(Research Title)

Palestine International Aerotropolis

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ABSTRACT

Many airports around the world are diversifying their land use strategies to integrate nonaeronautical development. These airports embrace the “airport city” concept to develop a wide range of commercial and light industrial land uses to support airport revenues. The consequences of this changing urban form are profound for both airport and municipal planners alike and present numerous challenges about integration of airport and regional planning. While several tools exist for regional planning and airport operational planning, no holistic airport landside and regional planning tool exist. What is required is a planning support system that can integrate the sometimes-conflicting stakeholder interests into one common goal for the airport and the surrounding region. This research presents a planning support system and evaluates its application to a case study involving Brisbane Airport and the South East Queensland region in Australia.

Keywords: Spatial Decision Support Systems, Planning Support Systems, Land Use Planning, Airport Planning., urban design, Airport City design, Aerotropolis, airport-oriented development

Dedication

I dedicate this project:

To God

Almighty my creator, my strong pillar, my source of inspiration, wisdom, knowledge and understanding. He has been the source of my strength throughout this program and on His wings only have I soared.

To My great teacher and messenger

Mohammed (May Allah bless and grant him), who taught us the purpose of life,

To My homeland Palestine

The warmest place;

To My great parents,

who never stop giving of themselves in countless ways,

To my uncle (Eng.zhaer bsharat)

who stands by me when things look bleak

All the people in my life who touch my heart,

For anyone who believes in dreams.

Thanks and appreciation.

"الحمد لله رب العالمين حمدًا لشُكرهِ أداءً ولحقهِ قضاءً، ولحُبهِ رجاءً ولفضلهِ نماءً ولثوابهِ عطاءً "

I also extend my gratitude to those sincere people who have spared no effort in helping us in the field of scientific research, especially the distinguished

" DR.Ali Abdalhamid & DR.Zahra Zawawi "

on this study and their credit for guiding me and helping me in tis project.

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1 OVERVIEW

1.1 INTODUCTION.

Transportation infrastructure has always shaped the evolution and economic position of cities. First, our major cities largely grew around seaports. Next, urban development took place along rivers that formed the backbones of the industrial revolutions in Europe and the United States. Railroads opened landlocked interiors of nations, fostering a third wave of city growth outward from their main terminals. Then, the expansion of suburban roadway systems created a fourth wave of urban development.

Today, Prof. John Kasarda [1]defines airports as *"The Way Forward"* for 21st Century as the fifth wave of transit-oriented development, where large commercial airports have become significant drivers of business location and urban economic growth. In some cases, airports are relocating the metropolitan center: their surrounding areas attract major concentrations of business functions previously confined to metropolitan downtowns.

So that Airport planning is a systematic process used to establish guidelines for the efficient development of airports that is consistent with local, state and national goals. A key objective of airport planning is to assure the effective use of airport resources in order to satisfy aviation demand in a financially feasible manner. Airport planning may be as broad based as the national system plan or more centrally focused as an airport master plan for a specific airport. The primary types of airport planning may basically be classified as follows:

- National System Planning (NPIAS).
- State Airport System Planning (SASP).
- Metropolitan Airport System Planning.
- Airport Master Planning.

Aviation and airports are creating new urban power centers in the Middle East and Asia, challenging the likes of Frankfurt, London, New York and Tokyo in capturing global business. So instrumental is air connectivity to the growth of the commercial, financial, leisure and logistics sectors of Dubai and Singapore that both places may be legitimately described as global aviation hubs with city-states attached. They have, in fact, become full-fledged aerotropolis.

An aerotropolis is a metropolitan sub-region where the layout, infrastructure, and economy are centered on an airport which serves as a multimodal "airport city" commercial core which we will focus on it in this research.

2.3 HISTORY AND DEVELOPMENT OF AIRPORTS

[1] John D. Kasarda is an American academic and airport business consultant focused on global competitive strategy and aviation-driven economic development

The origins and history of airports

Flying beyond clouds have been always a dream for humans at the late 19th century. Everything started with the invention of airplane by the so-called Wright brothers. They managed to make the first powered, controlled and sustained human flight on December 17, 1903. Interesting point here is that before airports, airplane came first. "Airfield" term wasn't hard to construct and design on those years. Any flat ground with proper wind would have been suitable for those aircrafts (light, with a tail wheel and low engine power).

Air transportation shifted to be the most chosen type of transport and played a significant role in the mid-1910s. After 1920s, when the First World War ended, first flights were opened by the air carriers between big metropolitan cities such as Paris, London, and Prague. Regardless of these flights, firms didn't need to build bigger and more usable airports. Airports were functioning in the most common way that they can function such as having just a simple passenger building for passengers and hangars for working on the airplanes.

If we think about what a war can benefit human life, there is not much more to say. However, wars benefited civil aviation and air transport in a very good manner. After the World War II, in the beginning of 1940s, ground communications were highly damaged but surplus of military aircraft also available to use them for civil aviation.

In a short period of time, airports needed to be reconstructed under the needs of aviation and new aircrafts. First affected part of the airports were the runways. As airports were started to be used much more frequently than in the past, runways needed to be more durable, paved and longer depending on the aircraft's needs. Consequently, big international airports started to have complex runaway systems to operate more efficiently. Demand on airports increased and terminal facilities were insufficient to meet demand. Other than services required for the processing of passengers, first non-aeronautical services were constructed, such as toilets, restaurants and duty-free shops in the borders of airport. Indeed, the need of such non-aeronautical services and the demand of those services right in the airport terminal were the first steps on the road of Airport City

During the development of aircrafts and airports until the end of the 1970s, airports were needed to be selected based on performance and geometrical characteristics of the aircraft t (Kazda & Caves, 2007) However, today, these circumstances have been changed and airports started to be the core utilities for cities.

1.2 RESEARCH PROBLEM

MOVEMENT RESTRICTIONS ON PALESTINIAN.

Israel has implemented strict travel restrictions in and outside the occupied Palestinian territories for decades, making it difficult for Palestinians to leave, return and travel through the areas.

Although the Israeli restrictions imposed on the movement of Palestinian people to/from/within the OPT [2]existed after the Oslo [3]Accords of 1994, they were intensified following the outbreak of the second Intifada in September 2000. Israel began to impose harsh through a complex, stringent system of checkpoints, physical obstacles, closures, fences, and walls. This led to the centonization of the OPT and the fragmentation of the Palestinian economy (World Bank, 2007).

In 2002, Israel began constructing a 708-kilometer-long Barrier, which already has had a profound impact on the contiguity of Palestinian communities and traditional market channels in the West Bank. The International Court of Justice (ICJ, 2004), the principal judicial organ of the United Nations, in its advisory opinion, on 9 July 2004, on the Legal Consequences of the Construction of a Wall in the Occupied Palestinian Territory, indicated that the sections of the Barrier route which ran inside the West Bank, including East Jerusalem, together with the associated gate and permit regime, violated Israel's obligations under international law.

More than 10 years after the commencement of the construction of the Barrier, movement and access for Palestinians is increasingly channeled through secondary roads, tunnels and underpasses constructed by the Israeli authorities especially for Palestinians, to force them not use direct routes that pass near existing illegal Israeli settlements and the exclusive roads for Israelis (OCHA, 2009). This combination of movement restrictions has inflicted serious damage on the Palestinian economy, increased transport and transaction costs, blocked access to international and local markets, precipitated massive unemployment, reduced incomes, and cultivated tension and frustration. A concrete example that highlights the impact of the Separation Barrier is the status of the city of Bir Nabala, which was a key center for wholesale trade and supply to Jerusalem and the West Bank. It has been isolated from other cities and lost many sale dealers because of the construction of the Separation Barrier and the resulting hike in transportation costs (CCDPRJ, 2008). Trade and exchange of goods between Palestinian cities is severely impacted by the Separation Barrier. Similarly, Palestinian farmers in the Jordan Valley, who are now obliged to use longer roads and pass through check points, face additional transportation cost in the range of $2 million annually, which reduces the competitiveness of Palestinian products (UNCTAD, 2013).

