *a*).

In reality, however, things tend to be more complex; the boundaries of urban colonies are usually unclear as indicated by administrative borders, especially when population movement is considered; temporary and seasonal migration is not usually reflected in census figures and can make enumerations of rural and urban populations unreliable (Tacoli, 1998).

2.3 Rural-urban Classifications in the Palestinian Territories

Criteria on which definitions of rural and urban areas can vary widely between different nations, making generalizations problematic. Palestine is a place where it is really hard to distinguish between rural and urban areas; before the year 1997, any community that has a municipality was considered as an urban area or a city, where

all other communities which don't include municipalities were considered as rural areas or refugee camps, but after many villages had been change into municipal administration, this classification didn't work anymore and it became necessary to find a new classification for rural-urban areas in Palestine. Although it is hard to draw a clear distinction between rural and urban communities in Palestine, PCBS adopted in 1997 a new classification standard that considers the special nature of the Palestinian communities. This classification standard considers that each community with a population of 10,000 or more (except refugee camps) besides these communities whose population is more than 4000 and less than 10000 but having at least four services out of five (public electricity network, public water network, post office, secondary school that grants the high school certificate and medical clinic with doctor's presence for 6 days per week) is considered as an urban community, and elsewhere the community is considered rural (PCBS, 2003 *a*; PCBS, 1999).

2.4 Rural and Urban Areas in Palestine

The Palestinian territories fall administratively into 710 communities, among them there are 14 governorates (9 in West Bank and 5 in Gaza Strip) and 2 districts as follows (PCBS, 2003 *a*):

1. **West Bank Governorates:** Jenin, Tulkarm, Qalqilya, Nablus, Ramallah and Al-Bireh, Jerusalem, Jericho, Bethlehem and Hebron.
2. **West Bank Districts:** Tubas and Salfit.
3. **Gaza Strip Governorates:** North Gaza, Gaza, Deir El-Balah, Khan Younes and Rafah.

Although the governorate is higher than the district within the administrative hierarchy, it should be noticed that districts are considered as an independent administrative areas that have their own local administrative liability.

However, the Palestinian communities fall mainly into three main classifications (urban, rural and camps), among them there are 73 urban communities, 605 rural and 30 camps distributed as shown in Table 2.1.

Table 2.1: Types of Palestinian Communities

Governorate / District	Community Type			
	Urban	**Rural**	**Camp**	**Governorate Total**
Jenin	6	89	1	**96**
Tubas	1	21	1	**23**
Tulkarm	5	35	2	**42**
Qalqilya	3	32	-	**35**
Salfit	2	21	-	**23**
Nablus	2	68	3	**73**
Ramallah and Al-Bireh	6	70	6	**82**
Jerusalem	23	26	2	**51**
Jericho	1	13	2	**16**
Bethlehem	3	65	3	**71**
Hebron	10	144	2	**156**
North Gaza	3	3	1	**7**
Gaza	1	3	1	**5**
Deir El-Balah	2	2	4	**8**
Khan Younes	4	10	1	**15**
Rafah	1	4	2	**7**
Final Total	**73**	**605**	**30**	**710**
Percentage %	**10.3**	**85.5**	**4.2**	**100.0**

Source: PCBS, 2000

In 1997, 1,381,879 inhabitants dwelled in the Palestinian urban communities contributing by 53.1% of total population (PCBS, 2000).

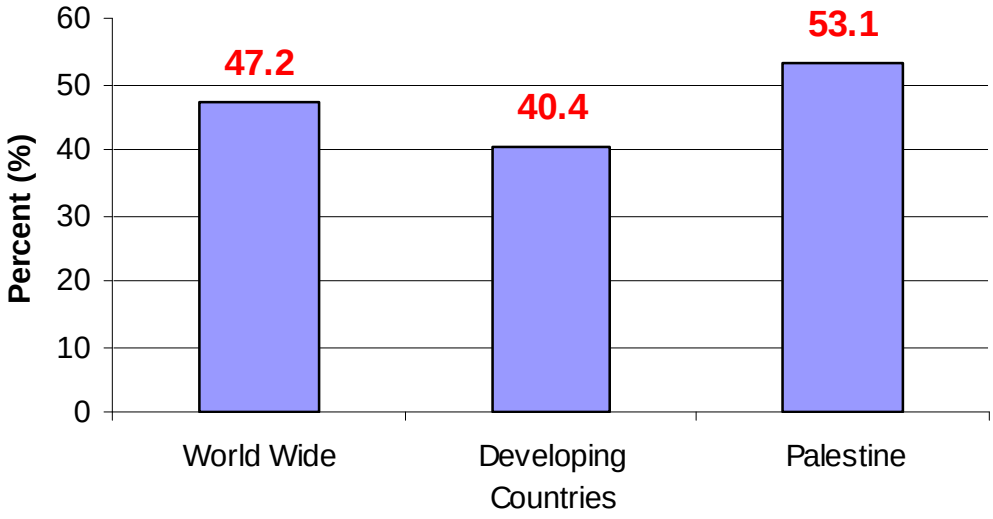


Figure 2.1: Urban Community Dwellers Percenateges, 1997

Source: United Nations, 2000; PCBS, 2000

When comparing this percent with the international average for urban community dwellers worldwide which is 47.2 % in the year 2000, it is clearly seen that the percent of urban communities dwellers in Palestine is much higher than the international average percent, mainly the developing countries to which Palestine belongs where the percentage of urban dwellers in these countries was 40.4 % in the year 2000 (United Nations, 2000; PCBS, 2003 *a*).

An overall indicator that can be used for measuring population density and to provide information regarding land rationalizing and utilization and concentration of land development patterns, is the dweller's share in the area of built-up land, or simply referred to as built-up area per capita. The built-up area per capita is the total area of land under buildings, roads, open spaces, green areas and any other facilities, including their auxiliary spaces, installed for the pursuit of human activities divided by the total number of dwellers residing that area (PCBS, 2002).

Table 2.2 presents a comparison between the existing built-up areas per capita in selected cities to show the concentration of dwellers in these communities.

Table 2.2: Built-up Areas Per Capita in Selected Cities, 2005

City	Built-up Area per Capita, m^2	Remarks
Tel Aviv	139	Crowded City
Haifa	237	
Western Jerusalem	177	
Ramallah and Al-Bireh	282	
Cairo	91	Very Crowded City
Vienna	477	
Brussels	551	
Berlin	557	
Source: *ARIJ, 2006; Prieler, 2006*		

The built-up area varies from one country to another depending on many factors related to the country's area, economy, population, social and political issues. However, when it is required to produce master plans and development maps, these factors are judged by planners and experts to estimate the "Design Built-up Area Per Capita", which stands for the different areas required by each person for appropriate inhabiting conditions, such as the area of land under buildings –considering the average floor to area ratio in the country-, open spaces and all other facilities required for human activities (Prieler, 2006).

According to MLG (2004), the "Design Built-up Area Per Capita" in Ramallah and Al-Bireh Governorate was estimated -according to the judgment of experts and based on national and international norms regarding areas required by each person- to be 305 m^2 per capita as considered in the suggested master plan of the governorate for

the year 2020. This figure has to be considered for any future planning purposes in the governorate.

Ramallah and Al-Bireh Governorate has experienced the most significant urban growth in the West Bank during the 1990's; this growth was mainly concentrated in Ramallah and Al-Bireh Cities, (MLG, 2004). By referring to Table 2.2; it can be seen easily that there is a big difference between the existing and the required built-up areas per capita in the twin cities Ramallah and Al-Bireh. Moreover, according to PCBS (2005), the average built area per capita in Ramallah and Al-Bireh Governorate is estimated to 303 m^2 which is very close to the required area for design purposes, this indicates higher population densities in the cities of Ramallah and Al-Bireh than what is suggested by local authorities.

2.5 Urban Expansion

2.5.1 Flows of People

Rural-urban migration is a natural process that may happen in response to economic stress and becomes an important element of household strategies that might affect the structure of population both in rural and urban areas; hence, sustaining the rural and urban populations of the developing world has been identified as a key global challenge for the 21st Century (Lynch, 2005; Tacoli, 1999).

Approaches to migration usually adopt the "push-pull" models of population movement which state that the direction of migration is mainly from rural to urban areas where better economic opportunities are available. However; despite the fact that it is necessary to good understanding of urbanization processes and to manage growth related problems of many large cities, only little is known about the scale, direction and demographic characteristics such as sex and age composition of internal

migration while increasing attention towards international migration took place in the recent years because of its political implications in destination countries. Although only little research has been conducted on internal migration, but it seems to have important impacts on destination areas, since migrants may compete for scarce resources with the local population. Anyhow, movement may not always be intended as permanent or even long-term, and evidence suggests that circular migration is also increasing as a result of higher costs of living in the cities. (Jamal and Weeks, 1988; Tacoli, 1998; Tacoli, 1999).

2.5.2 Land

Urban areas' physical expansion is almost always over rural areas, however, expanding urban areas doesn't transform only the land that becomes urbanized but land use and environmental changes that are basically associated with the expansion of the built-up area and the urban activities that develop there may take place affecting the surrounding area and the urban fabric itself (McGranahan et al., 2001).

As official urban boundaries rarely match the exact extent of the built up area; the urban boundary is uncertain, hence it becomes difficult to draw a clear distinction between environmental impacts that occur within urban centers and those in peri-urban areas (areas surrounding cities and urban centers), but since cities have boundaries that extend far beyond their built-up area, much of the 'peri-urban' population and many of the 'peri-urban' impacts will be within these boundaries, thus; they are generally occurring both in urban areas and in peri-urban areas. However, the peri-urban interface is subject to continuous processes of transformation since, usually, residential communities and industrial and commercial concentrations tend to develop in the immediate surrounds of urban centers and close to major cities but separated from the built up area, in addition, economic activities taking place in

peri-urban areas around urban centers motivate households to move from farming to more diversified income-generating activities and economic enterprises (Hardoy et. al., 2001).

In countries like Mozambique the demographic pressure on land can be better expressed by the decrease of some 30% of arable surface per capita in the last 20 years and the projection of a further loss of some 30 to 50% in the next 25 years (Forjaz, 2005).

2.6 Urban Environmental Burdens

Urban expansion tends to produce environmental burdens which in their turn tend to vary with economic status and local factors which are extremely important, and often dominant. In wealthier cities, the environmental burdens tend to involve global environmental pressures like greenhouse effect and resource depletion resulting in a very long term impacts, while environmental burdens in very low-income cities involve hazardous living and working environments that represent direct impact on the life and livelihood of urban dwellers, mainly those living in the poorest neighborhoods. However, development assistance in the urban environment field can help in providing the basis for addressing a wide range of environmental burdens and better urban environmental control, where the lack of understanding of environmental processes is often part of the problem, and can provide opportunities for enhancing the living environments of the urban (McGranahan et al., 2001).

Unfortunately, ecosystems do not respect the boundaries of private property, and property owners who don’t have the right to pollute can affect the ability of ecosystems to function effectively in the absence of governmental or social restraint against pollution which tends to be excessive. Historically, the lack of understanding

has often played a part in environmental inaction where environmental burdens have often been displaced rather than reduced at source since people are often ignorant of environmental burdens and have little motivation to become better informed besides the fact that urban dwellers are less aware of their dependence on natural processes and that urban consumers and producers are less likely to see the environmental impacts of their actions (McGranahan et al., 2004).

Over the years, urban centers have been founded near water resources, both to account for urban water demands and to benefit of water transport in order to have a strong regional dimension, since unlike many other resources that can more easily be imported from great distances, fresh water resources either within or around the urban centers are still the major resource of urban water consumption, and any unintentional changes to these water flows can create serious problems (McGranahan et al., 2004).

Urban water use requires higher quality and more stable supplies than most rural uses, and since urban water withdrawals rarely account for the urban water demands, the spatial range of urban water withdrawals is expanding and water may be diverted to urban areas from increasingly distant resources based on the fact that many urban dwellers do not have sufficient water to meet their basic needs and thus leading to common conflicts between urban and non-urban users. However, the social, economic and political importance of cities often ensures that their demands are given priority, and even where there is less water infrastructure, many cities are reaching further upstream for more and fresher water resources causing major impacts on upstream ecosystems (McGranahan et al., 2004; van den Berg et al., 2003).

Water enters and leaves urban areas in almost equal quantities, but while it is flowing through urban areas it is likely to be used, polluted or transformed affecting the surrounding region in a way that can influence the patterns of urban and peri-urban

development. In some cases, the effects on human wellbeing are clearly seen and ecological water requirements to maintain ecosystem function and local hydrological cycles are often neglected. Moreover, urban centers can cause a wide range of problems for downstream people and ecosystems, including those in other urban locations as sewers convey human waste out of urban locations, often releasing it untreated into local waterways or coastal waters causing, besides chemical water pollution around large industrial centers, an extreme health risk for people who might come to ingest the contaminated water, and damage to aquatic ecosystems and biodiversity downstream (McGranahan et al., 2004; van den Berg et al., 2003).

The use of water for population centers or human colonies for purposes of human use and consumption is known as urban public water use. Urban water can be used in different ways; residential, industrial, commercial, services, etc. Those waters, however, are to be discharged as urban effluents or urban wastewater (Scott et al., 2000).

Urban effluents are a major source of pollution and have always been a major problem throughout the world. The main sources of water pollution are: industrial (chemical, organic, and thermal wastes), municipal (largely sewage consisting of human wastes, other organic wastes, and detergents), and agricultural (animal wastes, pesticides, and fertilizers) (Brower et.al, 1990).

Since wastewater affects the environment and human in many ways, the water pollution crisis in urban areas has brought up an international trend towards wastewater treatment to help alleviate their problems. This trend focuses on sewage collection and treatment, as well as measures used to improve the institutional controls on sewage and pollution control in order to achieve overall objectives of optimizing water consumption and reducing pollution loads, besides an emphasis on

the reduction of industrial water consumption and the improvement of effluent discharge quality (Seckler, 1996).

Unfortunately, this environmental issue is mainly stressed in developing countries; the construction of urban drainage, sewage, and wastewater treatment (domestic and industrial) has lagged far behind the development and environmental requirements for the city, however wastewater improvement projects are being introduced recently in some developing countries but no sufficient funding is provided for the wastewater treatment plants to be constructed (Scott et al., 2000).

One of the most important issues to be addressed when considering urban land is waste disposal as there are very large variations between urban centers in the proportion of residential, commercial and industrial solid wastes that are collected, ranging from those urban centers where most such wastes are collected to those where most are uncollected. But it is common for 30-50 percent of the population in major cities in low-income nations to receive no regular waste collection service, and for most waste disposal for industrial and commercial enterprises to be unregulated (Hardoy et. al., 2001).

Most cities lack the officially licensed treatment plants and the specialist facilities needed to safely process wastes; many of the solid wastes that are collected are disposed of on illegal dumps with no provision to manage these dumps besides the fact that in most urban centers only few measures have been taken to stop industries and other generators of toxic or otherwise hazardous wastes from disposing of these wastes without treatment (Hardoy et. al., 2001).

2.7 Managing Urban Growth

Urbanization has been the dominant demographic trend during the last half century. In 1950, some 750 million people lived in urban areas while by the end of the 20th

century there were about three billion inhabitants, close to 50 percent of the world's population, living in urban centers,. Moreover, most of the world's growth in population between 2000 and 2020 is expected to be in urban areas, and urban population is expected to continue growing to two-thirds, or 6 billion people, by 2050 (World Commission, 1987; Walsh, 2004).

While the case is that, many policy makers, government officials, and stake holders have had a negative view of urbanization and the fear of uncontrolled urbanization has resulted in widespread policies designed to limit urban growth. Local development strategies in the developing world, however, are limited to the ancient rural-urban issue that tends to show urban growth as a result basically of rural-urban migration which is seen as an indicator of regional and sectoral deflections in models of planning urban public services, and a possible source of social unrest in the cities (Barcelo**,** 1999; Tacoli, 1998).

However, urbanization remains a crucial stage in the development process of developing countries and successful agricultural development depending on how it is managed (Becker and Morrison, 1996; Parnwell and Wongsuphasawat, 1997; Barcelo, 1999).

2.7.1 Approaches to Spatial Planning

In the 1950s and 1960s, small towns were generally seen as playing a positive role in development as the centers from which innovation and modernization would trickle down to the rural populations; high population growth rates are likely to lead to the creation of new urban centers with most of the functional activities in the city skirts and the villages around the main cities are also growing rapidly and started to transform into smaller urban centers which contain the basic urban services and facilities (Belsky and Karaska, 1990; Satterthwaite and Tacoli, 2003).

Although the forms it has taken have changed over time; the need for some kind of state intervention to promote development has been recognized and it can be said that real decentralization of decision-making with investment and resource-raising at the local level is required to allow the local needs and priorities and to stimulate both rural and urban development (Hardoy and Satterthwaite, 1986).

In the 1960s, besides the prevailing development paradigm, spatial strategies were designed to achieve economic growth by stimulating industrial development in designated centers known as "growth centers" through public investment. The "growth center" policy has failed by the 1970s coincidently with a major shift in the development paradigm and resulted in the view that urbanization was a parasitic process leading to underdevelopment and the neglect of agriculture (Hardoy and Satterthwaite, 1986).

