Faculty of Engineering

Urban Planning and Design Master Program UPLD

Managing Urban Growth by Using a GIS-based Multi Criteria Analysis:

A Case Study from Ramallah-Al Bireh Governorate, Palestine

Master Thesis Submitted By:

Jumana Jamil Abu Sada

Supervision

Dr Salem Thawaba

2009

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Submitted in Partial Fulfillment of the Requirements for the Master Degree in Urban Planning and Design from the Faculty of Graduate Studies, at Birzeit University- Palestine

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This Thesis was defended in 29 October 2009

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ملخص

يشهد العالم اليوم نموا حضريا متسارعا، في الوقت الذي أصبحت فيه الموارد تتناقص. إن أكثر من 65 ٪ من الفلسطينيين يعيشون في مناطق حضرية، فباتت نسبتهم في فلسطين أكبر بكثير من نسبة من يقطنون في مناطق حضرية في العالم والتي وصلت في العام 2008 إلى أكثر من 50%. تعد محافظة رام الله والبيرة من أكثر المحافظات تزايدا في النمو الحضري وقد صاحب هذا النمو ضغطا كبيرا على الخدمات و توفر فرص العمل و الحاجة إلى توفير السكن المناسب لجميع الناس القادمين إليها من مختلف محافظات ومدن وقرى ومخيمات الضفة الغربية.

إن الهدف من هذا البحث هو إيجاد طريقة علمية تساعد في تحديد الأماكن الأكثر ملائمة للتطور الحضري ضمن حدود محافظة رام الله والبيرة وقابلة للتطبيق في كل مكان. تهدف هذه المناطق إلى تخفيف الضغط عن مراكز المدن في نطاق ظروف معيشية وبيئية أفضل.

ارتكزت منهجية البحث على مرحلتين رئيسيتين : المرحلة الأولى تم فيها استخدام نظم المعلومات الجغرافية (GIS) كأداة رئيسية في مرحلة اختيار المناطق المناسبة، في حين تم في المرحلة الثانية استخدام التحليل المتعدد المعايير (Multi Criteria Analysis) لتقييم المناطق المختارة حسب أولوية البدء بالتطوير وذلك بعد إخضاعها لعدة معايير تم تطويرها من خلال هذا البحث.

أخيرا ، أظهرت نتائج البحث النهائية انه وبعد تقييم المناطق الست من جميع النواحي إن **الموقع 5 (المنطقة القريبة من رمون)** هي الأكثر ملائمة لتكون منطقة امتداد حضري بينما **الموقع 3 (المنطقة القريبة من عابود)** هي الأقل ملائمة.

إن هذه الدراسة إن لم تكن الأولى فهي من الدراسات الأولى التي تتطرق لدراسة ومنهجه وإدارة النمو العمراني في أحد التجمعات الحضرية الكبرى في فلسطين " رام الله والبيرة" وأثبتت نتائجها أن الآلية المستخدمة تصلح لأن تكون نموذجا يمكن تطبيقه في مختلف محافظات الوطن و في مناطق التحضر المشابهة لفلسطين.

ABSTRACT

Urban population growth is accelerating around the world while land is becoming a decreasing resource. Over 65% of Palestinians are living in urban areas which are much higher than the international percentage which are 50 %. Ramallah-Al Bireh Governorate is the most rapid growing governorate and this is accompanied by a significant pressure on services, employment opportunities, and the need to provide appropriate accommodation for all people coming in from all over the West Bank governorates, cities, villages and camps. This research aims to find suitable areas for absorbing urban growth in the Ramallah and Al Bireh governorate in order to alleviate the pressure on the city center as well as to find accommodations for all young families who looking for the better living conditions and a better environment. This research was conducted through two major phases: Geomorphic Information System (GIS) was the major tool for the site selection in Phase One, while in Phase Two; Multi Criteria Analysis (MCA) was applied to compare these sites together considering a set of criteria and different perspectives. Finally, in terms of the overall perspectives, **Site 5 (near Rammun)** is the most suitable for the any new urban development while **Site 3 (near Aboud**) is the least suitable site.

This research is not the first of its kind, but it is distinctive in its approach which addresses the study and modeling of urban growth management in one of the largest urban agglomeration in Palestine "Ramallah Al Bireh". The results have proven that the approach used can serve as a model, which can be applied in the different governorates of the West Bank, and in regions which are experiencing urbanization similar to that in Palestine.

Key words: Urban Growth, Geographic Information Systems, Multi Criteria Analysis, Criteria, Ramallah Al Bireh Governorate.

Table of Content

ABSTRACT ..... **v**
DEDICATION ..... **xii**
ACKNOWLEDGMENT ..... **xiii**
LIST OF ABBREVIATIONS ..... **xiv**
Chapter One: Introduction **2**
1.1 Introduction 3
1.2 Main Objective 5
1.3 Research Significance 5
1.4 Methods 6
1.5 Research Contents 6
1.6 Research Limitations 7
Chapter Two: Literature Review **8**
2.1 Urbanization 9
2.2 World Urbanization, Trends and Figures 9
2.3 Impacts of Urban Growth 11
2.4 Managing Urban Growth: 13
2.4.1 The concentration policy: 13
2.4.1 Decentralization 14
2.4.2 New Towns: 16
2.5 Urban growth in Palestine 21
2.5.1 Planning Experience in Palestine 23
Chapter Three: Study Area **25**
3.1 Historical Background: 26
3.2 Ramallah Al Bireh Governorate: 29
3.2.1 Population: 32
3.2.2 Population Projection: 33
3.2.3 Population Density 34
3.3 Ramallah Urban Development 36
Chapter Four: Data Analysis **39**
4.1 Site Selection Criteria and Methodology 40
4.1.2 Site Selection Criteria description 43
4.1.3 Site Selection analysis and preliminary results 46
4.1.3 Final Results 53

4.2 Sites Evaluation and Analysis 55
4.2.1 Introduction 55
4.2 .2 Multi Criteria Analysis Methodology 55
4.3 Development of Criteria for Site Evaluation 60
4.3.1 Criteria Description 61
4.4 Quantification of the actual values 68
4.5 Normalization of basic criteria 75
4.6 Determination of weightings and balancing factors 76
4.7 Quantifying the values of second and third levels of criteria 77
4.8 Preliminary Results 78
4.9 Final Results and Discussion 80
4.10 Description of the best Site: 83
Chapter Five: Conclusion and Recommendations 85
5.1 Conclusion 86
5.2 Recommendations 89
References: 91
Appendices 97

List of Figures:

Figure 2.1 Urban and rural populations of the world, 1950-2050 10

Figure 2.2 Galaxy Model 15

Figure 2.3 The original Garden City Concept by Ebenzer Howard 18

Figure 3.1 Historical Palestine through different political stages 27

Figure 3.2 Location of Ramallah Al Bireh Governorate 29

Figure 3.2 Israeli colonies and Military Zones, the wall in Ramallah Al Bireh Governorate 31

Figure 3.3 ABC Zones in Ramallah Al Bireh Governorate 31

Figure 3.4 Population Pyramid of Ramallah Governorate 32

Figure 3.5 Demographic Chart of Ramallah Governorate 34

Figure 3.6 Ariel photos of Ramallah and Al-Bireh in 1944 and 2000 36

Figure 3.7 The driving urban forces effecting the possibilities and limitation for Ramallah Al Bireh urban center's future expansion 37

Figure 4.1 Simplified flow chart of the two major phases 41

Figure 4.2 Detailed framework of the two phases 42

Figure 4.3 Main urban centers 43

Figure 4.4 The Israeli Colonies and Military Zones 44

Figure 4.5 The wall route within the governorate 45

Figure 4.6 The regional and bypass roads 45

Figure 4.7 10 m contour map and slope 46

Figure 4.8 2 km buffers away as needed areas for expansion 47

Figure 4.9 The Israeli Settlements and the 2 km buffers away as restricted zones 48

Figure 4.10 The separation wall and the confisticated land behind that wall 49

Figure 4.11 The regional and bypass road buffers as a mean of isolation the urban centers 50

Figure 4.12 10 m contour map and slope 51

Figure 4.13 Areas considered unsuitable for development 52

Figure 4.14 Output map before refinement 52

Figure 4.15 Suitable areas (after overlaying) 54

Figure 4.16 The Framework of the Criteria 56
Figure 4.17 Graphical representation of results 59
Figure 4.18 Graphical representation of a set of ranked management 60
Figure 4.20 Graphical representation of a set of ranked all sites based on different perspectives 79
Figure 4.21 Classified sites according to their acceptance 80
Figure 4.22 Accepted site scores based on the overall perspective 82
Figure 4.23 Ranked sites according to average overall perspective 83
Figure 4.24 Location of the best site 84
Figure 5.1 The ranked sites according to management aspects 87
Figure 5.2 Ranked sites according to socio-economic, environmental and infrastructure aspects. 88
Figure 5.3 Ranked sites according to overall perspective 88

List of Tables

Table 4.1 Characteristics of the potential sites 54

Table 4.2 List of the criteria in different levels..... 67

Table 4.3 The values of Criteria 1: Land Classification 68

Table 4.4 The values of Criteria 2: Distance to Settlement 68

Table 4.5 The values of Criteria 3: Distance to the separation wall 69

Table 4.6 The values of Criteria 4: Slope 69

Table 4.7 The values of Criterion 5: Aspect 70

Table 4.8 The values of Criterion 6: land continuity 70

Table 4.9 The values of Criterion 7: Cadastre and land registration 70

Table 4.10 The values of Criterion 8: Available land for building..... 70

Table 4.11 The values of Criterion 9: Agreement to national perspective 71

Table 4.12 The values of Criterion 10: Landownership 71

Table 4.13 The values of Criterion 11: Distance to city center 71

Table 4.14 The values of Criterion 11: Agricultural land..... 72

Table 4.15 The values of Criterion 13: Cultural heritage 72

Table 4.16 The values of Criterion 14: Social acceptance..... 72

Table 4.17 The values of Criterion 15: Average land price..... 72

Table 4.18 The values of Criterion 16: Number of existing residences..... 73

Table 4.19 The values of Criterion 17: Distance to water sources 73

Table 4.20 The values of Criterion 18: Distance to electricity network 73

Table 4.21 The values of Criterion 19: Green areas 73

Table 4.22 The values of Criterion 20: Vulnerability to ground water..... 74

Table 4.23 The quantified value of each site 74

Table 4.24 Ideal and worse value of each site 75

Table 4.25 The actual values of criterion for each site 75

Table 4.26 Weights for first level of criteria..... 76

Table 4.27 Weights for second level criteria 77

Table 4.28 Weights for third level criteria 77
Table 4.29 The scores of the second level criteria according to average perspectives 77
Table 4.30 The scores of the third level criteria according to average perspectives 77
Table 4.31 Summary of the most acceptable sites from different perspectives 81
Table 4.32 Most acceptable sites ranked according to their suitability 81

الإهـــــــــــــداء

إلى من على أكتـــــــافهم تربيت،

وعلى أخـلاقـــــهم كبرت،،

ومن إرادتـــــــهم تعلمت،،،

إلى من لـــولاهمـــــــــــــــا ما كنـــــــت....

أبي وأمي

DEDICATION

To the two people dearest to my heart

My Parents

Your support and encouragement, made it possible.

ACKNOWLEDGMENT

First and foremost I thank God Almighty for giving me the strength and patience to reach this far.

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LIST OF ABBREVIATIONS

ARIJ	Applied Research Institute- Jerusalem
ASL	Above Sea Level
GIS	Geographic Information Systems
HWE	House of Water and Environment
MCA	Multi Criteria Analysis
MOLG	Ministry of Local Governance
MOP	Ministry of Planning
NAD	Negotiation Affairs Department
PCBS	Palestinian Central Bureau of Statistics
PA	Palestinian Authority
TIN	Triangular Irregular Network
WB	West Bank
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFP	United Nations Fund for Population Activities

Chapter One: Introduction

1.1 Introduction

Urban population growth has been accelerating around the world for the past few decades while land is becoming a decreasing resource. Today, statistics show that more than half of the world's 6.6 billion people live in urban areas, crowded into 3 percent of the earth's land area **(**United Nations, 2008**).** The proportion of the world's population living in urban areas, which was less than 5 percent in 1800 increased to 47 percent in 2000 and is expected to reach 65 percent in 2030 (United Nations, 1991and 2007).

The rapid growth of the world's cities along with the associated problems of unemployment, poverty, inadequate health, poor sanitation, urban slums and environmental degradation has created alarming challenges in many developing countries.

While the population of urban areas continues to increase, managing urban growth has increased in importance and has become one of the most important challenges of the 21st century. In an attempt to meet the challenges faced, urban planners around the world are adopting solutions to minimize the impacts of rapid urban growth when they decide whether they want to encourage centralization, decentralization or the building new towns. By researching these experiences, the criteria for planning such places were found to be general standards and these often do not coincide with Palestinian circumstances. However, the Palestinian experience has been reviewed through the West Bank Regional Plan which has been proposed by the Ministry of Planning in 1998. This plan identified four models for development. Also, new plans have been revealed by Palestinian investors to build new cities with private investment. All these plans lack appropriate criteria for the selection of the best location.

In Ramallah-Al Bireh Governorate, like all other governorates, land is considered a very limited resource. In the status quo scenario, the urban expansion of Ramallah-Al Bireh

governorate's urban centers has reached its limits from the all directions (Ramallah Municipality, 2008). On the other hand, the Ramallah governorate unlike other West Bank governorates is still experiencing a population boom accompanied by a significant pressure on services and employment opportunities and the need to provide appropriate accommodation for all people coming in from all over the West Bank governorates, cities, villages and camps. This uncontrolled population growth is confronting urban planners and developers with numerous problems with regard to essential services, as well as heavy pressure on land and other resources, environmental degradation and urban flooding.

There is an urgent need for finding new places in order to ease the pressure on the city center and to create residential areas close to the city center.

In the absence of comprehensive planning and strategic intervention at the regional and local levels, the aim of this research is to locate the most suitable "sustainable" areas for absorbing urban growth in the Ramallah and Al Bireh Governorate

Geographic Information Systems (GIS) and Multi Criteria Analysis (MCA) are the two major tools used in this research. GIS deals mainly with suitability analysis, and MCA is used mainly for analyzing and evaluating the alternatives based on a decision maker's point of view and preference.

This research deals with the hypothesis of "status quo". In other words, the Israeli colonies were considered as another kind of built- up area, the wall was taken into consideration and areas A, B, C, based on the Oslo Accords were considered as facts on the ground. Of course, this approach does not give any justification for these **"on the ground facts".** The research deals with development areas as an urgent need taking into consideration the recent urban boom.

1.2 Main Objective

The main objective of this research is to find areas which are suitable for new urban development in order to alleviate the pressure on the city center as well as to find accommodations for all young people who are looking for better living conditions and a better environment. This approach is based on studying political national planning policy, and the socio- economic and environmental status of each site. The selected sites will be evaluated and ranked using Multi Criteria Analysis.

1.3 Research Significance

This study has gained importance due to two main reasons. Firstly it focuses on the development of a special scientific approach in order to select potential locations for new urban development. This approach is based on the spatial analysis of the geographic data (e.g. physical, socio-economic, using Geographical Information System (GIS). Also, this approach is applicable elsewhere. Secondly, the results of this study will be available to the Palestinian Authority as well as to the Palestinian investors as a guiding tool.

The added value of such a research is to establish a database which includes; digital maps, attribute, geographical and statistical data for the study area. This research will provide decision makers with basic directions, and analytical tools, in the form of a systematic approach when dealing with urban growth management. Moreover, this approach can be offered as educational material for students dealing with urban growth management.

1.4 Methods

In this Research the following methods were adopted:

1. Relevant literature, publications, statistics and studies were reviewed and analyzed. Data were collected from PCBS, UN reports, the Ministry of Local Governance (MLG), the Ministry of Planning (MOP) reports, Applied Research Institute Jerusalem (ARIJ), and other resources as listed in the reference list.
2. Interviews were made with decision makers in related ministries, municipalities, local government councils and professionals in planning and land brokers.
3. Two Questionnaires were prepared: the first questionnaire targeted decision makers; the second was designed to measure the community perception. The results of the questionnaires were obtained using the SPSS computer program.
4. Data collected were classified as quantitative and qualititative, data analysis was carried out by using GIS as a main tool for analysis. The Multi Criteria Analysis method was conducted to evaluate and rank the results.

1.5 Research Contents

This research includes 5 chapters. Chapter One is the introduction. Chapter Two reviews the world experiences in the face of large increases in urbanization and also discusses the Palestinian experience. Chapter Three discusses the general information about the Ramallah-Al-Bireh governorate. In Chapter Four, general criteria were developed for the selection of the appropriate areas within the governorate's boundary by using GIS. In the second part of this chapter, specific criteria were developed to obtain the most ideal site. Multi Criteria Analysis was the major tool in this part of the research. Chapter Five is the conclusion and recommendations chapter.

1.6 Research Limitations

There are specific limitations to the research process with regards to limitations of data collection and data analysis along the two stages of the research. These limitations can be summarized as follows:

- Data was obtained from different resources that were non-harmonized in time and some of the information was not available, and some other was difficult to obtain in time.
- Lack of funding for the research as this type of research needs field visits and contacts with decision-makers, planners, municipalities, and local councils.

- Lack of community awareness of the importance of the research, which thus led to the lack of access to information from the public.

Chapter Two: Literature Review

2.1 Urbanization

Urbanization is one of the apparent global changes which the world is observing. It is a dynamic process, which is highly involved in different aspects with different patterns. Different countries define their urban areas in different ways; that is why the UN defines urban areas according to the national census definition: "It is suggested that for purposes of international comparisons, countries define urban areas as localities with a population of 2000 or more, and rural areas as localities with a population of less than 2000 and sparsely populated areas" (World Urbanization Prospects, 2003).

In many parts of the world the structure of urbanization was established by the pre industrial city, which accompanied industrial and technological development which was then reflected on the urban fabric. For example, by 1800 only three percent of the world's population was located in urban places of 5,000 or more (UN, 2003) while in the year 2008, more than half of the world's people live in urban areas and by 2030 urban inhabitants will make up roughly 60% of the world's population which clearly means that the world on the verge of a shift from predominately rural to mainly urban (World Urbanization Prospects, the 2007 Revision).

2.2 World Urbanization, Trends and Figures

Although the world's population is urbanizing at an increasingly rapid rate, developing and developed countries differ greatly in urban growth rate. Less developed countries have often a greater rate of urban growth, while developed countries are the most urbanized and industrialized areas (UN, 2000, World Urbanization Prospects, 2007). **Figure 2.1**

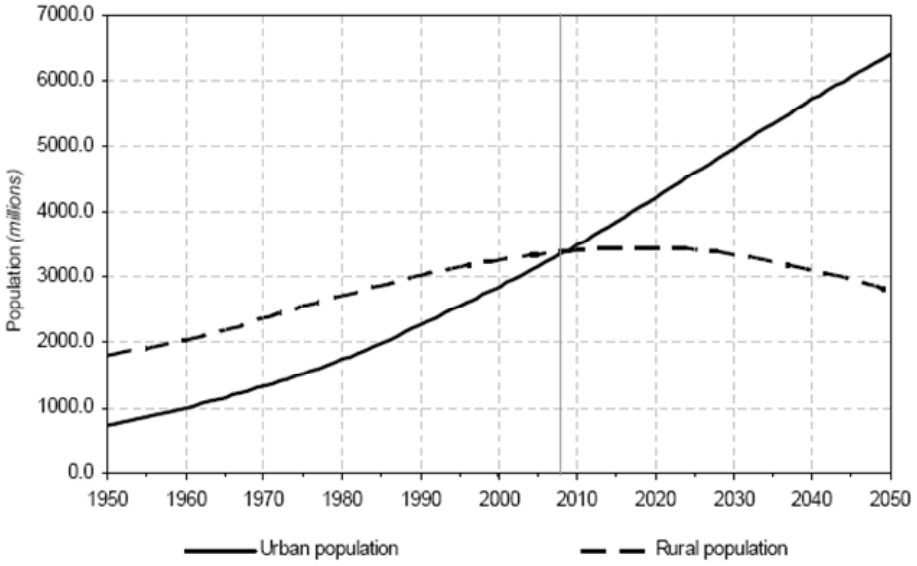

Figure 2.1 Urban and rural populations of the world, 1950-2050 (World Urbanization Prospects, 2007)

In Europe, for example, the urbanization level can be estimated as 40-60% which is resulted from a number of related factors, due to the industrialization which increased the percentage of urban population to the total population, the population growth rate, in addition to progress causing structural changes in the population in metropolitan areas.

On other hand, Latin America has a high rate of population growth which reaches 75%; the main two factors that affect the urbanization in Latin America are the immigration and revolution which led to the centralization of the urban population in the major cities in Latin America.

In contrast, the urbanization in Africa and Asia is considered to be relatively low since a small number of populations live in urban areas. This has characterized both continents as rural since each has no more than 38 and 41 %, respectively of its total population living in urban areas. Moreover, by 2030, 53% of Africa's population and 54% of Asia's population

are expected to be living in urban areas. In Africa, the cause of this growth has been mainly from migration to urban areas, while in Asia population distribution is the most significant characteristic for Asia urbanization where the urban population is concentrated either in the capital of the country, large cities or metropolis (UN, 2000).

In other parts of the world, the North Africa/Middle East region, the population was predominantly rural until the second half of the 20th century during the years following the Second World War, when only 27% of the region (81 million people) lived in urban areas (UNFPA, 1991). The causes of the urbanization in the Middle East the rural-urban migration and the economic growth which occurred a decade later with the oil price boom in 1970's and the immigration of Palestinian refugees (UN, 2000). The pattern of urbanization in the Middle East is clear in the overcrowded conditions within the old cities and a more modern trend of urban sprawl. (UN, 2000 and Pugh, 1995).

2.3 Impacts of Urban Growth

In general, it is clear that the world is becoming more and more urban. The three dominant factors that affect urbanization in whole world can be concluded as rural to urban migration combined with rapid population growth rate and industrialization. These factors led to improvement in communications, changes in construction technology, the telecommunication revolution, public health and safety improvement. In sequence these factors created a great pressure on land resources and cities structures through the increase of the demand and need for the new urban lands. Moreover, infrastructures have been pushed to their limits in order to attend to the needs of their increasing populations.

On the other hand the individual share (land needed per person) has decreased and this led to crowding in the major cities in terms of the number of dwelling units per km^2 as well as creating pressure on the roads, especially in the city center, in addition to the environmental pollution impacts (both air and water), unemployment and other social problems as well as the expansion of urban areas over the agricultural lands, especially in the developing countries where the agricultural lands are a major source of income.

One of the worst problems of urban growth is the growth of slums, where the areas are crowded with substandard and poor living conditions, with a lack of sanitation and primary utilities. Slum conditions make maintenance of law and order difficult. Unemployment and poverty have forced people into anti-social activities.

In general, sprawl is defined as a physical pattern of development due to increasing urban population. But in reality sprawl is characterized by unplanned and uncontrolled patterns of growth, forced by a large number of processes and leading to inadequate resource utilization. Sprawl is defined as the physical pattern of the spreading out of a city and its suburbs over more and more rural land at the periphery of an urban area. This involves the conversion of open space into built-up, developed land over time. (sprawlcity.org)

Suburbs are another physical fact of urban growth beyond the borders of the city (Praeger, 1969). This phenomenon began as a socially exclusive community which allowed people to live in a reasonably pleasant location away from the crowded areas of the city center, and then suburbs generated employment as well as provided housing. However, the suburbs were still dependent on the central cities' services (Grogan and Proscio, 2002). After the Second

World War, the suburbs were serviced with a transportation system, since the residential areas were placed outside the city centers.