Entering and leaving occupied Palestinian territories is also difficult for Palestinians. The border with Egypt is rarely open and has a waiting list of 30,000 people. Passage

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occupied Palestinian territory [2]

Oslo:, is an agreement signed between Israel and the state of Palestine Liberation [3]
,Organization (PLO) on September 13, 1993

through the northern border is up to Israeli officials' discretion. Travel between the Gaza Strip and the West Bank is extremely difficult. Traveling through Jordan has become more restrictive this year, as more travel permits are denied. Many of the people who attempt to leave are students or people seeking medical treatment.

Entering occupied territories as a foreigner is also difficult, even for Palestinians who were born or are living abroad. U.S. citizens report that they've faced discrimination for attempting to travel to occupied territories, and detention and interrogation are not uncommon. It's particularly challenging for activists and journalists to enter the territories.

"The stability of geography and the continuity of land – these have completely disappeared from my life and the life of all Palestinians. If we are not stopped at borders, or herded into new camps, or denied reentry and residence, or barred from travel from one place to another, more of our land is taken, our lives are interfered with arbitrarily, our voices are prevented from reaching each other, our identity is confined to frightened little islands in an inhospitable environment of superior military force sanitized by the clinical jargon of pure administration."
Said 1985

Over the years, tens of thousands of Palestinians who have sought to go abroad through the allenby crossing to Jordan, have had their permits rescinded or their applications rejected after being blacklisted by the Israel Security agency. No reasons are given for the rejection, and restrictions are usually instituted without prior warning. as a result, many Palestinians only learn about the restrictions when they attempt to cross a checkpoint and are blocked.

Freedom of movement is a human right, yet the individual permit regime makes it a privilege to be granted or denied by Israeli authorities as an exception to the norm. freedom of movement must not be made dependent on any particular purpose or reason.

1.3 THE IMPORTANCE AND JUSTIFICATIONS OF RESEARCH

SEVERAL THINGS MAKE THIS RESEARCH MORE THAN USFEL.

Research is significant when it pertains to something important, and when it provides new knowledge or insights within a field of knowledge so the benefit, contribution or 'significance' of this research:

1. To provide a graphic representation of future airport development and anticipated land use.
2. The location process of a major international airport and The justification of the need for a new airport.

3. To establish a realistic schedule for implementation of the proposed development.
4. To identify a realistic financial plan to support the development.
5. To validate the plan technically and procedurally through investigation of concepts and alternatives on technical, economic and environmental grounds.
6. To prepare and present a plan to the public that adequately addresses all relevant issues and satisfies local, state and federal regulations.
7. To create a design for the airport development by portraying planned facility growth.
8. To establish a framework for a continuous planning process.
9. Key objective of airport planning is to assure the effective use of airport resources to satisfy aviation demand.
10. To meet the near and long term needs for planning in Palestine state.
11. The instruction through which the airport promoter can ensure that growth upholds safety requirements and airport design standards and is fully reliable with airport and community land use plans.
12. Efficient tool for the airport supporter, particularly its maintenance staff and growth.
13. To plan the larger scale outlook drawing of prevailing and buildings, hangars, parking lots, planned aprons, and other landside facilities engrossed in the development of area rounded airport.

1.4 OBJECTIVE AND MOTVATION

MAIN OBJECTIVE OF THE RESEARCH.

The main aim of this research is to present current design framework of Airport Cities on Palestinian Land based on planning analysis ,criteria and studies. which then can be evaluated and improved in terms of urban design. The importance and difficulty of this study starts from the lack of studies that have been done since today in this field. It is hardly tried to concentrate on the discussion of spatial quality of Airport Cities and how it can be improved by looking current examples.

There's several details objective to serve the main ones which is:

1- SOCIAL AND CULTURAL OBJECTIVE:

A. Increase in people's mobility.

Airports function anchor a new aerotropolis model of economic development, that promises to "shape business location and urban development in the 21st century as much as highways did in the 20th century, railroads in the 19th and seaports in the 18th".

ACCORDING TO JOHN KASARDA AND GREG LINDSAY,

B. Education opportunities inside (aircraft education) and outside (student opportunities).
C. Faster & possibly more communication with the West.
D. Promote local culture to visitors.

2- ECONOMIC OBJECTIVE:

A. Increased speed of trade (due to faster means of transportation).
B. Possible increase in amount of imports & exports.
C. Passenger transportation
D. Commencement of tourism industry
E. Increase in local employment opportunities (people can work at the airport OR since some people may come to set up businesses there will be more jobs available).

3- POLITICAL OBJECTIVE:

A. A sustainable resistant weapon in case of state weakness and war.
B. Unblocking Israel occupation siege on boundary of Palestine.
C. Eliminate hard travel through bridges and Israeli security inspections.

4- MILITARY OBJECTIVE:

A. Establish army base
B. Establish flying school.

1.5 RESEARCH QUESTIONS

This study sought to answer the following questions:

Main Questions Airport City concept become clearly a powerful solution for metropolitan cities to boost their economy and urban development. Airports have been seen only as transfer stations and were located to periphery sides of cities since first times. However, today, airports become a major catalyzer for urban and economic growth which gradually made them to be a vital part of cities. The main hypothesis of the thesis is that urban design should have a role in planning an Airport City. Within this scope, this research aims to find the answer of following question: “What should be the design framework for Airport Cities in order to create more urban spaces?” To develop such a framework, it is important to analyze Airport City structure in terms of urban design guidelines.

With respect to main question and hypothesis of this study, this thesis aims to respond to the below questions by analyzing four cases which formed under different design principles:

a) What are the main design criteria that should be evaluated for Airport City?
b) What are the various land uses within the vicinity of Airport and their impact on the Airport?
c) What are the design perspectives for Airport City development?
d) Is there a single solution for any case in the world that can be applied?
e) What is impact of Airport on other land uses within its vicinity?
f) What is the land requirement for the ultimate development of Airport?
g) How can airport planning principles have integrated in the physical development of the land uses within the vicinity of the Airport?
h) What are the essentials in designing an Airport City?
i) Do Airport Cities correspond to their main characteristics in terms of design?

1.6 DEFINITION OF KEY TERMS AND CONCEPTS

This section defines key terms that will be used in the study.

1.6.1 Urban Planning and Land uses.

Urban planning in a broader sense refers to planning the spatial structure of activities and land uses in an urban area. The land uses are the ways people utilize land to meet their needs. The use to which land is put in urban areas is therefore often influenced by availability of infrastructure and service networks. The land uses, and activities take place on land and occupy space. They also interact and interrelate with each other in space, hence, the need for a spatial pattern to guide their operations. The planned spatial pattern is supposed to ameliorate the pattern that may exist. This is done through land use planning which consequently brings about improvement in that spatial arrangement to facilitate more efficient and effective operation in response to human needs.

1.6.2 Aeroplan reference field length.

The minimum field length required for take-off at maximum certificated take-off mass, sea level, standard atmospheric conditions, still air and zero runway slope. Field length means balanced field length for Aeroplan's, if applicable, or take-off distance in other cases.

1.6.3 Dependent parallel approaches.

Simultaneous approaches to parallel or near-parallel instrument runways where radar separation minima between aircraft on adjacent extended runway center lines are prescribed.

1.6.4 General aviation

All civil aviation operations other than scheduled air services and non- scheduled air transport operations for remuneration or hire.

1.6.5 Usability factor

The percentage time during which the use of a runway or system of runways is not restricted because of the cross- wind component.

1.6.6 Aerotropolis

An urban complex whose layout, infrastructure and economy are centered on an airport. The airport city is functions as the multimodal core of the aerotropolis, in the way that the central business district does to the metropolis.

1.7 RESEARCH PLAN AND METHODOLOGY

The systematic, theoretical analysis of the methods applied to this study.