The lack of sound urban planning resulted in the conversion of farmland to residential housing and has lately accelerated. Recently, rural-urban linkages have become the focus of renewed interest among policy makers and researchers as many of the satellite villages are growing to form cities due to the rapid growth in population. In this context, planners where to decide whether they want to encourage even greater centralization (known as compact cities) or to promote polycentric development patterns (known as multi-nucleation cities). The first strategy would require decision makers to promote intensified development in the core of the cities and inner suburbs, through the construction of high rise buildings that could accommodate the growing population densities that are forecast for the future. Nevertheless, such a strategy would not be appropriate for all the cities, particularly those where open space is very limited in the core. Therefore, given a number of alternative scenarios, strategic planning should first be tested to select the best solution. The second strategy of

polycentric urban forms would create new nodes of commercial and residential development outside of the traditional core, leading to new independent urban centers in the future to solve the complex problem of land development (Escobar, 1995).

2.7.1.1 Sustainable Planning

Sustainability is not a concept that everybody understands. For the great majority of people it simply means the possibility of remaining alive through the difficulties of everyday struggle for food and shelter and the chance of escaping war or sickness. The definition of sustainability, however, depends on who is talking and on what he is talking about, hence we must ask ourselves what kind of sustainability are we concerned about? (Forjaz, 2005).

Cities remain the biggest challenge for testing the validity and applicability of concepts and policies for sustainable development. The importance of cities has not just been established on demographic grounds, but on economic, political, social and environmental grounds as well (Walsh, 2004).

Towns and cities that have taken steps to remain healthy over the long term are defined as "sustainable communities". This means that sustainable communities are those communities where improvement in the quality of human life is achieved in harmony with improving and maintaining the health of ecological systems by limiting waste, preventing pollution, maximizing conservation and promoting efficiency, and developing local resources to revitalize the local economy besides considering the needs of future generations while using available resources to meet current needs (Walsh, 2004).

The concept of sustainable urban development is not new. Many generations of economists, ecologists, city planners and other social scientists have long been concerned about the relationships between our ecological and economic systems in a

highly populated and resource hungry world. Considering the fact urban population all over the world is growing, it is clear that competition for resources such as water, food, power, and green space will strain communities' capacities to provide for its citizens in a fair and equitable way. It becomes increasingly apparent that local action will be needed to address the growing development needs of urban concentrations in a manner that is both sustainable and equitable (Forjaz, 2005).

Sustainable urban development means different things to different people. However, there is a general consensus that "sustainable urban development" is a good and desirable state of development that countries should commit to, but considerable confusion remains on how to translate this broad objective into national and local strategies or plans of actions for achieving it. Sustainable urban development refers to community and social development that meets the needs of the present without undermining the environment or social systems on which we depend (Forjaz, 2005).

Sustainable development has become an important guide to many communities that have discovered that traditional approaches to planning and development are creating, rather than solving, social and environmental problems. The concept also embodies the belief that the world has "finite resources" and, consequently, in order to continue improving the quality of life for future generations, societies must adopt coordinated approaches to planning and policy making that involves the individual and public on both a local and international level and to define clearly how resources are to be managed and allocated or re-distributed to ensure efficiency in service delivery and hence sustainability (Walsh, 2004).

2.7.2 Palestinian Strategies towards Sustainability

The West Bank is experiencing a significant population growth. This growth is considered as one of the most important issues for meeting growth challenges in

looking for more sustainable development. The Palestinian Ministry of Planning and International Cooperation (MOPIC, 1998) has introduced a regional plan which studied the geographical characteristics of the Palestinian localities in the West Bank and set four urban growth models, as shown by Map 2.1, in order to come up with the most appropriate pattern of geographical distribution of people for future development based on the degree of concentration or de-concentration of future population.

Model I

This model indicates that population is to be distributed evenly among all communities in the West Bank causing small communities to witness the same population growth rate as the bigger ones.

Model II

According to this model, concentration of population in the major cities and main communities due to natural population growth and other factors is to be distributed proportionally among certain sub-centers based on the sub-centers existing population sizes. These centers were selected based on a multi criteria suitability study for growth, in Ramallah and Al-Bireh Governorate, there are six communities that were suggested by MOPIC to act as new sub-centers; Bani Zeid, Birzeit, Sinjil, Silwad, Beit Ur Al-Tahat and Ni'lin. The geographical setting of these centers was studied by MOPIC in terms of different variables like road network conditions and availability of utilities which can be modified to meet any future possibility of turning one or more of these suggested sub-centers to act as real sub-center.

Model III

The highest degree of population concentration appears in this model. It is considered that the biggest urban agglomerations will receive about 60% of the total population

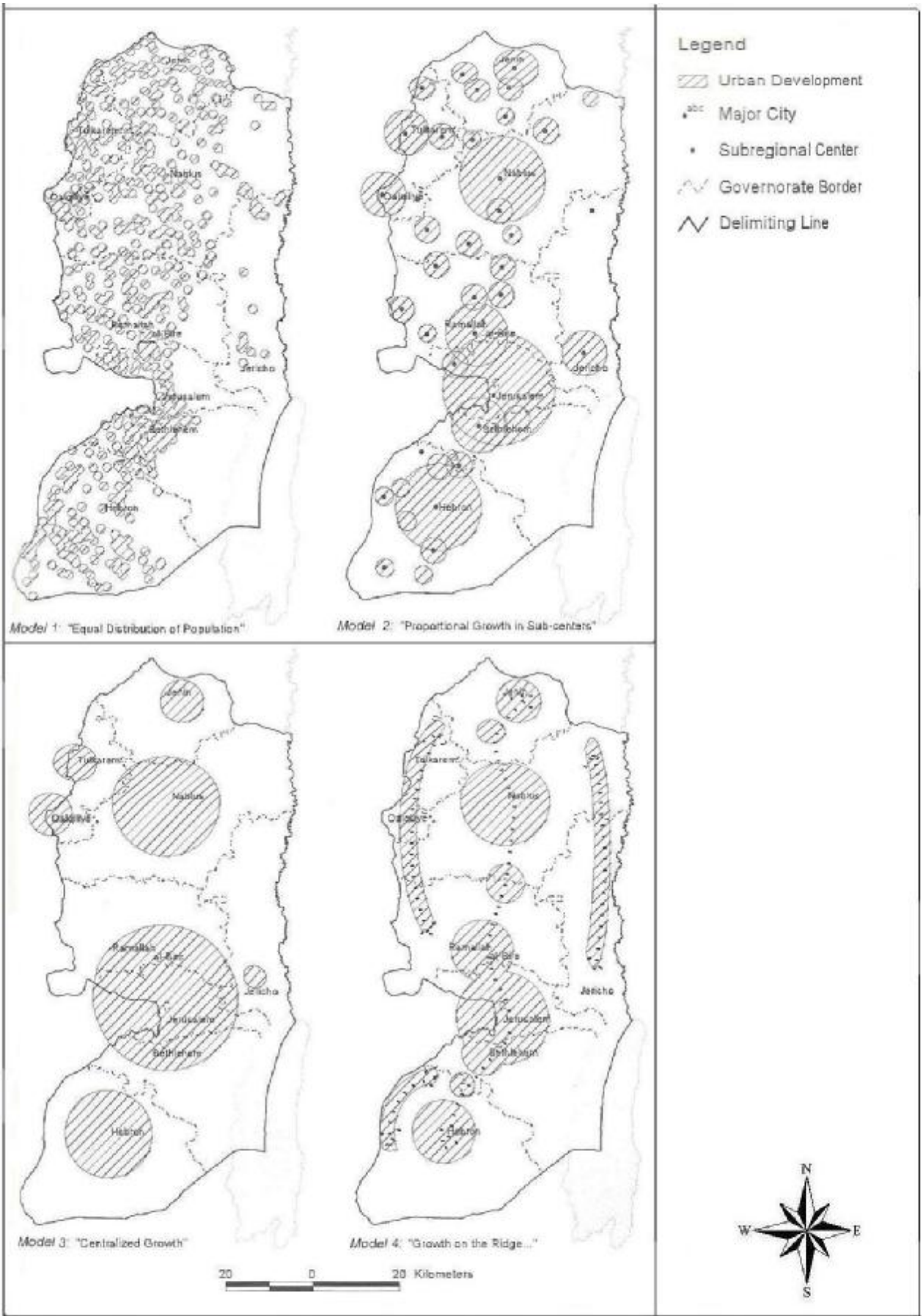
growth, where small communities reliant on natural growth will remain stagnant in terms of population change. This will cause most of the future population to concentrate along the ridge area where the existing large agglomerations are located.

Model IV

In this model many considerations were taken into account to restrict population growth in some centers due to limited available land for growth. Growth in such areas will need to consider the capacity of land available for growth with least conflict and without violation of sensitive and valuable land. This means that future population will concentrate along the main centers ridge area, while all other communities will receive natural growth only.

This research is dealing with environmentally sustainable urban development within Ramallah and Al-Bireh Governorate. The focus of this study is to find the best scenario for sustainable urban expansion in the study area in the year 2020 under the current political situation, i.e. with the presence of Israeli occupation in all of its forms such as colonies, segregation wall, bypass roads and all other restrictions against Palestinian progress. However, another scenario that considers peace agreements and full Palestinian control over the land can be studied in detail if any future prospects for peace appear to site.

While the case is that, both the expected built-up area –based on the witnessed growth rates during the past years- and the design built-up area –required to meet the needs of population for future development- are to be calculated in the designated target year in order to compare these figures with the available environmentally suitable land for urban development.



Map 2.1: Conceptual Outlines of The Urban Expansion Modeling (Models I-IV, West Bank Gvernorates)

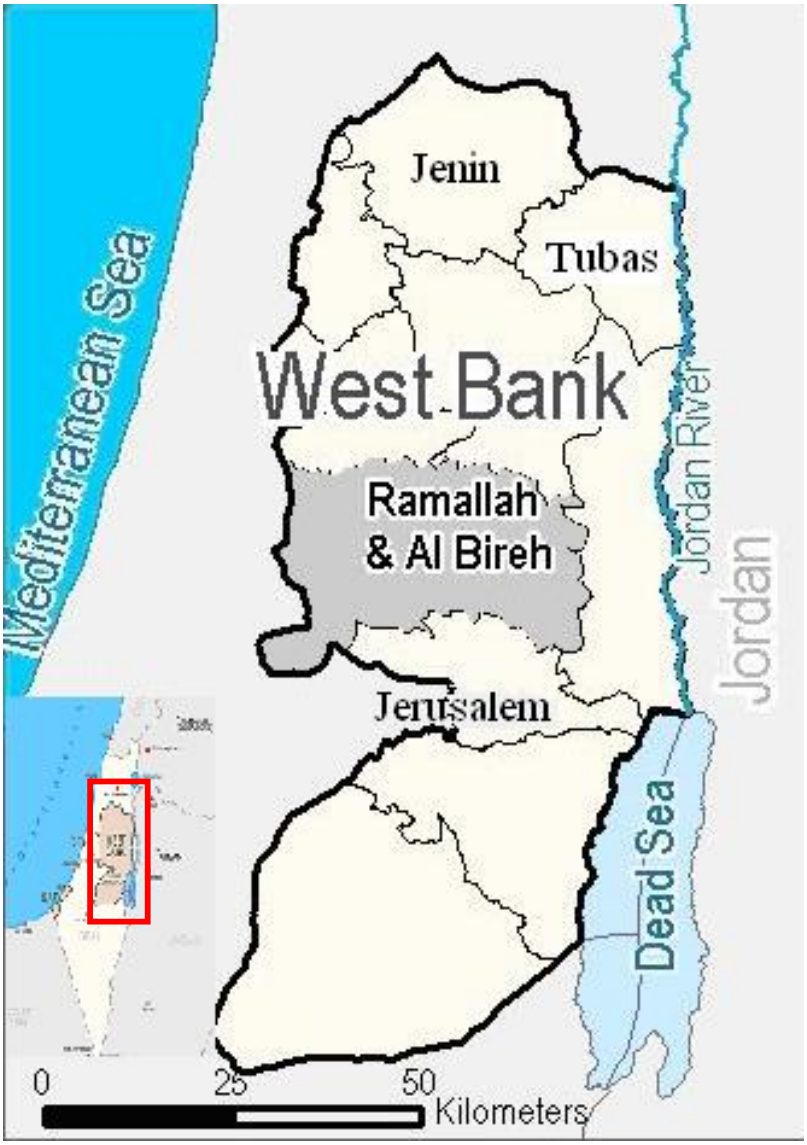
Source: Ministry of Planning and International Cooperation, 1998

CHAPTER THREE

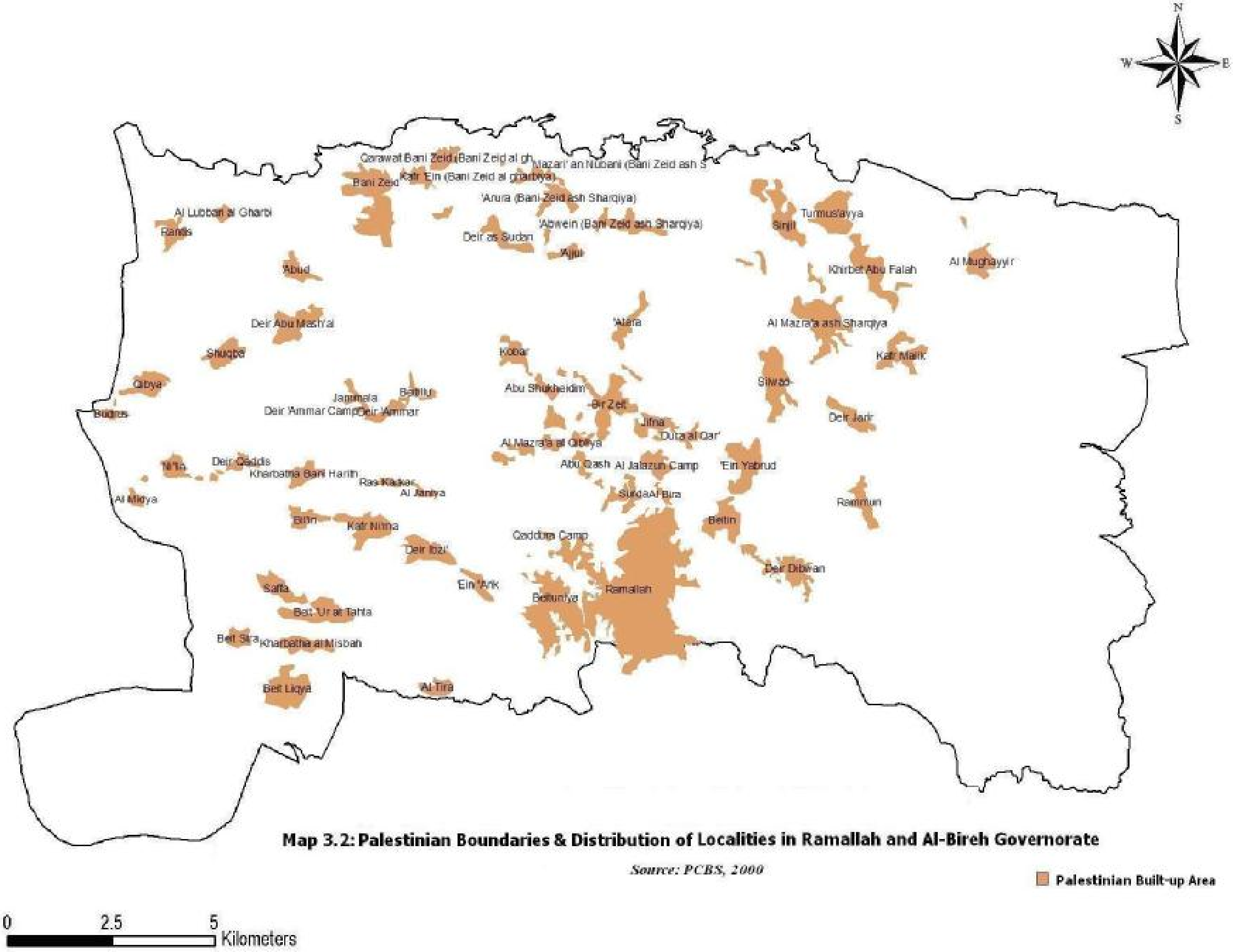
STUDY AREA

3.1 Location

Ramallah and Al-Bireh Governorate is located in the middle part of the West Bank and extends from Jerusalem Governorate in the south to Nablus Governorate in the north and from Jericho Governorate in the east to the green line between Israel and West Bank from the west and measures approximately 855 km^2 which is approximately 14.5% of the West Bank (Map 3.1), and includes 76 Palestinian localities and 6 refugee camps representing about 10% of its total area, (Map 3.2), (PCBS, 2002).