2.4 Managing Urban Growth:

The population of urban areas continues to increase from 2.86 billion in 2000 to 4.98 billion by 2030. This dramatic increase creates a high demand on services, increases the pressure on transportation systems and increases the difficulties to serve the people that live away from the main urban centers. Obviously, the required area per person is minimized.

Managing urban growth has increased in importance and has become one of the most important challenges of the 21st century (Cohen, Barney, 2003). In an attempt to meet the challenges faced urban planners around the world adopted solutions to minimize the impacts when they decided whether they want to encourage centralization, decentralization or the building new towns:

2.4.1 The concentration policy:

This development pattern is focused mainly on gathering centers on a minimum area of land with expansion vertically. The ideas is applied by establishing a number of new cities and satellite towns away or close to existing urban areas, or the creation of the suburbs which allowed people to live in a reasonably pleasant location away from the pollution and poverty of the inner-city, but still allowed them to work in the economically booming urban areas in order to distribute some of the services to relieve the pressure on major cities.

(Schaeffer and Sclar, 1975). This policy would require planners to promote development in the center of the cities and inner suburbs through the construction of high rise buildings that could accommodate the forecasted population. Such a policy would be suitable for a city where its land resources are limited.

- The compact city model is one of the concentration policies. It is introduced as an alternative to urban sprawl and focuses on limiting the peripheral expansion of urban areas. The compact city is designed to make more efficient use of existing land resources and infrastructure, as well as reducing private car usage as public transportation becomes more viable in area of higher urban densities.

- The satellite city model is to a small or medium-sized city that is near a large central city. The optimum population of a satellite city is between 25,000 and 250,000 inhabitants. Satellite cities have growth limitations and when a maximum size has been reached, another satellite is started. Satellites are separated from the central city by rural land and each satellite city is surrounded by greenbelts (Golany, 1976).

2.4.1 Decentralization

Decentralization is the second policy which depends mainly on the distribution of urban centers horizontally in order to distribute the social and economic activities in sub-centers which will lead to minimize the population density away from the main urban center. There are many directions of this strategy:

- The broad acre city is a type of decentralized community and is an urban development concept proposed by Frank Lloyd Wright as a solution to urbanization. The concept of this model was to combine social ideas and values with modern concerns about technology, communications, electric power, and developing systems in construction, manufacturing, and transportation. Each family was given one acre (4,000 m^2) of land, and each city was inhabited by 1,400 families (Wright, 1932).

- The galaxy model is one of a decentralization policy. It represents an urban form in which the older center and sub centers of a city are separated into small units, each with a relatively dense central core and linked by a transportation network (Frey, 2005) **Figure 2.2**. The centers of units might be relatively equal in importance. The units provide a large variety of house types from high density, low rise at the cores around traffic nodes and low density family units towards the edge of and in areas between units.

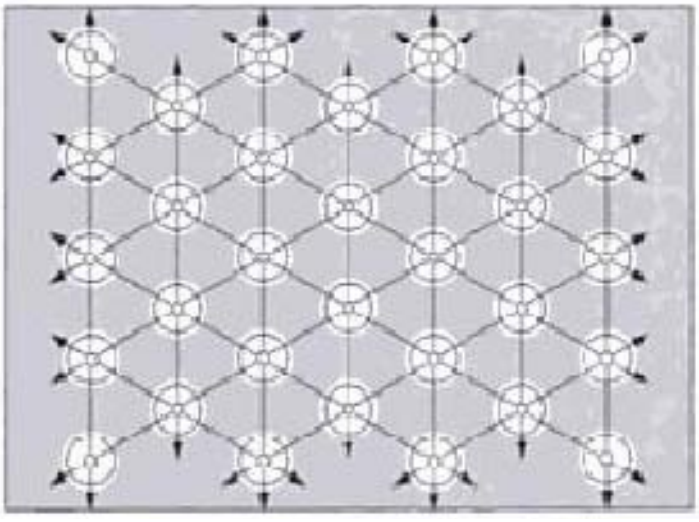

Figure 2.2 Galaxy Model, (Frey, 2005)

2.4.2 New Towns:

On the other hand and in many countries around the world, building new towns has been a policy of managing urban growth in rapidly growing urban areas. The British experience was basically developing garden cities and new towns. However, the idea of developing new towns has also succeeded in other countries such as Germany, France and Egypt (Pakzad, 2007).

The International Experience in New Towns:

The idea of new cities is not new. It has been in existence since the end of the nineteenth century when Ebenzer Howard was the first to propose the creation of Garden City in England. It gained global attention during the 20th century especially in the period after the Second World War, when large numbers of new cities in many countries were created around the world as a means of capturing the surplus from cities within planned developments rather than allowing random and unplanned urban growth. These new towns were starting either from scratch or from an already existing human settlement or even rural community with sufficient urbanizing potential which can provide the most modern facilities, schools, shopping or parking. However, the purpose of building new cities is numerous and varied; including reduction of population density in the main cities, and transferring inhabitants to areas of low density as in the case of Great Britain, and to ease pressure on major cities such as in France and Egypt. In the case of Australia and Brazil, building new capitals of countries was the main reason, and Saudi Arabia is heading to build industrial

cities purposefully to exploit natural resources. In the United States of America, the purpose was to absorb more migrants to settle there.

The sections above explain that every country has its own purpose to build new cities which differs from others, but it is worth mentioning that Britain laid the cornerstone of planning for new towns, so among all other countries, Britain was the pioneer in this development. After that, many other countries adopted Britain's concept and learned this knowledge.

- **The British Experience:**

The idea of the British New Towns movement was originally posed by Ebenezer Howard who proposed the idea of the Garden City in 1898. Howard's Garden City- as described in his book *Garden **Cities** of Tomorrow* is a self sufficient settlement of no more than 32,000 people in 400 ha linked to other Garden Cities of 2000 people in the agricultural belt of just over 2000 ha (Hall, His main concept was to prevent sprawl around London from continuing in order to protect productive agricultural land. His vision showed a central city of 58,000 with six satellite cities around it. Each has its own industry and services, and was reasonably self sufficient in meeting the needs of its population. Belts of agricultural land separate the cities. The total population would include about 25,000 (Thomas, 1985) **Figure 2.3.**

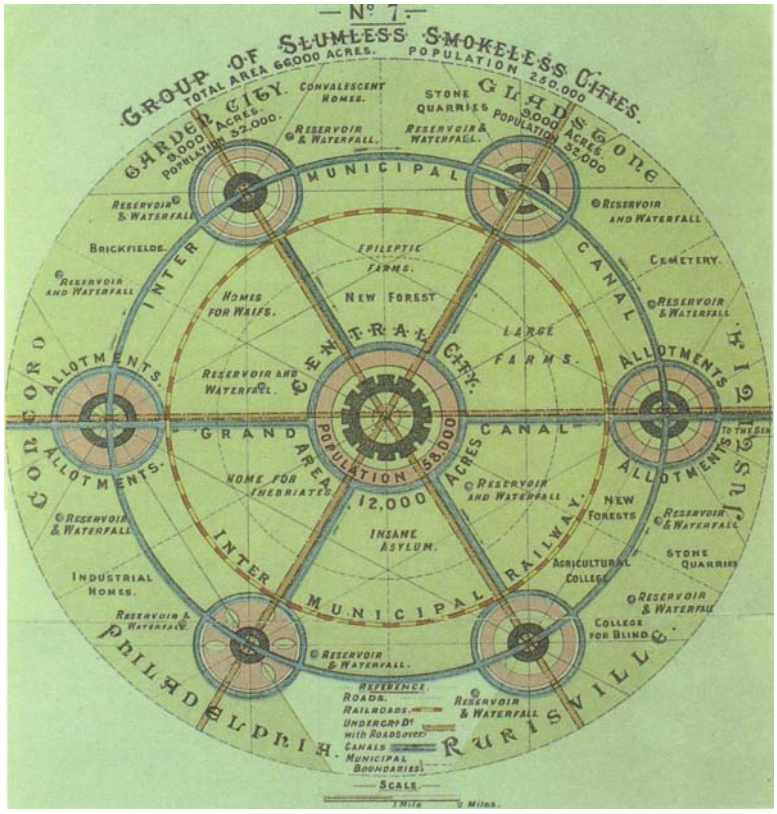

Figure 2.3 The original Garden City Concept by Ebenzer Howard (Thomas, 1985)

After the Second World War, the British government launched the New town programme (New Town Acts 1946) as a national project. This project adopted Howard's concept. The programme has been issued to determine the regulation and the rules of what constituted self-contained and balanced communities and ranges for the ideal size of a New Town (Bennett, 2005).

- **The Egyptian Experience:**

During the last century the population of Egypt has grown about ten fold, whereas the population of Cairo increased more than thirty folds. Egypt's large and rapidly growing population is limited to a narrow strip of arable land along

the Nile River. In 1992, Egypt's total population of 54.7 million had increased since 1980 at an average annual rate of 2.4 percent (Zigmann, 2007).

According to the 1996 census, the growth of Cairo city lowered to 1.6% yearly compared to the 2.6% growth percentage in the 1980's. Moreover, Cairo faced an enormous influx during the past 30 years and grew from 6.7 million inhabitants in 1976 to over 10 million in 2002 (Touman, 2006). Most of Egypt's populations live in urban areas, and 39% have settled in the capital Cairo. The population of the next largest city, Alexandria, numbers only 3 million.

The high population growth rate related to Cairo has been caused by many reasons such as growth of Cairo, the natural increase of population, and the regional- internal migration including movement of inhabitants from the south to the north heading to the delta and the Suez Canal seeking agricultural land and job opportunities (Touman, 2005).

As the population continues to grow and concentrate in one city, Cairo coped with the rapidly growing population by the master plan of Greater Cairo. In 1969, a master plan for Greater Cairo was launched by the president Abd Al-Nasser. The goal of this plan was to disburden the capital by the construction of satellite towns in the desert surrounding Cairo in order to absorb Cairo's growth, and to provide alternative sites for urban development (Stewart, 1996). After Abd Al Nasser died in 1970, his successor Anwar al Sadat (1974) supported for the creation and execution of Nasser's plan and later it turned

into a large scale programme beginning with the construction of the first new town in 1977. A number of new urban forms were supposed to be developed, including satellite towns, new towns, and new settlements (Stewart, 1996).

New urban towns became the effective solution for housing and community service development in Egypt. Three town types were the options for the new towns in Egypt; first, satellite towns which have an access to main cities, second, twin cities which consist of a housing expansion of the existing desert towns, and the third type was a new category of cities known as “new settlements." These are described as self-sufficient communities located next to existing urban centers.

Three satellite towns have been built; they are sited within a distance of 40 km to Cairo. Some of them are industrial towns (City 6th of October), while others are sleeping towns (City 15th of May). Population targets in these cities range from 250,000 to 500,000.

Moreover, four new towns emerged at a greater distance from the capital (90 km). These are supposed to serve as new regional centers and to offer new job opportunities through the selective settling for industry. These are designed to accommodate populations of 500,000 to 1 million each. Two of these towns, 10 Ramadan and Al Badr, are located near the Greater Cairo Region.

The new settlements are sited directly on the edge of the Cairo agglomeration and they are supposed to develop an independent economic base which would reduce the essential of commuting to Cairo.

New towns in Germany:

The creation of new towns in Germany was raised during the transition period from pre industrialization to Industrialization. The percentage of the workers who were employed in manufacturing rose to 30% of the total labor force (Praeger, 1969) and this problem led to the need of finding new centers to accommodate these workers.

2.5 Urban growth in Palestine

The situation in Palestine is different compared to other countries. The total Palestinian territory is divided into the West Bank and the Gaza Strip with total area of 6165 km^2. the West Bank is 5800 km^2 in area, 130 km long and ranges between 40-65 km in width, and Gaza Strip is 365 sq km in area , 45 long and between 5-12 km wide. According to the 2007 Census, 2,350,583 people are living in the West Bank and Gaza, the average population density in Gaza is about 3880 person per km^2 whereas the average population density in the West Bank is 416 per km^2 (PCBS, 2008).

The West Bank is divided into 11 districts: Jenin, Tulkarm and Nablus Districts occupy its north in the middle is Ramallah, Jerusalem and Bethlehem, Hebron is in the south, and the eastern part of the West Bank is Jericho. In Gaza, there are two centers, Gaza City in the north and Khan-Yunis City in the south. By the end of 2007 the Palestinian Central Bureau of Statistics (PCPS)

stated that 2.5 million Palestinians lived in the West Bank (including East Jerusalem).

Urban areas in Palestine are defined by the Palestinian Central Bureau of Statistics (PCBS) as: ”any locality with at least 10,000 inhabitants; all governorate and district centers regardless of size; and localities whose populations vary from 4,000 to 9,999 persons provided they have at least four of the following services: public electricity network, public water network, post office, health centre with a full-time physician and a school offering a general secondary education certificate (PCBS, 1997)

In Palestine the issue differs from other countries since the proportion of Palestinian land that is actually under Palestinian control is even smaller than the origin size of the West Bank (initially in 1993 it was just 3% of the West Bank, then extended to 18% of the original size of the West Bank in the year 2000) (khamaiseh, 2006).

In Palestine, the increase in urban population mainly resulted from three reasons: the high natural growth rate of the urban population, the re-classification of rural localities as they grow and reach a certain number that makes them cities and towns, and the uncontrolled rural-urban migration of residents from the North and South of the West Bank to the main cities, especially Ramallah city. The data available from PCBS stated that the percentage of the urban population in the West Bank and Gaza is 68.7% which is much higher than the international average 50% in 2007, and also higher than the percentage of urban areas compared to other the developing countries which reached to 40.4% for the same year. Comparatively, in the 1997 census, the figures for rural and urban areas were close at 46.6% for urban areas of the total of the West Bank population and 46.9% for rural areas of the total

of the West Bank population. The percentage of refugee camps was 6.5% of the total of the West Bank population (PCPS, 2008).

2.5.1 Planning Experience in Palestine

The Ministry of Planning prepared the first Palestinian regional plan for the West Bank in 1998. The plan proposes four models for development. The plan is supporting the main urban- ridge along the middle series of mountains where six of the eleven governorate administrative centers are located. Moreover, the plan highlights the need for enhancing urban development along the eastern and western edges of the West Bank area (MOP, 1998).

Various options for creating new living spaces for the immigrants/returnees were investigated during the Palestinian-Israeli negotiations; one of these options was to develop new towns. Three selected locations were studied as pilot projects: (two towns in the West Bank and the third in the Gaza Strip). The selection of these three was based mainly on the land use plan proposed in the Regional Plans of 1998 for West Bank and Gaza Governorates, and on the Emergency Natural Resources Protection Plans of 1996 for West Bank and Gaza Governorates. The other option was to use the vacant public and waqf lands in/around existing urban areas (MOP, 1998).

The RAND Corporation proposed a plan which addresses the infrastructure needs which suits a growing Palestinian population. The main concept of this plan is a linear urban network based on a high speed railway linking West Bank cities to each other and the Gaza strip. The arced corridor is about 225 km including a railway, highway, and open water canal and energy network. The plan considers a total population of five million inhabitants including

returnees. The West Bank population is expected to exceed this limit in about 20 years (Suisman et al , 2005).

Nowadays, new plans have been revealed by Palestinian investors to build new cities in order to solve the rapid population growth. Master plans of creating new cities near Ramallah have already been launched; Rawabi, ten kilometers to the north of Ramallah, it is expected to accommodate 25,000 residents with more than 5,000 housing units in addition to town centers with commercial offices, schools, hospitals, hotels and other entertermaint services (Rawabi.ps).

On the long run, many investors are also looking forward for planning new cities near Nablus, Jenin and Hebron.

Despite reviewing the Palestinian experiences in the face of large increases in urbanization, Palestinian urban centers are still facing a sprawl that threatens the balance of its urban growth. In the absence of strong planning intervention at the regional and local level, this research is focusing on finding scientific criteria for selecting new urban areas for absorbing the increasing flux of population in the Ramallah Al Bireh Governorate.

Chapter Three: Study Area

3.1 Historical Background:

Historical Palestine is the land that lies between the Mediterranean Sea and Jordan River with global coordination of (31^0 North, 35^0 East). It has an area of 27,000 Km^2. It was under the Ottoman's empire for four centuries. The urban structure was formed in that time from few major cities such as Safad, Tibeias, Akka, Yaffa, Haifa, Hebron, and Nablus, and villages, towns and agricultural hamlets, and a few bedouins in the south (Coon, 1991).

After the collapse of the Ottoman regime, Palestine became under the British Mandate. In 1917, the Balfour Declaration supported the creation of a Jewish National Home in Palestine, which facilitated the creation of Israel.

In November 1947, the UN General Assembly adapted a plan to divide Palestine. According to that plan, the Jewish population formed only 30% of all the population and they owned only 6% of the land. This plan was rejected and then the Israeli state was declared on 78% of Palestine (ARIJ, 2006).

In 1948 , the Israeli occupation forces declared 78% of historical Palestine as a state of Israel, while the rest 22% (5661 Km^2) in the West Bank became under Jordanian rule while Gaza Strip (365 km^2) became under Egyptian rule. During that period, at least 418 Palestinian villages were demolished and transformed into Jewish cities and villages.

In 1967, a major change occurred when Israel occupied the West Bank including Jerusalem, the Gaza Strip, Golan Heights, and Sinai **Figure 3.1.**

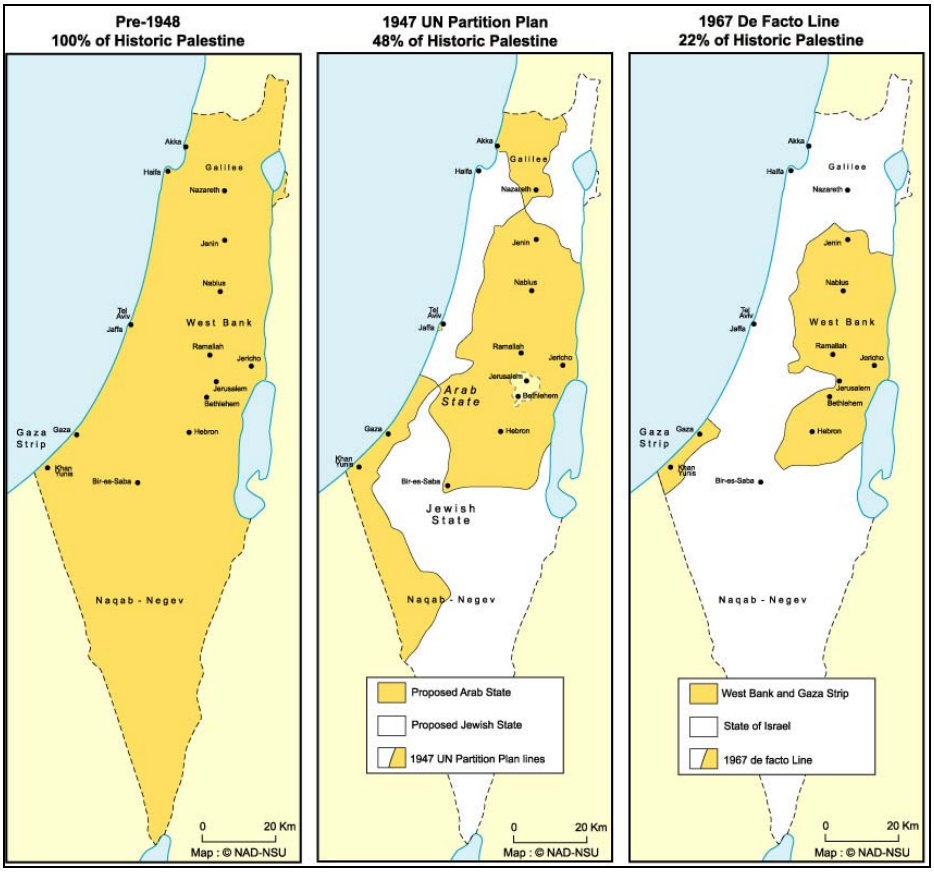

Figure 3.1 Historical Palestine through different political stages (NAD, 2008)

During the Israeli occupation of the West Bank, their forces further launched military attacks against the Palestinian people destroying their lands and resources, and more than 350,000 Palestinian refugees were forced to leave their lands. Many of the Palestinian villages were destroyed (ARIJ, 2006).

Since the year 1967, Israel did not allow development in Palestinian central cities through control of their expansion. They also confisticated Palestinian lands to construct Israeli Colonies. There are more than 250 Israeli colonies and sites built in the West Bank, including Palestinian East Jerusalem. These sites house 450,000 Israelis with approximately 250,000 settlers live in the West Bank (ARIJ, 2006). Israel has also designated a bypass road system throughout the West Bank Governorates which extends in length up to 765 km. These two

Israeli actions have affected Palestinian urban development by first, controlling the land which may be used to develop the Palestinian communities, and secondly to prevent the expansion of the urban areas (ARIJ, 2006).

After the Oslo agreement, the PLO and Israel signed a "Declaration of Principles" in 1993 through which limited Palestinian self-rule was established. Areas of the West Bank were divided into three types, Area A, B, and Area C. Areas A are Palestinian areas with full Palestinian control. This includes the area of the main cities. This represents 3% of the total area of the West Bank. Area B, roughly 24% of the area, is under joint Israeli and Palestinian control. The Israelis are responsible for its security while the Palestinians have the civil authority. Area C is completely under Israeli control and the Israelis consider it as a "state" land (ARIJ, 2006)

During 2000-2006, Israel continued to practice a policy that aimed at confiscating more Palestinian lands. This is clearly observable in the construction of the Israeli Separation and Annexation Wall, which seeks to deny the Palestinian people of a large part of their land and water resources, squeezes their means of livelihood and growth and restricts their movement between isolated cantons; whereas Israel is continuing with its colony expansion policy.

The wall will stretch for 770 km in the West Bank, and around 12% of the total West Bank area will be segregated behind it. The wall will completely isolate 29 Palestinian villages behind the wall and will also affect another 138 Palestinian villages (ARIJ, 2007).

In addition, Israel has created a de facto eastern separation wall without walls but through control of access along the Jordan Valley and the Dead Sea. This zone has a total area of 1555 km^2 representing 29.4% of the West Bank (ARIJ, 2007).

3.2 Ramallah Al Bireh Governorate:

Ramallah Al Bireh Governorate was selected as the Study area. The Governorate is situated in the middle part of the West Bank. It is bordered by the Green Line from the West, Jericho from the east, Salfit Governorate from the north, and Jerusalem Governorate from the south **Figure 3.2.**

The Governorate occupies an area of 830 km^2 which is about 14.5% from the West Bank area. The built up area is about 88 km^2. There are 75 localities in the Ramallah Governorate, 14 of the localities are urban and 56 of them are in rural areas .The Governorate also hosts five refugee camps of Al Am'ari, Qaddoura, Al Jalazon, Deir Ammar and Birzeit. (PCPS, 2008).

Figure 3.2 Location of Ramallah Al Bireh Governorate

The twin cities Ramallah and Al Bireh are considered to be the center of the Governorate. They share the same urban area. The population concentrated in the twin cities is about 62,000 persons. Most services, including health, financial, education, governmental and commercial services are located within these cities. This resulted in a strong attraction for the people from localities in the Governorate and other Governorates to the twin cities (PCBS, 2009).

Ramallah Al Bireh Governorate has always been affected by the many changes that Palestine has gone through politically, socially and culturally. This change in urban area was accompanied with changes in the population during that time which stands as witness to these changes.