The methodology employed in an experiment is essential to its success, this methodology comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge on main three framework:

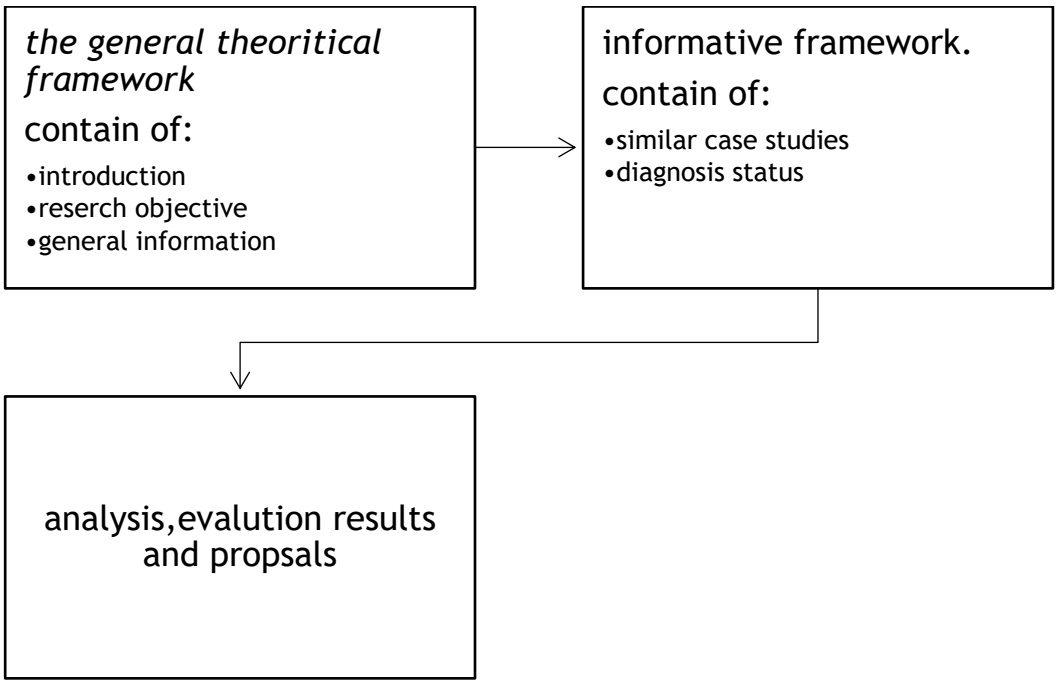

Figure 1: methodology of research.

1. the general theoretical framework: It includes the studies that discuss the main concept and definition of the aerotropolis and how it's compatible with the idea of the international airport in Palestine and what are the main principles and guidelines for planning airport and how to apply these principles plus of Reviewing documents discussed deeply the philosophy of

airport aspect and Viewing Place making approach and some example about it.

2. Informational framework: It includes all the information regarding the concept of aerotropolis and the principles of applying airport in Palestine and the planning projects methods (plans, photos, maps…).

3. Analytical and deductive framework: Methodology used in this study is a phenomenological approach to focused on the data available about the study area to set up the strengths, weaknesses, opportunities and threats (SWOT) in the study area, then we can determine the real potential in Palestine.

1.8 DATA SOURCES

the source of the data.

During data collection phase, information will be gathered and then classified to fit with the research objectives and expected outputs from different scours:

1. Libraries: two kinds of libraries were used to collect data from Library of the university and Online Libraries, it includes Master researches official books, Papers .
2. Official Sources: Studies and reports which are done by Ministry of local government and (Geo-Molg).
3. Semi-official Sources: Researches and studies which are done by Research offices, Department of planning, universities.
4. Internet: is an essential source since it does not waste time searching for a piece of information instead of getting it from the field by yourself.
5. Personal Resources: Interviews, surveys and questionnaires. Research tools are mainly (GIS, Internet, Academic website which publish researches).

2 CONCEPTUAL AND THEORITICAL BACKGROUND

2.1 INTRODUCTION

This chapter explains the path of a research and grounds it firmly in theoretical constructs. The overall aim of the two frameworks is to make this research findings more meaningful, acceptable to the theoretical constructs in the research field and ensures generalizability. They assist in stimulating while ensuring the extension of knowledge by providing both direction and impetus to the research inquiry.

which provides a general overview and history of airports, it is tried to be discussed planning and development perspective of airports. Standards have been given in this part which are internationally accepted guidelines for airport planning. Also, land use patterns around airports have been categorized under certain most used land uses and described with conceptual schemes. In addition, this chapter presents general information about Palestinian Aviation's history.

" Air transportation sector includes airway management, airport management, air traffic control service, ground control and catering services, education, maintenance, infrastructure and superstructure, coordination and supervision of other aviation activities in terms of international requirement",

STATE PLANNING ORGANIZATION (DPT) IN TURKEY,

2.2 THE FUTURE OF AIR TRANSPORTATION

Transportation system in our cities.

Transportation system is fundamental and necessary component to the economy of any region. The movement of people and goods leads to trade and commerce between markets, which in turn, lead to jobs, earnings, and overall economic benefit for a community's residents. Even though there are a variety of transportation modes, such as automobiles, trucks, ships and railroads, perhaps no other mode has a significant an impact on intercity trade and commerce than aviation. Travel in the aviation system allows for intercontinental travel of large volumes of passengers and cargos in relatively short periods. Access to markets around the world has resulted in the largest communities reaping extraordinary economic benefit. Airports are gateways to nations' aviation system, providing access to air transportation for the surrounding community. Commercial air carriers provide access to air transportation between major metropolitan areas of the country. Thousands of smaller cities, towns and villages have access to aviation by way of airports serving general aviation .

The airport has become vital to growth of business and industry in a community by providing air access for companies that must meet demands of supply, competitions

and expanding marketing areas. Communities without airports or sufficient air service have limitations placed on their capacity for economic growth .

Airports, related aviation, and non-aviation business located at the airport represent a major source of employment for many communities around the country. The wages and salaries paid by airport related business can have a significant direct effect on the local economy by providing means to purchase goods and services while generating tax revenue as well. Local payrolls are not only a measure of an airport's economic benefit to community. In addition, employee expenditure generates successive waves of additional employment and purchases that are more difficult to measure but nevertheless substantial .

In addition to the local direct economic activity generated by the regular expenditure of resident employees, the airport also stimulates the economy indirectly using local services for air cargo, food catering to airlines, aircraft maintenance, and ground transportation on and around the airport. Regular purchase of fuel, supplies, equipment, and other services from local distributors inject additional income in to local community. Also, earnings from direct and indirect economic generators further act to recycle money within the local community, dollars pass from one person to another. The multiplier effect operates in all cities as aviation-related dollars are channeled throughout the community .

An airport provides an additional asset to the general economy by generating billions of dollars by year in state and local taxes. These tax dollars increase the revenue available for projects and services to benefit the residents of each state and community. Whether the extra tax dollars improve the state highway system, beautify state parks, or help prevent tax increase, airport-generated tax dollars work for everyone .

Cities with good airport facilities also profit from tourist and convention business. This can represent substantial revenues for hotels, restaurants, retail stores, sports and rental cars and local transportation, among others. The amount of convention business varies with size of the city, but even smaller communities show a sizable income from this area .

Beyond the benefits that an airport brings to the community as transportation facility and as a local industry, the airport has become a significant factor in the determination of real estate values in adjacent areas. Land located near airports almost always increases in value as local economy begins to benefit from the presence of the airport. Land developers consistently seek land near airports, and it follows inexorably that a new airport will inspire extensive construction around it .

2.3 HISTORY AND DEVELOPMENT OF AIRPORTS

The origins and history of airports

Flying beyond clouds have been always a dream for humans at the late 19th century. Everything started with the invention of airplane by the so-called Wright brothers. They managed to make the first powered, controlled and sustained human flight on December 17, 1903. Interesting point here is that before airports, airplane came first. "Airfield" term wasn't hard to construct and design on those years. Any flat ground with proper wind would have been suitable for those aircrafts (light, with a tail wheel and low engine power).

Air transportation shifted to be the most chosen type of transport and played a significant role in the mid-1910s. After 1920s, when the First World War ended, first flights were opened by the air carriers between big metropolitan cities such as Paris, London, and Prague. Regardless of these flights, firms didn't need to build bigger and more usable airports. Airports were functioning in the most common way that they can function such as having just a simple passenger building for passengers and hangars for working on the airplanes.