Map 3.1: Location of Ramallah and Al-Bireh Governorate.
Source: *PCBS, 2005*



Map 3.2: Palestinian Boundaries & Distribution of Localities in Ramallah and Al-Bireh Governorate

Source: PCBS, 2000

3.2 Land Use

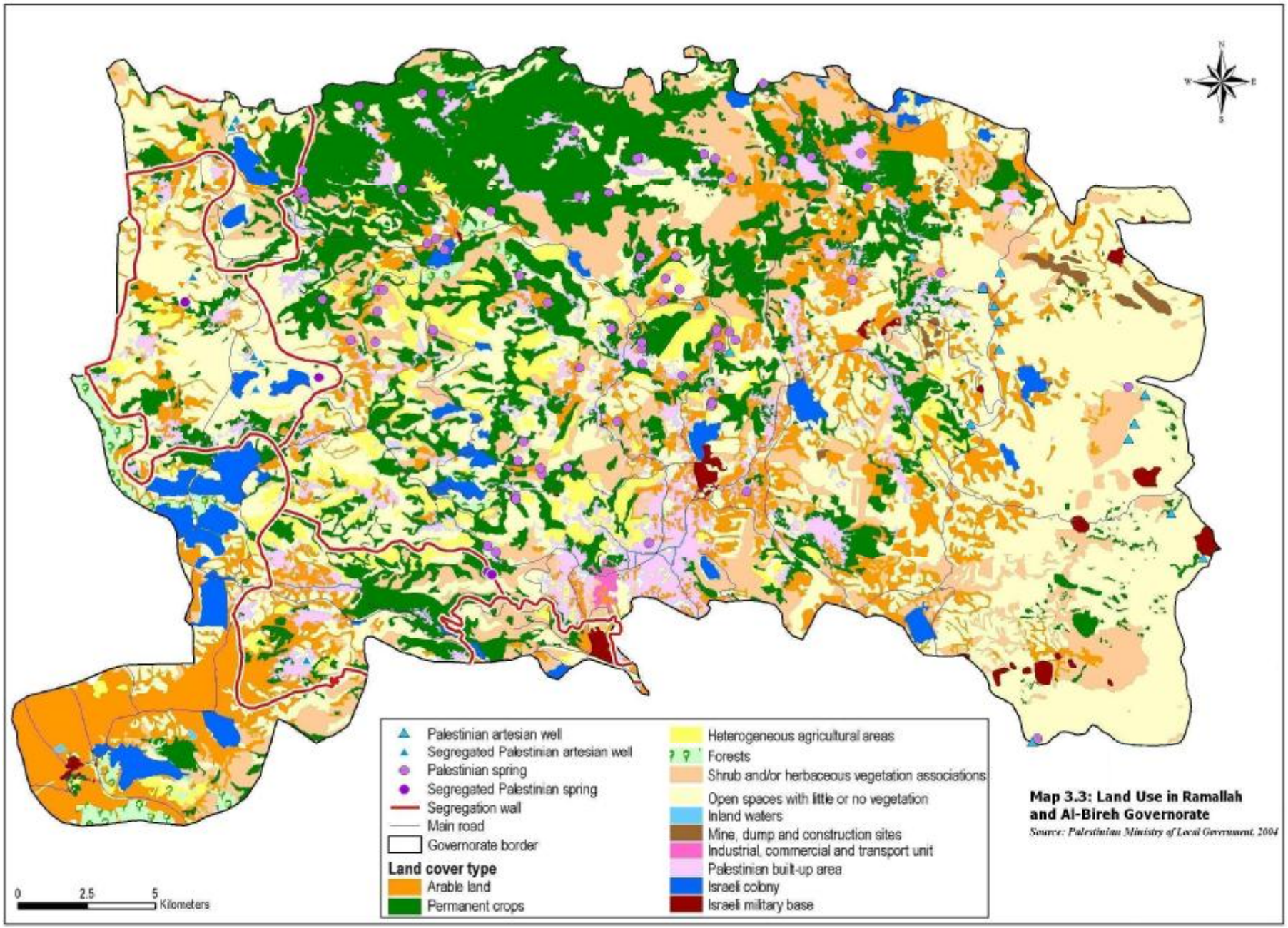
As indicated by "Oslo II" interim agreement, Ramallah and Al-Bireh Governorate is divided into three areas; Area A, B, and C which are differentiated by a different level of control by the Palestinians (ARIJ, 1996):

- "Area A", which includes the Palestinian built-area in Ramallah and Al-Bireh cities in addition to Al-Ama'ri and Qaddura refugee camps, and covers 19.7 km^2 (2.3%) of the governorate`s land and all responsibilities for internal security and public order are held by Palestinians.
- "Area B" includes the populated villages, camps and the built-up area of the hamlets. It accounts for approximately 227.4 km^2 (26.6%) of the total area of the governorate and Palestinians have full control over civil society except that Israel continues to have overriding responsibility for security.
- "Area C", covers 71.1% of the governorate`s land and includes some Palestinian built-up areas as well as Israeli colonies, closed military areas and military bases. Palestinians have responsibility for civil life in this area such as economics, health and education. However Israel retains control of security and power related to territory.

According to ARIJ (1996), PCBS (2002) & PCBS (2004 *a*); there are, functionally, eight major land use classes within the boundaries of Ramallah and Al-Bireh Governorate, serving both the Israelis and Palestinians. These are Palestinian built-up areas, Israeli colonies, closed military areas and bases, nature reserves, forests, cultivated areas, and industrial areas. In addition, there are some other uses like roads and grazing lands, (Table 3.1 and Map 3.3).

Table 3.1: Land use classification in Ramallah and Al-Bireh Governorate, 2004

Land Use	Area (km^2)	Percent of Land %	Description/Comments
Palestinian Built-up Areas	86.6	10.10	There are 76 Palestinian localities (6 urban & 70 rural) and 6 refugee camps (3 registered camps by UNRWA besides 3 unofficial camps).
Israeli Colonies	28.5	3.33	There are 27 Israeli colonies in Ramallah and Al-Bireh Governorate.
Closed Military Areas	108.6	12.70	The Israeli army claims that these areas are important both as security zones and for military training purposes. The closed military areas cover almost the entire eastern border while the eight military bases are distributed over the governorate.
Military Bases	2.4	0.28	
Nature Reserves	47.9	5.60	Israeli Authorities had declared 15 pieces of land as a nature reserve in order to prevent the Palestinians from using it then, mostly, after a while it becomes an Israeli settlement.
Forests	2.3	0.27	There are 6 forested areas in the governorate.
Cultivated areas	184.3	21.60	Majority are rain-fed lands while minimal (< 1%) are irrigated.
Industrial areas	1.37	0.16	There are two industrial areas, one is located to the south of Ramallah city and the other to the east of Al-Bireh.
Others (*unused land, roads or land used for grazing*)	393.03	45.96	* Poor Palestinian road network consisting of 488.6 km of regional, main and access roads. * 146.2 km of by-pass roads designed to prevent future expansion of the Palestinian built-up areas and dividing the governorate into cantons.
Total	**855 km^2**	**100%**	
Source: *MLG, 2004; PCBS, 2002; PCBS, 2004 a & UNRWA, 2006*			



Map 3.3: Land Use in Ramallah and Al-Bireh Governorate

Source: Palestinian Ministry of Local Government, 2004

3.3 Demography and Population

Demographic trends in Ramallah and Al-Bireh Governorate, as is the case of other governorates in the West Bank, have been closely related to the political situation. By the end of 1994, the estimated population of Ramallah and Al-Bireh Governorate reached about 176,154 inhabitants (ARIJ, 1996).

In 1997, the population census performed by the Palestinian Central Bureau of Statistics (PCBS) for the Palestinian territories revealed that the population of Ramallah and Al-Bireh Governorate was 205,448 inhabitants while in the year 2006, as shown in Table 3.2, the estimated total population in the governorate was 295,365 inhabitants close to 12% of the total population in the West Bank (PCBS, 2006).

Table 3.2: Estimated Population Distribution in Ramallah and Al-Bireh Governorate

Year	The total governorate	Existing Urban Centers					Non-Urban Areas
		Ramallah and Al- Bireh	Silwad	Birzeit	Deir Dibwan	Beitunia	
1997	205,448	45,989	5,131	4,686	4,901	9,391	135,350
2000	231,690	51,881	5,788	5,286	5,529	10,594	152,612
2003	265,800	58,527	6,530	5,964	6,237	11,951	176,591
2004	275,593	60,927	6,798	6,208	6,493	12,441	182,726
2005	285,454	63,425	7,076	6,463	6,759	12,951	188,780
2006	295,365	66,025	7,366	6,728	7,036	13,482	194,727
Source: MLG, 2004; PCBS, 2004*a*; PCBS, 2006 (Based o PCBS classification, see page 14)							

According to the estimations of MLG (2004), and based on the population projections by PCBS (2006), it is expected that the population of Ramallah and Al-Bireh Governorate will continue increasing at an alarming average growth rate of 4.1% per

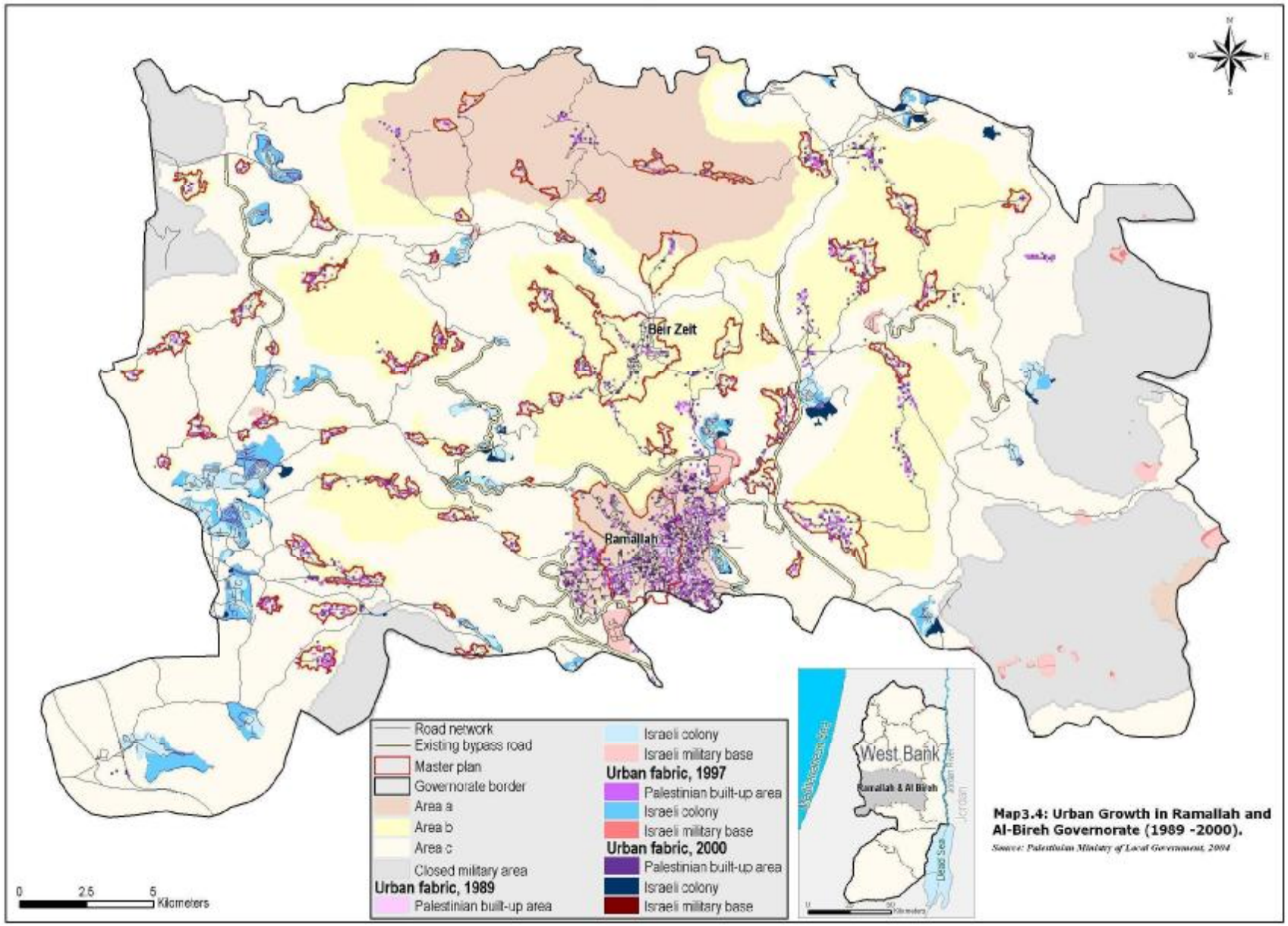
year considering that this governorate is an attraction point for those people coming from other governorates either for better life style or due to the political situation.

3.3.1 Internal Immigration and Flows of People

The phenomenon of migration from rural to urban areas for better economic situation is not new, but the phenomenon of Palestinians migration between the localities of the West Bank is a special case that requires special attention, as it is not a natural process that may happen in response to only to economic stress, but mostly it comes due to the unique political situation in the area caused mainly by Israeli violence and Israeli restrictions. Palestinians access to services such as health and education has been limited and negatively affected the economy, social conditions and human rights making the life of the Palestinians very hard and causing some of them to migrate either inside or outside the West Bank in order to search for an easier and a better way of life. Hence, internal migration from the northern and southern parts to the central part of the West Bank especially to the economic and administrative center of the region "Ramallah" increasingly took place mainly during the last five years where massive migration occurred due to different problems in the socio-economic and political system in the North of the West Bank. (MLG, 2004; OCHA, 2002).

3.4 Urbanization in Ramallah and Al-Bireh Governorate

The total Palestinian built-up area in Ramallah and Al-Bireh Governorate has increased from 17,325 dunumus in 1989 to 39,301 and 86,600 dunums in 1997 and 2000, respectively (Map 3.4). As indicated by Table 3.2, there are six urban centers existing in Ramallah and Al-Bireh Governorate; Ramallah, Al-Bireh, Silwad, Birzeit, Deir Dibwan and Beitunia. Among the six centers, Ramallah and Al-Bireh are considered as the major urban centers in the governorate (MLG, 2004; PCBS, 2003 *b*).



Map3.4: Urban Growth in Ramallah and Al-Bireh Governorate (1989 -2000).

Source: Palestinian Ministry of Local Government, 2004

Table 3.3: Built-up Area Estimations in Ramallah and Al-Bireh Governorate, 2000

Community	Total Area (Dunums)	Built-up Area (Dunums)
Ramallah and Al- Bireh	36,751	17,858
Silwad	18,880	659
Birzeit	14,088	861
Deir Dibwan	73,332	765
Beitunia	23,366	1,225
Non-Urban Areas	688,583	65,232
Total Governorate	**855,000**	**86,600**
Source: *PCBS, 2000*		

The built-up area of Ramallah and Al-Bireh cities increased from 12,361 dunums in the year 1989 to 14,346 and 17,858 dunums in the years 1994 and 2000, respectively.

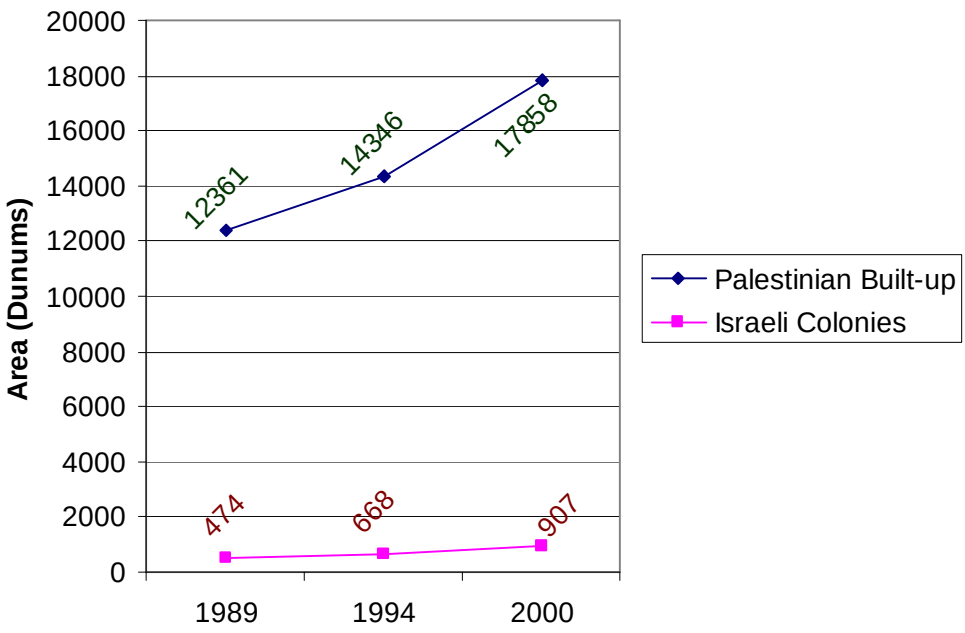


Figure 3.1: Expansion of Palestinian Built-up Areas and Israeli Colonies Inside Ramallah and Al-Bireh Cities