The most important changes happened after the 1948 war when Ramallah Al Bireh Governorate became under Jordanian rule, and then many refugees from the Israeli occupied part came to settle in Ramallah City. Again a major change occurred in 1967 when Ramallah and the rest of the West Bank and Gaza Strip were occupied by Israel. The Ramallah Governorate observed another period of emigration even from the cities which where occupied in 1948 (Niruz, 2004).

The wall in Ramallah Governorate extends along 78.971 km, and it will segregate 99.091 km^2 of Palestinian lands. The wall redraws the political boundary of Ramallah. More than 12% of the area was annexed to Israel. (**Figure 3.2**)

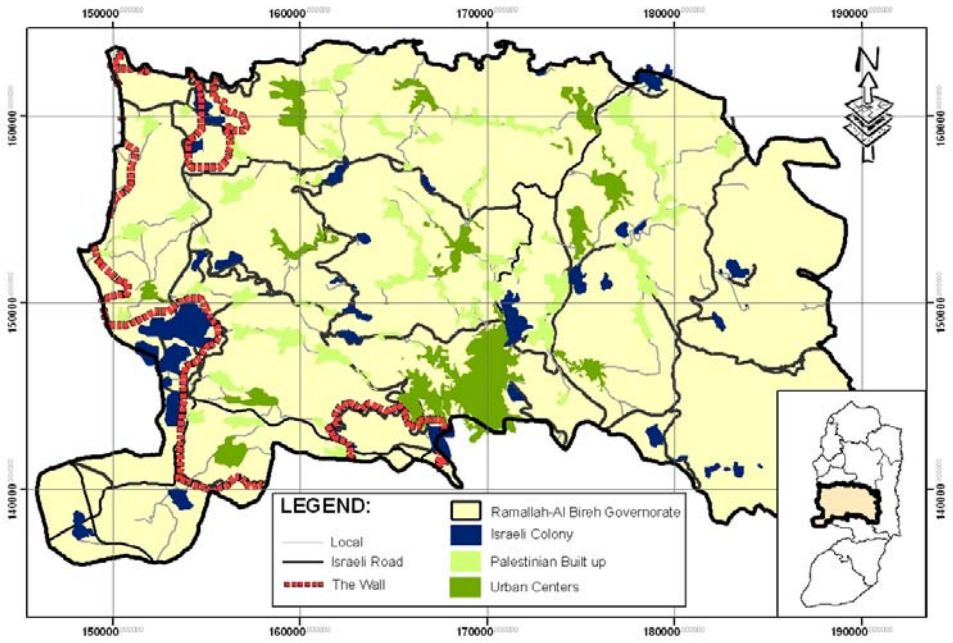

Figure 3.2 The current situation of Ramallah Al Bireh Governorate

According to the Oslo Agreement, Ramallah Governorate became under the Palestinian control, 101.731 km^2 of its land were classified as Area A, and 210.738 km^2 were classified as Area B, while 535.369 km^2 were classified as Area C (ARIJ, 2006).

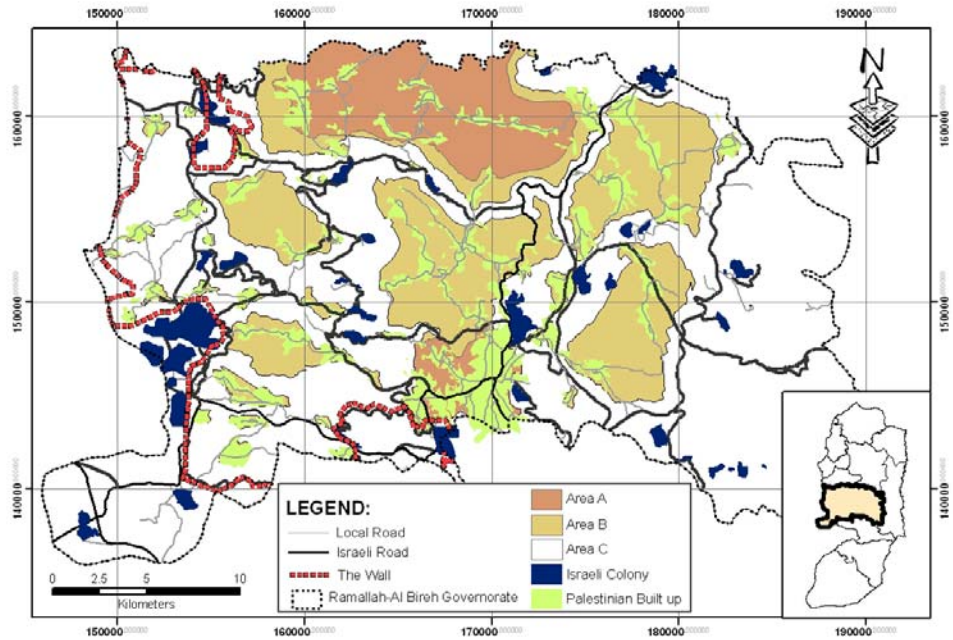

Figure 3.3 ABC Zones in Ramallah Al Bireh Governorate

One more significant change was after arrival of the Palestinian Authority when Ramallah City was chosen to be the administrative center of the government. The city of Ramallah was chosen because of its geographic location and its closeness to Jerusalem. In this period, many of returnees settled in Ramallah and the internal migration started towards Ramallah (MOP, 2007).

3.2.1 Population:

According to PCBS (1997), Ramallah Governorates' population was 205,448 persons while, the 2007 census stated that the Governorate is home to 279,730. 52% of the Governorates' populations are living in urban areas, 42% live in rural areas and 6% living in refugee camps. The population of Ramallah Governorate is around 12% of the total population of the West Bank (PCPS, 2008).

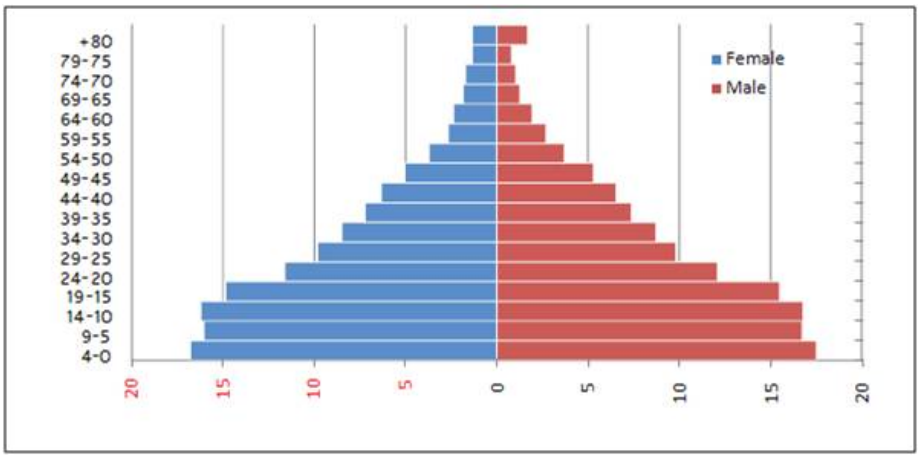

Figure 3.4 Population Pyramid of Ramallah Governorate (Source: PCBS, 2008)

The population pyramid in **Figure 3.4** shows the population distribution by age group in 2007. The graph is large at the base and becomes narrow at the top, which gives a sign of young population. The percentage of children under the age of 15 years makes up 38% of

Ramallah – Al Bireh Governorates' total population, while the youth account for 58.1%, and the older group accounts for just 3.9%.

The annual growth rate in Ramallah- Al Bireh Governorate had an average of 2.9. The growth rate in the Governorate is less than the national growth rate which reached 3.4% (PCPS, 2008). The growth rates are considered high compared with the world growth rate which is 1.2% (PRB 2005, World Population Data Sheet).

The data shows clearly the high percentage of a young population of the Governorate, most likely due to migration of the young generation to Ramallah seeking for jobs provided by the governmental institutions and the private sector which are mostly concentrated in Ramallah and Al Bireh cities.

3.2.2 Population Projection:

According to PCBS, the following demographic equation is used to measure the population growth and to calculate population trends.

$$\text{Population}_T = \text{Pop}_b * (1+\text{growth rate})^n$$

T: target Year

b: Base year

n: number of years

Based on this equation, the projected population for Ramallah- Al Bireh Governorate can be calculated for the target year of 2030 as follows:

$\text{Population}_{2030} = \text{Pop}_{2007} * (1+\text{growth rate})^{23}$

The population data for the end of year 2007 were used as a primary data in the population projections considering the average population growth rate 3%.

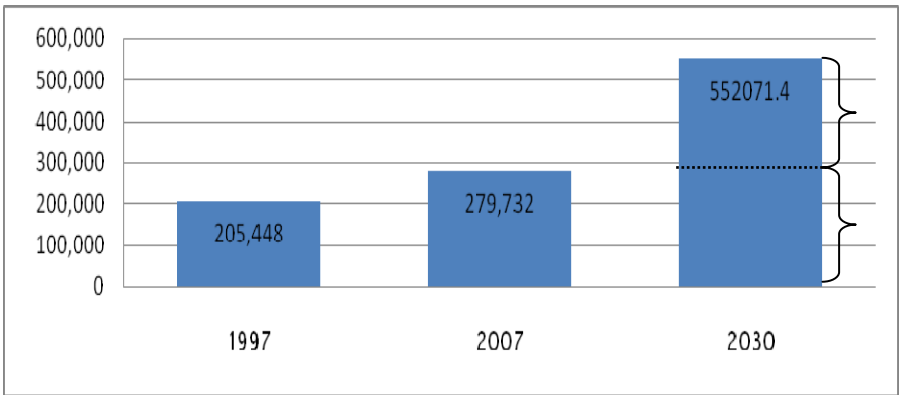

Figure 3.5 Population Trend of Ramallah -Al Bireh Governorate (PCBS, 2008)

According to the projection, by the year 2030 the population of the Governorate expects to increase to 552071.4. Therefore; the percentage of change in the population number from 2007 to 2030 is 97.0%.

The **Figure 3.5** shows Ramallah Governorate's population will double by 2030. This population growth is a result of natural increases and uncontrolled migration.

3.2.3 Population Density

In 2007, the population density of Ramallah Governorate was 327 person/km^2 compared to the population density in 1997 which was 217 person/km^2. (PCBS, 1997 and 2007). The population density is expected to increase due to high population growth and the limited land resources. This is due to the Israeli land confiscation polices (ARIJ, 2007).

Based on the population data (2008), it is expected that the population of Ramallah Governorate will continue to increase significant at an average growth rate of 3.4% per year (PCBS, 2009) taking into account that this Governorate is a magnet for those people coming from other Governorates, cities, villages, either to improve their life style or due to the political situation.

During the past nine years, Ramallah has been transformed still not only as an administrative center but also as an institutional, cultural, and service center of the West Bank. Since that time Ramallah acts as a magnet that has attracted people from all West Bank's cities, towns, villages either to work or to get services.

This internal migration has placed a considerable demand for housing and public services and facilities, in addition to the pressure on roads which are not adequate to absorb this numbers, as well as decreasing touristic attractions which were replaced by commercial centers and residential buildings.

Official statistics from the Municipalities of Ramallah and Al Bireh show a rapid increase in the number of buildings in the past years. The municipality of Ramallah granted 240 licenses for total area of 1247,9432 m^2 in 2007 compared to 149 licenses for total area of 132,422 m^2 in 2004 (Ramallah Municipality, 2009). In the Municipality of Al Bireh the total area of 135,473 m^2 were licensed in 2003 compared to a total area of 254,919 m^2 in 2005 (Al Bireh Municipality, 2009). The high demands on the land also add to increase in land prices.

Continuing construction expansion has caused a significant decrease in green areas. Many buildings are replacing most of those areas to accommodate the hundreds of people who moved and settled in Ramallah Governorate.

3.3 Ramallah Urban Development

The rapid urbanization in Ramallah Al Bireh Governorate includes concentration of the economic establishments in the urban centers. In 2004 in Ramallah AL Bireh cities, there were about 2,659 economic establishments with 10,845

employees (PCPS, 2005). The increase of economic activities in the twin cities has led to sprawl of the building and expanding of the built-up area as part of urbanization.

The built-up area of Ramallah city expanded during the period of 1989-1994 by 16.1%, with the built-up area growth being an average of 397 donums per year. While in the period between 1994- 2000, the built-up area of Ramallah grew by 24.5 percent, and the built-up area growth in average of 585 donums per year, this accelerating urbanization transformed Ramallah from a non-dense city with low-rise buildings not more than four stories, to high-rise buildings reaching about twenty stories (Khamaiseh, 2006). (**Figure 3.6**).

Figure 3.6 Ariel photos of Ramallah and Al-Bireh cities in 1944 and 2000. (Ramallah Municipality)

So, what type of urban expansion can Ramallah and Al Bireh have? The urban expansion of Ramallah and Al Bireh is very limited since Jabal Al Taweel (Psagot colony) is closing any eastern expansion; the Givait Zeev colony is preventing southern expansion, the same with hilly terrain in the West, while Beit Eil colony is closing North east expansion. This leaves Ramallah and Al Bireh with one option for expansion which is the North West as shown in **Figure 3.7** (Ramallah Municipality, 2008). On the other hand, there is a need to accommodate more people in the future!

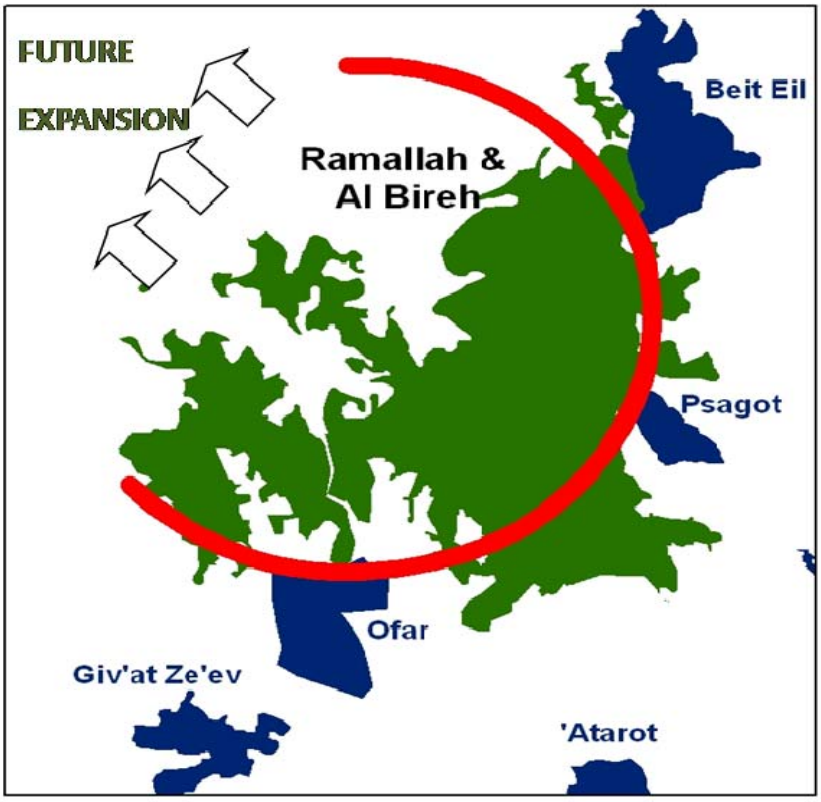

Figure 3.7 The driving urban forces effecting the possibilities and limitation for Ramallah's future expansion

According to Abu Ghoush, A., Abu Sada, J. and Suboh R, 2008, Ramallah city is expected to reach the optimum population after which there will be an attack on the individual share of land (area/person) which is estimated at 280 m^2/person in Ramallah City and a density of 557

person/km^2. This will negatively affect the living standards of the population finally leading to the overcrowding of future population growth. It is important to note that this result is based on the scenario that the population growth only resulted from natural growth and internal migration towards Ramallah City.

These challenges necessitate a comprehensive plan in order to absorb this flux of people in a sustainable way. This type of comprehensive plan can be created by developing certain criteria, which will assess and find new possibilities for future expansion, and a way to manage urban expansion in a sustainable way.

Chapter Four: Data Analysis

4.1 Site Selection Criteria and Methodology

4.1.1 Introduction:

To meet the goal of the research, various data sources were approached. The majority of the needed data were gathered from the Palestinian Bureau of statistics (PCBS), the Ministry of Local Governance (MOLG), Applied Research Institute - Jerusalem (ARIJ), and Ministry of Planning (MOP). These data were last updated in 2007. The rest of the required data was obtained from other relevant literature, publications, and studies and other institutions. Based on different sources, GIS databases were developed for Ramallah Al Bireh Governorate consisting of all demographic information. Various thematic maps were created for the Ramallah Al Bireh governorate by digitizing, georeferencing using GIS software (ARC Map 9.2) using high resolution (Ariel photos) in order to obtain the main spatial features. The features derived from images were road network, built up area, settlement and military zones. A 3D analysis tool was used to get the TIN model from 10 m contour map to generate and obtain slope. The qualitative parts of data were obtained from the interviews which were conducted with the Palestinian planners and decision makers from the MOLG and the MOP.

Choosing appropriate locations is clearly related to specific circumstances. The purpose of the analysis process is to find the potential area for future development. This was achieved through the scenario of status quo in which political constraints play a major role in the study area (i.e. Israeli control of open spaces and other suitable areas for development) see **Figure 4.1**. The analysis depends on the defined constraints to be used as guidelines and direction of the study in achieving the desired result. The GIS functions involved in the process were the overlay function, classification, proximity and measurement. The initial selection stage consisted of two parts. The first part was an excluding process in which each constraint layer such as areas for expansion, road buffers, and areas confisticated by Israelis within the

governorate which were already restricted were not included in the available areas of urban development. In the second part of the initial selection stage, the potential areas that were a result from the first step (the excluding process) were refined based on its shape or size. In next part of this chapter, these potential sites from the initial selection process will be evaluated according to the developed criteria. **Figure 4.1** shows the general framework of the two major phases that the research has gone through, i,e, (1) selection process (2) evaluation process, where GIS and Multi criteria analysis are integrated. GIS allows describing and analyzing different potential sites whereas Multi Criteria Analysis will then be applied to assess these sites. **Figure 4.2** shows how buffer zones are assigned to the input criteria based on adapted guidelines and the resulting areas are refined to produce the final candidate sites in phase one, while in phase two show how the MCA was applied to compare these candidate sites considering a set of parameters in order to find the most suitable site.

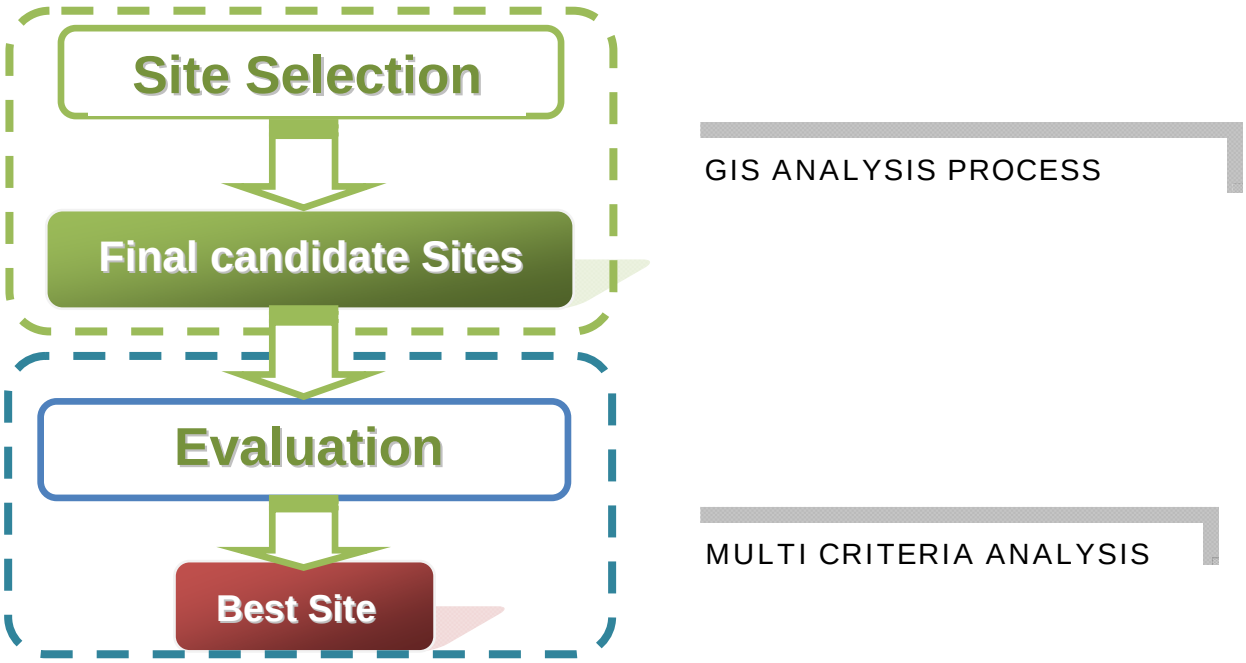

Figure 4.1 Simplified flow chart of the two major phases

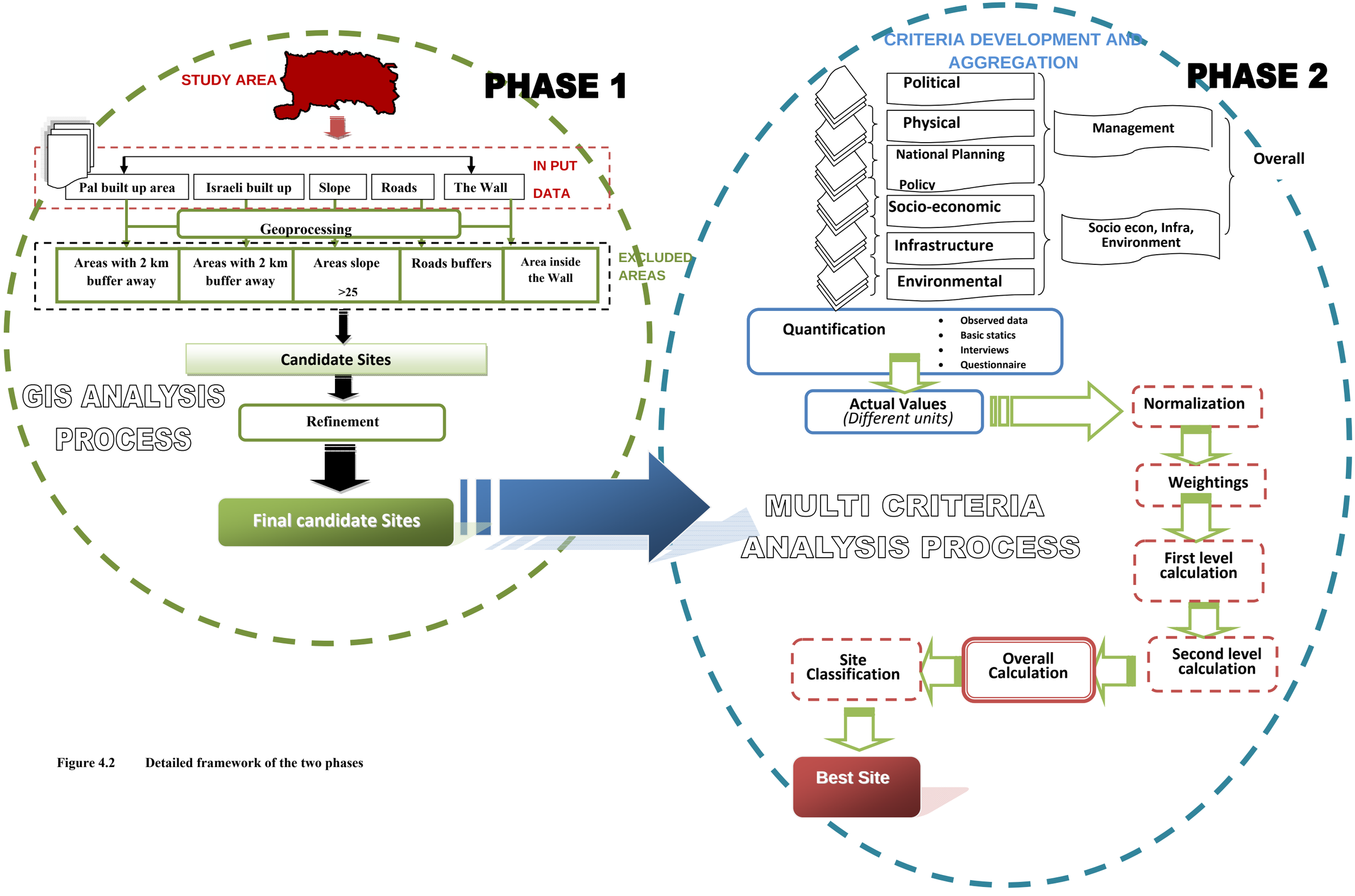

Figure 4.2 **Detailed framework of the two phases**

4.1.2 Site Selection Criteria description

Factors influencing the selection process of the sites were proposed by reviewing relevant studies from the literature review and from a planners' point of view. The considered factors are: main urban centers slope more than 25%, Israeli colonies and military zones, The wall, and road network. Following this procedure, maps were created for each constraining criterion and a final composite map is produced by simple overlaying of the thematic maps.