If we think about what a war can benefit human life, there is not much more to say. However, wars benefited civil aviation and air transport in a very good manner. After the World War II, in the beginning of 1940s, ground communications were highly damaged but surplus of military aircraft also available to use them for civil aviation.

In a short period of time, airports needed to be reconstructed under the needs of aviation and new aircrafts. First affected part of the airports were the runways. As airports were started to be used much more frequently than in the past, runways needed to be more durable, paved and longer depending on the aircraft's needs. Consequently, big international airports started to have complex runaway systems to operate more efficiently. Demand on airports increased and terminal facilities were insufficient to meet demand. Other than services required for the processing of passengers, first non-aeronautical services were constructed, such as toilets, restaurants and duty-free shops in the borders of airport. Indeed, the need of such non-aeronautical services and the demand of those services right in the airport terminal were the first steps on the road of Airport City

During the development of aircrafts and airports until the end of the 1970s, airports were needed to be selected based on performance and geometrical characteristics of the aircraft (Kazda & Caves, 2007[4]). However, today, these circumstances have been changed and airports started to be the core utilities for cities.

[4] Kazda - Airport Design and Operation (Elsevier, 2007)

2.4 HISTORY OF AIRPORT ON PALESTINE.

PALESTINIAN CASE.

Once upon a time, Palestine had its own int'l airport.

Long ago in 1920 Qalandia Airport (Jerusalem Airport) is a regional airport, located between Jerusalem and Ramallah was opened. it was the first airport in the British Mandate for Palestine.

PICTURE1 : QALANDIA AIRPORT

Royal Jordanian and Middle East Airlines were known to operate daily commercial flights to and from Qalandia airport before 1967 under the Jordanian occupation. After Israel occupied the West Bank after the Six-Day War in 1967, the airport fell under Israeli control. Arkia and El Al Israel Airlines operated daily commercial flights to and from the airport between 1967 and 2001 when the airport was closed to the civilian traffic after the breakout of the Second Intifada in 2000.

Yasser Arafat International Airport, formerly Gaza International Airport, is in the Gaza Strip.

The Palestinian Airlines was founded in 1995 and started operating on July 23, 1997 with a series of flights from Al Arish in Egypt, to Jordan, Saudi Arabia, and the UAE.

The only Palestinian owned aerial way out for the people of Gaza was no more.

PICTURE3 : Palestinian Airlines Boeing 727-200 at Dubai International Airport, U.A.E(.1999)

At one point, it had a handling capacity of 700,000 passengers per year and operated 24 hours, 364 days a year. It gave the people of the Gaza strip better access to the world outside their narrow, densely populated confines.

the long-awaited airport didn't last long though; it ceased operations during the Second Intifada on October 8, 2000. The radar station and control tower were destroyed by the Israeli Air Force on

December 4, 2001. The airport closed in 2001 after sustaining heavy damages by the Israeli army.

Long ago in 1920 Qalandia Airport (Jerusalem Airport) is a regional airport, located between Jerusalem and Ramallah was opened it was the first airport in the British Mandate for Palestine.

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From that moment until now, the Palestinian territories stand without an international airport. This absence had many economic, social and political effects, this project aims to establish the bases and criteria for selecting an international Palestinian airport from several aspects such as the site, the general plan, land use changes, and many planning criteria that should be studied to add a huge project that can make the civilizational development of the State of Palestine.

2.5 THE NEED OFAIRPORT IN PALESTINE

The airport impotence in Palestinian communities.

There's several details need that Palestine missing du to absence of airport

SOCIAL AND CULTURAL OBJECTIVE:

E. Increase in people's mobility.
F. Education opportunities inside (aircraft education) and outside (student opportunities).
G. Faster & possibly more communication with the West.
H. Promote local culture to visitors.

ECONOMIC OBJECTIVE:

F. Increased speed of trade (due to faster means of transportation).
G. Possible increase in amount of imports & exports.
H. Passenger transportation
I. Commencement of tourism industry
J. Increase in local employment opportunities (people can work at the airport OR since some people may come to set up businesses there will be more jobs available).

POLITICAL OBJECTIVE:

D. A sustainable resistant weapon in case of state weakness and war.
E. Unblocking Israel occupation siege on boundary of Palestine.
F. Eliminate hard travel through bridges and Israeli security inspections.

MILITARY OBJECTIVE:

C. Establish army base
D. Establish flying school.

2.6 AIRPORT CITY "AEROTROPOLIS"

The concept of airport city.

The 'Airport City' concept acknowledges the notion that large airports take the characteristics of a real city. They develop non-aeronautical services far beyond the core business of providing a location for passengers. Airports have not only become catalyst for employment and economic growth, but they have attracted a full range of businesses to the airport vicinity, which are reminiscent of the way seaports and river deltas become centers of economic activity in past centuries. Modern airports are becoming meeting places and indeed a destination, with corporations scheduling meetings at or near airports to maximize the available time of their managers.

An airport city is the ultimate transit-oriented development [5](TOD) strategy. It is best described as an airport centric city. The airport is at the heart of the city and is serviced by good access links from all modes of transport. The airport city is an interchange with access to global, regional and local markets. An airport city is spatially much larger than a traditional airport. In fact, an airport city extends beyond the airport boundary and incorporates surrounding land not owned or controlled by the airport. Finally, an airport city is not limited to aeronautical activities and has a broad spectrum of non-aeronautical activities (Stevens, 2006, Kasarda, 1996). Although the airport city concept was first described by Conway (1980) almost three decades ago, it has only recently been adopted as an industry standard.

The privatization and corporatization of airports has had the greatest influence on the land use composition of the modern airport and in turn the surrounding region. Privately controlled airports have more flexibility than their public owned

[5] A transit-oriented development is a type of urban development that maximizes the amount of residential, business and leisure space within walking distance of public transport

predecessors. This means that modern airports have been operated and developed to maximize investor return with little interference from government. Therefore, because of the privatization of airports, planning efforts have focused on increasing an airport's competitive advantage over other airports (de Neufville and Odoni, 2002).

The airport city is a way to commercially exploit an airport's vacant land reserves to provide new revenue streams for airport operators. On airport developments like car parks, office precincts, retail outlets and freight hubs have replaced much of the traditional green buffers on airport land. Indeed, revenue from non-aeronautical development (i.e., terminal concessionaires, car parking, investment property, commercial land developments, and sale of assets) has at many airports worldwide surpassed the revenues generated from aeronautical activity (Wells & Young, 2004). [6]

Increasingly, the development of business and technology parks and retail complexes is a preferred commercial strategy at airports where suitable land assets exist, and where landside access infrastructure will allow such development. Although it may be recognized that even without accounting for accessibility, a growing number of airport business parks are gaining popularity as an airport commercial strategy (SGS Economics and Planning, 2003).

Many hotel chains report that airport hotels are among their most profitable properties, due not only to high demand for rooms, but for revenues generated from conference services and catering. Airport cities are usually located only partially on land belonging to the airport, but also on off-airport land, a situation which many entail land use planning.

Airports which offer a greater choice of flights and destinations, more frequent service and more flexibility in rescheduling (that is, they possess the most efficient physical Internet) have become especially valuable to firms and metropolitan regions that depend as much on "economies of speed" as others do on economies of scale or economies of scope. Operating as an "urban pipe" that minimizes the friction of distance, the aerotropolis provides these firms a speed advantage.

Airport city developments also draw on the non-travelling public to generate an increasing proportion of commercial revenue. These developments are often identifiable beyond the airport's boundary as regional commercial investors see the benefits of locating near the developing airport city. This has important implications for the municipality responsible for planning the area surrounding the airport. Little

.Airport planning & management / Alexander T. Wells, Seth B. Young [6]

attention has been given to these districts surrounding airports, and few town planning authorities understand how to plan development to best leverage this economic resource, and how it may fit into broader transportation and regional land use planning (Blanton, 2004).