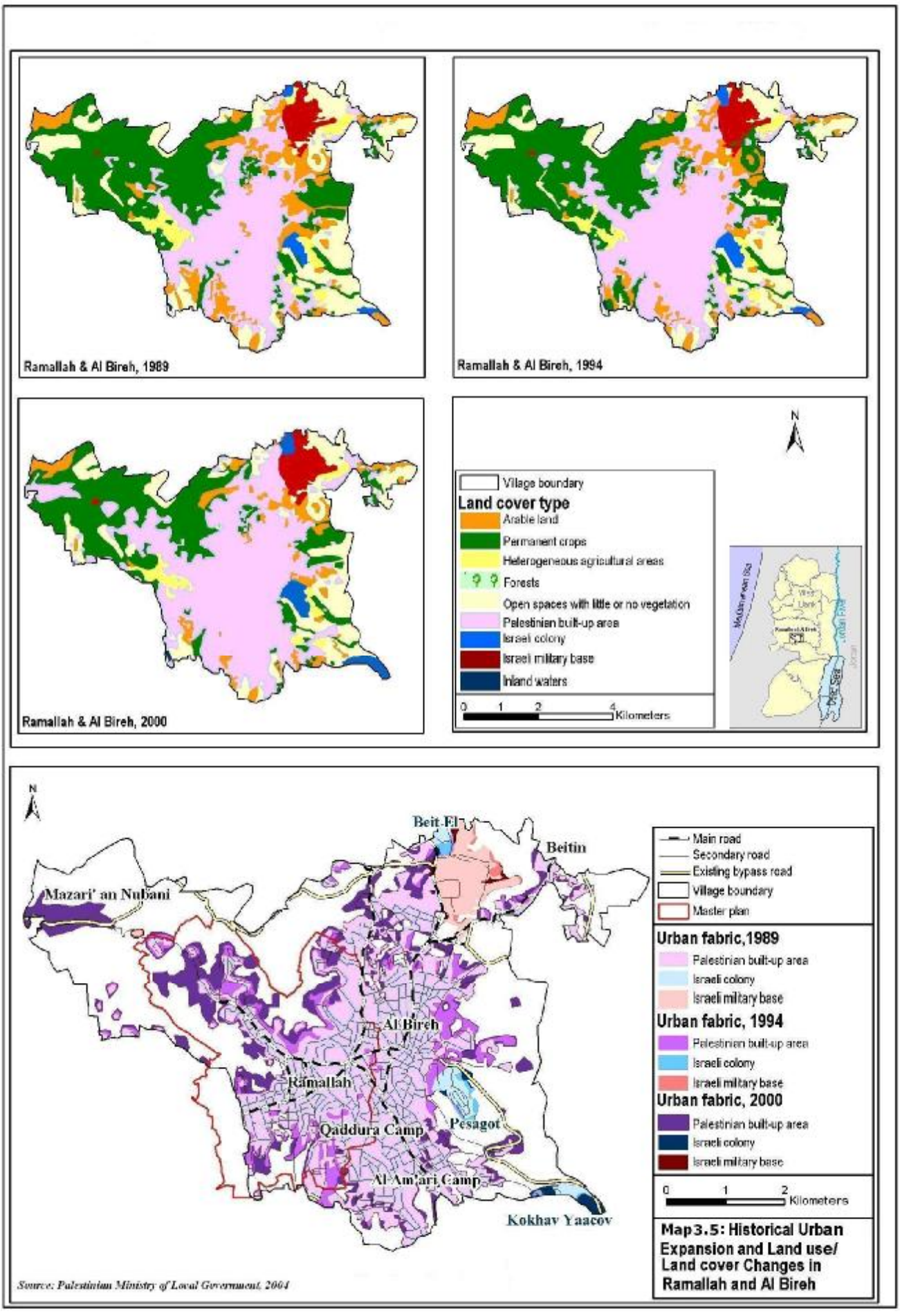
Since the year 2000, when Al-Aqsa Intifada has started, the built-up area growth rate has witnessed severe deduction and very slight changes have taken place over the estimated area in 2000 (See Figure 3.1 & Map 3.5), (MLG, 2004; PCBS, 2003 *b*).

On the other hand, the Israeli colonies continued to expand during the nineties especially in the western parts of the governorate until its area reached 28490 dunums in the year 2004. The built-up area of the Israeli colonies and military bases within Ramallah and Al-Bireh has increased from 474 dunums in 1989 to 668 and 907 dunums in 1994 and 2000, respectively, moreover, there are several Israeli military bases inside the village boundary of Ramallah and Al-Bireh whose area has increased from 1216 dunums in the year 1989 to 1434 dunums in the year 2000. Moreover, many bypass roads were constructed around Ramallah city and at the governorate north-western and north-eastern peripheries to link between the Israeli colonies and Israeli military bases besides the Israeli segregation wall that will ensure the inclusion of the Israeli colonies situated in the western and eastern periphery of Ramallah Governorate (MLG, 2004; ARIJ, 2006).

3.5 Infrastructure Utilities

3.5.1 Piped Water Supply

Until the 1950's, Ramallah and Al-Bireh Governorate depended upon rainfall collection cisterns and small local springs for its water supply; however, the growth in population has multiplied the demand on drinking water, so the municipalities of Ramallah and Al-Bireh expanded the water supply in 1966 through the Jerusalem Water Undertaking (JWU) which was responsible for administrating water sources and providing domestic water for most of the population in Ramallah and Al-Bireh Governorate and some villages in Jerusalem (ARIJ, 1996).


Ramallah & Al Bireh, 1989
Ramallah & Al Bireh, 1994
Ramallah & Al Bireh, 2000
N
Village boundary
Land cover type
Arable land
Permanent crops
Heterogeneous agricultural areas
Forests
Open spaces with little or no vegetation
Palestinian built-up area
Israeli colony
Israeli military base
Inland waters
0 1 2 4 Kilometers
N
Beit-El
Beitin
Mazari' an Nubani
Al Bireh
Ramallah
Qaddura Camp
Pesagot
Al-Am'ari Camp
Kokhav Yaacov
Main road
Secondary road
Existing bypass road
Village boundary
Master plan
Urban fabric,1989
Palestinian built-up area
Israeli colony
Israeli military base
Urban fabric, 1994
Palestinian built-up area
Israeli colony
Israeli military base
Urban fabric, 2000
Palestinian built-up area
Israeli colony
Israeli military base
0 1 2 Kilometers
Map 3.5: Historical Urban Expansion and Land use/ Land cover Changes in Ramallah and Al Bireh
Source: Palestinian Ministry of Local Government, 2004

Currently, 25% of water in Ramallah and Al-Bireh Governorate is obtained from five groundwater wells located near the village of Ein Samia near to Ramallah city and operated by the Jerusalem Water Undertaking (JWU), where the rest (75%) are bought from the Israeli Water Company (Mekerot), (Musleh, 2006).

According to the survey conducted by PCBS (2005), 74 localities in Ramallah and Al-Bireh Governorate has access to the piped water supply through either the Jerusalem Water Undertaking, or the West Bank Water Department or the Israeli Source Mekorot.

The quality and continuity of the water supply are better in Ramallah and Al-Bireh Governorate than other governorates in the West Bank although some villages suffer from water shortages, especially in the summer. The water quality at the Ein Samia wells is regularly inspected by the Palestinian Water Authority (PWA) to insure the quality of the water supply. The results of the tests are within World Health Organization "WHO" guidelines indicating good drinking water quality (ARIJ, 1996; Musleh, 2006; PCBS, 2005).

The population of Ramallah city was estimated to consume1.6 times more water than the rest of the governorate in the year 2005. Moreover, Israel over pumps very large amounts of water from Palestinian wells estimated to equal the total Palestinian water consumption in the governorate (ARIJ, 1996; Musleh, 2006).

3.5.2 Sewage Disposal Facilities

In the Occupied Palestinian Territories, wastewater treatment has been neglected to a certain extent, with most attention focused on measures to solve water quantity and supply problems. Appropriate management of wastewater has been neglected throughout the Occupied Palestinian Territories, both prior to and during the present conflict, and little investment has been made in the wastewater sector since the Oslo

Accords. The situation is worsened by the discharge of untreated wastewater from Israeli colonies (ARIJ, 1996; ARIJ, 2006).

As there are no regulations to control industrial effluents in the West Bank, industrial wastewater is largely discharged untreated into municipal sewerage networks, cesspits, or into the environment, thus polluting soils and groundwater. Chemical industries including the pharmaceutical industry are concentrated in the Ramallah and Al-Bireh governorate. The effluent from these facilities contains many toxic and biologically active constituents and it is usually collected through the sewage network without any pretreatment, for factories located in Ramallah and Al-Bireh cities or through cesspits for those located in Bir Zeit or Beitunia. Additionally, a large number of industries also discharge their wastewater into the collection system (ARIJ, 1996; ARIJ, 2006).

Present wastewater treatment in Ramallah and Al-Bireh Governorate is inadequate to serve the volume of wastewater being discharged. Only 8 localities are connected to the sewage network and just 4 of them are disposing 50% or more of their wastewater in the treatment plants. Many localities in the governorate suffer from wastewater flooding especially in the winter time; the content of the cesspits in many villages is disposed of in areas cultivated with olive trees, barely and many other crops. Jifna village is one of the villages whose population is suffering from the flooding of cesspits at Al-Jalazone camp. Wastewater in the camp, collected by open channels and cesspits, overflows to surface and discharges to nearby wadi on the agricultural land of Jifna village damaging the trees and creating health hazards. Flooding of wastewater is a major environmental and health problem, leading to odor problems,

mosquito infestation and disease transmission. (PCBS, 2005; UNEP, 2003).

Photo 3.1: Wastewater from Al-Jalazone Camp covering the agricultural land of Jifna village (*Source: ARIJ, 2006*).

The existing treatment plant in Ramallah city was constructed in 1974. It has been overloaded for many years, and treatment therefore has little effect. Mechanical failure of some of the equipment has also been reported. Effluent from the plant is disposed of by an overflow pipe line that extends for almost two kilometers south where it discharges freely to the soil surface in Wadi Beitunia. Disposal of untreated wastewater into open areas and wadis is one of the major issues that Palestinian officials are worried about. But the high costs of constructing modern wastewater treatment plants and proper disposal systems, restrain the municipalities in the West Bank to meet the challenge of building such facilities on their own and thus they need an international assistance in this area. There are plans; however, for constructing a new wastewater treatment plant for Ramallah and to be located in Area C, meaning that Israeli approval of the plans is required. Oral approval was reportedly given in

August 2000 but as a result of the renewed conflict since September 2000; no further progress has been made. Though delayed by the conflict the construction of a new wastewater treatment plant has been completed in the year 2000 in Al-Bireh, and located approximately at a distance of 1.5 km down stream Wadi Al-Ein to the east of the Al-Bireh city. This treatment plant is designed to serve an estimated 40,000 people in the first phase taking into consideration the feasibility to expand it to 80,000 people in the future. The final treated wastewater effluent is planned to be used for the agricultural purposes in Deir-Dibwan land where large uncultivated areas exist (UNEP, 2003; MEDAWARE, 2004).

Although treated wastewater can play an important role in water resource management as it can substitute for fresh water in irrigation, the direct discharge of raw wastewater can create serious pollution problems and spring water contamination. It is believed that there are many undiscovered polluted springs which may be causing serious health problems to the people (UNEP, 2003).

3.5.3 Solid Waste Collection Services

Ramallah and Al-Bireh Governorate is currently experiencing the same problems facing other governorates in the West Bank. The management of solid waste at all stages of handling is inadequate as many obstacles are restricting the proper management of solid waste; among them are the political restrictions besides financial and technical difficulties. The poor or the absence of a collection system, had lead to open burning of garbage in inhabited areas as well as uncontrolled dumping sites. The current management of solid waste has created many environmental problems and many of the dumping sites became a source of bad smells, epidemic and insects which calls for immediate attention to avoid the hazardous situation (PCBS, 2005; ARIJ, 2006).

Most of the localities in Ramallah and Al-Bireh Governorate besides the refugee camps are privileged with solid waste collection services and solid waste management is considered a major problem facing the residents and local authorities in the governorate. There is uncertainty with respect to the quantities of waste generated in households in Ramallah and Al-Bireh governorate but it is estimated that the daily generated solid waste is approximately 0.9 kg/person and with a population of 292,121 inhabitants, it is estimated that 263 tons of household waste is generated daily in the governorate where the largest quantity of the solid waste is generated in the two cities of Ramallah and Al-Bireh. The location and volume of waste collection containers are chosen roughly without any considerations to the quantities produced and frequency of collection, resulting in solid waste accumulation near the containers. (PCBS, 2005; PCBS, 2004 *a*; PCBS, 2004 *b*).

The Ramallah landfill was established in the late 1960s, with an original area of about 4500 m^2 in the south western part of the city far from the built-up area although it was a random dumpsite. As burning the garbage was common, the total accumulation of solid waste was limited, but since the early 1990s the municipality stopped burning wastes as the built-up areas expanded towards the dumpsite where the western wind carries the smell and the fumes towards the city causing environmental and hygienic problems to the inhabitants. As a result, the accumulation of wastes reached risky levels. A mountain of garbage located near the industrial area is now more than 60 meters high and during winter, rain makes the dumpsite less stable and there is danger of a collapse on the adjacent residential and industrial areas besides causing soil and ground water pollution. In 1995, the Ramallah municipality tried to close the dump and searched for an alternative site. Choices were very limited in the overpopulated and confined city. The problem became more complicated when the nearby town of

Beitunia closed its landfill, as this site was also located in the populated area within the boundaries of its municipality and became harmful for public health, and began to use the Ramallah landfill in 1996. Hence, a new sanitary dumpsite was suggested to be constructed in Deir Dibwan, about 30 kilometers from Ramallah city, which would have served the entire governorate of Ramallah and Al-Bireh, but was refused because it is in Israeli controlled 'C' area and the Israeli military occupation continued to restrict plans for suitable locations in areas under their control. Moreover, in the summer of 2000, and before the beginning of the Al-Aqsa Intifada, Ramallah municipality arranged with the municipality of Al-Bireh to use the latter's dumpsite. However, one week after the beginning of the Al-Aqsa Intifada, the Israeli military forces closed Al-Bireh municipality dumpsite. Two months later, Al-Bireh municipality started to use an unsanitary site owned by local citizens near Al-Jinan neighborhood to the northeast of Al-Bireh. This site is located in an agricultural land close to houses and a neighboring school with the risk that soil and ground water in the area may become contaminated. Before this solution was found, large amounts of solid waste of different types accumulated in residential areas. The municipality had to stop the garbage collection, as there was no place to dispose of it. Hence, residents burned garbage in the containers in order to reduce the smell and volume of accumulated solid wastes causing destruction of many garbage containers besides those which were destroyed during the Israeli invasions (Al-Khatib and Abu Safieh, 2003).

Photo 3.2: (A) Ramallah Dumpsite (B) Wastes with height of 60 m

Source: *Al-Khatib and Abu Safieh, 2003.*

The closure of Al-Bireh landfill site, and restrictions on finding a suitable alternative for the overloaded landfill of Ramallah has increased the problems of solid waste management in the governorate and made it difficult to schedule disposal since the status of the sites was not always known and this situation interrupted collection service in those communities using these landfills and trash accumulated in the streets and flowed from the overloaded garbage containers.

Photo 3.3: (A) Al-Bireh Dumpsite (B) Al-Jinan Dumpsite

Source: *Al-Khatib and Abu Safieh, 2003.*

Photo 3.4: (A) Wastes beside container (Ramallah City) (B) Old vehicles dumped near houses (Al-Bireh City)

Source: *ARIJ, 2006.*

Moreover, Ramallah and Al-Bireh Governorate started to face a serious problem with the disposal of old equipment such as smashed cars, frames and tires, destroyed furniture, utilities and equipment, and industrial waste -some of which is hazardous- which where estimated to 70 tons of waste per day inside and around the overflowing garbage containers in the governorate, especially during the April 2002 invasion, which has threatened the public health of the people living in this area (Al-Khatib and Abu Safieh, 2003).

According to the engineer of Al-Bireh municipality, when the situation became more critical, the Palestinians were allowed -through German intermediation- to open Al-Bireh landfill for few hours each day, except Saturday. And the Israeli decision was mainly because the colonies of Pssagot and Beit Eil will use this landfill to dispose their solid wastes including those which are hazardous.

3.5.4 Transportation

The transportation sector in the Palestinian territories occupies special importance because it represents the primary means of travel, however, the existing transportation system is unable to provide transportation that will facilitate development, at both regional and local levels, and enhance accessibility. A Palestinian regional road

network has not been developed since 1967, where Israeli bypass roads construction is still in progress. Further more, there are many other problems in this sector such as the lack of public transportation services and roadway inaccessibility and closures caused mainly by the current political situation which is accompanied by Israeli check points and restrictions towards Palestinian motion. In general, the transportation infrastructure in Ramallah and Al-Bireh Governorate, especially in Ramallah and Al-Bireh cities, lacks capacities for accommodating the current demands and traffic jams can be easily observed during the morning and noon rush hours (MOPIC, 1998). According to PCBS (2004 *a*), the Palestinian road network length in Ramallah and Al-Bireh Governorate measures 488.6 km while the number of transportation vehicles registered in the governorate has reached 13192 marking the highest value among the other governorates and indicating that the governorate's inhabitants own approximately 12.2 % of the total number of vehicles in the West Bank, however more than one third of the vehicles in the governorate are concentrated in Ramallah and Al-Bireh cities. There are about 48 vehicles per 1000 capita in Ramallah and Al-Bireh Governorate compared to 20 vehicles in the other parts of the West Bank.

CHAPTER FOUR

METHODOLOGY

4.1 General Approach

The mixed urban land use in Ramallah and Al-Bireh Governorate and high population densities in Ramallah and Al-Bireh cities require studying and analyzing the current trend of urban development to assess its impact on the environment.

Data required for this study has been collected either through referring to published maps, studies and statistics, visits to related organizations and ministries, meetings and discussions held with local planning experts.

A series of satellite images obtained from the Palestinian Ministry of Local Government were used to show the land use and the urban growth directions in the governorate since 1989 to 2000. The direction of the urbanization trend is determined by observing the spatial formation of the urban area to identify locations that experienced development and over what kind of land.

Population projections where made for the governorate through the years 2010, 2015 and 2020 based on the population growth rate estimated by the Palestinian Ministry of Local Government and Palestinian Central Bureau of Statistics, and then the future urban trends and projections of land needs to meet both the expected built-up area based on the witnessed growth rates during the past years through trend line estimations, and the design built-up area, which was defined as the required area for all human activities, based on the required built-up area for each person (m^2 per capita) obtained by Palestinian Ministry of Local Government, these two values -expected built-up area and design built-up area- were compared together to determine whether the expected urbanization level will result in a built-up area that meets or exceeds the required area. The required built-up area was, then, used for all analysis purposes and was compared with the area of land available for future

urbanization to find whether the suitable land for future urbanization meets the required built-up area or not.