Constraints are the exclusionary factors in the selection process. In this research, five basic layers (thematic maps) were set as constraint layers where it was not allowed to plan any future development. In order to find the suitable lands for development, areas were excluded from the total in the governorate area. The following are the factors that considered in this assessment:

1) **Main urban center**: In this Research, built up areas play a major role. This research is trying to allocate new development areas near by those already existing areas, taking into consideration the natural growth of these areas in order to avoid overlapping between the proposed sites and the existing ones.

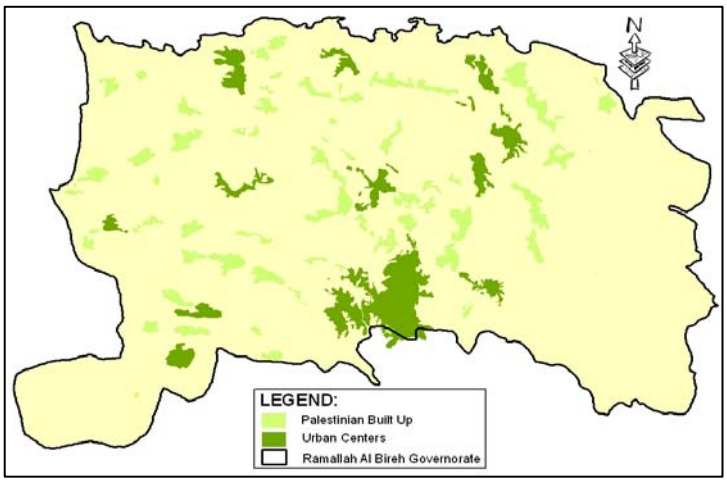

Figure 4.3 Main urban centers

(2) Israeli colonies and military areas:

The research dealt with these areas in the same way it dealt with the Palestinian urban areas; where in the final status condition these areas will be transformed to the Palestinian Authority so no need to propose any overlapping with the proposed developmental sites (the outcome of the research). There are 30 Israeli colonies located in the governorate, taking up about 30 Km^2 of land.

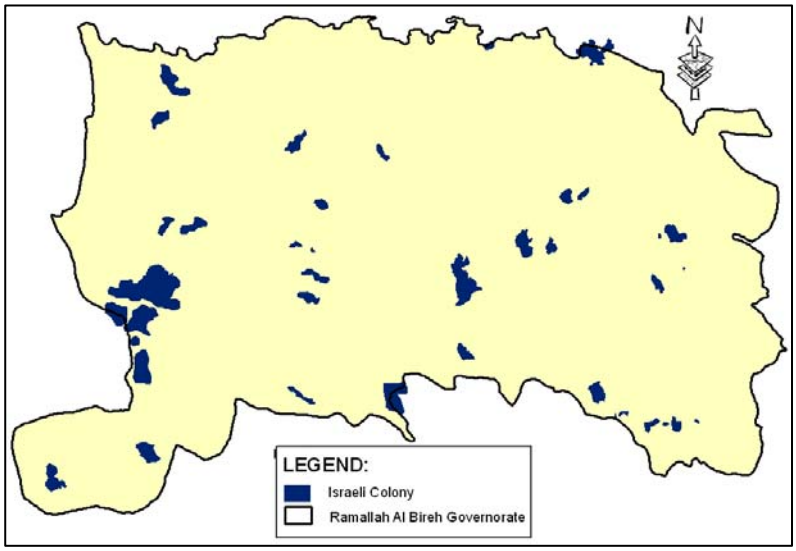

Figure 4.4 The Israeli Colonies and Military areas

(3) The wall:

In Ramallah Al Bireh governorate, the wall extends along the western part of the governorate (As written in the assumptions of the Research, the areas that were annexed by the wall were excluded from the governorate area).

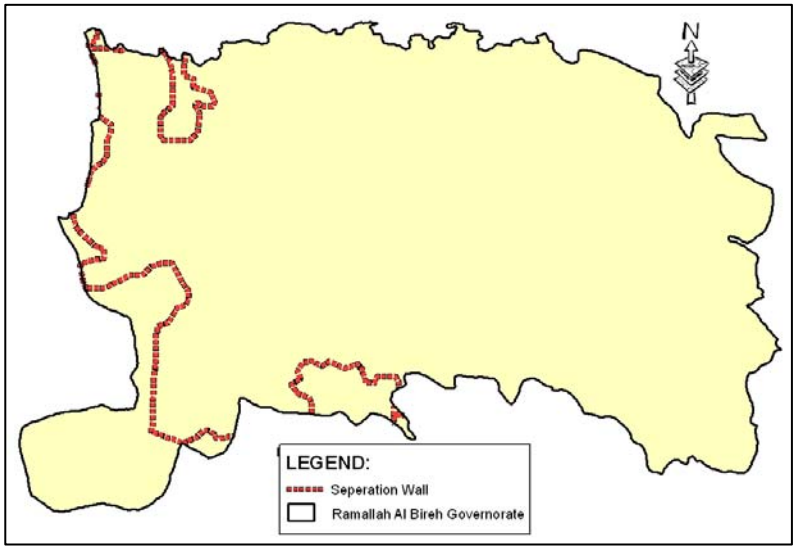

Figure 4.5 The wall route within the governorate

(4) Road network:

The road network in this district occupies a total area of 13.1 $km^2$and is 695.9 km in length. It is classified into three categories: local, regional, and bypass roads. In this research, the total area of the regional (24 m width) and bypass road (70 m width) were excluded from the study area.

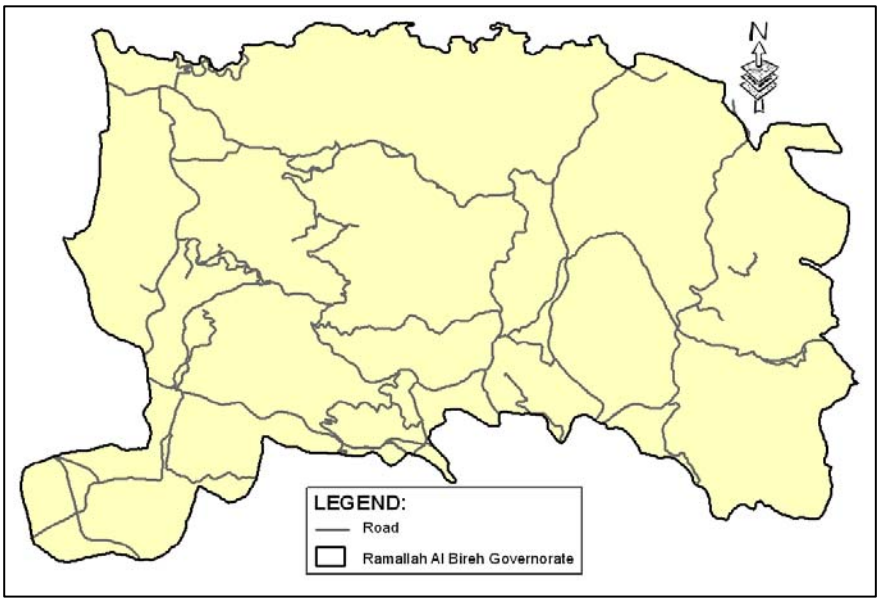

Figure 4.6 The regional and bypass roads

(5) Slope: The slopes help to identify the maximum rate of change in surface value over a specific distance and they are expressed in degrees or percentage (Anavberokhai, 2008). The map represents the slope in the Governorate. The cross section of the governorate shows the undulating topography which stretches from the western slope (350 m ASL) through the mountain ridge 800 m and goes to the Dead Sea (-100 m ASL).

According to the MOLG, the sites on a slope above 25% are not suitable for urban expansion and are considered as restricted areas.

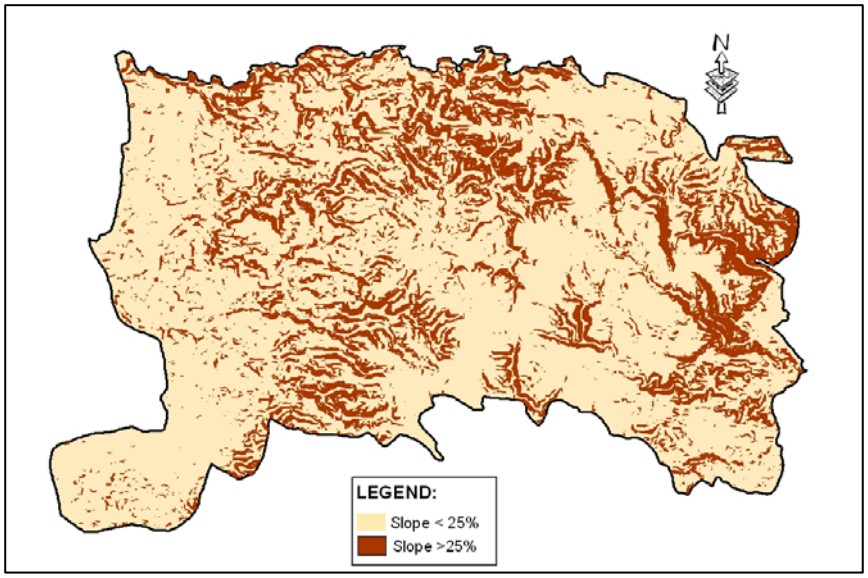

Figure 4.7 Slope map of Ramallah Al Bireh Governorate

4.1.3 Site Selection analysis and preliminary results

In order to produce the initial site selection map, several GIS functions were conducted. The five constraint layers were used to distinguish between lands that are suitable for urban areas and those that are restricted. The map was produced by merging each individual layer with the study area, then erasing the unsuitable land. This procedure produces a constraint map for each layer. The consecutive exclusion process of all unsuitable land produces the final

constraint map which provides a large group of selected sites which comply with all the initial criteria. Over 20 scattered areas were found to be suitable sites based on the initial criteria. These selected sites are then refined by considering the size or the shape of the site.

(1) **Main urban center**: As mentioned previously, a 2 km buffer around the 14 main urban centers was created in order to give room to absorb natural growth in these areas in order to avoid overlapping between the proposed sites and the existing ones.

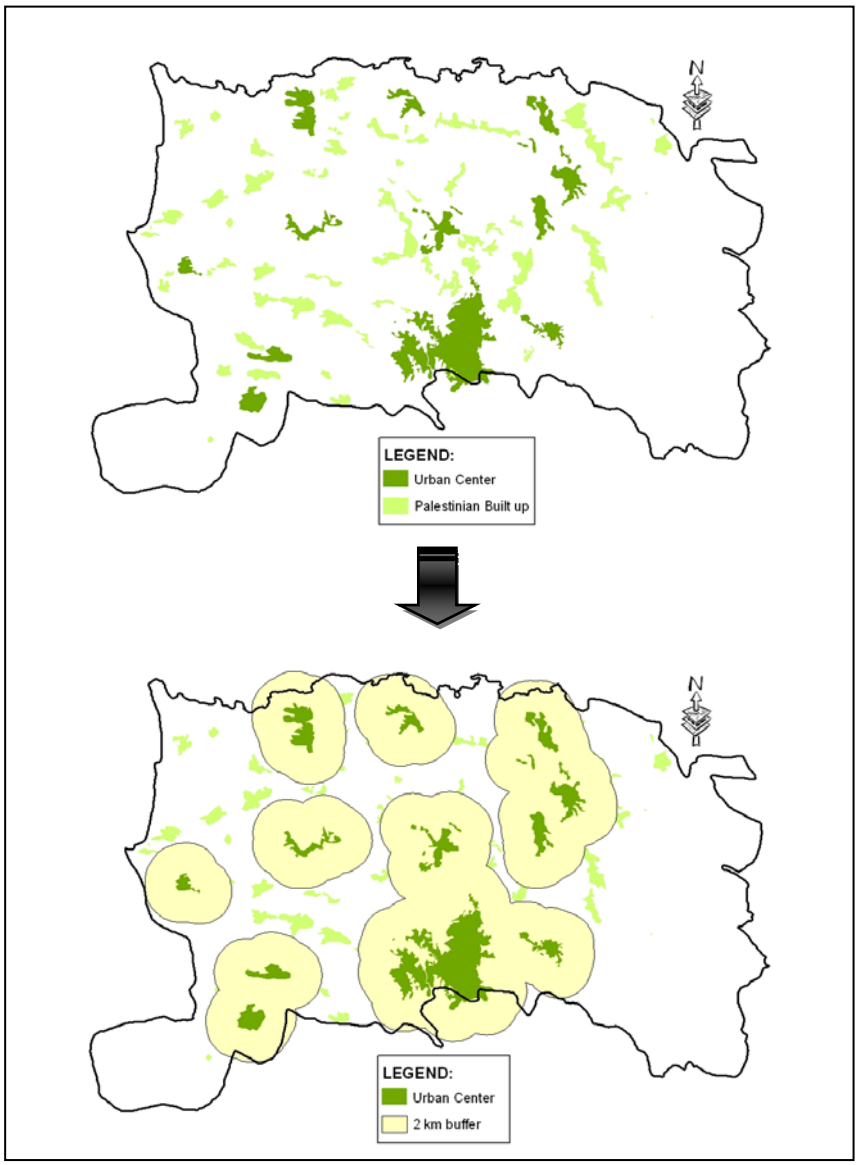

Figure 4.8 2 km buffers away as needed areas for expansion

(2) Israeli settlements and military areas:

Based on the assumption, 2 km buffer zones were created around the colonies and military zones.

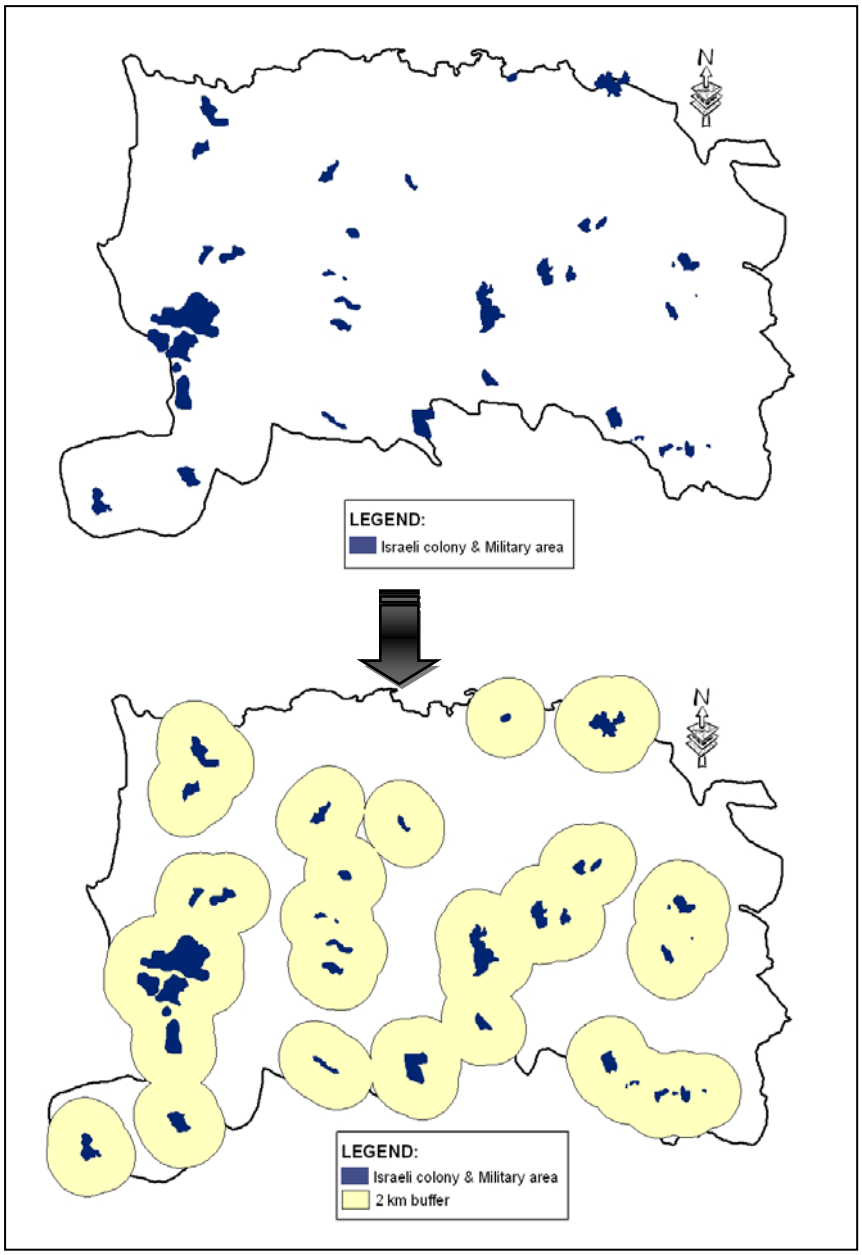

Figure 4.9 The Israeli Settlements and the 2 km buffers away as restricted zones

(3) The wall:

About 95 km^2 were annexed by the wall. These areas were excluded from the Governorate total areas.

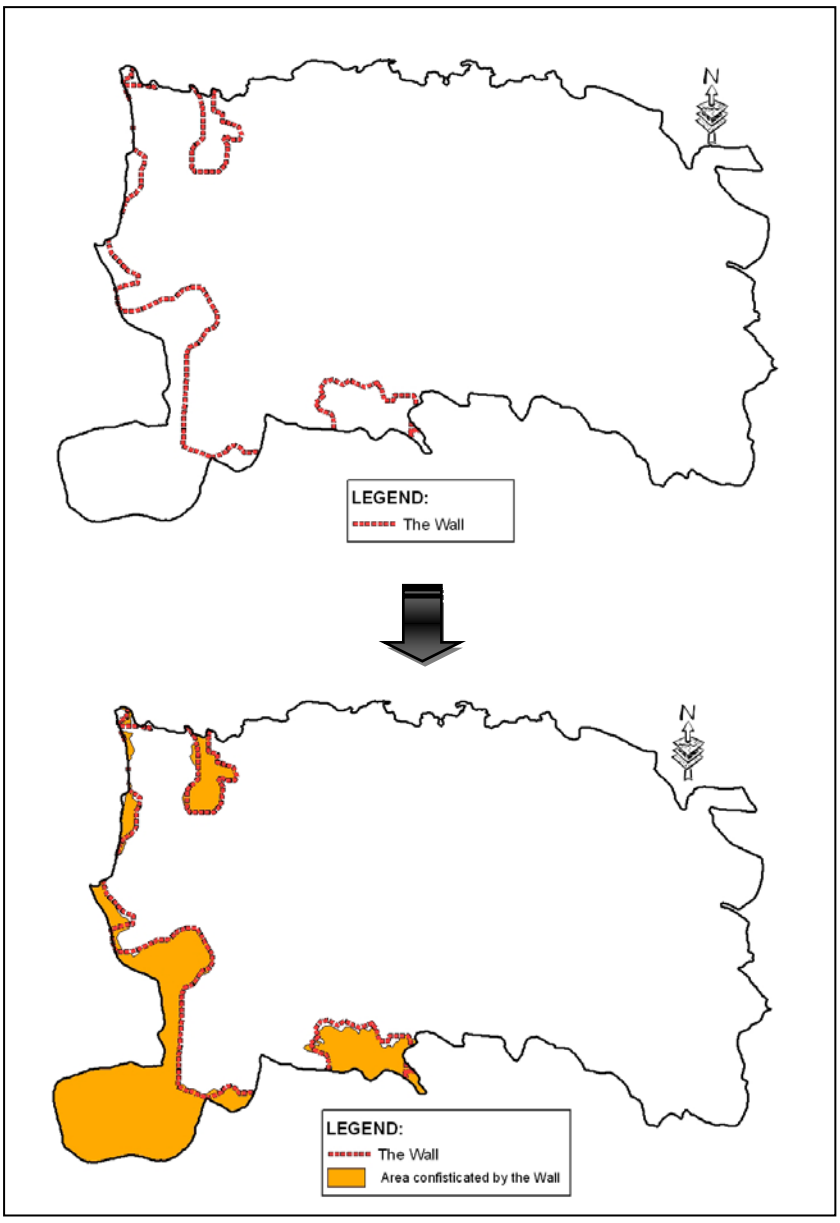

Figure 4.10 The separation wall and the confisticated land behind that wall

(4) Road network: Data available about roads are symbolized as lines, in order to convert these lines to areas; buffer zones were created around each road, 70 m buffer for the regional roads and 24 for the regional road.