Finally and perhaps more importantly given the current global economic downturn, the airport city should provide greater resilience through its diverse revenue streams. This could provide a significant difference to the overall profitability of an airport which is operating in a climate where airlines are going out of business daily.

"WHAT, EXACTLY, IS AN AEROTROPOLIS"?

Simply stated, an aerotropolis is a metropolitan subregion whose infrastructure, land use and economy are centered on an airport. It consists of an airport's aeronautical, logistics and commercial elements, and it connects transportation infrastructure with clusters of aviation-oriented businesses and residential developments that continually feed off each other and their proximity to the airport .

The chief value of the aerotropolis is that it offers businesses rapid connectivity on a massive scale. Aerotropolis firms, many in the high-tech and advanced business-service sectors, are often more dependent on distant suppliers, customers and enterprise partners than those located in their own metropolitan region. For these firms, **Time Is Not Only Cost — It Is Also Currency**.

By providing these firms with rapid long-distance accessibility, the aerotropolis helps them cut costs, increase productivity and expand market reach, thereby becoming more competitive and participating more effectively in the international division of labor. Metropolitan and regional trade in high-value goods and services is accelerated through airline routes that operate as a "physical Internet," moving products and people quickly over long distances, just like the digital Internet moves data and information.

PICTURE4 : Xi'an Aerotropolis -china

Corporate headquarters are gravitating to airport areas as well. Research at MIT (Massachusetts Institute of Technology) has shown that over half of the Fortune 500 headquarters are located within 10 miles of U.S. airport hubs. This compares to 29 percent of all U.S. business establishments.

As increasing numbers of aviation-oriented businesses and commercial service providers cluster around airports, these areas are becoming significant urban growth nodes where air travelers and locals alike work, shop, meet, exchange knowledge, conduct business, eat, sleep and are entertained, often without going more than 15 minutes from the terminals. An airport city evolves on and immediately around the airport, serving as the multimodal, multifunctional central business district of an extended aerotropolis, anchoring aviation-enabled trade in goods and services and driving it throughout the broader metropolitan region.

Spatially, just as the traditional metropolis is made up of a central city and its suburbs, the aerotropolis consists of an airport city at its core and outlying corridors and clusters of aviation-linked businesses and their associated residential developments. Some of these clusters are substantial and can be observed up to 20 miles from the busiest hub airports.

No aerotropolis will look exactly like this illustration, but many will eventually take on similar features, led by newer "greenfield" airports on metropolitan peripheries that are much less constrained by internal space and prior decades of adjacent development.

The aerotropolis is a much more dynamic, forward-looking concept than a static, antiquated airport that was developed well before aviation and airports took on their current functions. Multimodal transportation infrastructure (air, highway, rail and links to ports) will connect aerotropolis businesses to markets near and far, undergirding the aerotropolis' economic significance in the decades ahead.

The "Aerotropolis Age," with aviation and airports increasingly determining the urban winners and losers in 21st century globalization, has already commenced. It will have immense ramifications for the business and competitive futures of our major cities and their broader metropolitan regions.

2.7 AIRPORT CITY PLANNING

Airports have a potential of shaping the geography of the urban areas.

Increase in the volumes of passengers and freight traffic since the beginning of 1980s has caused many airports to exceed their capacities, leading enlargements in technical and service facilities. In United States, many airports are planning to expand their

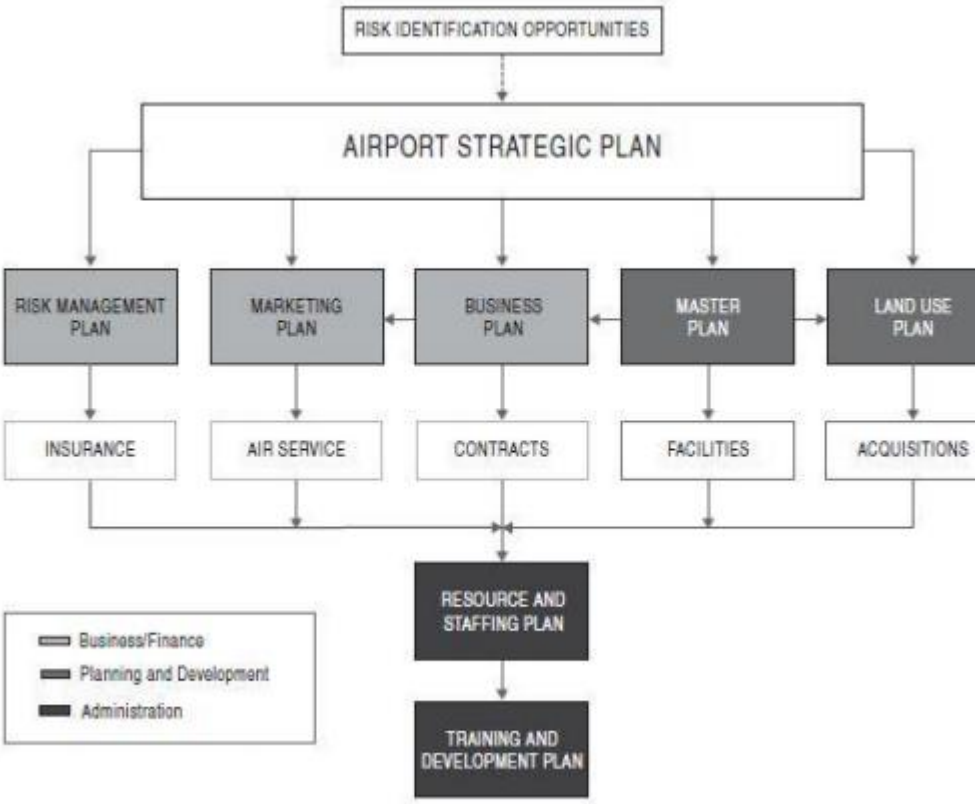


Figure 2 : Interrelationship of airport planning processes (ACRP Report 20 - Strategic Planning in the Airport Industry, 2009)

capacities on the basis of the FAA's plan to modernize the National Airspace System over 2025. Airport expansion has been always a concern for governments due to limited open space and incompatible land uses around airports. Noise issue has been one of

the most sensitive and critical concern in airport development because of noise-sensitive urban areas such as hospitals, residential communities and educational institutions. Correspondingly, Kelly (1997) emphasized that airports caused residents, living around them to gain a negative impression about airports. Regardless of such a negative reaction, airports continue to expand their boundaries to locate new industrial usages with new employment opportunities. These workplaces mostly consist of businesses that are mostly dependent on-air transportation to increase their profit by reducing transportation costs (Li et al., 2007). In this manner, the more employment opportunities around the airports attract the more residents near airports to minimize their commuting time. As a result, new schools, hospitals, commercial and religious facilities are developing immediately (McMillan, 2004).

Airports have a potential of shaping the geography of the urban areas as central railway stations did in the past. This power of airports mostly depends on the keyword 'accessibility'. Investments which have been done to increase accessibility improve connections between airport and its surroundings. At first, landside access is

the most important part of accessibility. Ground transportation determines the airport growth. Secondly, it is essential to provide similar access standards for an airport city just like a city. Thirdly, it is crucial to provide appropriate means of public transportation to make the airport compete with the rapid formation of poly-centric metropolitan areas (Figure 1).

2.7.1 AIRPORT MASTER PLAN

Federal Aviation Administration (2015) defines the master plan as the strategy for the future development of the airport. Besides, the plan should consider all developments which are both in and out of airside and possible socio-economic and environmental factors. The following guidelines should be included:

• Development of facilities,

• Development of land uses in the airport vicinity,

• Determination of impacts of airport construction on the environment,

• Determination of airport ground access (International Civil Aviation Organization, 1987).