In this context, the future area and direction of urbanization trends were investigated in Ramallah and Al-Bireh Governorate using GIS to introduce an urban development sustainability map that satisfies certain selected political, based on the selected political scenario of this research, and environmental factors, GIS layers where obtained from different accredited Palestinian organizations such as ARIJ, PCBS and ministry of Planning.

Figure 4.1 shows the hierarchy how the methodology of this research goes starting by data collection and ending with the main output of the study in the shape of developmental map.

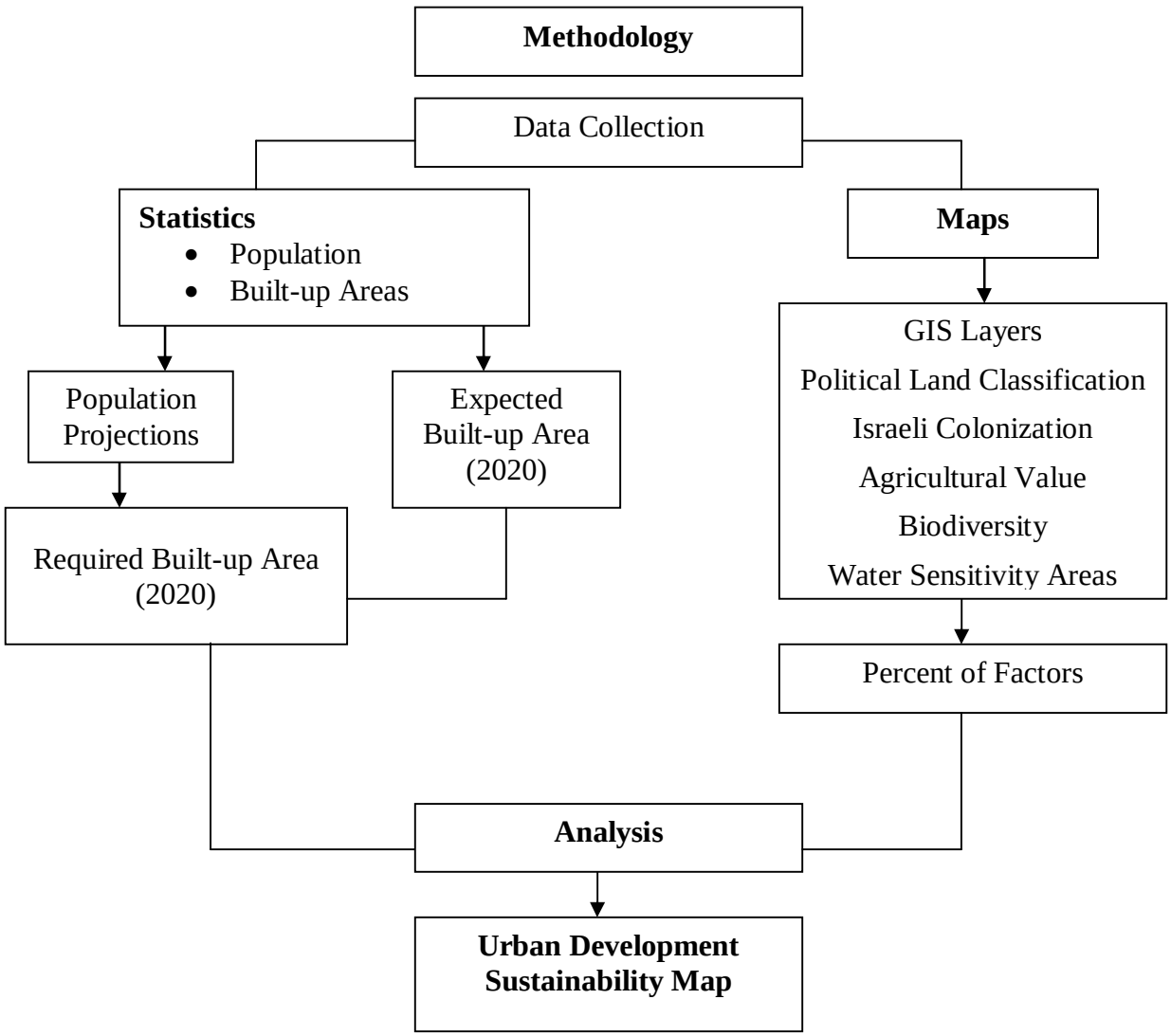


Figure 4.1: Research Methodology Chart

4.2 GIS Processing

This study aimed at modeling future urban development in Ramallah and Al-Bireh governorate by locating those areas that are most suitable for urban expansion in a way that maintains the sustainability of natural resources besides protecting the urban environment.

Suitability of any place for certain human activity or specific type of land use depends on its characteristics which must meet the demands of the required activity in order to be suitable for the designated type of land use. Topological and environmental relationships, however, are best derived and preserved within a GIS environment which can be integrated with many techniques that can be used to classify and weight the characteristics of places, mainly when different themes are involved (Gerrit, 2002; Itami, 1994; Jankowski, 1989).

In his research Oh. (2005) used GIS coupled with an assessment system, based on selected factors, to assign different weights for the road conditions. He used "A" to express the best road condition of traffic flow, and graded the conditions into different classes until he reached "F" which expressed the worst condition.

In this research the site of an urban activity is thought of as a function of a number of factors that affect urban expansion and urban environment. Each of these factors reflects a certain criteria advised by the planner that is thought to have a direct influence on the potential site for urban development. Each factor was thought of as a GIS layer and was assigned a certain percent based on its importance to indicate the land suitability for expansion in a way that gives the whole assigned percent for the land when it completely satisfies the requirements of the factor, while a ration of the whole assigned percent is given elsewhere.

The researcher suggested subjectively many different weighting factors then held some meetings and discussions with many experts* in the fields of planning and environment in the related ministries and municipalities to assign the factors which are mostly expected to indicate to what extent the area is suitable for urban development and the distribution of their weights. The following factors and weights were found to be the first option for measuring land suitability for future expansion:

1. Political Land Classification (15%)

The political constraints are important to check the suitability of land for urban development which, in the case of Palestine, clearly reflected by the classification of areas like A, B or C as discussed in chapter 3.

This factor was assigned a percent of 15%. Lands within area "A" are completely under Palestinian Control and were defined as the areas most suitable for Palestinian expansion and given the whole share of this factor, i.e. 15%, where lands in area "B" where given 10% and those in "C" where given 5%, see Map 4.1.

2. Israeli Colonization (15%)

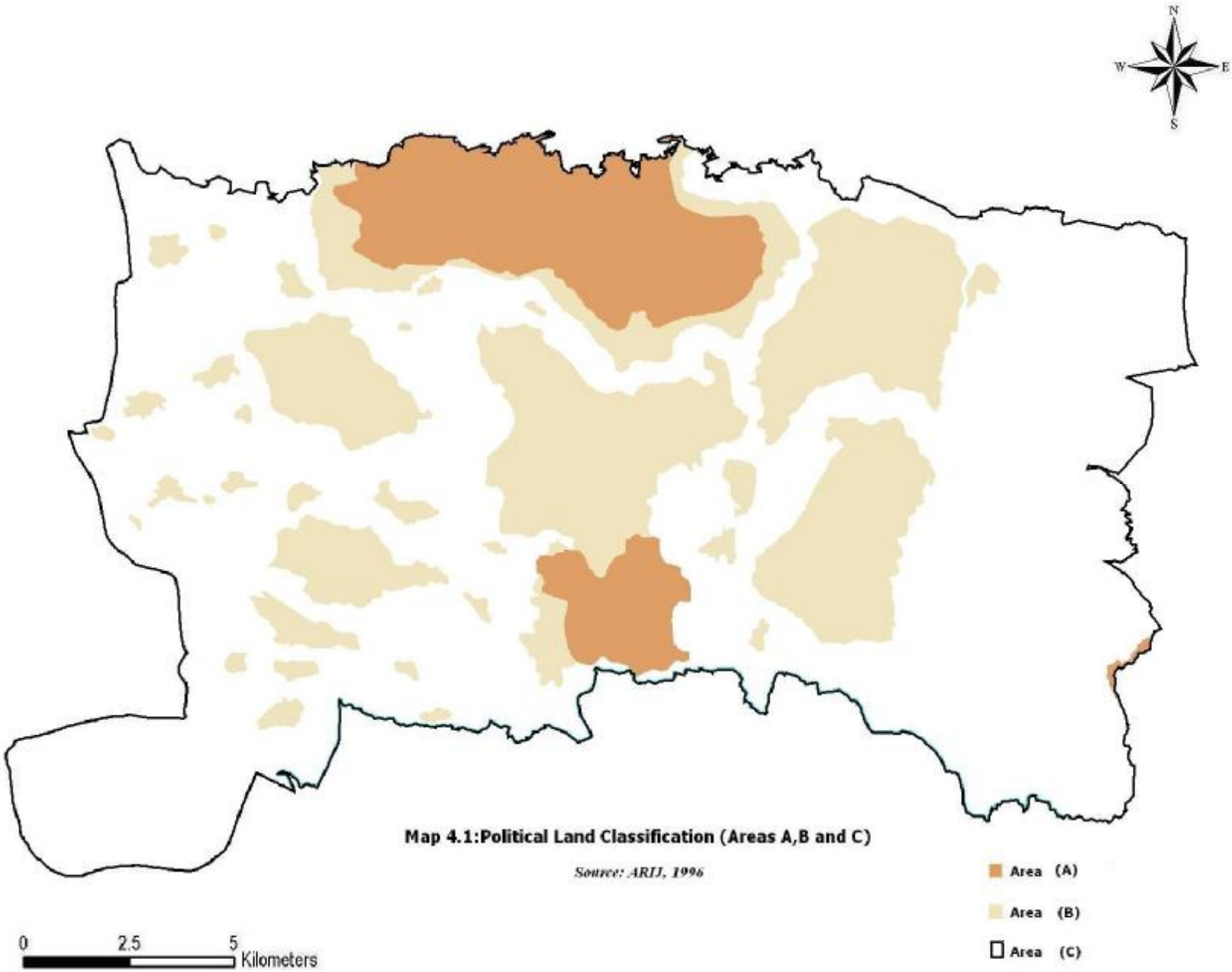
Israeli restrictions towards Palestinian urban development caused by colonization can be in different types such as the segregation wall that swallowed most of the fertile agricultural land in order to be constructed and prohibited Palestinians from using their lands which lie within about 100 m around the wall, colonies and military bases (MLG, 2004). As the scenario adopted by this study reflects the current geopolitical situation not the situation under peace, then a percent of 0.0% was assigned to lands

* Discussions to determine the factors and their weights were held with the following experts:
1. G. Manager of Palestinian Ministry of Local Government.
2. Manager of Projects & International Relations, Palestinian Environmental Quality Authority.
3. Manager of Engineering Dept., Al-Bireh Municipality
4. Chief of Planning Dept., Al-Bireh Municipality
5. Chief of Planning Dept., Ramallah Municipality
6. Dr. Salem Thawaba, Assistant Professor – UPLD, Birzeit University

located within the 100 m zone around the segregation wall and to those lands within the boundaries of Israeli colonies and military bases as there is no chance yet for urban expansion to go in that direction, however 15% was assigned for all other lands, see Maps 4.2 A & 4.2 B.

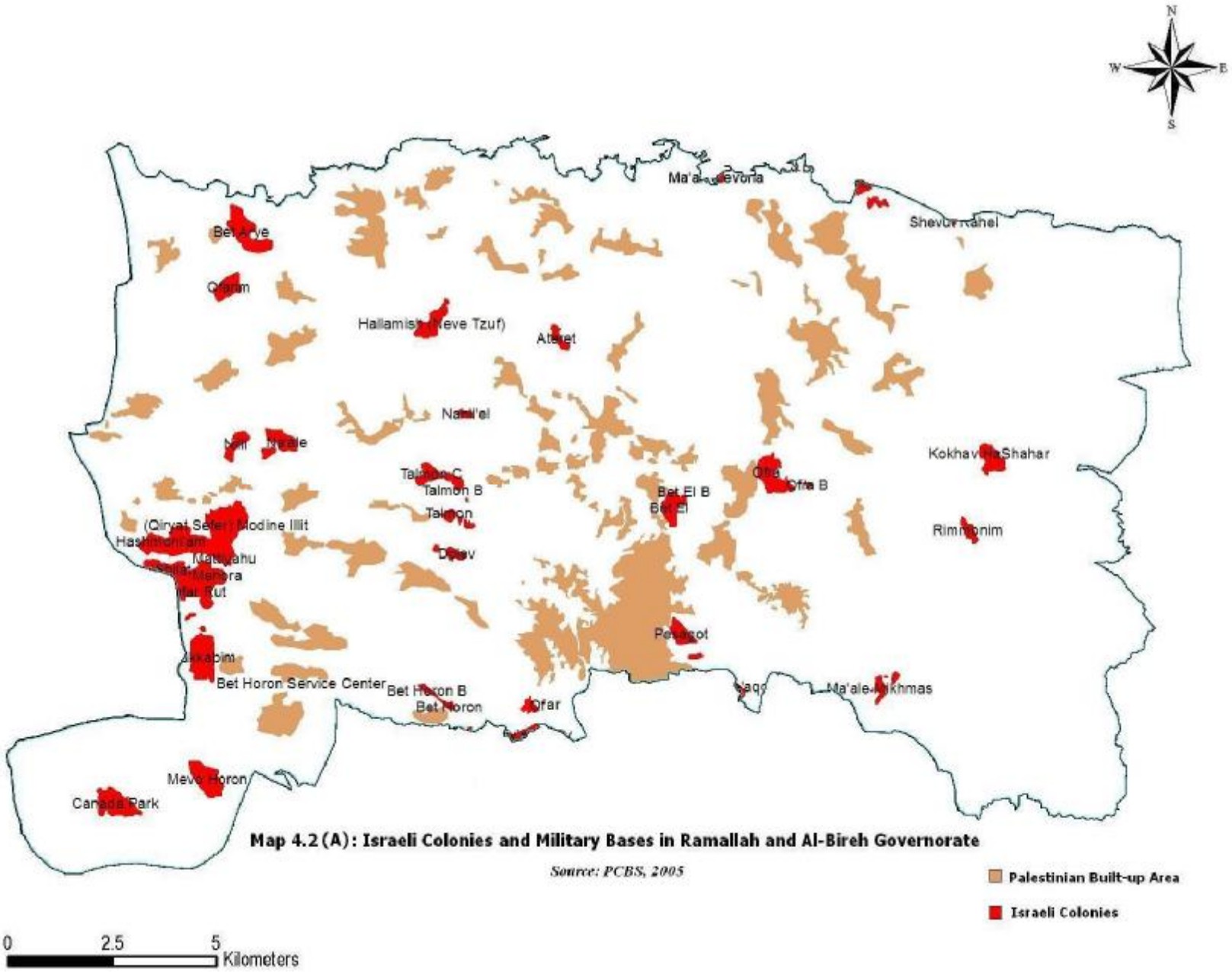
3. Agricultural Value (30%)

The Palestinian Ministry of Planning and International Cooperation, MOPIC (1998) has classified the agricultural land in the Palestinian governorates into three classifications: high value, moderate value and low value. This classification was mainly based on soil fertility and suitability for agricultural use; hence the full weight of 30% was assigned to unfertile lands which were classified as "low suitability" to indicate higher suitability for urbanization where 20%, 10% and 0.0% where given to lands classified as "moderate to low", "moderate" and "high" suitability respectively since fertile lands are needed for agricultural purposes. The weight of 0.0% which was assigned for lands of highest agricultural value was deeply argued before it was agreed on by the experts since some construction is taking place over such lands, but the dominant opinion was that the aim of the research is to organize future urbanization trends; thus it is required to prevent fertile lands from being exposed to urban development and to restrict any expansion over such lands, however, few exceptions can be given for agricultural housing in these lands after being approved by experts in related organization, see Map 4.3.