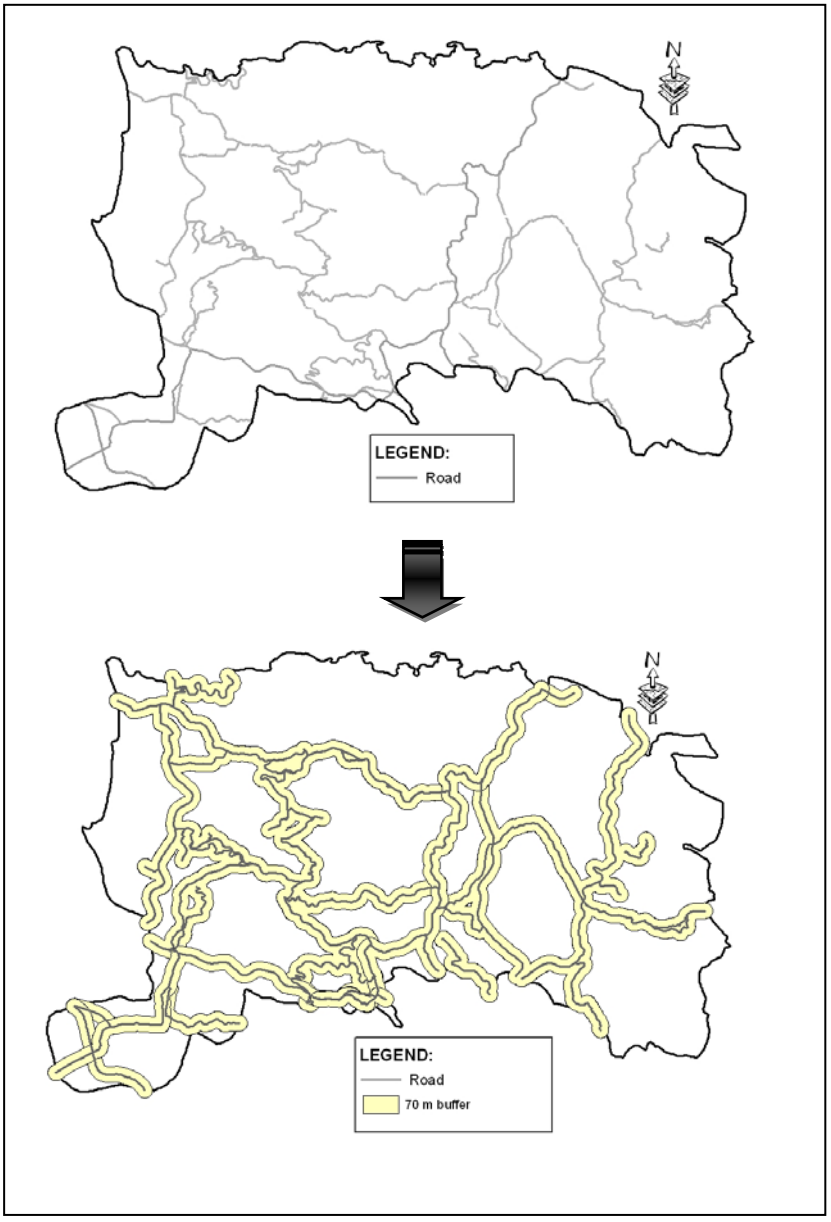

Figure 4.11 The regional and bypass road buffers as a mean of isolation the urban centers

(5) Slope: In this research, areas with steep slopes are not suitable for any urban development. A TIN was generated from 10 m contour lines. Thus according to MOLG a 25% slope is accepted.

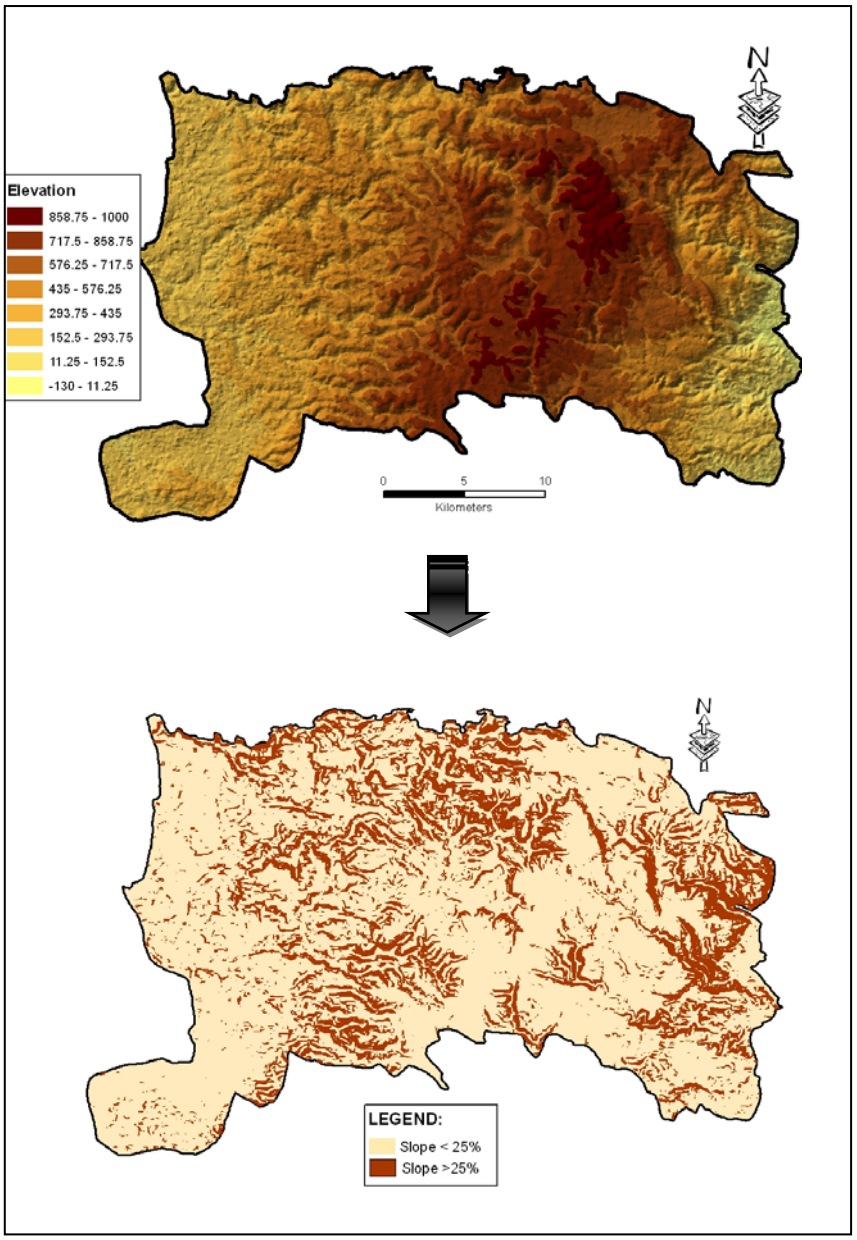

Figure 4.12 Topography and slope maps of Ramallah Al Bireh Governorate

An analysis of suitable site selection was carried out, taking all the previously mentioned factors into account. All buffer zones were combined in order to depict all constraints and then were used to eliminate areas from consideration in the final analysis

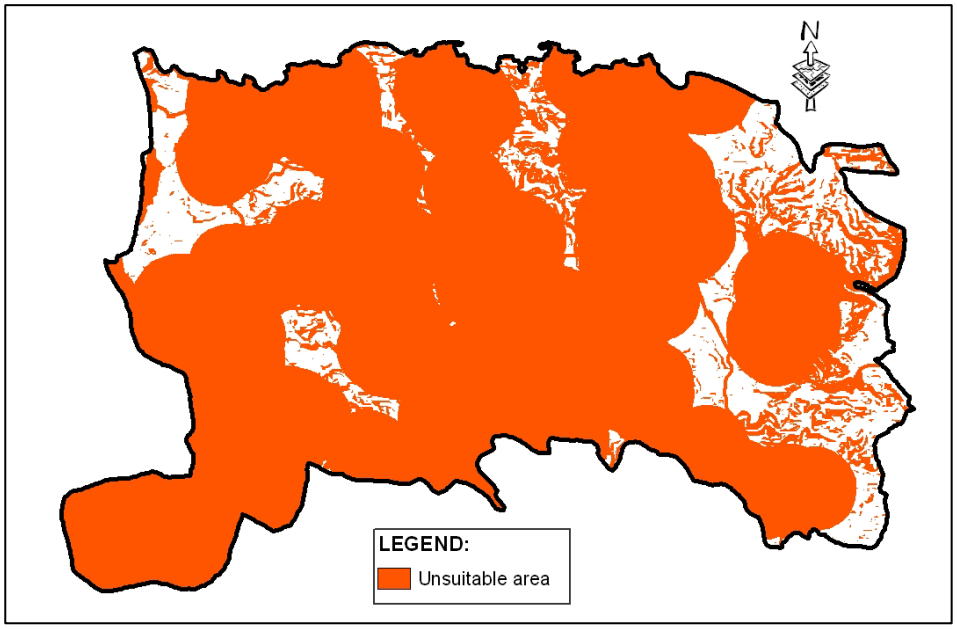

Figure 4.13 Areas considered unsuitable for development

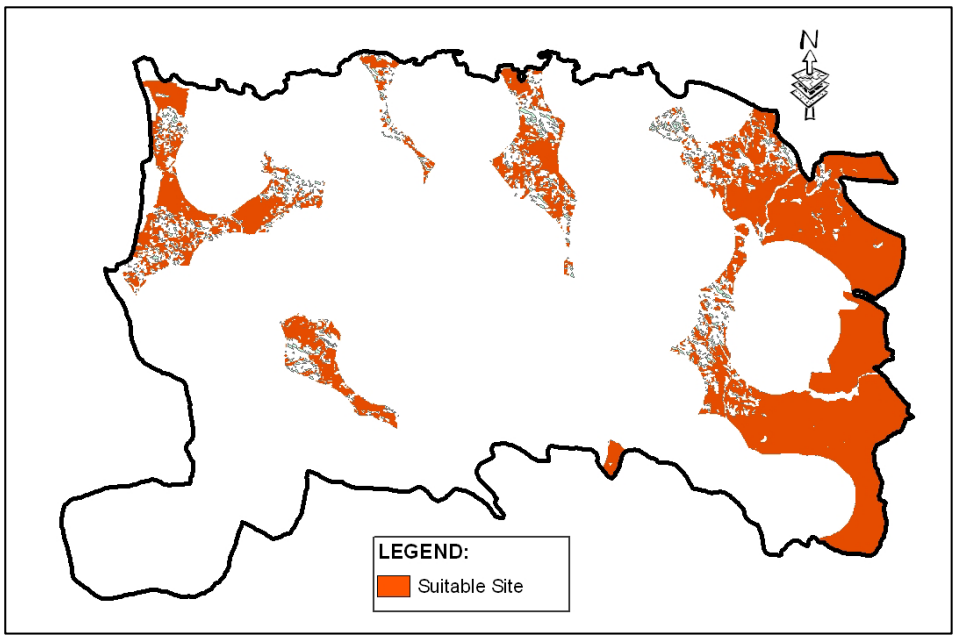

Figure 4.14 Output map before refinement

The resulting selected sites were then refined by considering the area and the shape of the site in order to find the final output.

A suitable site for urban development must have a reasonable size with adequate open space, circulation, and all the needed services. In this research, the site should have available sufficient space to accommodate not less than 10,000 people. In order for the potential site to be considered an urban area, such a population will need a minimum site area of 2.5 squared kilometers when taking into consideration an area of 250 squared meters per person as recommended by the MOLG.

4.1.3 Final Results

The final result obtained in this selection process is a map showing 13 sites which were selected as potential areas for urban development by using GIS operations. **Figure 4.14** shows the suitable sites for urban development and **Table 4.1** provides some characteristics of the final candidate sites. The 13 candidate sites which have been identified will be evaluated. A multi-criteria decision analysis will be employed to signify the highest-ranking site which will be described in the coming chapter.

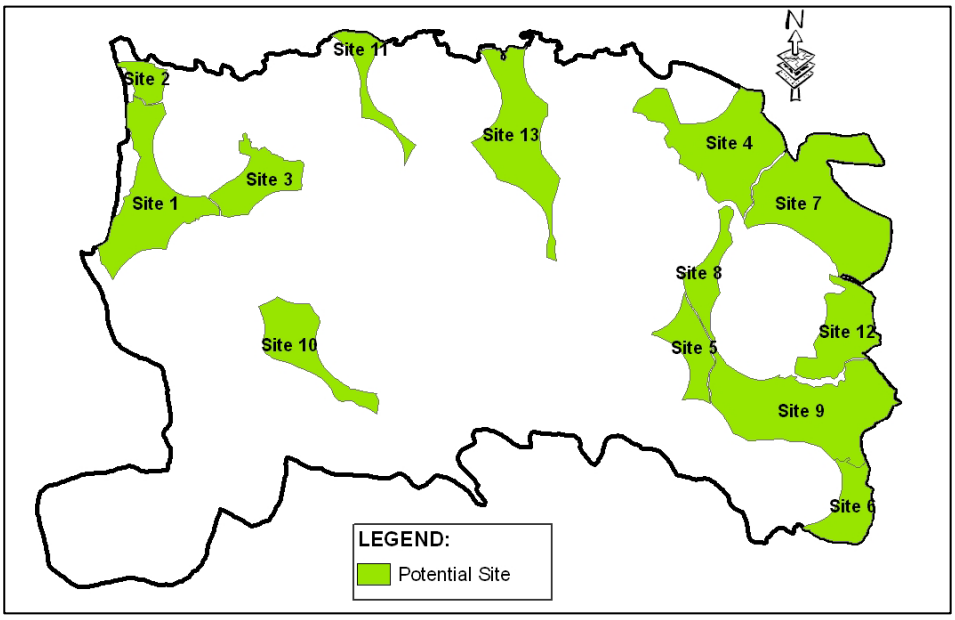

Figure 4.15 Suitable areas (after overlaying)

Table 4.1 Characteristics of the potential sites

NO.	SITES	Area (Km^2)	Nearest Locality	Average Elevation (m)
1	Zone 1	18.74	Shuqqba, Qibya	500
2	Site 2	3.32	Rantis	150
3	Site 3	9.07	Aboud	400
4	Site 4	22.59	Turmus'ayya	200
5	Site 5	7.27	Rammun	700
6	Site 6	7.58	Badiw Al mua'rrajat	200
7	Site 7	29.23	Ein Samia	600
8	Site 8	5.99	Al Taybeh, Kufr Malik	350
9	Site 9	29.92	Badiw Al mua'rrajat	400
10	Site 10	10.94	Deir Ibzie'	400
11	Site 11	4.89	Qarawet Bani Zeit	700
12	Site 12	11.60	Ein Samia	100
13	Site 13	18.88	Attara	100

4.2 Sites Evaluation and Analysis

4.2.1 Introduction

Urban development of any new urban area is influenced by several factors such as physical, socio economic and environmental issues and amenities (Alsalabi, 2005). The 13 selected sites were analyzed and evaluated in order to rank them and to determine the most ideal site. The Multi criteria Analysis (MCA) was followed and adopted as a decision-making tool, it was used to make a comparative assessment of alternative sites taking into account several points of view. Each step in the MCA process is described in details.

4.2 .2 Multi Criteria Analysis Methodology

Multi Criteria Analysis (MCA) is a methodology consisting of techniques for evaluating options on individual, often conflicting criteria, and combining the separate evaluations into one overall evaluation (Malczewki, 1999). The overall evaluation is achieved by establishing preferences between options with reference to a set of defined objectives or criteria. The extent of achievement of these objectives is then assessed by the established criteria but no one option will obviously be best in achieving all objectives.

In this research, the evaluation method followed is based on the method which was developed by UNESCO (1987, 1988).

(a) Criteria development and Aggregation

The first step of MCA is to develop a set of basic criteria covering social, economical, environmental, political, national policy, natural recourses, infrastructure and other related aspects, **Table 4.2**. These criteria were used to measure the impacts of developing urban areas on all aspects.

As a second step of developing criteria, the basic level of criteria were grouped into second-level and third level criteria as shown in **Figure 4.16**

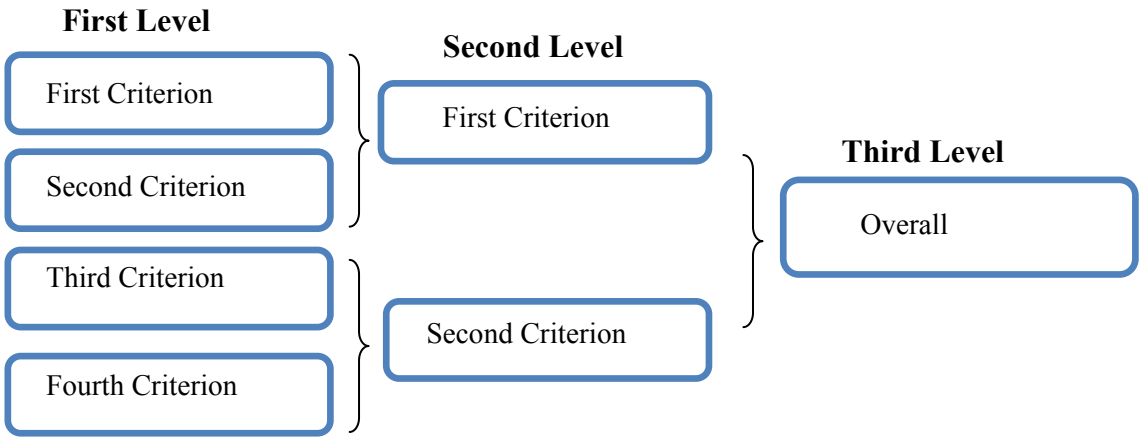

Figure 4.16 The Framework of the Criteria

(b) Evaluation Criteria

This step is the most critical and time consuming one. Since the first level of criteria should be calculated for the 13 selected sites, then the calculation method for each criterion should be defined as shown in the coming section. This may involve the study of available information such as observed data or basic statistics. In some cases, additional measurement data could be required. In addition to criteria quantification, the ideal and the worst values of each criterion should be also defined. The ideal values may correspond to either the lowest value (i.e. distance to the center) or the highest value (i.e. distance to the pollution source) of criteria.

(c) Normalization of basic criteria

Since units of basic criteria are different, such as percentages (%), prices (dollar/donum), areas (km^2) distance (km), the future trade-off analysis requires that the actual values should

be normalized, that is, transformed into the interval 0 – 1. The normalized value of criteria (i) can be calculated as the following formula:

$$S_i = \frac{Z_{i+} - Z_i}{Z_{i+} - Z_{i-}} \qquad (1)$$

Where: Z_i^+ is the best value and Z_i^- is the worst value in which $S_i = 0$ corresponds to the best value, and $S_i = 1$ corresponds to the worst value

(d) Calculating the second level of criteria

The first level criteria **Table 4.2** were grouped into second level criteria which include political, physical, national policy, socio economic, environmental and infrastructure criteria; the value of each group is calculated based on the values of normalized basic criterion with the weight applied by the decision makers to each indicated group as follows:

$$L_j = \left[\sum_{i=1}^{n_j} \alpha_{ij} \, S_{ij}^2 \right]^{1/2} \qquad (2)$$

Where

$S_{i,j}$: Criteria *i* in group *j*.

$\alpha_{i,j}$: Weight applied to the *i*th indicated grouping;

n_j : Criteria *i* in group *j*.

L_j : Represents the value of criteria

(e) Calculating the third level of criteria

This step is conducted by grouping the second level criteria into a third level of criteria (two criteria: socio-economic environmental and infrastructure criteria), the value of each third group criteria is calculated as follows:

$$L_k = \left[\sum_{j=1}^{m_k} \alpha_{jk} \; L_{jk}^2 \right]^{1/2} \qquad (3)$$

Where:

k=1 , for management criteria

k=2 , for socio-economic and infrastructure and environmental criteria

m_k: number of elements in each third level group

(f) Calculating the Overall Score

The result of the third-level formulation is two composite distances. The next step is done with the following expression:

$$L = \left[\alpha_1 \; L_1^2 + \alpha_2 \; L_2^2 \right]^{1/2} \qquad (4)$$

(g) Results Presentation

The overall score of each site will be presented graphically in 2D plane as shown in **Figure 4.17.** The location of each site in the plane represents the degree of achieving the ideal location for developing a new urban area that satisfies all mentioned aspects. The X- axis signifies the composite value of socio economic, environmental, and infrastructure which is ranged from 0-1 and the Y- axis represents the composite value of management which also ranges from 0-1.

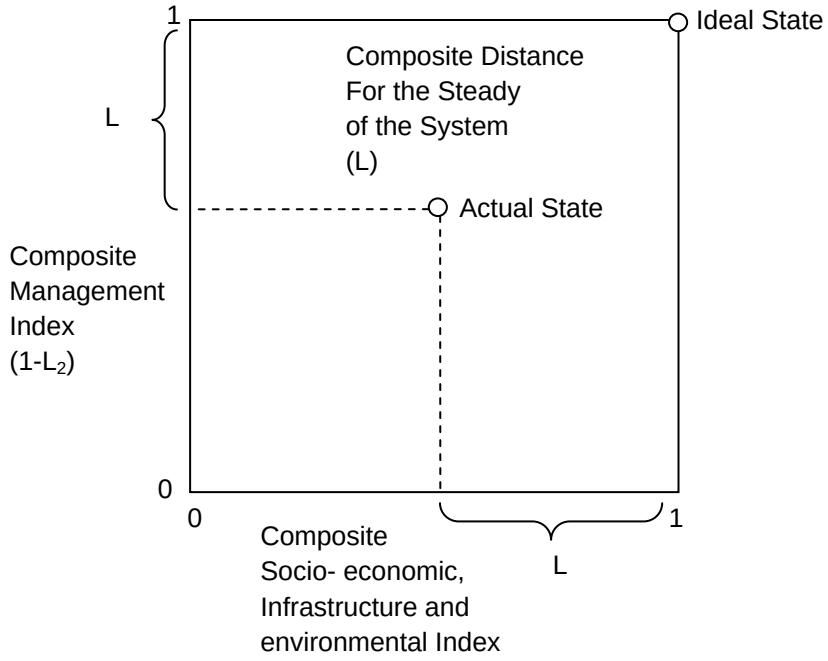

Figure 4.17 Graphical representations of results

(h) Sites Classification using the 2D plane

The plane shown in **Figure 4.18** is divided into three zones: sound, acceptable and poor zones. The boundary of these zones is calculated based on Formula (5). This classification is used to help the decision maker to filter the evaluated sites, i.e. all sites located in the poor zone could be ignored.

$$\beta = \left[\alpha_1 (1-x)^2 + \alpha_2 (1-y)^2\right]^{1/2} \qquad (5)$$

Where (x,y) = location of the sites on the plane

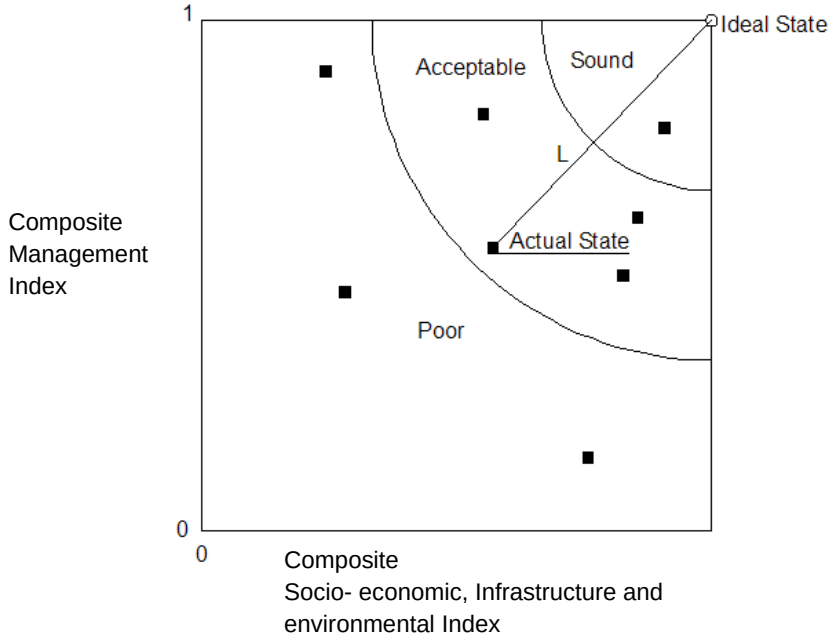

Figure 4.18 Graphical representation of a set of ranked management

4.3 Development of Criteria for Site Evaluation

The first and the most sensitive stage of MCA is to develop the criteria which will be used to quantify the impact of developing new urban areas on all aspects and then used for the overall evaluation. The criteria were built on literature review and planning guidelines in the context of the West Bank and also benefited from the last experiences in Europe and the Arab World and from discussions with Palestinian planners and decision makers. The criteria were selected based on six themes; political, physical, socio-economic, policy, environmental and natural resources. Each of the themes was used to evaluate the suitability described below.