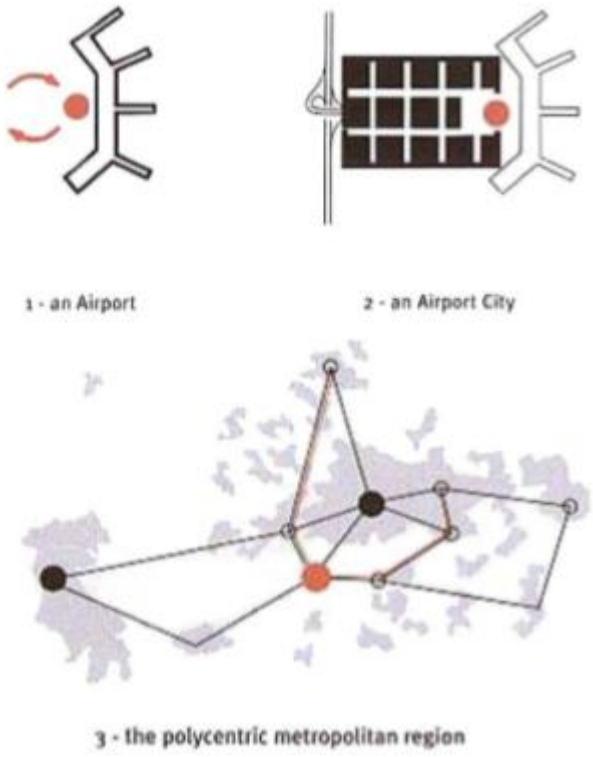


Figure3 : accessibility of an airport

Strategic planning of airports is much more compressive than master planning. Strategic planning gives a background to master plan about the airport's vision while master plan clarifies the facilities and reserved space according to the vision of the airport (ACRP Report 20, 2009). Airport master plans are approved by the local governmental agencies or authorities which own and/or operate the airport. Airport master plans need to be updated regularly to measure necessary maintenance services, development, expansion, and modernization levels on local, regional and national basis

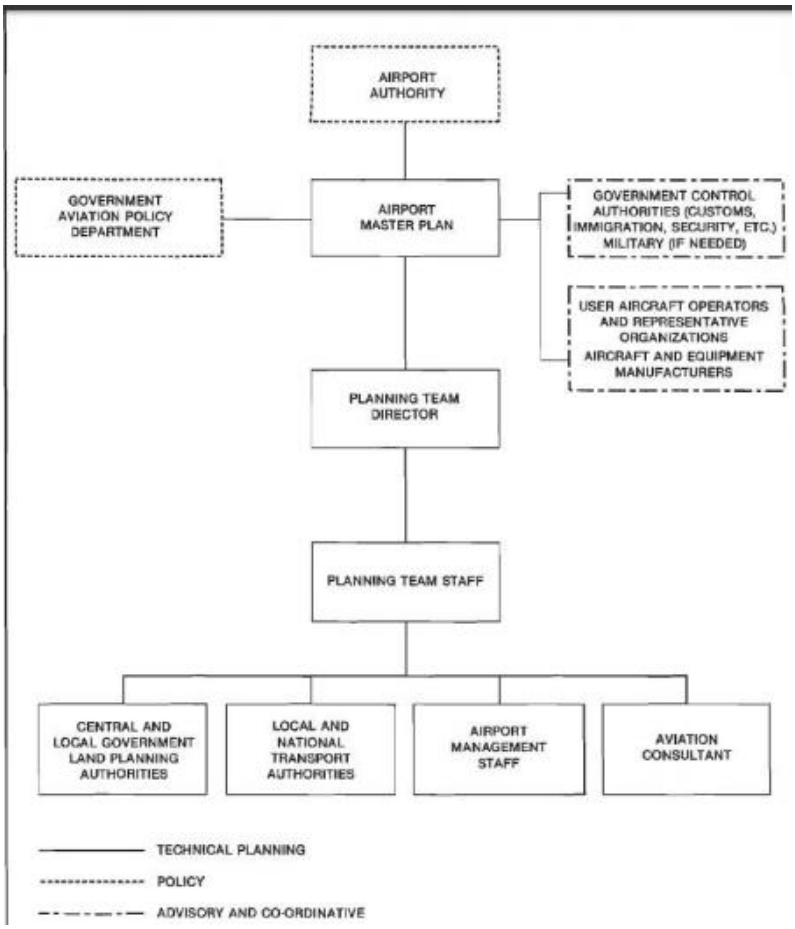


Figure 4 Typical airport master planning organization (International Civil Aviation Organization, 1987)

2.7.2 LAND-USE PLANNING

Land-use planning may include on-airport and off-airport components which are compatible with master plan. Off airport part of the airport development becomes more crucial in today's new planning concepts such as Airport City and Aerotropolis. Planning both on and off-airport developments gives good results in terms of noise and environmental impact controls. It is advised that off airport planning should be finalized in coordination between central and local governments, regional planning agencies, local residents and other interested stakeholders. Land-use plans, developed before off airport planning, should be taken into consideration (Florida Department of Transportation Aviation Office, 2010).

Land use planning for an airport is a comprehensive planning. In on-airport planning the way which runways, taxiways, and approach zones are planned becomes significant to configure the land uses around airports. Airport planning, policies and programs must be carried out in coordination with the objectives, policies and programs of the master plan of airport. It is important to integrate transportation facilities and public services with patterns of residential and other major land uses depending on the size, location and configuration of the airport (Young & Wells, 2004).

Table 1 shows how different commercial activities been effected by potential concerns. Such tables should guide planners to what they should do and what would be the results of such developments in long term. It is just an overview of topics which to begin an evaluation of choosing suitable land use on a case-by-case basis for every community.

Table 1 : Land use compatibility chart for commercial activities (Mead & Hunt, 2004)

Land Uses	Noise Sensitivity	Concentration of People	Tall Structures	Visual Obstructions
Commercial Activities				
Eating and Drinking Establishments	I	I	P	P
Quick Vehicle Servicing Uses	N	P	N	P
Office Uses (i.e., business, government, professional, medical, or financial)				
Low-Rise (2-3 Levels)	I	P	N	P
Mid-Rise (3-12 Levels)	I	I	P	P
High-Rise (12+ Levels)	I	I	I	P
Retail Uses (i.e., sale, lease, or rent of new or used products)				
Sales-Oriented *Personal Service-Oriented* *Repair-Oriented*	P	P	P	P
Hospitality-Oriented (hotels, motels, convention centers, meeting halls, event facilities)	I	P	P	P
Low-Rise (2-3 Levels)	I	P	N	P
Mid-Rise (3-12 Levels)	I	I	P	P
High-Rise (12+ Levels)	I	I	I	I
Outdoor Storage and Display-Oriented	P	P	N	P
Surface Passenger Services (i.e., passenger terminals for buses, rail services, local taxi and limousine services)	P	I	P	P
Vehicle Repair Uses (i.e., vehicle repair or service shops, alignment shops, tire sales)	N	P	N	P

I = Impact; **P** = Possible Impact; **N** = No Impact.

2.7.3 STRATEGIC PLANNING:

Strategic planning is defined as the process preparation of an organization strategy or direction of the way how to allocate its resources to follow that strategy (Mintzberg et al., 2013). As it is generally described as a long-term process, there should be revision of strategies in certain periods of time. Airport strategic planning process can be defined in four main phases: preplanning, analysis/evaluation, implementation/execution and monitoring (ACRP Report 20, 2009). These steps are considered to be the same for all airport strategic plans regardless of airport size or type. The amount of data to be collected, reviewed, and analyzed may vary

depending on organization's size and complexity, the amount of effort and time used in planning process, and the number of stakeholders involved in planning process (ACRP Report 20, 2009).

2.7.4 AEROTROPOLIS

Aerotropolis is an urban form which is shaped around an airport city (Kasarda, 2008). This form is a very similar looking to the traditional metropolis. Basically, it is an area of high density developments stretching up to 25 km in radius from the airport in its core (Menon, 2014). Aerotropolis comprises aviation-oriented businesses and their associated residential developments besides the airport city core. For example; retail, hotel and entertainment centers, set of airport-linked business parks, industrial and logistics parks, information and communications technology complexes, wholesale merchandise marts and residential developments make this model to operate as a consistent form of development in itself. In addition, its economic impact may also reach up to 95 km from the major airports.