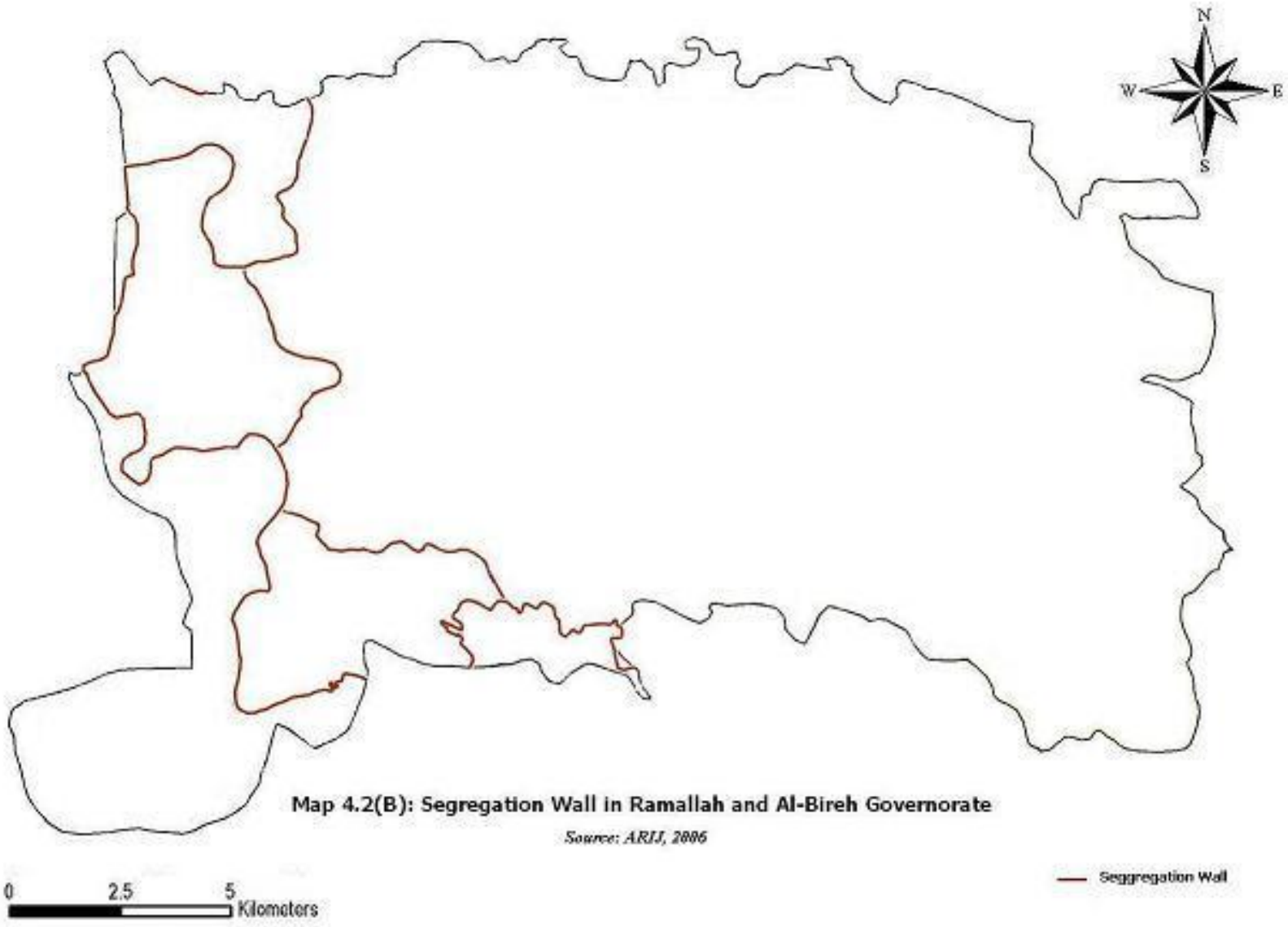
Map 4.1:Political Land Classification (Areas A,B and C)

Source: ARIJ, 1996



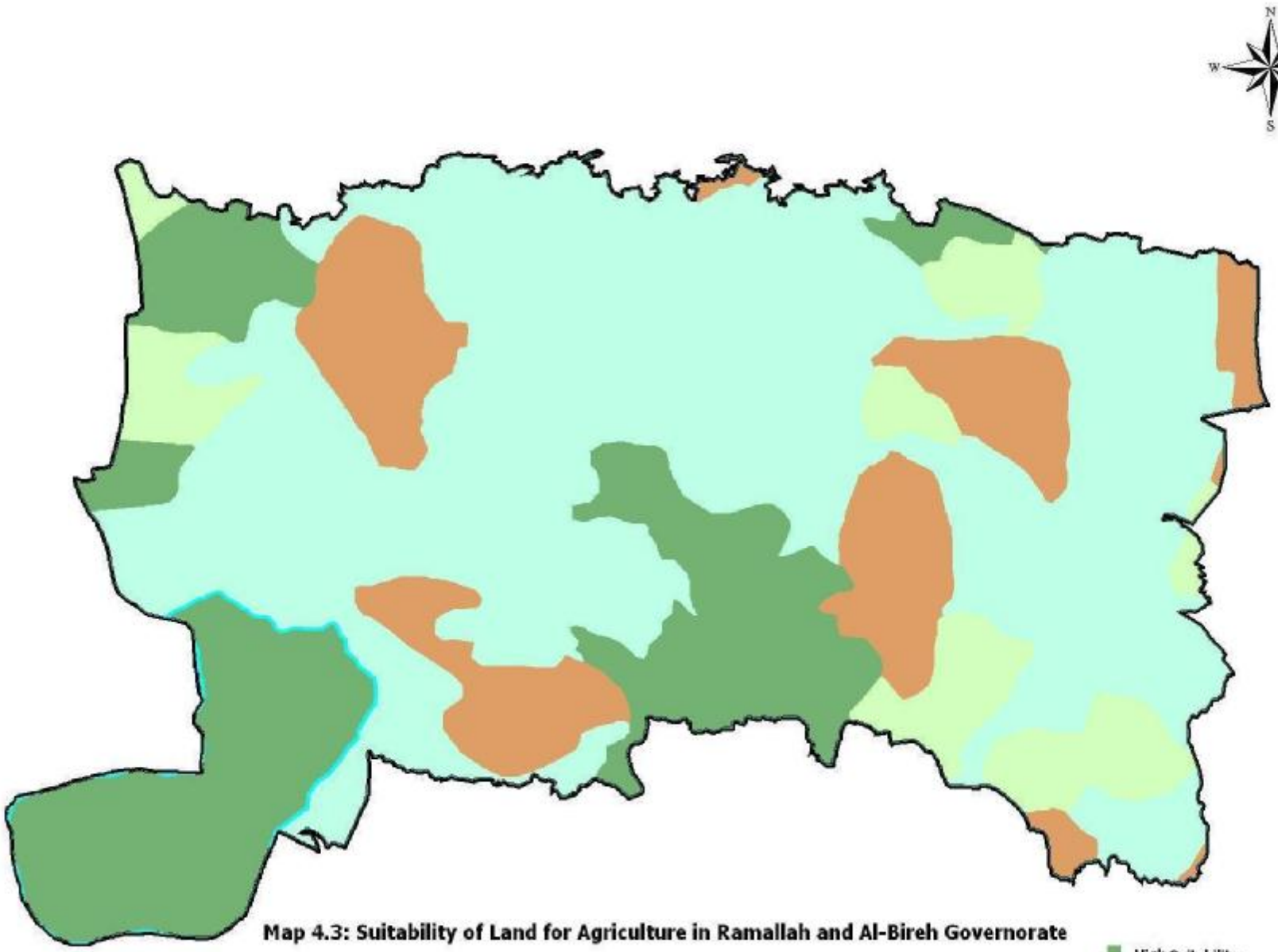
Map 4.2 (A): Israeli Colonies and Military Bases in Ramallah and Al-Bireh Governorate

Source: PCBS, 2005



Map 4.2(B): Segregation Wall in Ramallah and Al-Bireh Governorate

Source: ARIJ, 2006



Map 4.3: Suitability of Land for Agriculture in Ramallah and Al-Bireh Governorate

Source: MOPIC, 1998

4. Biodiversity (20%)

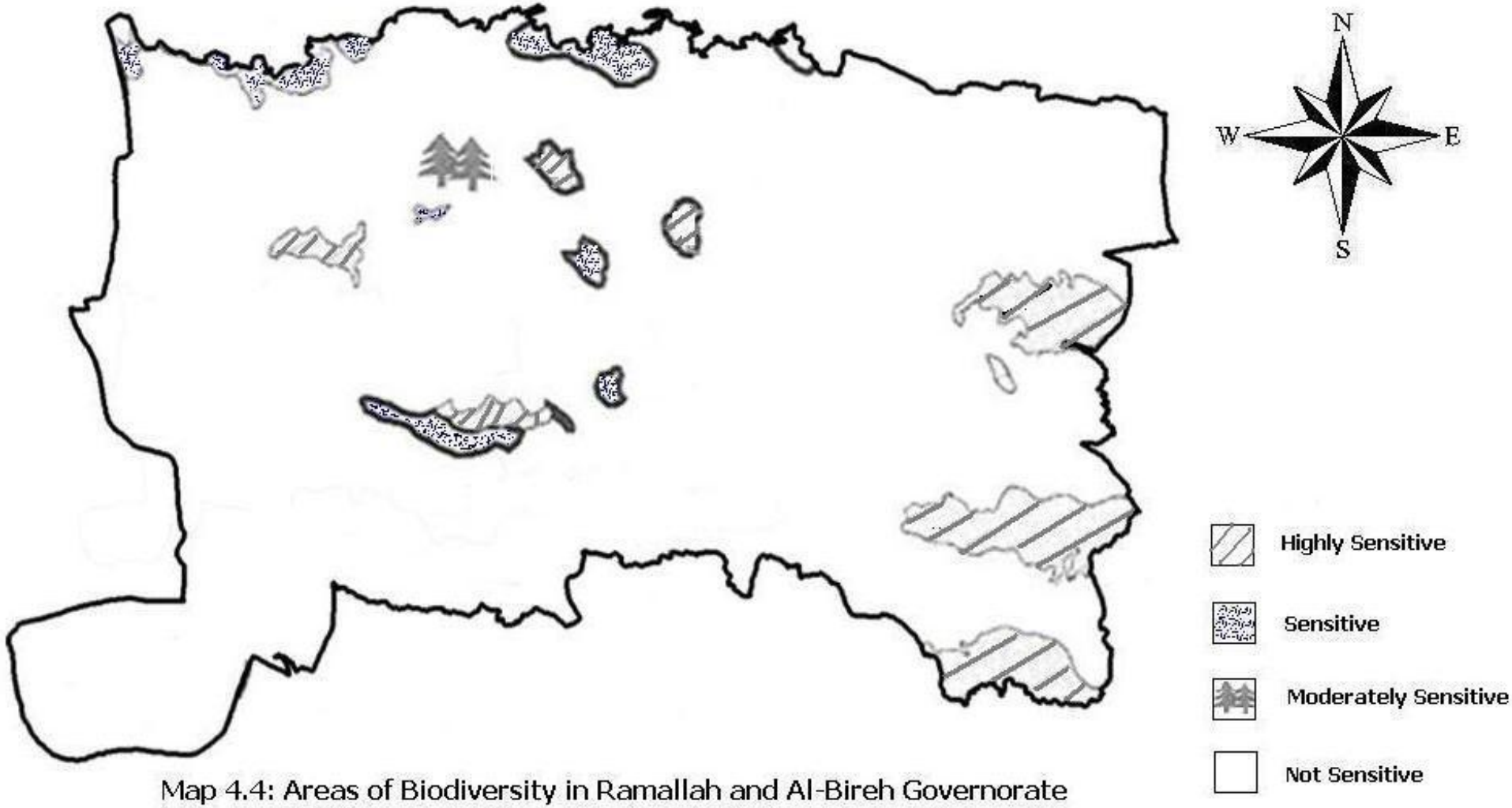
Biodiversity is a general term used to describe the flora and fauna in a certain area (Burgess et. al., 1997). The Palestinian land constitutes one of the most complicated ecosystems in the world. This land must be protected against urban development, hence the Palestinian Ministry of Planning and International Cooperation has classified it into four classes based on their ecological sensitivity; highly sensitive, sensitive, moderately sensitive and not sensitive and where assigned respectively 5%, 10%, 15% and 20% that represents the hole share of this factor, see Map 4.4.

5. Water Sensitivity Areas (20%)

Water is a scarce resource mostly in all Palestinian governorates, the water status in Ramallah and Al-Bireh Governorate is very critical as the demand for water is high and it is expected to increase rapidly in the future subjecting the governorate to real shortages in water supply, mainly if the Israeli over pumping and excessive urban use of Palestinian water continue, thus urban development shouldn't take place over areas of significance to water (MOPIC, 1998; MLG, 2004). These areas where classified by the Palestinian Ministry of Planning and International Cooperation into four classifications; highly sensitive, sensitive, moderately sensitive and not sensitive, hence the full percent of this factor, i.e. 20% was assigned to those lands classified as "not sensitive" where 15%, 10% and 5% were given respectively to moderately sensitive, sensitive and highly sensitive lands, see Map 4.5.

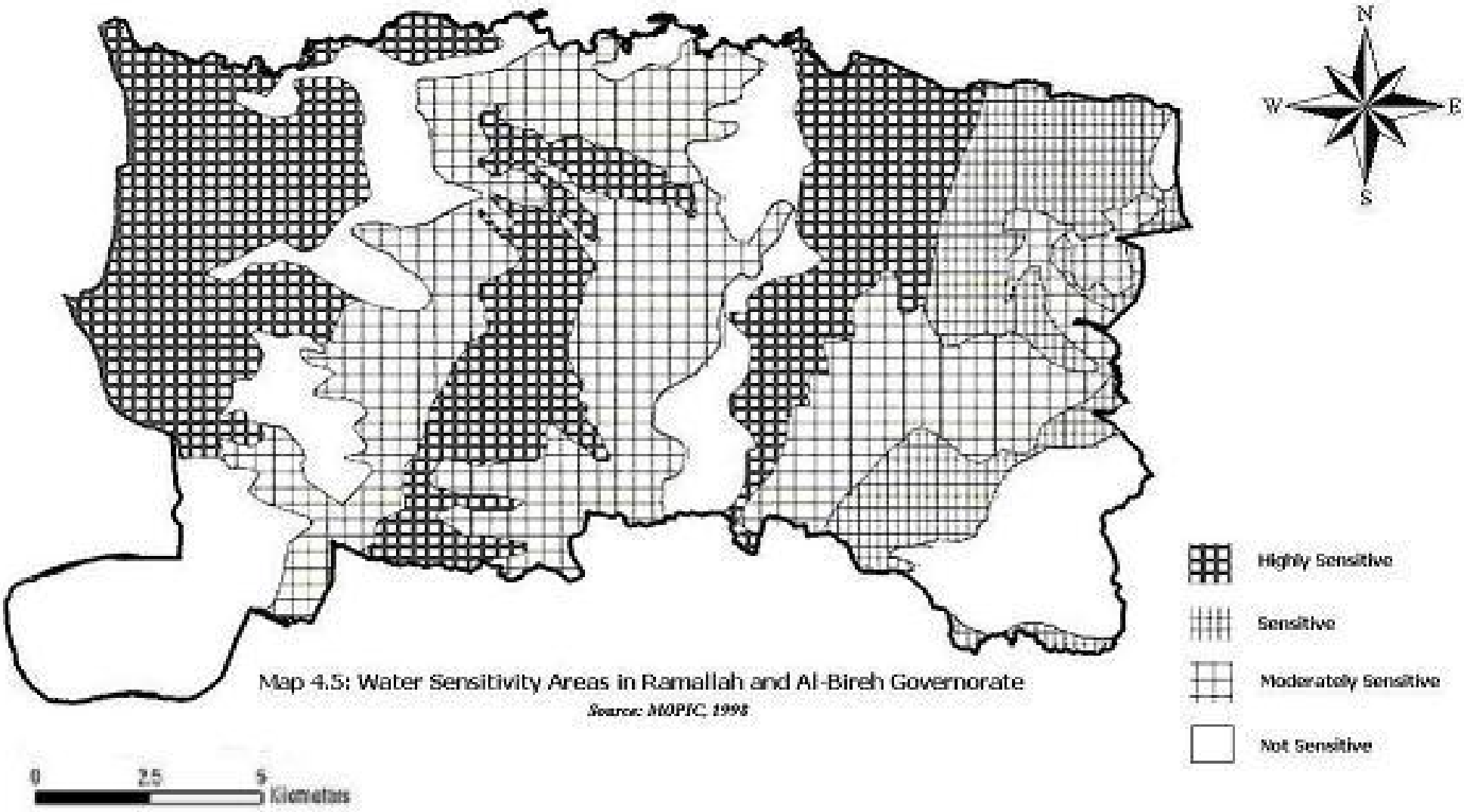
The total percent gained by each area from all factors is then summed up and compared to one of the five intervals (0-20%, 21-40%, 41-60%, 61-80%, 80-100%) described as "Not Suitable", "Less Suitable", "Moderate Suitable", "Suitable" and "Most Suitable" to show the capability of land towards development. Then the total

area that falls in each interval was calculated and plotted in the form of map and compared to the projected needs of built-up area to indicate whether the available suitable area meets the projected one or not.