4.3.1 Criteria Description

1. **Political Criteria:**

In Palestine, political issues play a major role in urban planning issues. The current political condition imposed on Palestinians has its impact on urban development. It is important to take into consideration all the currently imposed political conditions in this assessment, bearing in mind that this in no way legitimizes the existence of any Israeli settlement, which are illegal under International law and will be dismantled in the final status agreements. The political criterion includes:

(1) **Land Classification (Areas, A, B, C**) which reflects the level of control and administrative condition. The percentage of areas Type A, B, and C in each zone was calculated by GIS, the ideal situation was assigned as that in which Palestinians have full authority over their land and the worst condition is that in which Israelis have full control over the Palestinian land.

(2) **Distance from Israeli colony** reflects the political sensitivity of any area to be allowed or not allowed to establish any new development. The average aerial distance from each site to the closest settlement in km is measured by using the GIS distance tool. In this analysis, the farthest distance from the site to the settlement is considered as the ideal condition, while the closest distance is the worst.

(3) **Distance from the separation wall** reflects the sensitivity of any site. The average aerial distance from each site to the wall route in km is measured by using the GIS distance tool. The farthest distance from each site to the wall is ideal situation; while any site that is bordered by the wall is the worst.

2. Physical Criteria:

Physical characteristics affect the planning of urban development. Among the physical factors that are commonly studied in residential site selection is slope and aspect which are described as follows:

(1) Slope: According to Salabi (2005) the acceptable slope for residential development is 10%. According to Ministry of Local Governance, any area with slopes exceeding 25% is not suitable for urban development. The GIS Spatial analyst tool was used to calculate the percentage of the slope. Areas with slope < 25% were determined as the ideal condition, whereas the areas with slope > 25% were avoided because high costs are involved in the planning in these areas.

(2) The aspect is the direction the slope faces. By using the spatial analyst, aspect was derived for the study area. In Palestine the west and southwest exposures were identified to be the suitable sites, the south is moderate suitable, and north took the worst value.

(3) Land Continuity reflects the fragmentation and complexity of each potential zone for urban development. According to the West Bank topography, it is difficult to find one piece of land with a slope less than 25%, therefore, this criterion is considered to measure the level of fragmentation of the suggested areas. In the analysis, the steep slope areas are erased from the evaluated zone. It is measured by counting the number of significant sub-zones within each zone. The most ideal values are those which contain the minimum number of sub-areas, whereas the most fragmented zone is the worst.

(4) **Cadastre and land registration** measures the general aspects of land delimitation and documentation. It is designed to ensure property rights of individuals or the government. The data was obtained from the Land Authority. The most ideal situation is land which is totally cadastre, while the site that is totally not registered is the worst.

(5) **Site Size:** is an important factor to be considered. This criterion measures the availability of land to accommodate a designated number of people in each site. The land area was calculated by using GIS. The result is the vacant land with a suitable slope. Thus the maximum area is the ideal area while, the smallest site total area is the worst.

3. National planning policy and guidelines criteria:

A national policy for urban growth provides important factors to solve the main problem of the central city. A national policy for urban growth should show a clear strategy for directing growth and development.

(1) **Agreement to national perspectives** reflects the level of preference of the site based on the perspective of national plans and governmental vision. This criterion was examined by interviewing planners from the Ministry of Local Governance and the Ministry of Planning.

(2) **Land Ownership** shows the ownership properties of each zone. This information was investigated from the Land Authority and from the local councils and municipalities, the preference was for a site of public ownership as it minimizes the need for negotiation and acquisition. According to the MOLG, the most ideal situation is when

100% of the zone is private owned while the worst is when the 100% is publicly owned.

4. Socio- economic criteria:

The socio- economic aspects are the most important aspects according to the people because they affect their daily lives such as the accessibility to reach their work, and other daily activities. These aspects aim to make people lives easier as well as create a better quality of life for the inhabitants, these aspects are:

(1) **Accessibility** is one of the important issues for new urban development as it provides the link between the communities. (Al Salabi, 2005). Thus, the distance between each zone and Ramallah center is important because it significantly impacts moving costs. By using GIS tools, the travel distance between each zone and the center of Ramallah was measured. Nearby sites are considered the ideal sites, and sites which are too far away were considered the worst.

(2) **Social Acceptance** reflects the expected general public acceptance to live in the site. This is measured by a questionnaire filled by a selected group (a selected group of 100 young people above the age of 18, currently living in Ramallah and searching for a place to live). The ideal site is the site which gets the highest acceptance by the public. The site with lowest acceptance is considered the worst.

(3) **Land Prices** reflect the value of the land. Land prices in an area are usually studied to predict future trends. Here the prices vary from one place to another within the governorate boundary. The average land price in each zone is investigated by asking

a number of land brokers in Ramallah-Al Bireh governorate. The lowest price is the ideal price while the highest is the worst.

(4) **Number of existing residences.** The number of people living in/or surrounding area of each zone reflects density of the site. The data was obtained from the PCBS census year data. The site with the minimum number of people is the most ideal. The worst site is the site with the highest number of people.

(5) **Agricultural sites** reflect the percentage of agricultural land in each site. The data was obtained from calculating the area of the fertile lands (the field crops and olive trees). It is a preference to consider the site with minimum agricultural land area as an ideal site in order to prevent fertile land from being exposed to urban development. The destruction of agricultural land will have many negative implications on those relying on them for economic benefits; hence, the site with the largest agricultural area is the worst.

(6) **Cultural Heritage** is an important measure. (i.e. the existence of significant archeological or architectural monuments in the site). The site which has any monuments or cultural site is considered to be an important resource and is in need for protection. It also reflects the significance of the site. The locations of cultural heritage areas and sites were obtained from MOP. Any zone that has a heritage site or area took an advantage and is considered to be a most ideal site, while the site with no archeological site is the worst

5. **Infrastructure Criteria:**

(1) **Distance to water sources** reflects the accessibility to a water supply. It is measured by the distance of the proposed site from nearest reservoir. The closest distance is most ideal. While the furthest distance is the worst, since it may involve high costs.

(2) **Distance to electricity network** reflects the accessibility to an electrical source. It is the distance of the proposed site from an electrical source (high voltage transmission line) which is the distance to the nearest built up area. The closest distance is most ideal, while the furthest distance is the worst and may involve high costs.

6. **Environmental Criteria:**

The quality of environment in Palestine is rapidly deteriorating, mainly a consequence of air pollution, groundwater pollution. Thus environmental issues have become a major concern for planners.

(1) Green areas: the green area and the landscape areas percentage in each site increase the aesthetic qualities of the site.

(2) **Vulnerability to ground water** reflects the sensitivity of each potential site to groundwater pollution. The data that was obtained from HWE database, shows that Ramallah-Al Bireh governorate was classified into 3 categories, from high vulnerable to very low vulnerable The most ideal is when the potential site is located over a very low sensitive area, and the worst, when the site is located over the high sensitive areas.

In summary, all these basic criteria were listed and aggregated to second and third level of criteria as shown in **Table 4.2**.

Table 4.2 List of the criteria in different levels

First Level Criteria	Second Level Criteria	Third Level Criteria
Land Classification	Political	Management
Distance from settlement (Km)		
Distance from the wall		
Slope (percentage of slope<25)	Physical	
Aspect		
Land coninuinty (No of pieces)		
Cadastre and land registration		
Site Size		
Agreement to national perspectives	National Planning Policy	
Land ownership	Socio Economic	Socio- Economic, Infrastructure and environmental
Social acceptance		
Land prices		
No of existing residences		
Agricultural land		
Cultural Heritage		
Distance to water resources	Infrastructure	
Distance to electricity network		
Green areas	Environmental	
Vulnerability to ground water		

4.4 Quantification of the actual values

Calculating the actual values of basic criteria: This step involves the study of available information such as observed data or basic statistics. In some cases additional measurement data could be required.

(1) Land Classification: The percentage of areas Type A, B, and C in each zone is calculated by GIS. In this criterion, the value 0 was assigned for area A, 1 for area B and 2 for Area C.

$$CR_i = B_i + 2C_i$$

Where:

CR_i, criterion *i*

B_i : Percentage of area Type B

C_i : Percentage of area Type C

The values of land classification criteria for all suggested sites are shown in **Table 4.3.**

Table 4.3 The values of Criteria 1: Land Classification

Criterion 1	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Land Classification	1.83	2	1.35	1.29	1.37	2	2	1.23	2	1.52	0.12	2	0.33

When the site has an actual value of 2, this means that total area of the site is area Type C, while any site has actual value 0 is totally area A.

(2) Distance to Settlement: The average aerial distance in km from each site to the closest settlement in km is measured by using the GIS distance tool, **Table 4.4**.

Table 4.4 The values of Criteria 2: Distance to Settlement

Criterion 2	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Distance to Settlement (km)	2	2	2	1.5	2.5	3	3	1.8	2	1	2	2.3	2

(3) Distance to the separation wall The average aerial distance from each site to the wall route in km is measured by using the GIS distance tool. The value 0 means that the site is bordered by the wall from one side, the values are showed in the **Table 4.5.**

Table 4.5 The values of Criteria 3: Distance to the separation wall

Criterion 3	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Distance to the separation wall (km)	2	2	2	1.5	2.5	3	3	1.8	2	1	2	2.3	2

(4) Slope: GIS Spatial analyst tool was used to calculate the percentage of the slope by using map calculator. Areas with slope < 25% was calculated, **Table 4.6**.

Table 4.6 The values of Criteria 4: Slope

Criterion 4	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Slope (% of area < 25%)	94.5	91.6	79.2	84	93	93	54	86	65	73	63	60	49

(5) The aspect By using the spatial analyst, aspect was derived for the study area from the slope. The value 0 was assigned for South and South West, the value 1 assigned for East, West and Southeast. The value 2 assigned for North, Northeast and Northwest, while the flat area was assigned with value 3. The values calculated as follows:

$$CR_i = AS_i^{W, E, SE} + 2AS_i^{N, NE, NE} + 3AS_i^{F}$$

Where:

CR_i, criterion *i*

AS_i : Percentage of area with specific aspect

W, E, SE: South and south west directions

N, NE, NW: North, Northeast and Northwest direction

F: Flat

The values of land classification criteria for all suggested sites are shown in **Table 4.7**.

Table 4.7 The values of Criterion 5: Aspect

Criterion 5	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Aspect	1	0.94	1.1	1.2	0.94	0.94	0.98	0.95	1	1	1	0.98	0.95

(6) Land Continuity. It is measured by counting the number of sub-zones within the same larger zone, **table 4.8**.

Table 4.8 The values of Criterion 6: land continuity

Criterion 6	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
land continuity (No of pieces)	3	1	16	9	1	2	64	4	48	27	21	58	127

(7) Cadastre and land registration: In this criterion, the value 0 was assigned for a site with no cadastral. The value 1was assigned for the registered sites, **Table 4.9**.

Table 4.9 The values of Criterion 7: Cadastre and land registration

Criterion 7	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Cadastre and land registration	0	0	0	1	1	0	0	1	0	1	1	0	1

(8) Available land for building: (Vacant Land): The land area is calculated in square kilometers by using GIS. The result is the vacant land with a suitable slope.

Criterion 8 (Vacant land) = Total area-(built up + natural reserved)

$$CR_i = A_i - (A_i^{BLT} + A_i^{NR})$$

Where:

A_i, Total Area

A_i^{BLT} : Built up Areas

A_i^{NR}: Natural Reserved Areas

The values of land classification criteria for all suggested sites are shown in **Table 4.10**.

Table 4.10 The values of Criterion 8: Available land for building

Criterion 8	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Available land for building	**14.8**	**3**	**5.2**	**14.3**	**5.7**	**7.1**	**14.4**	**4.9**	**19.4**	**6.7**	**2.8**	**6.9**	**8.5**

(9) Agreement to national perspective. This criterion was examined by the survey planners and decision makers in the Ministry of Local Governance and the Ministry of Planning. It ranks the sites regarding to the degree of agreement, **Table 4.11.**

Table 4.11 The values of Criterion 9: Agreement to national perspective

Criterion 9	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Agreement to national perspective	5	11	6	2	7	12	10	3	9	13	8	4	1

(10) Landownership: In this criterion, the value 0 was assigned for site where the majority of the land is private land, the value 1 was assigned for the land that is governmental land and waqf land , and the value 2 assigned for the unknown landownership, **Table 4.12.**

Table 4.12 The values of Criterion 10: Landownership

Criterion 9	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Landownership	0	0	0	1	1	2	0	2	2	0	0	2	0

(11) Accessibility (Access to Ramallah (min/trip): By using GIS tools, the travel distance in kilometer between each zone and the center of Ramallah was measured, **Table 4.13.**

Table 4.13 The values of Criterion 11: Distance to city center

Criterion 11	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Distance to city Center (km)	23	32	24	22	13	28	28	15	13.5	18	18	18	12.5

(12) Agricultural Area: The land area is calculated in square kilometers by using GIS. Agricultural areas include the field crops and the olive trees, **Table 4.14.**

Table 4.14 The values of Criterion 11: Agricultural land

Criterion 12	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
agricultural land (km^2)	1.23	0.0	0.19	3.6	1.04	0.0	1.66	0.53	1.14	0.0	0.00	0.0	0.76

(13) Cultural Heritage is an important measure. The site which has any monuments or site considered to be an important resource in need for protection was given a score of 1, while the site which has no archeological site took a score 0, **Table 4.15.**

Table 4.15 The values of Criterion 13: Cultural heritage

Criterion 13	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Cultural Heritage	1	0	0	0	0	0	1	0	0	1	0	0	0

(14) Social Acceptance reflects the expected general public acceptance to live in the site. This is measured by a questionnaire for a selected group. Each site has a percentage of acceptances by public, **Table 4.16.**

Table 4.16 The values of Criterion 14: Social acceptance

Criterion 14	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Social Acceptance (%)	0	0	3	17	17	4.5	0	10.5	6	9	6	1	26

(15) Land Prices The average land price in each zone is investigated by asking a number of land brokers in Ramallah-Al Bireh governorate, **Table 4.17.**

Table 4.17 The values of Criterion 15: Average land price

Criterion 15	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Average Land Price (1000US dollar/donum)	8.5	4	8.5	55	12.5	3.75	8.5	11	4.75	17.5	12.5	7.5	17.5

(16) Number of existing residences. The number of people in the surrounding area of each zone reflects the density of the site. The data was obtained from the PCBS census data, **Table 4.18.**

Table 4.18 The values of Criterion 16: Number of existing residences

Criterion 16	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Number of existing residences	12531	0	5269	9494	2469	0	0	1364	0	11307	6250	0	6431

(17) Distance to water Sources reflects the accessibility to the water source. It is measured by the aerial distance of the proposed site from the nearest reservoir, **Table 4.19**.

Table 4.19 The values of Criterion 17: Distance to water sources

Criterion 17	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Distance to Water Sources (km)	2.5	1.5	1.5	1.5	1	1	0	2	1	1	1	0	2

(18) Distance to electricity network reflects the accessibility to an electrical source. It is measured by the distance of the proposed site from electrical source (high voltage transmission line) which is the distance to the nearest built up area, **Table 4.20.**

Table 4.20 The values of Criterion 18: Distance to electricity network

Criterion 18	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Distance to Electricity network (km)	2.5	1.5	1.5	1.5	1	1	0	2	1	1	1	0	2

(19) Green areas: The green area and the landscape areas percentage in each site increase the aesthetic qualities of the site. By using GIS tools, the percentage of green area was calculated, **Table 4.21**.

Table 4.21 The values of Criterion 19: Green areas

Criterion 17	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Green Areas (%)	**42.65**	**23.3**	**49**	**41.6**	**49.5**	**0**	**6.1**	**59.83**	**4.1**	**41.5**	**62**	**0.25**	**49**

(20) Vulnerability to ground water reflects the sensitivity of each site to groundwater pollution. The data was obtained from the HWE database and shows that the Ramallah-Al Bireh governorate is classified as high vulnerable to moderate and low vulnerable. The value 0 assigned to high vulnerable areas, 1 for moderate and 2 for the low vulnerable, **Table 4.22.**

Table 4.22 The values of Criterion 20: Vulnerability to ground water

Criterion 20	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
Vulnerability to ground water	1	1	0	0	0	2	0	1	0	1	1	0	2

In summary, the quantified values for the 13 suggested sites are shown in the **Table 4.23**; also, **Table 4.24** shows the ideal and worst values of each criterion.

Table 4.23 The quantified value of each site

No.	Indicator	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
1	Land Classification	1.83	2	1.35	1.29	1.37	2	2	1.23	2	1.52	0.12	2	0.33
2	distance from settlement (Km)	2	2	2	1.5	2.5	3	3	1.8	2	2	2	2.3	2
3	distance from the wall	0	0	0	21	23	19	31	23	13.6	0.5	5.5	30	13
4	Slope(percentage of slope<25)	94.5	91.6	79.2	84	93	93	54	86	65	73	63	60	49
5	aspect	1	0.94	1.1	1.1	0.94	0.94	0.98	0.95	1	1	1	0.99	0.95
6	land coninuinty (No of pieces)	3	1	16	9	1	2	64	4	48	27	21	58	127
7	cadastral	0	0	0	0	0	0	0	0	0	0	0	0	0
8	available land for building	14.83	3.04	5.24	14.36	5.69	7.06	14.44	4.93	19.35	6.72	2.76	6.99	8.50
9	Agreement to national	6	3	5	4	6	7	9	8	5	8	5	7	3
10	land ownership	1.83	2	1.35	1.29	1.37	2	2	1.23	2	1.52	0.12	2	0.33
11	Acess to Ramallah (min/trip)	23	32	24	22	13	28	28	15	13.5	18	18	18	12.5
12	agricultural land (km2)	1.23	0.00	0.19	3.60	1.04	0.00	1.66	0.53	1.14	0	0	0	0.76
13	Arcological zones	1	0	0	0	0	0	1	0	0	1	0	0	0
14	Social acceptance	0	0	0.03	0.17	0.17	4.5	0	10.5	6	9	6	1	26
15	Average land price (US	8500	4000	8500	55000	12500	3750	8500	11000	4750	17500	12500	7500	17500
16	No of existing residence	12531	0	5269	9494	2469	0	0	1364	0	11307	6250	0	6431
17	distance to Water resources	2.5	1.5	1.5	1.5	1	1	0	2	1	1	1	0	2
18	distance to Electricity network	0	1	0	0	1.5	14	1	1	5	0	0	4	0
19	Greenery	42.65	23.3	49	41.6	49.55	0	6.1	59.83	4.14	41.57	62	0.25	49
20	vulnarability to ground water	1	1	0	0	0	2	0	1	0	1	1	0	2

Table 4.24 Ideal and worse value of each site

No.	Name	Ideal	Worse
1	Land Classification	0	2
2	distance from settlement (Km)	3	1.5
3	distance from the wall	31	0
4	Slope(percentage of slope<25)	94.5	49
5	aspect	0	3
6	land coninuinty (No of pieces)	1	127
7	cadastral and land registration	1	0
8	available land for building (remaining area)	19.4	2.8
9	Agreement to national perspective	1	13
10	land ownership	0	2
11	Acess to Ramallah (min/trip)	12.5	32
12	agricultural land (km2)	0	3.60216
13	Arcological zones	0	1
14	Social acceptance	26	0
15	Average land price (US dollar/donum)	3750	55000
16	No of existing residence	0	12531
17	distance to Water resources	0	2.5
18	distance to Electricity network	0	14
19	Green Areas	62	0
20	vulnarability to ground water	0	2

4.5 Normalization of basic criteria

Subsequently the actual values for each criterion are required to be normalized, **Table 4.25** that is transformed into the interval 0-1 the normalized value of criteria (i) can be calculated as formula (1) described in **Section 4.2.1** ***(c)*****.**

Table 4.25 The actual values of criterion for each site

No.	Indicators	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
1	Land Classification	0.92	1.00	0.68	0.65	0.69	1.00	1.00	0.62	1.00	0.76	0.06	1.00	0.17
2	distance from settlement (Km)	0.67	0.67	0.67	1.00	0.33	0.00	0.00	0.80	0.67	0.67	0.67	0.47	0.67
3	distance from the wall	1.00	1.00	1.00	0.32	0.26	0.39	0.00	0.26	0.56	0.98	0.82	0.03	0.58
4	Slope(percentage of slope<25)	0.00	0.06	0.34	0.23	0.03	0.03	0.89	0.19	0.65	0.47	0.69	0.76	1.00
5	aspect	0.33	0.31	0.37	0.37	0.31	0.31	0.33	0.32	0.33	0.33	0.33	0.33	0.32
6	land coninuinty (No of pieces)	0.02	0.00	0.12	0.06	0.00	0.01	0.50	0.02	0.37	0.21	0.16	0.45	1.00
7	cadastral and land registration	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00
8	available land for building (remaining area)	0.27	0.98	0.85	0.30	0.82	0.74	0.30	0.87	0.00	0.76	1.00	0.75	0.65
9	Agreement to national perspective	0.33	0.83	0.42	0.08	0.50	0.92	0.75	0.17	0.67	1.00	0.58	0.25	0.00
10	land ownership	0.00	0.00	0.00	0.50	0.50	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
11	Acess to Ramallah (min/trip)	0.54	1.00	0.59	0.49	0.03	0.79	0.79	0.13	0.05	0.28	0.28	0.28	0.00
12	agricultural land (km2)	0.34	0.00	0.05	1.00	0.29	0.00	0.46	0.15	0.32	0.00	0.00	0.00	0.21
13	Cultural Heritage	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00
14	Social acceptance	1.00	1.00	1.00	0.99	0.99	0.83	1.00	0.60	0.77	0.65	0.77	0.96	0.00
15	Average land price (US dollar/donum)	0.09	0.00	0.09	1.00	0.17	0.00	0.09	0.14	0.02	0.27	0.17	0.07	0.27
16	No of existing residence	1.00	0.00	0.42	0.76	0.20	0.00	0.00	0.11	0.00	0.90	0.50	0.00	0.51
17	distance to Water resources	1.00	0.60	0.60	0.60	0.40	0.40	0.00	0.80	0.40	0.40	0.40	0.00	0.80
18	distance to Electricity network	0.00	0.07	0.00	0.00	0.11	1.00	0.07	0.07	0.36	0.00	0.00	0.29	0.00
19	Green Areas	0.31	0.62	0.21	0.33	0.20	1.00	0.90	0.03	0.93	0.33	0.00	1.00	0.21
20	vulnarability to ground water	0.50	0.50	0.00	0.00	0.00	1.00	0.00	0.50	0.00	0.50	0.50	0.00	1.00

4.6 Determination of weightings and balancing factors

The weighting or the importance of each criterion among its group was based on the personal understanding of the decision maker. The consideration of the views of other experts might have a significant effect on the final result. The following tables show the different perspectives for the different level of criteria, including the perspective of planners, the public, and the Ministry of Planning as a national vision. All of these were used to determine the total average perspective, to be used in the evaluation of each site. These weights and balancing factors for the first, second level criteria are summarized in **Tables 4.26, 4.27 and 4.28.**

Table 4.26 Weights for first level of criteria

No.	1st level Criteria	Weight (Planners)	Weight (MOP)	Weight (Public)	Weight (Avg)
1	Land Classification	0.4	0.5	0.5	0.47
2	distance from settlement (Km)	0.3	0.25	0.3	0.28
3	distance from the wall (Km)	0.3	0.25	0.2	0.25
4	Slope(percentage of slope <25)	0.15	0.1	0.25	0.17
5	Aspect	0.15	0.05	0.1	0.1
6	land continuity (No of pieces)	0.25	0.1	0.15	0.17
7	Cadastre and land registration	0.1	0.05	0.15	0.1
8	available land for building (remaining area)	0.35	0.7	0.35	0.46
9	Agreement to national perspective	0.7	0.6	0.7	0.66
10	land ownership	0.3	0.4	0.3	0.34
11	Access to Ramallah (min/trip)	0.15	0.5	0.3	0.32
12	agricultural land (km^2)	0.2	0.05	0.15	0.13
13	Cultural Heritage	0.15	0.05	0.025	0.075
14	Social acceptance	0.2	0.1	0.4	0.23
15	Average land price (US dollar/donum)	0.2	0.2	0.1	0.17
16	No of existing residence	0.1	0.1	0.025	0.075
17	distance to water resources	0.5	0.5	0.6	0.53
18	distance to electricity network	0.5	0.5	0.4	0.47
19	Greenery	0.35	0.5	0.3	0.38
20	vulnerability to ground water	0.65	0.5	0.7	0.62

Table 4.27 Weights for second level criteria

No.	Criteria (Second Level)	Weight (Planners)	Weight (MOP)	Weight (Public)	Weight (Avg)
1	Political	0.3	0.1	0.2	0.20
2	Physical	0.5	0.2	0.4	0.35
3	National Planning Policy	0.2	0.7	0.5	0.45
4	Socio-economic	0.5	0.4	0.6	0.5
5	Infrastructure	0.2	0.4	0.15	0.25
7	Environmental	0.3	0.2	0.25	0.25

Table 4.28 Weights for third level criteria

No.	Criteria (Second Level)	Weight (Planners)	Weight (MOP)	Weight (Public)	Weight (Avg)
1	Management	0.6	0.7	0.45	0.58
2	Socio-economic environmental and Infrastrucre Aspects	0.4	0.3	0.55	0.42

4.7 Quantifying the values of second and third levels of criteria

Based on the normalized values of basic criteria and the suggested weights estimated in the previous section, the values of the second and the third level of criteria were calculated. According to Formula 4 and 5 described in **Sections 4.2.1 (g) and (h),** the results are summarized in the **Tables 4.29** and **4.30**.