Kasarda's airport development model is being used for today's major airports. Some airports choose to even rebuild their system around aerotropolis model. The reasons lying behind this process are the followings;

- Logistics centers for freight,
- Business centers,
- Shopping and entertainment facilities,
- Accommodation and service providers

Main factor in aerotropolis development is speed which becomes a very important aspect of today's businesses and life. New economies also demand connectivity and agility to use speed efficiently. Kasarda (2008) defines this development as the form which follows function and continues as follows:

> *"Airport expressway links (aerolanes) complemented by airport express trains (aerotrains) bring cars, taxis, buses, trucks and rail together with air infrastructure at the multi-modal commercial core (the Airport city). Aviation-linked business clusters and associated residential developments radiate outward from the airport city, forming the greater aerotropolis."*

A similar definition was made by Le Corbusier (1987) in the 1920s for the existence of the skyscrapers accompanying multi-nodal grand central station. He mentioned the keyword 'commerce' for such an urban form which was highly depended on the speed and said that "the city which can achieve speed will achieve success" (Le Corbusier, 1987).

Three important aerotropolis principles are defined by Freestone (2009);

1. Clustered development rather than ribbon one,

2. High quality design standards,

3. Beautification of airport gateways.

Kasarda (2010) suggests some planning principles of this model to make more city-friendly. A good infrastructure planning can change our way of living;

• Aerolanes and Aerotrains should connect aerotropolis with regional business and residential areas.

• Trucks-only roads should be added to give more priority to non-freight traffic.

• Time-cost efficiency instead of distance-cost should be counted as the primary planning measurement metric between key nodes.

• In planning the location of businesses, it is important to evaluate frequency of uses for each business, to maximize time-cost access and minimize congestion.

• Activities, such as manufacturing, warehousing and trucking, should be spatially segregated from whitecollar service facilities and airport passenger flows.

• It is important to place sensitive commercial and residential developments outside of high intensity flight paths to control noise and air pollution.

• It is important to have sufficient green space. Cluster development along airport corridor is more capable of creating green space than any other strip development.

• Landmark is one of the 'Lynch's Five Elements' for the city (Lynch, 1960). Iconic structures and architectural features are important to make way-finding easier and place-making better.

• Housing areas, which serve for airport area workers and frequent air travelers, and also hotels, should be designed to provide necessary local services and a sense of neighborhood (Kasarda, 2010).

Aerotropolis should be considered together with sustainable smart growth. The most important part in planning such a huge development is to know how to build such environment in a best sustainable way. Kasarda (2010) emphasized that new urbanism guidelines are necessary to create healthy mixed-use residential clusters along airport corridors. New urbanism describes design of such terms (Principles of urbanism, n.d.);

- Walkability
- Connectivity
- Mixed-use & Diversity
- Mixed housing
- Quality architecture & Urban design

- Traditional neighborhood structure
- Increased density
- Green transportation
- Sustainability
- Quality of life

2.7.5 AIRPORT CITY

Airport-centered urban development is categorized under three interconnected concepts; the aerotropolis (airportintegrated urban economic region), the airport corridor and the airport city. Differences between these concepts depend on geographical scale, business approaches and commercial activities at and around airport.

Airport City is basically a dense cluster of operations, originating from synergetic and symbiotic relations between the networks of the airlines at the airport and commercial development on the airport landside (Ashford et al., 2011).

It is explained as an "inside the fences" area including terminals, apron, and runways, also with air cargo, logistics, offices, retail and hotels (Kasarda, 2008). Strategically, airports work in a regional system, by combining transport and land-use planning (Güller Güller et al., 2003).

Figure5 airport urban development concept

2.7.6 AIRPORT CORRIDOR:

Another concept of airport-driven development is airport corridor, defined by Schaafsma et al. (2008) and van der Blonk et al. (2006). It is a planned and integrated linear real estate development linking airport with city. Some of the examples are the highway-oriented airport corridor of Denver, the transit-oriented airport corridor of Zurich, and the city-oriented airport corridor of Copenhagen. Formation of airport corridors are summarized by two different stories: it has appeared either in city regions where specific governance structures have been placed for such corridor development, or by a huge investment guaranteed by public authorities in infrastructure, commercial areas and types of buildings, their density and size of the development, and geographic location relative to the runway environment (Airport Cooperative Research Program, 2010). Airports are very

sensitive structures because each of those specific elements affects land use type around airports and identifies their compatibility with the environment of the airport.

Residential developments around airports are to be designed carefully due to the

Table2 :concept feature

Graphic Example	Concepts' Features	Planning and Developing
Airport Region (70s)		
	* An embryonic Aerotropolis from the 70's * A public planners view * Development of residential and industrial areas around the airport * Connected to host city and to main industrial and logistical sites by roads (highways and conventional roads) and conventional rail	* Top-down planning * Public authorities view * Public developers
Airport City		
	* Limited to the airport perimeter * Large supply of various services: commerce; public services; leisure and business spaces	* Privately and public developed and managed by airport authorities
Airport Corridor		
	* Developed on a corridor between the airport and the host city * Greater and more varied involvement of public on the infrastructure planning * Connected to host city and region by highways (express or not) and railway (express/high speed or not)	* Public-privately planned * Intervention of various stakeholders in cooperation: airport authorities; private developers; local and regional public institutions;
Aerotropolis		
	* Extrapolation of the Airport City to the surroundings of its perimeters * Replication of Airport City services, industrial, residential, thematic and logistical spaces * Features similar to Airport Corridor	* Unplanned to national and regional planed * Mix of developers: private; public; private and public
Airea		
	* A fragmented and dispersed developed area around the airport in a polycentric and metropolitan way * Features similar to Airport Corridor and Aerotropolis	* Regional and local planning * Private and public developers * Mix between private/public and small/large components

Airport; **A** - Airport City; Concept's area; Host city

potential safety and noise issues. Today, almost every airport is under the risk of over construction because of the population increase and need of accommodation. It is very important to discourage, or at least keep residential developments near airports at a possible minimum level. Table 3 shows how different residential land uses are affected by potential concerns. Such tables should guide planners to what they should do and what would be the results of such developments in long term. It is crucial to select necessary type of building by considering both density and airport operations. It is considered that having more of small cluster-type housing projects with sufficient open spaces, rather than several hundred homes with limited open space (Airport Cooperative Research Program, 2010). Geographic location of the development is another issue in design around airports. Runways have certain lighting standards. Any development around an airport, especially around Runway Protection Zones (RPZs), shouldn't cause visual obstructions for pilots. Figure 4 compares typical linear pattern, which is parallel to the runaway, with a more acceptable parcel layout.

Land Uses	Noise Sensitivity	Concentration of People	Tall Structures	Visual Obstructions
Single-Family Uses (attached and detached)	I	P	N	P
Multi-Family Uses (i.e., two or more principal dwelling units within a single building on the same parcel, ap				
as condominium, elder, assisted living, townhouse-style)				
Low-Rise (1-3 Levels)	I	P	N	P
Mid-Rise (4-12 Levels)	I	I	P	I
High-Rise (13+ Levels)	I	I	I	I
Group Living Uses (i.e., assisted living, group care facilities, nursing and convalescent homes, independent group living)	I	I	P	I
Manufactured Housing Parks	I	I	N	P

I = Impact; P = Possible Impact; N = No Impact.
Source: Mead & Hunt, Inc.

Table 3 :Land use compatibility chart for residential activities (Mead & Hunt, 2004)

Commercial development requires specific review and evaluation by planners to determine compatibility with airport operational areas (Airport Cooperative Research Program, 2010). For example; mixed use developments can be given as a good example. However, it shouldn't be forgotten that mixed use has some challenges in defining density that differs in every hour of the day depending upon the location of the commercial area. Double check of the specific types of uses and hours of occupancy becomes important in designing the facilities around airports.