Map 4.4: Areas of Biodiversity in Ramallah and Al-Bireh Governorate

Source: MOPIC, 1998



Map 4.5: Water Sensitivity Areas in Ramallah and Al-Bireh Governorate

Source: MOPIC, 1998

CHAPTER FIVE

RESULTS & ANALYSIS

5.1 Population Statistics Analysis

Figure 5.1 indicates that the population of Ramallah and Al-Bireh cities comprises approximately 22% of the total population of the governorate, while the population of the other urban communities in the governorate comprises about 12%, on the other

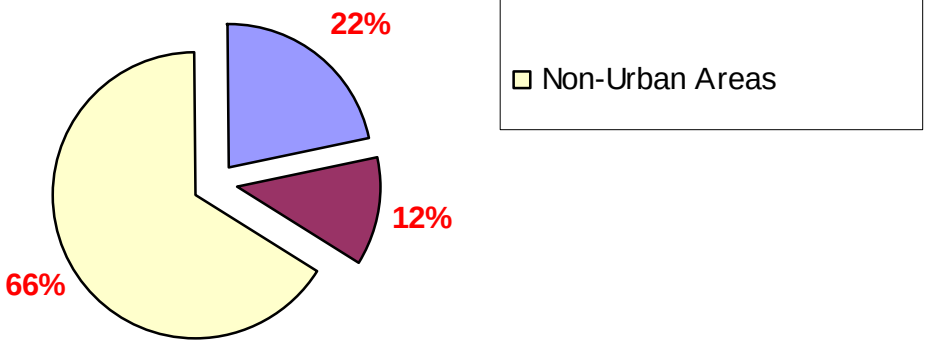


Figure 5.1: Population Distribution in Ramallah and Al-Bireh Governorate, 2006

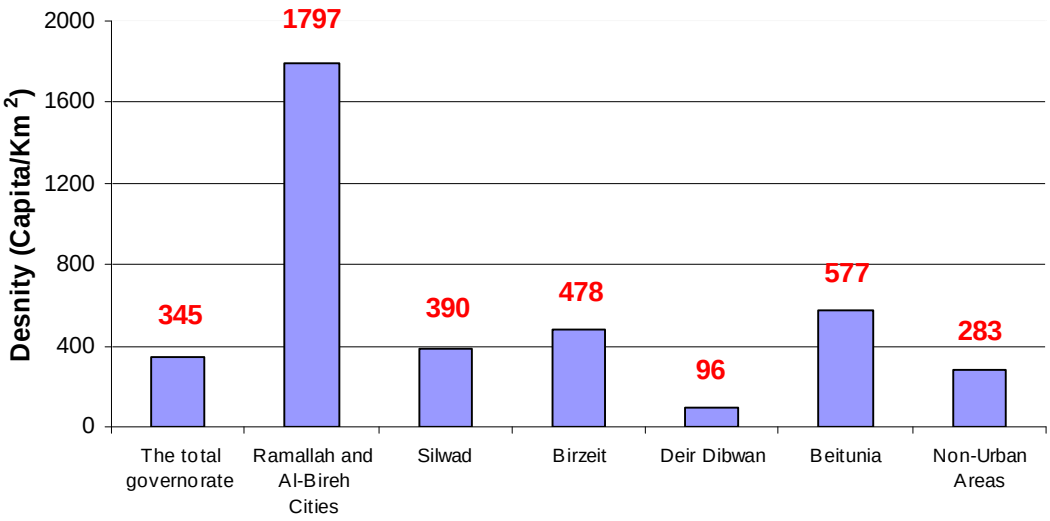


Figure 5.2: Distribution of Estimated Population Densities over the Total Community Area in Ramallah and Al-Bireh Governorate, 2006

hand those living in non-urban areas represent the rest of the total population. The population density in Ramallah and Al-Bireh cities are the highest among the other urban centers in the governorate as shown in Figure 5.2.

If the expectations of MLG regarding population growth rate become true, then considering the year 2006 as a base year, the population of Ramallah and Al-Bireh Governorate will exceed 500,000 inhabitants in the year 2020 (See Table 5.1 and Figure 5.3).

Table 5.1: Population Projections in Ramallah and Al-Bireh Governorate

Year	The total governorate	Ramallah and Al-Bireh	Silwad	Birzeit	Deir Dibwan	Beitunia	Non-Urban Areas
2006*	295,365	66,025	7,366	6,728	7,036	13,482	194,727
2010	346,866	77,537	8,650	7,901	8,263	15,833	228,680
2015	424,049	94,791	10,575	9,659	10,101	19,356	279,565
2020	518,405	115,883	12,928	11,809	12,349	23,663	341,772

** Based on PCBS projections, see Table 3.2*

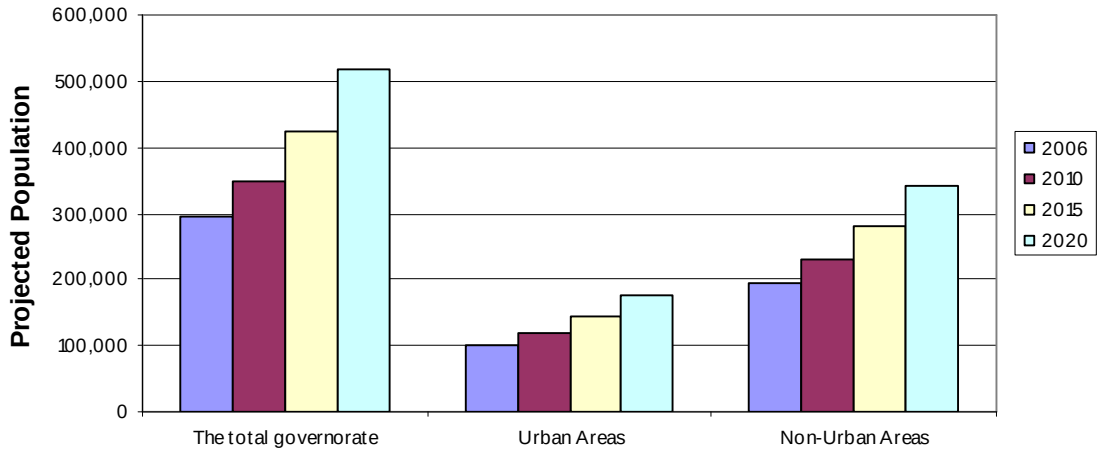


Figure 5.3 (A): Population Projections in Ramallah and Al-Bireh Governorate for the Years 2006, 2010, 2015, 2020

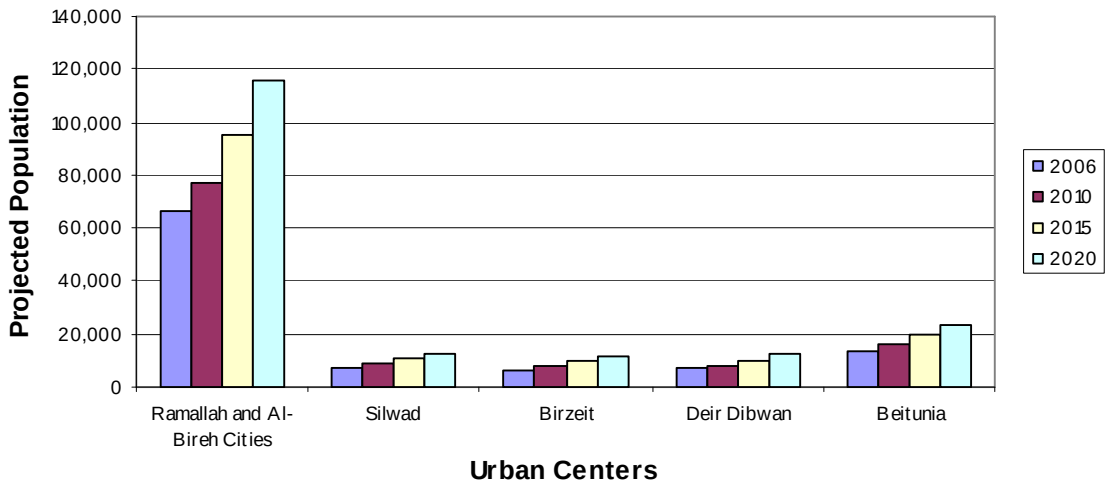


Figure 5.3 (B): Population Projections in the Existing Urban Centers of Ramallah and Al-Bireh Governorate

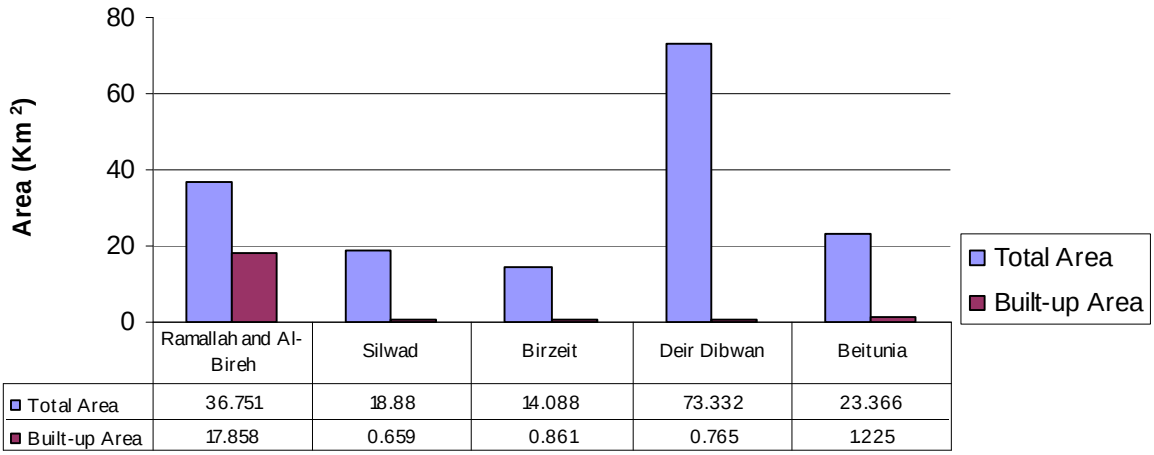
5.2 Urban Growth Analysis

The built-up area of Ramallah and Al-Bireh Governorate increased rapidly during the 1990`s; it has increased by more than four folds since 1989 to 2000.

Ramallah and Al-Bireh cities witnessed the largest growth in built-up area with an increase of 16.1% between 1989 and 1994 and 24.5% during the period between 1994 and 2000**.** The built-up area in Ramallah and Al-Bireh twin cities occupies about 50% of the total area of the twin cities represents and it represents about 20% of the total governorate's built-up area, it has grown enormously compared to that in the other urban centers; it is almost five times of that in all other urban centers in the governorate (See Map 3.4, Figure 5.4 & Figure 5.5).

The analysis of the satellite images of Ramallah city for the years 1989, 1994 and 2000 (Maps 3.4 and 3.5, pages 45 & 48) shows an increasing urbanization trends mostly on permanent crops and to some extend on arable lands and on heterogeneous agriculture in the northeast and western parts of the city.

Since 1994 the urban area of the city has expanded mostly northwestwards inside the master plan boundary; new urban areas have appeared to the east of Qaddura and Al-Am'ari camps as well as two small urban locations east of Al-Bireh. Urban growth to the east of the refugee camps was on some heterogeneous agriculture area causing a negative impact on the environment.



	Ramallah and Al-Bireh	Silwad	Birzeit	Deir Dibwan	Beitunia
Total Area	36.751	18.88	14.088	73.332	23.366
Built-up Area	17.858	0.659	0.861	0.765	1225

Figure 5.4: Built-up Areas in the Urban Centers of Ramallah and Al-Bireh Governorate

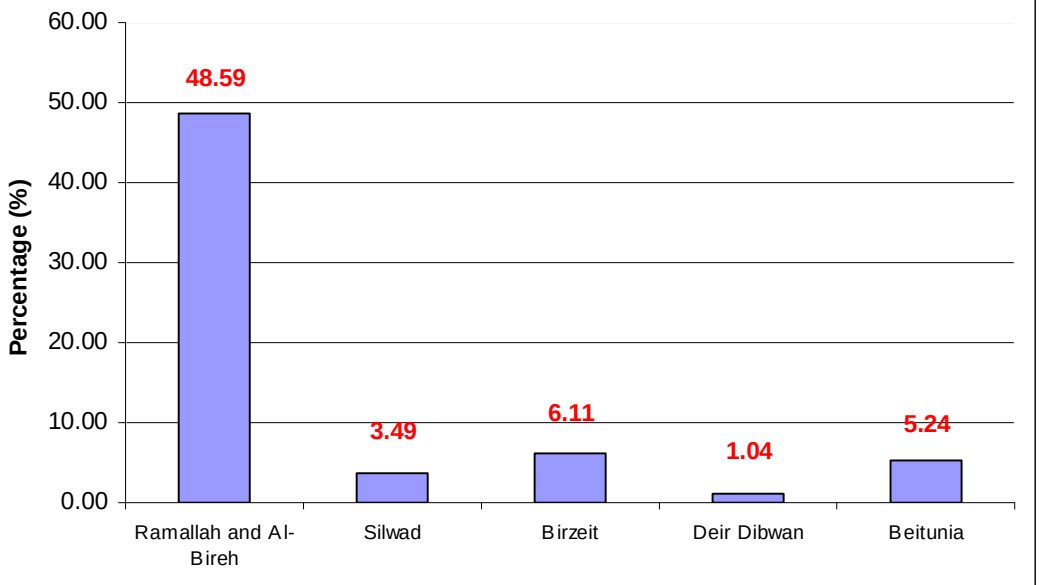


Figure 5.5: Percentages of Built-up Areas in the Urban Centers of Ramallah and Al-Bireh Governorate

The images also indicate that Israeli colonies have expanded towards the Palestinian valuable agricultural lands, especially heterogeneous agricultural lands which were

directly affected by the Israeli activities like bulldozing of lands, uprooting of trees and houses demolition for the construction of Israeli bypass roads, colonies and the segregation wall, in addition to the closures and checkpoints which have had a negative impact on the Palestinian economy and isolated villages in the region from the Palestinian community and restricted their people to reach the neighboring Palestinian localities or the main cities in the governorate.

Built-up area projections are required to study the trends of urbanization in the governorate and to find out the future directions of urban growth.

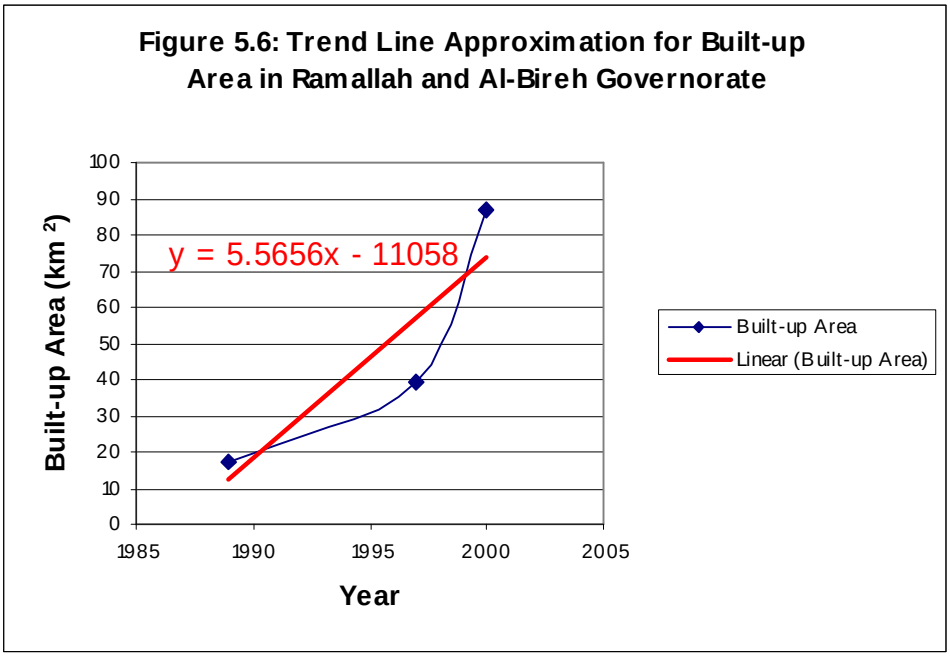


Figure 5.6: Trend Line Approximation for Built-up Area in Ramallah and Al-Bireh Governorate

To estimate the expected built-up area of Ramallah and Al-Bireh Governorate in the target year of this research, it was required to set certain relation between the witnessed urbanization growth rates during the past years, hence a trend line has been drawn based on the growth rates of the years 1989, 1997 and 2000, see Figure 5.6, then the expected built-up area was derived based on the trend lines' equation.

By applying the equation of the trend line, it can be found that the expected built-up area of Ramallah and Al-Bireh Governorate in the year 2020 is 184.51 km^2. This number, predicts the level of urbanization in the target year based on the growth

levels in the governorate during the past years. However, the required built-up area which reflects the real area needed to meet the needs of population, was then calculated based on the recommendations of MLG regarding the built-up area needed per capita for the year 2020 (305 m^2 per capita), and it has been used for all analysis purposes since this study aims to organize and to set guidelines for the urbanization process more than measuring and expecting the degree of urbanization in a certain year. Table 5.2 and Figure 5.7 show the required built-up area for the years 2010, 2015 and 2020 based on the pre described population growth scenario and the required area per capita (305 m^2).