Table 4.29 The scores of the second level criteria according to average perspectives

No.	2nd Level Criteria	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
1	**Political**	0.88	0.92	0.77	0.71	0.52	0.71	0.69	0.61	0.82	0.80	0.54	0.73	0.47
2	**Physical**	0.38	0.74	0.68	0.25	0.57	0.60	0.57	0.60	0.45	0.57	0.75	0.71	0.74
3	**National Planning Policy**	0.27	0.68	0.34	0.30	0.50	0.95	0.61	0.60	0.80	0.81	0.47	0.62	0.00
4	**Socio-Economic**	0.70	0.74	0.60	0.80	0.50	0.60	0.73	0.31	0.39	0.52	0.43	0.49	0.19
5	**Infrastructure**	0.73	0.44	0.44	0.44	0.30	0.74	0.05	0.58	0.38	0.29	0.29	0.20	0.58
6	**Environmental**	0.44	0.55	0.13	0.20	0.12	1.00	0.56	0.39	0.58	0.44	0.39	0.61	0.80

Table 4.30 The scores of the third level criteria according to average perspectives

No.	Name	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
1	Management	0.44	0.21	0.34	0.55	0.46	0.28	0.38	0.40	0.34	0.30	0.36	0.30	0.42
2	Socio-economic and environmental Aspecs	0.36	0.36	0.53	0.39	0.62	0.23	0.40	0.60	0.55	0.54	0.60	0.51	0.47

4.8 Preliminary Results

The overall scores of the 13 sites were calculated based on the **Formula 5** described in Section 4.2.1 *(h)*. **Figure 4.19** represents the site scores on average weights from different perspectives and different aspects.

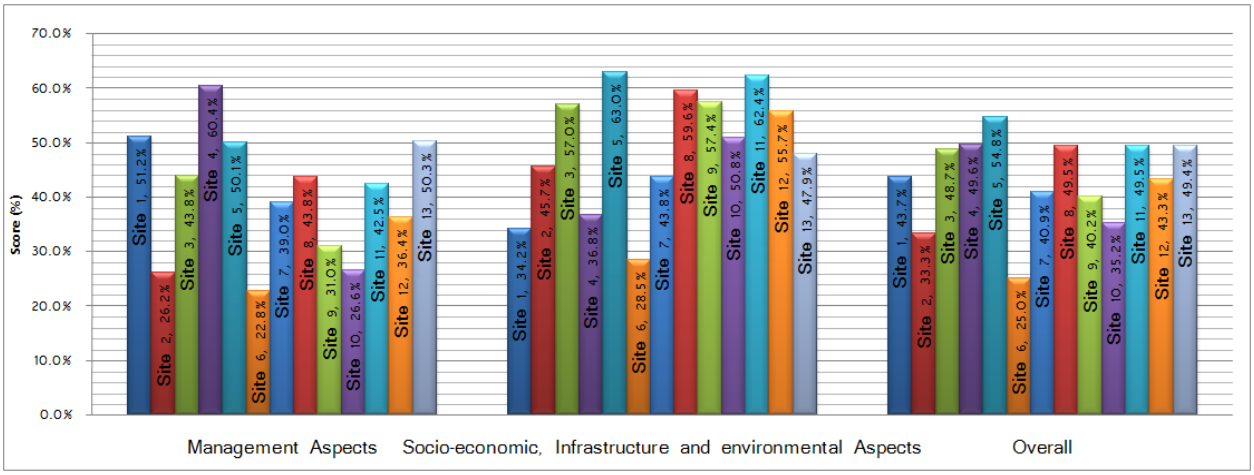

Figure 4.19 Site scores based on average weights (from different perspectives)

The initial results show that Site 5 is the best site among the thirteen sites while Site 6 is the worst location from the overall aspects. However, location 5 is the best overall; location 4 is the best in terms of management, while Sites 5, 8, and 11 are the best locations in terms of socio economic, infrastructure and environmental aspects.

All scores from different perspectives, such as the perspective of the planners, the public and MOP was represented graphically in the same way. It is assumed that any site that is located in the poor zone in terms of any perspective is rejected. Therefore, **Figures 4.20** show that Sites 1,2,7,6 and 12 were removed from the list, while Sites 3, 4, 5,8,11, and 13 are the most acceptable sites for establishing new urban development.

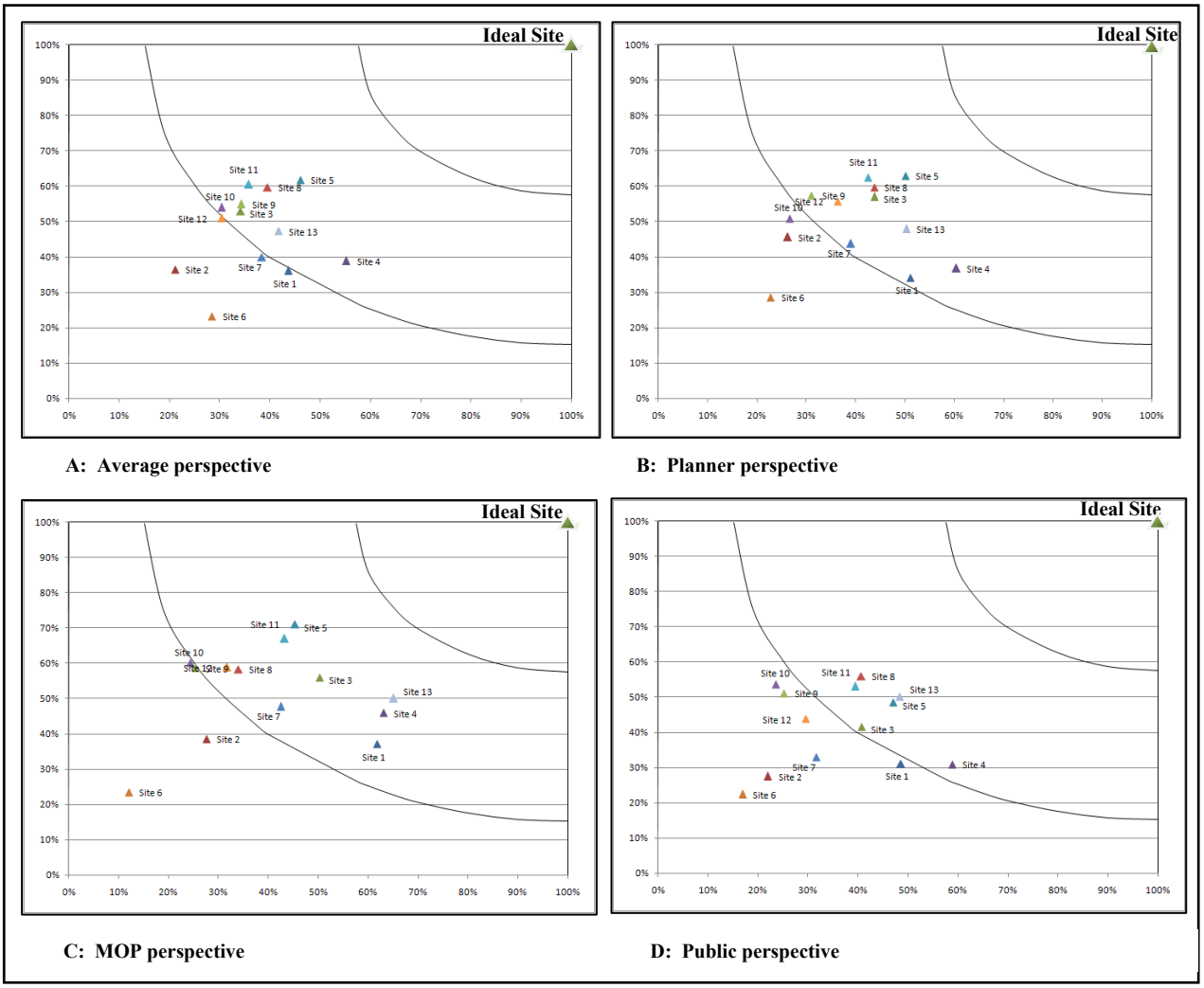

Figure 4.20 Graphical representation of a set of ranked all sites based on different perspectives

Figure 4.21 shows the classification of the 13 sites according to their acceptance. The six accepted sites are considered the best sites for urban development and will be analyzed and ranked in the coming section.

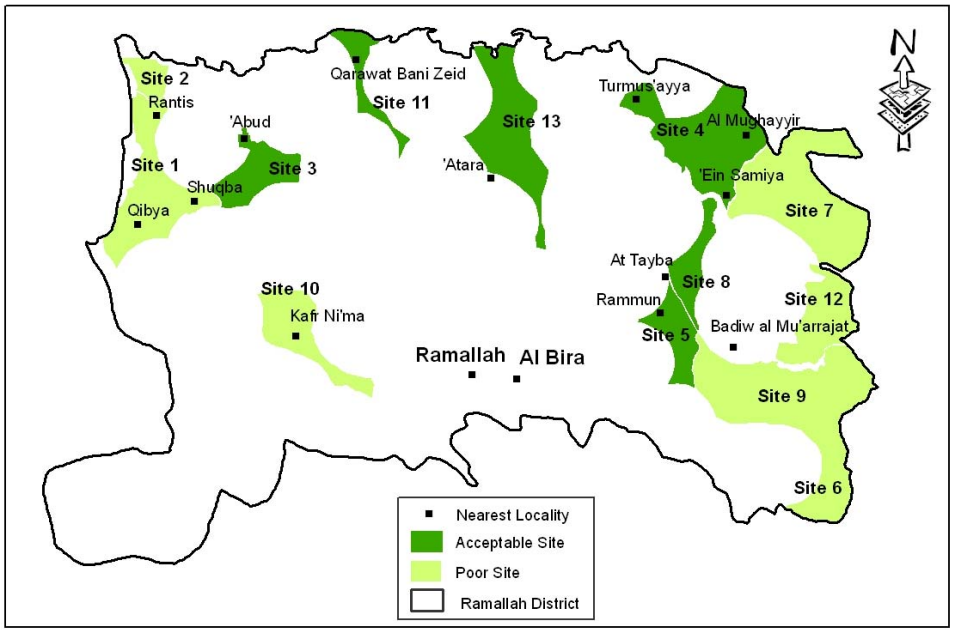

Figure 4.21 Classified sites according to their acceptance

4.9 Final Results and Discussion

The results obtained after the detailed analysis of the selected six sites are in **Table 4.31.** Also, **Table 4.32** shows the summarized sites ranking. The red color indicates the accepted sites where the green colors indicate the least acceptable sites. **Figure 4.22**. Based on the management aspects, site 4 (near Turmus'yya) is the most acceptable site while Site 8 (near Al Taybeh) is the least acceptable site. In general, the accepted sites were ranked as the following: 4, 13, 5, and 3,11,8 respectively. On the other hand, according to Socio-economic, infrastructure, and environmental aspects Site 5 (near Rammun) is the best site while Site 4 (near Turmus'yya) is the worst. In general, the sites were ranked 5, 11, 8, 3, 13, and 4 respectively. From an overall perspective, Site 5(near Rammun) is the best site while Site 3 (near Abud) is the worst site.

Table 4.31 Summary of the most acceptable sites from different perspectives

Management Aspects	Site 3	Site 4	Site 5	Site 8	Site 11	Site 13
Mopic	50.3%	63.1%	45.3%	34.0%	43.2%	65.1%
Public	40.7%	58.9%	47.1%	40.7%	39.4%	48.4%
Planner	43.8%	60.4%	50.1%	43.8%	42.5%	50.3%
Avg (Weight)	34.2%	55.2%	46.0%	39.5%	35.8%	41.7%
Average (Score)	**42.2%**	**59.4%**	**47.1%**	**39.5%**	**40.2%**	**51.4%**
Socio-economic, Infrastructure, and environmental Aspects	**Site 3**	**Site 4**	**Site 5**	**Site 8**	**Site 11**	**Site 13**
Mopic	56.0%	45.9%	71.1%	58.3%	67.0%	50.0%
Public	41.6%	30.8%	48.5%	56.0%	53.1%	50.2%
Planner	57.0%	36.8%	63.0%	59.6%	62.4%	47.9%
Avg (Weight)	53.0%	38.9%	61.8%	59.7%	60.5%	47.3%
Average (Score)	**51.9%**	**38.1%**	**61.1%**	**58.4%**	**60.8%**	**48.9%**
Overall	**Site 3**	**Site 4**	**Site 5**	**Site 8**	**Site 11**	**Site 13**
Avg	40.2%	45.6%	51.1%	46.2%	44.0%	42.5%
Public	41.2%	41.7%	47.9%	48.6%	46.5%	49.4%
Planner	48.7%	49.6%	54.8%	49.5%	49.5%	49.4%
Avg (Weight)	40.2%	45.6%	51.1%	46.2%	44.0%	42.5%
Average (Score)	**42.6%**	**45.6%**	**51.2%**	**47.6%**	**46.0%**	**45.9%**

Table 4.32 Most acceptable sites ranked according to their suitability

Management Aspects	Site 3	Site 4	Site 5	Site 8	Site 11	Site 13
Mopic	3	2	4	6	5	1
Public	4	1	3	5	6	2
Planner	4	1	3	5	6	2
Avg (Weight)	6	1	2	4	5	3
Average (Score)	**4**	**1**	**3**	**6**	**5**	**2**
Socio-economic, Infrastructure, and environmental Aspects	**Site 3**	**Site 4**	**Site 5**	**Site 8**	**Site 11**	**Site 13**
Mopic	4	6	1	3	2	5
Public	5	6	4	1	2	3
Planner	4	6	1	2	3	5
Avg (Weight)	4	6	1	3	2	5
Average (Score)	**4**	**6**	**1**	**3**	**2**	**5**
Overall	**Site 3**	**Site 4**	**Site 5**	**Site 8**	**Site 11**	**Site 13**
Avg	6	3	1	2	4	5
Public	6	5	3	2	4	1
Planner	6	2	1	4	3	5
Avg (Weight)	6	3	1	2	4	5
Average (Score)	**6**	**5**	**1**	**2**	**3**	**4**

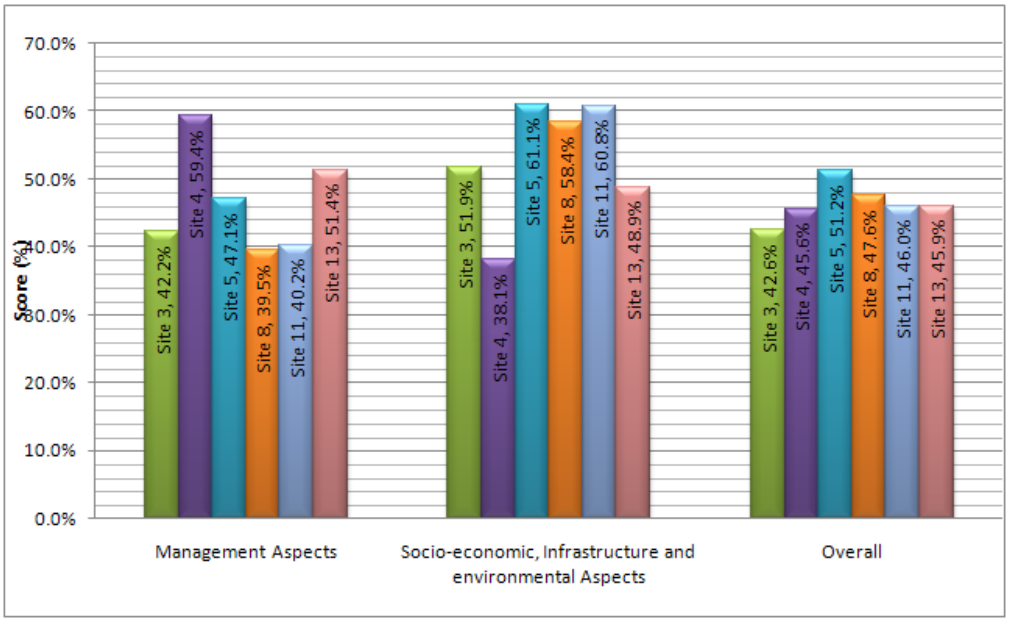

Figure 4.22 Accepted site scores based on the overall perspective

The final result obtained in this research is also represented on the map over the area of study showing the 6 suitable sites for new urban development. These six sites are ranked respectively from the most acceptable site to the least acceptable site. **Figure 4.23** shows that Site 5 (near Rammun), Site 8 (near Al Taybeh), Site 11 (near Qarawet Bani Zeid) ranked the first, second and third options while Site 13 (near Atara), Site 4 (near Turmus'ayya) and Site 3 (near Abud) are ranked the fourth, fifth and the sixth options.

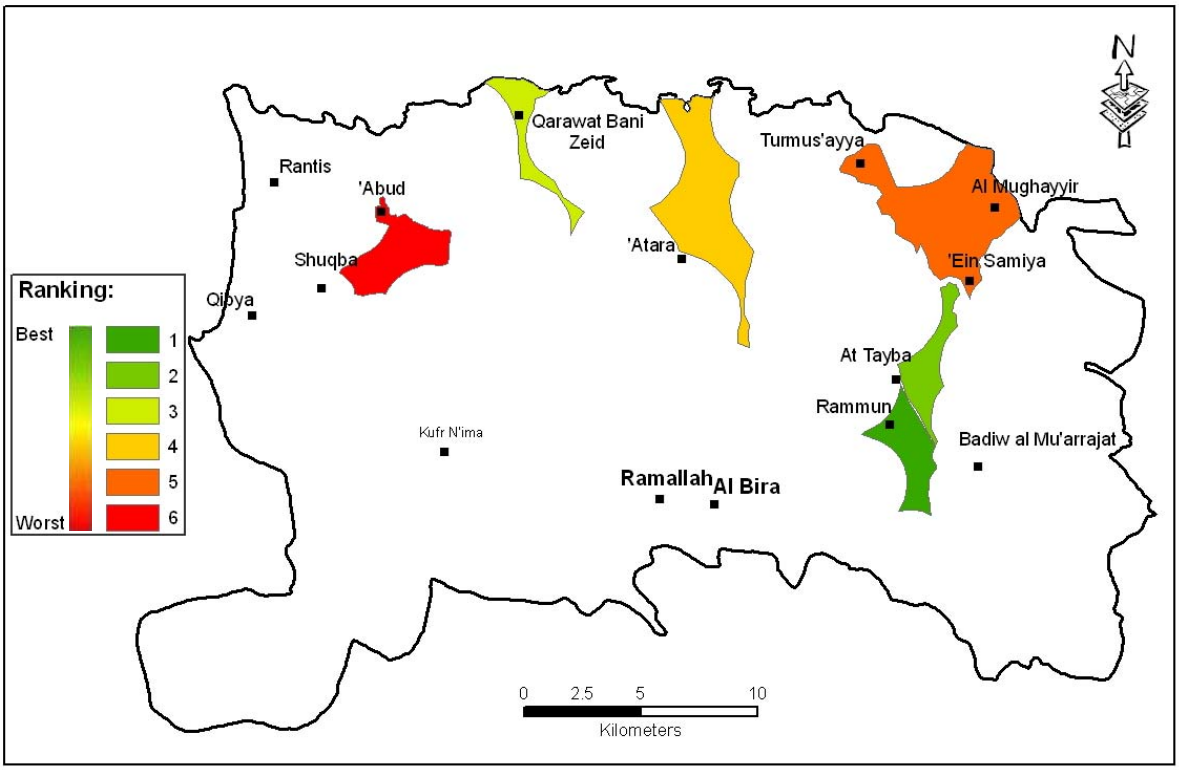

Figure 4.23 Ranked sites according to average overall perspective

4.10 Description of the best Site:

Of the six potential sites, Site 5 (near Rammun) is the most suitable site in terms of overall perspectives. The site is located in the south central of the Governorate; it faces the coastal area of Palestine, 12 km east of Ramallah **Figure 4.24**. The site has a reasonable size (7.22 km^2) to be considered an urban area. It is located near Rammun village where it forms a significant point in the landscape, being situated on and around the summit of a hill and visible from all directions to Ramallah. Moreover, the site gained the high acceptance from the people who filled the questionnaire due to its closeness to the Ramallah and its remarkable environment.

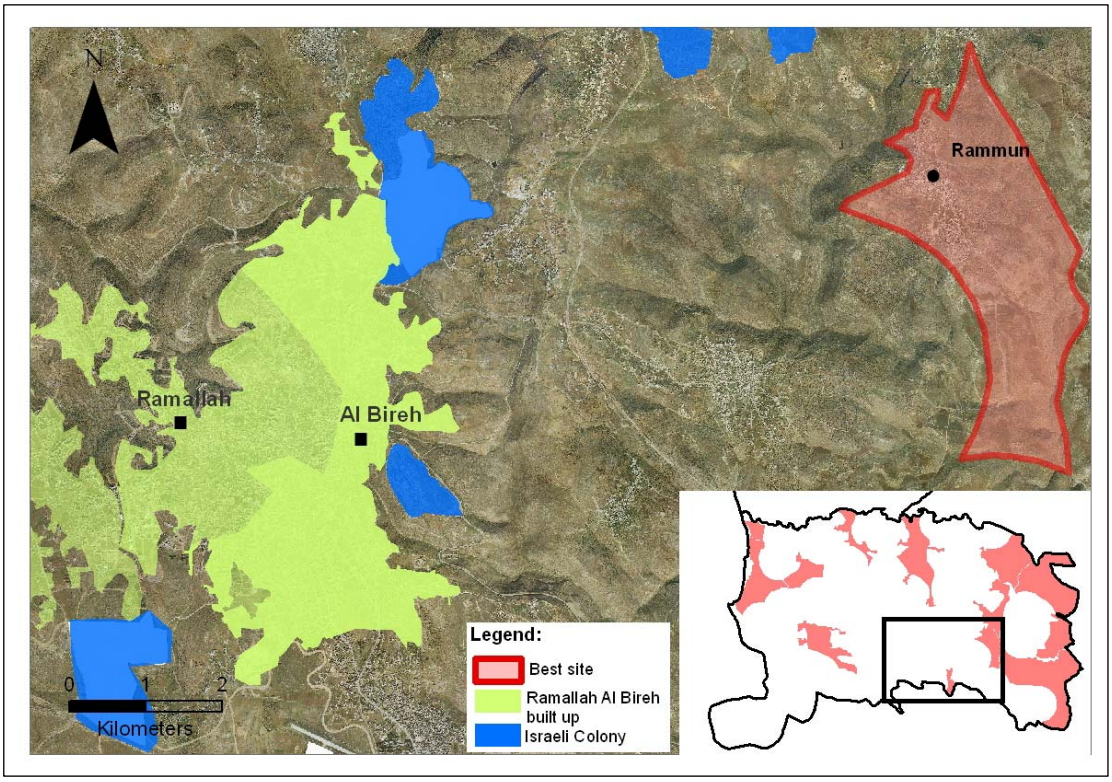

Figure 4.24 Location of the best site

Chapter Five: Conclusion and Recommendations

5.1 Conclusion

Land is a scarce resource all over the world. The population of the world is increasing while the land is limited. In Ramallah-Al Bireh governorate, like all other West Bank governorates, land is considered a very limited resource. In the status quo scenario, the urban expansion of Ramallah-Al Bireh governorate's main cities has reached its limits from all directions. On the other hand, the Ramallah-Al Bireh governorate unlike other West Bank governorates is still experiencing a population boom accompanied by a significant pressure on services and employment opportunities and the need to provide appropriate accommodation for all people coming in from all over the West Bank, cities, villages and camps. So there is an urgent need to think about the means of finding places where the newcomers can live and ease the pressure on the city center and create residential accommodation close to their work places and provide them with a better environment.

The 13 sites selected in the initial selection process were evaluated to determine the most suitable site. In the second part of analysis, the Multi Criteria Analysis (MCA) was followed and adopted as a decision making tool. The criteria which were selected to evaluate the potential sites were built on the literature review and planning guidelines in the context of the West Bank and took into consideration experiences in Europe and the Arab World and from discussions with Palestinian planners and decision makers. The criteria were selected based on six themes; political, physical, socio-economic, national policy, environmental and infrastructure networks. Each of the themes was used to evaluate the suitability of each site. The evaluation process took into consideration different perspectives, and these include the perspective of planners, the public, and the Ministry of Planning as a national vision. All of these were used to determine the total average perspective to be used in the evaluation of each site.

The sites were then ranked based on their distances from the ideal point and can be shown on a graphical plot for Good, Acceptable and Poor sites.

A graphical plot of each site was drawn to represent the Management-socio economic, environmental and infrastructure relationship to determine the distance of each site from the ideal sites as a result of the analysis and through different perspectives, 6 sites were identified as acceptable sites for new development, while the other 7 sites were excluded. These 6 acceptable sites were evaluated in detail in order to determine the most ideal location.

The result of the research showed that Site 4 (near Turmus'ayya) was the most suitable location in terms of management aspects. This site is followed by Site 13 (near Atara), Site 5 (near Rammun) , Site 3 (near Aboud), Site 11 (near Qarawa bani zeid) while Site 8 (near Al Taybeh) is the least acceptable among the six sites. This result is shown in **Figure 5.1**

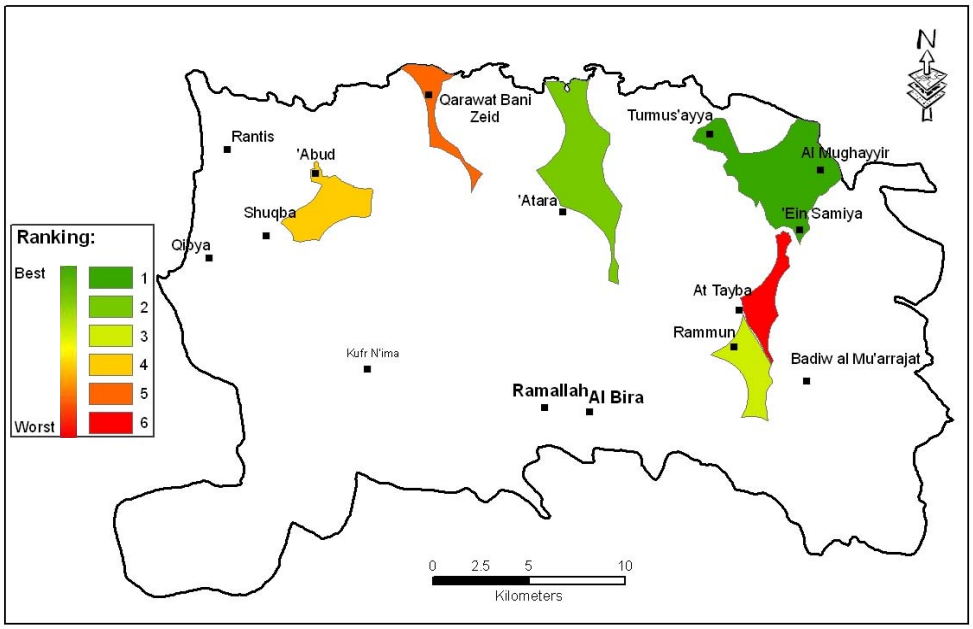

Figure 5.1 The ranked sites according to management aspects.

On the other hand, Site 5 (near Rammun) is the most suitable site in terms of the socio-economic, environmental and infrastructure aspects. This site is followed by Site 8 (near Al Taybeh), Site 11 (near Qaraweh bani zeid), Site 13 (near Atara), whereas Site 3 (near Aboud), and Site 4 (near Turmus'ayya) are the least acceptable sites.

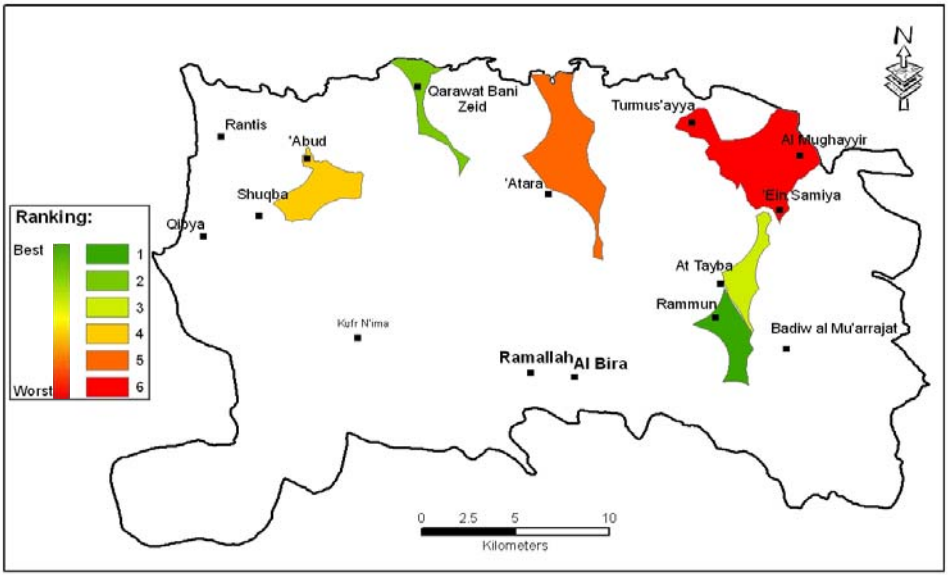

Figure 5.2 Ranked sites according to socio-economic, environmental and infrastructure aspects.

Finally, in terms of overall perspectives, Site 5 (near Rammun) is the most acceptable site while Site 3 (near Aboud) is the least acceptable site.

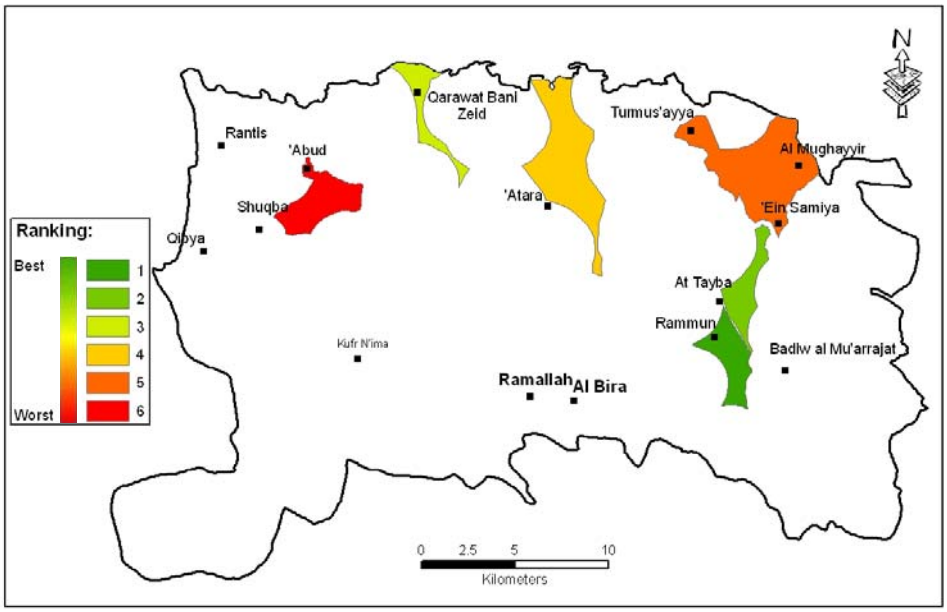

Figure 5.3 Ranked sites according to overall perspective

5.2 Recommendations

It is clear from this research that finding place for new urban development is urgently required to achieve a better quality of life for the Palestinian people. Site selection criteria were developed as well as a methodology for evaluating and ranking these sites.

During this research, it was found that refined guidelines are still needed in order to achieve more accurate results and determine more useful decision-making. It is recommended to take a number of preparation steps at a national level to facilitate adapting this methodology as national guidelines for developing new urban areas.

1. Establishing a united data information center to ensure completed comprehensive, accurate, updated, and easily accessed information which is consistent with developing a GIS based model which has the capability of easily modifying the data.

2. Improving coordination among the related governmental and private organizations. This can avoid research duplications, the waste of time, and incorrect results, and this will positively affect decision-making and give accurate results and decisions.

3. There is a need to do further studies in order to do a detailed study for each of the West Bank's governorate in order to identify the possibilities of finding future urban development areas.

4. Special attention is required to the vacant developable areas either by developing some existing centers or establishing new centers in order to protect them from confiscation by the Israelis.

5. Enhancing the coordination between the governmental**,** private and universities to support researchers in terms of finance, information and expertise.

6. Increasing public awareness to increase the cooperation between public and governmental and private organizations.

This research has also generated several questions which must be answered these include:

- What types of new urban development do we need (i.e. cities, towns, suburbs)?
- What about developing existing suburban communities around major cities?
- Is there a need to come up with a standard for individual share in built environment and his/ her share in urban open spaces?

Through adapting a scientific approach such is the one developed and applied in this research; the answers to these questions may be discovered.

I do strongly believe that this research does meet the goals of scientific research because it adds more concrete information and adds a lot to knowledge. This research is a unique one since it is the first Research taking all the applied variables and the process could be applicable else where.

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Appendices

ماجستير التخطيط العمراني

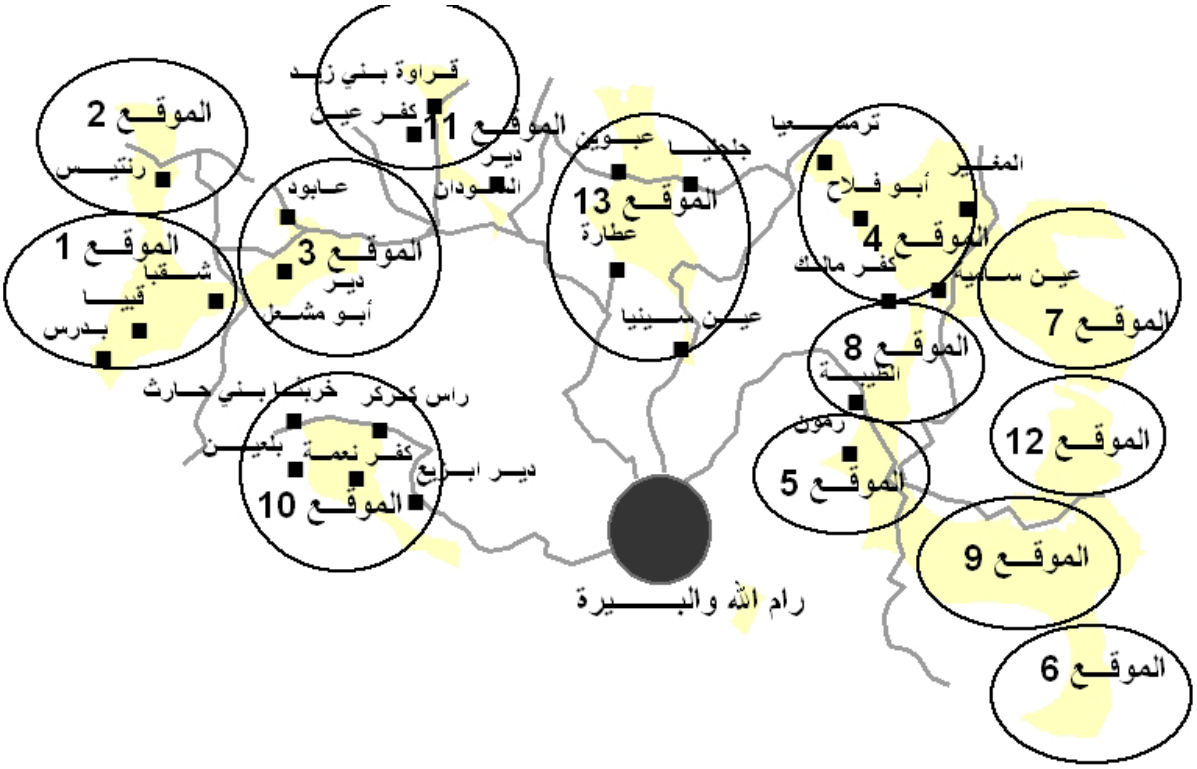
استمارة(رؤية أصحاب القرار)

1. معلومات عامة:

1. الاسم:.....
2. المسمى الوظيفي:.....

2. الوضع المستقبلي:

أين ترى اتجاه التوسع المستقبلي القادم في محافظة رام الله والبيرة تماشيا مع الرؤية الوطنية. خيارا الرجاء ترتيب المناطق حسب الأولوية:



المواصفات / الموقع	البعد عن مركز رام الله والبيرة (كم)	معدل الارتفاع عن سطح البحر (م)	القرى المحيطة	بعدها عن أقرب مستوطنة (كم)	بعدها عن الجدار (كم)	الكثافة السكانية بالمنطقة: (شخص/كم^2)	نسبة المناطق الخضراء (%)
الموقع الأول (1)	23	200	شقبا، قبيا، بدرس	2	0	670	43
الموقع الثاني (2)	32	200	رنتيس	2	0	0	23.3
الموقع الثالث (3)	24	400	عابود	2	0	580	49
الموقع الرابع (4)	22	700	ترمسعيا، أبو فلاح	1.5	21	420	42
الموقع الخامس (5)	13	600	رمون	2.5	23	360	50
الموقع السادس (6)	28	100	----	3	19	0	0
الموقع السابع (7)	28	350	عين سامية	3	31	0	6
الموقع الثامن (8)	15	700	الطيبة وكفر مالك	1.8	23	228	60
الموقع التاسع (9)	13.5	150	----------	2	13.5	0	4.1
الموقع العاشر(10)	18	500	دير ابزيع، كفر نعمة، بلعين خربثا بني حارث	2	0.5	1033	42
الموقع الحادي عشر (11)	18	400	قراوة بني زيد،عبوين، دير السودان	2	5.5	1200	62
الموقع الثاني عشر (12)	18	100	بدو المعرجات	2.5	30	0	0.3
الموقع الثالث عشر (13)	12.5	600	عطارة، جلجليا وعين سينيا	2	13	320	49

- الموقع الأول.....
- الموقع الثاني: .....
- الموقع الثالث:.....
- الموقع الرابع.....
- الموقع الخامس.....
- الموقع السادس.....
- الموقع السابع.....
- الموقع الثامن.....
- الموقع التاسع.....
- الموقع العاشر.....
- الموقع الحادي عشر:.....
- الموقع الثاني عشر:.....
- الموقع الثالث عشر:.....

شكرا لتعاونكم.....

ماجستير التخطيط العمراني

استمارة

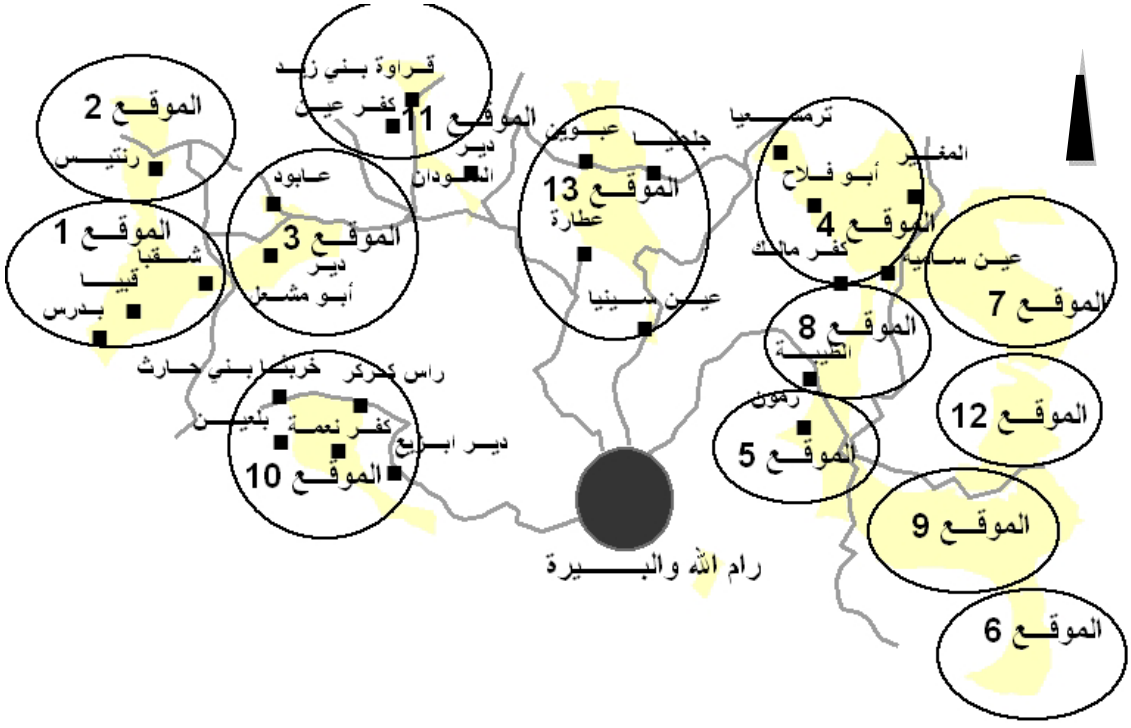
تهدف الاستمارة إلى قياس رأي المجتمع المحلي في محافظة رام الله والبيرة في اختيار أنسب مكان لتجمع سكني جديد:

3. معلومات عامة:

3. الجنس: 1. ذكر 2. أنثى
4. العمر: 1. أقل من 25 3. 25-30 4. 30 – 35 5. 36-40 6. أكثر من 40
5. الحالة الاجتماعية: 1. أعزب 2. متزوج
6. التحصيل العلمي: 1. شهادة ثانوية 2. دبلوم 3. بكالوريوس 4. أكثر من ذلك
7. طبيعة العمل: 1. حكومي 2. خاص 3. أخرى
8. مكان العمل: 1. مدينة رام الله 2. مدينة البيرة 3. أخرى
9. مكان الإقامة: 1.مدينة رام الله 2. مدينة البيرة 3. قرى رام الله
10. الدخل الشهري(بالشيكل) : 1. 1500 او أقل 2. 1600-2500 3. 2600- 3500 4. أكثر من 3500

4. الوضع المستقبلي:

أمامك 13 خيارا لإقامة تجمع سكني جديد ضمن حدود محافظة رام الله والبيرة: (انظر الخارطة). مرفق أيضا مواصفات كل موقع الرجاء **اختيار ثلاث مناطق يمكن أن تسكن فيها ثم رتب هده المناطق حسب الأولوية.**



المواصفات / الموقع	البعد عن مركز رام الله والبيرة (كم)	معدل الارتفاع عن سطح البحر (م)	القرى المحيطة	بعدها عن أقرب مستوطنة (كم)	بعدها عن الجدار (كم)	الكثافة السكانية بالمنطقة: (شخص/كم^2)	نسبة المناطق الخضراء (%)
الموقع الأول (1)	23	200	شقبا، قبيا، بدرس	2	0	670	43
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الموقع الخامس (5)	13	600	رمون	2.5	23	360	50
الموقع السادس (6)	28	100	----	3	19	0	0
الموقع السابع (7)	28	350	عين سامية	3	31	0	6
الموقع الثامن (8)	15	700	الطيبة وكفر مالك	1.8	23	228	60
الموقع التاسع (9)	13.5	150	----------	2	13.5	0	4.1
الموقع العاشر(10)	18	500	دير ابزيع، كفر نعمة، بلعين خربثا بني حارث	2	0.5	1033	42
الموقع الحادي عشر (11)	18	400	قراوة بني زيد،عبوين، دير السودان	2	5.5	1200	62
الموقع الثاني عشر (12)	18	100	بدو المعرجات	2.5	30	0	0.3
الموقع الثالث عشر (13)	12.5	600	عطارة، جلجليا وعين سينيا	2	13	320	49

الموقع الأول:.....

الموقع الثاني: .....

الموقع الثالث:.....

شكرا لتعاونكم.....

No.	1st level	weight 1	2ndlevel	weight 2	3rd level	weight 3	Overall
1	Land Classification		Political		Management		Overall
2	Distance from settlement (Km)						
3	Distance from the wall						
4	Slope(percentage of slope<25)		Physical				
5	Aspect						
6	Land coninuinty (No of pieces)						
7	cadastre and land registration						
8	Available land for building (remaining area)						
9	Agreement to national perspective		National PlanningPolicy				
10	Land ownership						
11	Acess to Ramallah (min/trip)		Socio-Economic		Socio-economic and environmental Aspecs		
12	agricultural land (km2)						
13	Cultural heritage						
14	Social acceptance						
15	Average land price (US dollar/donum)						
16	No of existing residence						
17	Distance to water resources		Natural Resources				
18	Distance to electricity network						
19	Greenery		Environmental				
20	Vulnarability to ground water						