Table 5.2: Required Built-up Area* in Ramallah and Al-Bireh Governorate, (km^2)

Year	The total governorate	Ramallah and Al-Bireh	Silwad	Birzeit	Deir Dibwan	Beitunia	Non-Urban Areas
2006	90.09	20.14	2.25	2.05	2.15	4.11	59.39
2010	105.79	23.65	2.64	2.41	2.52	4.83	69.75
2015	129.33	28.91	3.23	2.95	3.08	5.90	85.27
2020	158.11	35.34	3.94	3.60	3.77	7.22	104.24

** Based on the recommendations of MLG for "Design Built-up Area Per Capita", see page 23.*

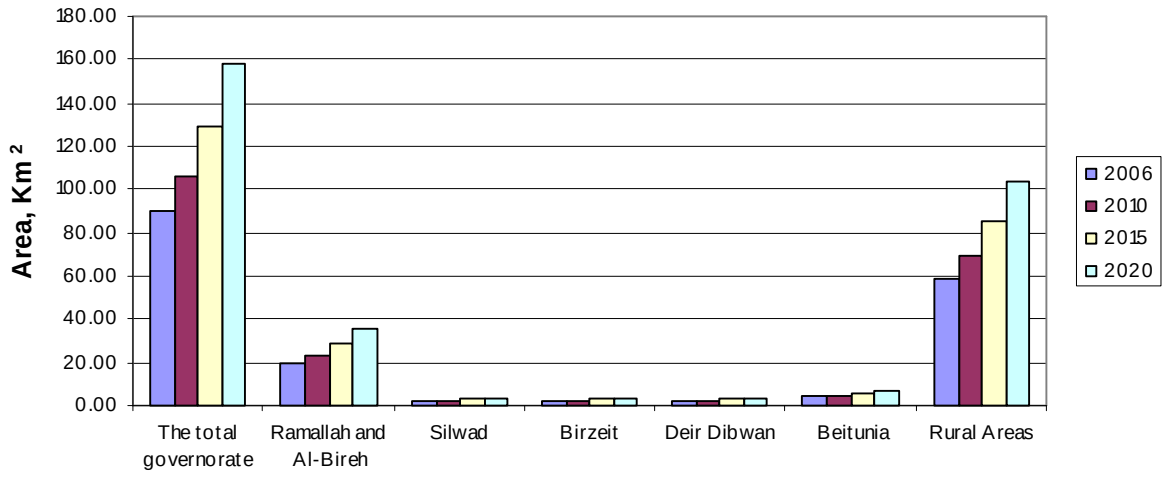


Figure 5.7: Required Built-up Area in Ramallah and Al-Bireh Governorate for the Years 2006, 2010, 2015, 2020

It could be noticed that the expected built-up area in Ramallah and Al-Bireh Governorate (184.51 km^2) is larger than the required one (158.11 km^2) by about 26.5 km^2; this assures that the level of urbanization in the governorate increases heavily more than required.

Furthermore, Ramallah and Al-Bireh cities are approaching the case of complete land utilization in the year 2020; this requires seeking suitable lands that can satisfy the needs of urban growth.

5.3 GIS Analysis for Land Availability

Analysis of potential sites for future urban development was applied using GIS depending on the pre discussed layers and factors, then a GIS-based map was introduced and has been used as the basis for planning to assist in the identification of suitable land for urbanization as indicated by Map 5.1 which shows the most proper areas for future expansion and those where expansion shouldn't or can't take place. Table 5.3 summarizes the results of the analysis and describes lands as most suitable, suitable, moderately suitable, less suitable and unsuitable for urban expansion.

Table 5.3: Area of Available Lands for Urban Development in Ramallah and Al-Bireh Governorate by Suitability

Available land (km^2)	Suitability Classification
52.70	**Most Suitable**
251.40	**Suitable**
196.30	**Moderately Suitable**
317.40	**Less Suitable**
37.20	**Not Suitable**

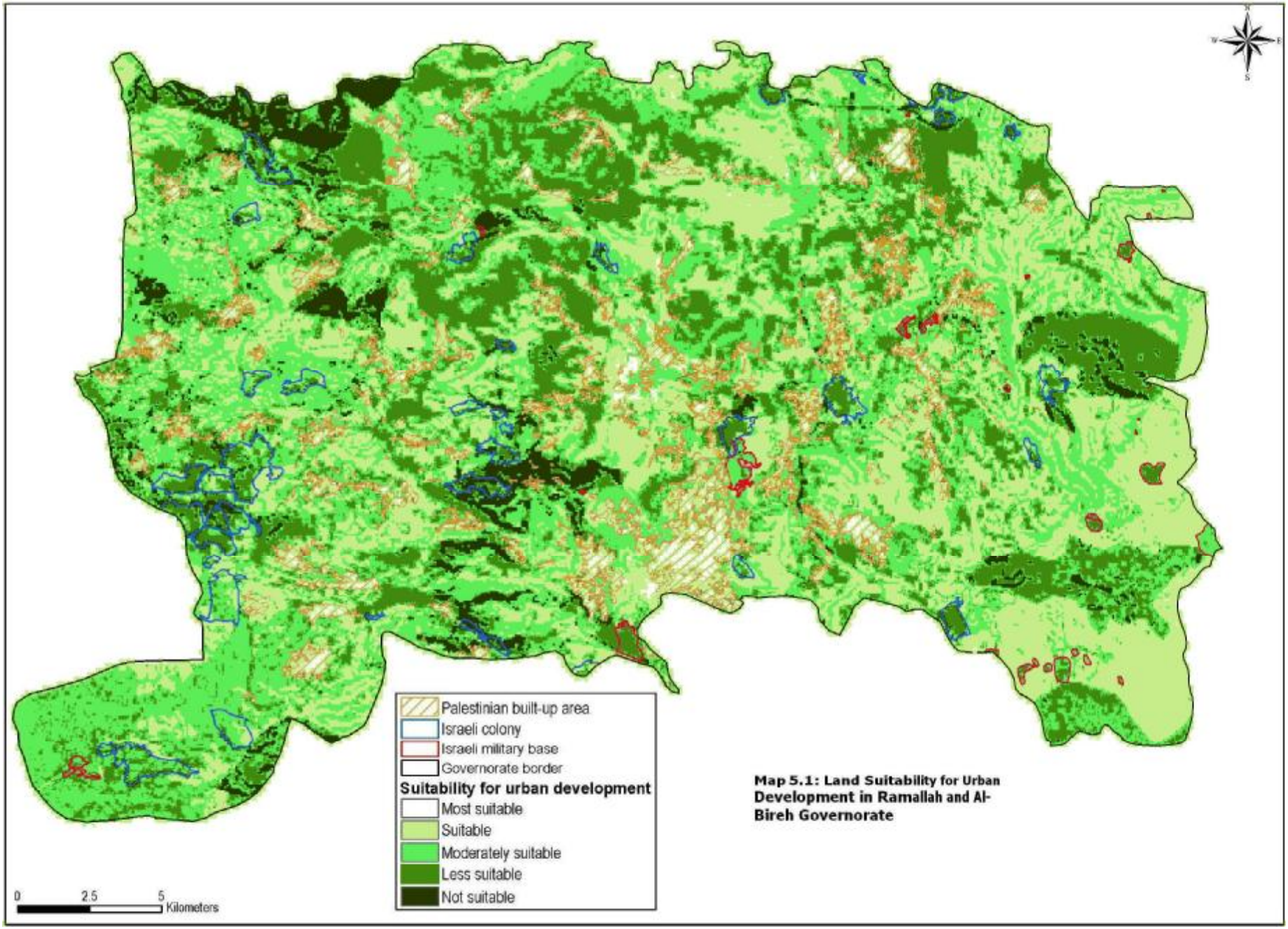
Taking the first two classes in Table 5.3 as the optimum location for urbanization, it is clear that the total suitable area for urban development in the governorate equals

304.10 km^2, and then by excluding 7 km^2 representing the areas located within Israeli colonies and military bases but was classified through weights as suitable, the suitable area for urban growth becomes 297.10 km^2.

The analysis results are then compared with the future projected urban trends in order to evaluate what practical information can be provided for planning purposes.

It was found that, based on GIS analysis results, the environmentally suitable area for urban development is larger than that required to satisfy the suggested share of each person (305 m^2/capita), which is 158.11 km^2, and that it can meet the demand of urban growth and land needs driven by population and built-up area growth scenarios till 2020 in Ramallah and Al-Bireh Governorate.

This fact requires special attention and needs to be really considered in future planning in order to reduce the pressure on the congested centers and to re-orient the urbanization trends towards those areas classified as suitable.



Map 5.1: Land Suitability for Urban Development in Ramallah and Al-Bireh Governorate

CHAPTER SIX

DISCUSSION & RECOMMENDATIONS

6.1 Urbanization and Demographic Trends

It is clear from the analysis that population densities and urbanization trends in Ramallah and Al-Bireh twin cities are the highest among the other communities in the governorate and that the urban expansion and the decline in agricultural areas were significant in the twin cities mainly during the period that accompanied the peace process (1994-2000) were the urbanization increased in a faster pace than in the period 1989–1994.

This could be explained by the fact that Ramallah and Al-Bireh cities with their unique location in the middle part of the West Bank witnessed an increase in built-up area accompanied by rapid population growth leading to an increase in the urbanization mainly during the peace process which resulted in increasing immigrant numbers to the Palestinian Territories in general and specially to Ramallah city that became the administrative center of the Palestinian National Authority (PNA). This encouraged the implementation of large projects which included large infrastructure and construction investments. All types of buildings were constructed including commercial, residential, industrial, service and public buildings.

Moreover, the setting of Israeli check points and the closure of the West Bank, after the beginning of the Al-Aqsa Intifada, limited the Palestinians access to services and hindered mobility between the different communities, hence those people who are related to Ramllah and Al-Bireh Governorate, specially Ramallah and Al-Bireh cities, in their daily life immigrated to the governorate leading to higher population growth rate.

This migration, if continues, will definitely lead to an alarming rate of population increase in Ramallah and Al-Bireh Governorate causing infrastructure shortages, as

the governorate at its present situation is not ready for such an increase and this will definitely lead to environmental problems (wastewater, solid waste, etc…

Moreover, if population growth in Ramallah and Al-Bireh twin cities continues at the expected rate, then and as it was found in the analysis; the projected built-up area of these cities (35.34 km^2) will approach their total community area (36.75 km^2) and a forest of buildings will replace the open places in the twin cities. This should be seriously considered in any future planning process.

In this context, it is badly needed to organize the urbanization process in the governorate, mainly in Ramallah and Al-Bireh cities where population densities are increasing at an alarming rate, especially when compared to the other centers in the governorate, since this might cause existing infrastructure and utilities being unable to cope with the needs of dwellers.

6.2 Land Availability Study

Although the analysis of land availability is fairly simple and weighting factors were subjectively assigned, the results can identify the most suitable sites for future urban expansion and development.

Thus, and as it was found that the environmentally suitable land in Ramallah and Al-Bireh Governorate can satisfy the future needs for urban development, it is suggested to stop the population flux towards these two main cities, and to distribute population and services to new sub-centers. This will, consequently, reduce the pressure on the overloaded infrastructure of Ramallah and Al-Bireh cities.

Suggesting a locality to act as a new sub-center is not an easy process, it requires deep and detailed studies and research. Even when attempting to assign a new sub-center that sustains environment, a locality can't be suggested to act as a sub-center only

because its area is environmentally suitable for growth; it needs to have many other characteristics related to its geographical setting among the neighboring localities and the available or planned road networks and utilities besides its social, historical and economical situation.

While the case is that, it is suggested to move towards Bani Zeid, Birzeit, Sinjil, Silwad, Beit Ur Al-Tahat and Ni'lin, Map 6.1 (A).

These sub-centers are distributed almost over all Ramallah and Al-Bireh Governorate; Bani Zeid in the north of the governorate, Birzeit in the middle, Sinjil and Silwad in the east, Beit Ur Al-Tahta to the south and Ni'lin to the west, besides the fact that the village boundaries of these sub-centers include some environmentally suitable land for urban growth (See Map 6.1 (B)) and that their suitability for acting as sub-centers based on their geographical setting, available and planned road networks and utilities, social and historical importance and economical trends has been studied and approved by the Palestinian Ministry of Planning and International Cooperation and other local organizations.

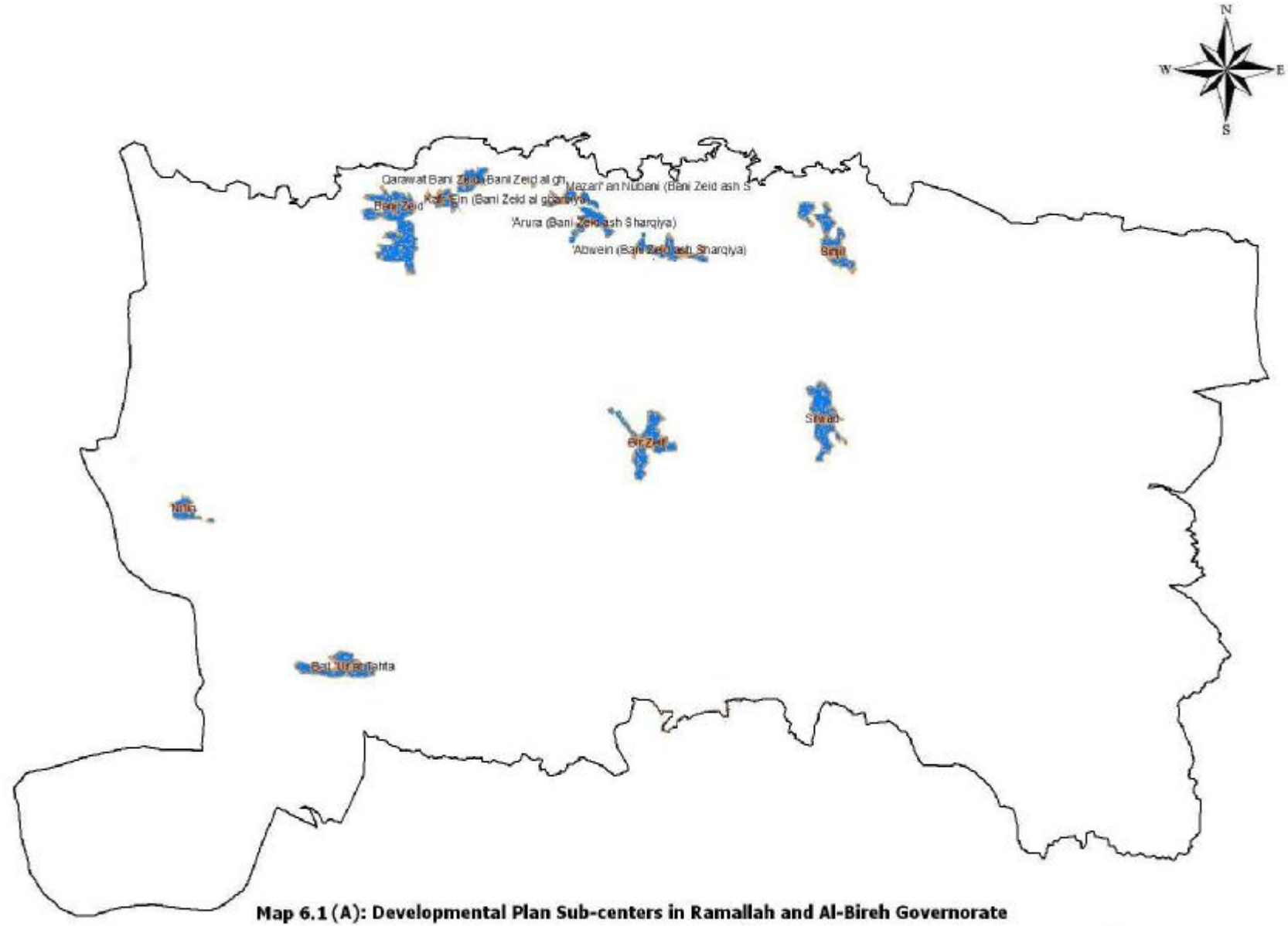
Moreover, these centers agree with the third planning model suggested by the Palestinian Ministry of Planning and International Cooperation as it will cause most of the future population to concentrate along the ridge area where the existing large agglomerations are located.

Furthermore, the selection of these sub-centers could have a political aspect as Bani-Zeid, Ni'lin and Beit Ur Al-Tahta are located near the segregation wall and, thus, acting as an urban sub-center could stop the Israeli attack towards confiscation of the lands of these sub-centers.

However, it should be noticed that the land which has to be utilized in these sub-centers must lie within the environmentally suitable areas for sustainable urban

development as indicated by this research. This meets the part of "Model IV" that concerns restricting population growth in some centers due to shortage in suitable land for urban growth which should be reoriented to other lands with least environmental conflict and without violation of sensitive and valuable land.

This requires stake holders to develop new strategies for future development noticing that future urban planning should not utilize the total amount of the suitable land for urbanization but it should consider longer term sustainability and cope with rapid population growth over longer time periods.



Map 6.1 (A): Developmental Plan Sub-centers in Ramallah and Al-Bireh Governorate

Source: MOPIC, 1998

Map 6.1 (B): Environmental Suitability within the Village Boundary of Suggested Sub-Centers

6.3 Recommendations

The following recommendations are introduced to Palestinian stake holders, urban planners, related governmental and private associations and to whom it may concern to minimize the negative impacts of urban development on Palestinian environment and natural resources:

1. Planners are suggested to promote development in the suggested sub-centers.
2. Related governmental authorities are required to develop procedures, rules, regulations and plans to guide future urban development at the regional, governorate and local levels.
3. Environmental Impact Assessment (EIA) should be performed before starting any large-scale development projects, such as housing projects, to evaluate the impact of urban development.
4. Land for future urban development should be assigned and clearly announced through well-designed master plans for at least ten years in advance, and must take place only on areas classified as suitable for urban expansion.
5. Areas of green cover and open spaces in which urban growth will not be permitted should be introduced in order to reduce the negative impact of urbanization on the cultivated lands and nature reserve areas.
6. Regulating the issuance of new building permits and to narrow it within Ramllah and Al-Bireh cities to avoid construction on environmentally valuable lands, while authorities are required to ease it within the suggested sub-centers.
7. Motivating future investments and economical growth in the suggested sub-centers.

8. Related associations should encourage sound development through financing loans for urban development on suitable areas.

   An immediate assessment should be conducted to review the status of the infrastructure utilities in the governorate and their capability to meet the needs of population, mainly in Ramallah and Al-Bireh cities and the suggested sub-centers, besides the opportunity for enhancing their capacity.

9. Launching public awareness campaigns on environmental burdens which can be caused by extra population densities and motivate dwelling in the suggested sub-centers.
10. Further studies are suggested to go in parallel with this research in order explore the situation of urban growth under the peace scenario and the return of Palestinian refugees.

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