In any airport-oriented development, industrial and manufacturing areas take a role to provide enough economic benefit. Today, industrial parks are the most popular development concept for industrial areas. They include a mix of industrial businesses, manufacturing facilities, office parks, and R&D complexes. Industrial and manufacturing areas need good connections to major transportation lines and nodes such as highways, interstates, railroads, and airports. Inter-modal connectivity is a key point because today's economy depends highly on speed and time (Airport Cooperative Research Program, 2010).

any accidental situation are noted. Besides, institutional activities differ in densities in a certain area. High concentrations of people always involve high level of risk for airport operational and approach areas.

Agriculture, parks, recreation or any open space usage would harm airport developments at the minimum level comparing to other land uses. However, there is a high risk of creating wildlife around and between those areas. Farms around airports should be taken under control by limiting the type of seeding that can be planted. For example; row crops and orchards may cause hazardous interactions for airplanes. Especially on low-level flights, approaching and departing, such plantations may create bird strikes.

3 CASE STUDIES

3.1INTRODUCTION

This chapter show Studies, which analyze airports in terms of urban planning.

3.2 AIRPORT AND REGIONAL PLANNING

THE AUSTRALIAN CONTEXT

Balancing land use compatibility with airport operation is the role of airport land use planning and its importance was recognized in the 1930s (Bednarek, 2000). The term compatibility should refer to both on-airport land use, in the form of airport master planning, and the land uses beyond the airport's boundary, often represented in local town and regional community planning.

As mentioned earlier, 22 Australian airports were privatized (under a 99-year lease agreement) in 1996. This privatization of Australia's major airports lead to increased non-aeronautical development on airport property (Walker and Stevens, 2008). This type of development has not gone unnoticed (or unchallenged) by the airport's neighbours. In the last decade, this regulatory planning difference has caused numerous challenges and debate between airport, local and regional planners.

The recent National Aviation Policy White Paper (NAPWP) (Commonwealth of Australia, 2009) calls for improved planning at Australia's airports to facilitate better integration and coordination with off-airport planning. To aid this policy the government supports the establishment of a Planning Coordination Forums for each main capital city airport (i.e., Adelaide Airport, Brisbane Airport, Canberra Airport, Darwin Airport, Hobart Airport, Melbourne Airport, Perth Airport, and Sydney Airport). The NAPWP describes the Planning Coordination Forums as follows:

" .... the Planning Coordination Forum will act as the vehicle to lead constructive ongoing dialogue on matters such as Master Plans, the airport's program for proposed on-airport developments, regional planning initiatives, off-airport development approvals, and significant ground transport developments that could affect the airport and its connections. The Government anticipates that the proposed Planning Coordination Forums will build on rather than replace existing mechanisms. The Planning Coordination Forums will create a mechanism to consider the implications of metropolitan planning issues for the airport at a more strategic level and ensure that airports are considered as part of longer term strategies."

The Planning Coordination Forums will comprise airport planners, state planners, local planners and possibly expert advisors. At this stage the Australian governments

is remaining flexible on the conduct and makeup of the Planning Coordination Forums. The NAPWP states that each Planning Coordination Forum will be tailored to the circumstances of the parties involved. In our opinion, a PSS is the perfect vehicle to support the decision makers in the Planning Coordination Forums.

3.2.1 PLANNING SUPPORT SYSTEMS (PSS)

Geertman and Stillwell (2003) define Planning Support Systems (PSS) as any geographical information and spatial modelling system that has been developed to support public or private planning processes (or parts thereof) at any defined spatial scale and within any specific planning context. Geertman (2002) proposes that PSS is the missing link between planners and technical geographic information systems (GIS). Key to PSS are the use of metrics and terminology that planners and decision makers can readily understand.

A large variety of PSS have emerged in recent years and numerous taxonomies of them have been presented in the literature (Geertman and Stillwell, 2004, Klosterman and Pettit, 2005, Snyder, 2003). Klosterman and Pettit (2005) present a good insight into the off-the-shelf PSS that are ready to support planners and researchers alike. It would appear that the usage of PSS is becoming more widespread and that planners are more accepting of the outputs they generate.

BENEFITS OF PSS FOR AUSTRALIAN AIRPORT AND REGIONAL PLANNING

Australia's privately-owned airports are an interesting contrast to the publicly owned airports of Europe and the USA. This distinction coupled with its associated governance frameworks makes facilitating collaborative planning more problematic in Australia. A PSS with its ability to compare and communicate different spatial planning policies is seen as a prefect tool to bridge the gap between federal, state and local planning requirements. With the increasing number of stakeholders in the airport panning domain, a system that can express a common planning language would be invaluable to bring together the disparate groups.

In addition, the PSS will employ an analytical method of evaluation via an agreed set of indicators. This will allow the different stakeholder positions to be communicated to the broader planning group with less emotion and in factual terms. A PSS could support the Planning Coordination Forums through integration of the local and state spatial plans with the airport spatial plan.

3.2.2 BRISBANE AIRPORT CASE STUDY BRISBANE AIRPORT (BNE)

is Australia's third busiest airport behind Sydney Airport (SYD) and Melbourne Airport (MEL). Passenger numbers at Brisbane Airport in 2008 were 19,011,760

making it a relatively small airport when compared to Atlanta International Airport (ATL) which had 90,039,280 passengers in the same year (Centre for Asia Pacific Aviation, 2009). However, the property size of approximately 2,700 hectares, of which 1,000 hectares is suitable for land use development, makes it one of the largest in area of any of its national and international contemporaries. Brisbane Airport is privately owned by Brisbane Airport Corporation (BAC) which has clearly articulated its intention to develop this land and transform BNE into an airport city (Brisbane Airport Corporation, 2009). Planning of Brisbane Airport falls under federal control through the Airports Act 1996.

PICTURE5 : Brisbane Airport master plan- Astralia.

Brisbane Airport is part of the larger 8,000 hectare Australia TradeCoast (ATC) precinct which is developing as an economic and employment centre of major regional and national significance. The site is currently home to 7,500 businesses (including Brisbane Airport and the Port of Brisbane) and it is anticipated that by 2026 the area could provide up to 103,939 jobs and qualify as the largest employment centre outside of Brisbane Central Business District (CBD) (Queensland Government, 2008a). While not all of the ATC will develop into aviation related industries, its size and proximity to the airport will allow the Brisbane airport city to development outside the airport's property boundary. Such development would be necessary if Brisbane Airport is to develop into a true airport city as described by Conway (1993) and Kasarda (2006).

Key airport and regional planners in the Brisbane case study have formed a Planning Coordination Forum of sorts. It currently comprises representatives from Brisbane Airport Corporation, Brisbane City Council (the only municipality adjacent to Brisbane Airport) and the Queensland State Government. It was established before the NAPWP was published and its aim and structure closely align to the Planning Coordination Forums of the NAPWP.

3.2.3 AVAILABLE DATA

Due to the nature of the stakeholders involved in the Brisbane case study, a rich set of diverse GIS datasets were available. The following is a list of the main datasets utilised in the PSS:

- property parcel information,
- both airport and local government land use information,
- major planned infrastructure projects,
- employment area information,
- population forecasts,
- airline growth forecasts,
- demographic information (i.e., Census data from 1996 to 2006),
- transportation zones and network,
- transport travel study information,
- aircraft noise contours and flight path densities,
- noise complaint information,
- economic activity areas and statistics, and
- aerial photography.

In this case, all stakeholders will come together at the Planning Coordination Forums, so a desktop and not web-based tool will suffice. Finally, a geographic information system-GIS-based system that supported customization through a programming SDK was seen as important criteria to select an appropriate PSS for this case study. After careful consideration, Community Viz was evaluated as the most suitable for this research project. This decision was supported by a number of other projects that have utilized CommunityViz in a similar fashion (Zolnik et al., 2010, Kwartler and Bernard, 2001, Brown, 2010).

the results of the Brisbane case study implementation of the PSS. The resulting PSS is shown in Figure 1. It uses a standard GIS interface that allows different data sources to be layered together in a 2-dimensional mapping interface. In addition, a third dimension of “time” can also be displayed on the basic mapping interface or as a chart indicator. The interface runs within ArcMap and requires the CommunityViz extension. While most of the functionality is controlled by CommunityViz toolbars some additional customized toolbars have been implemented.

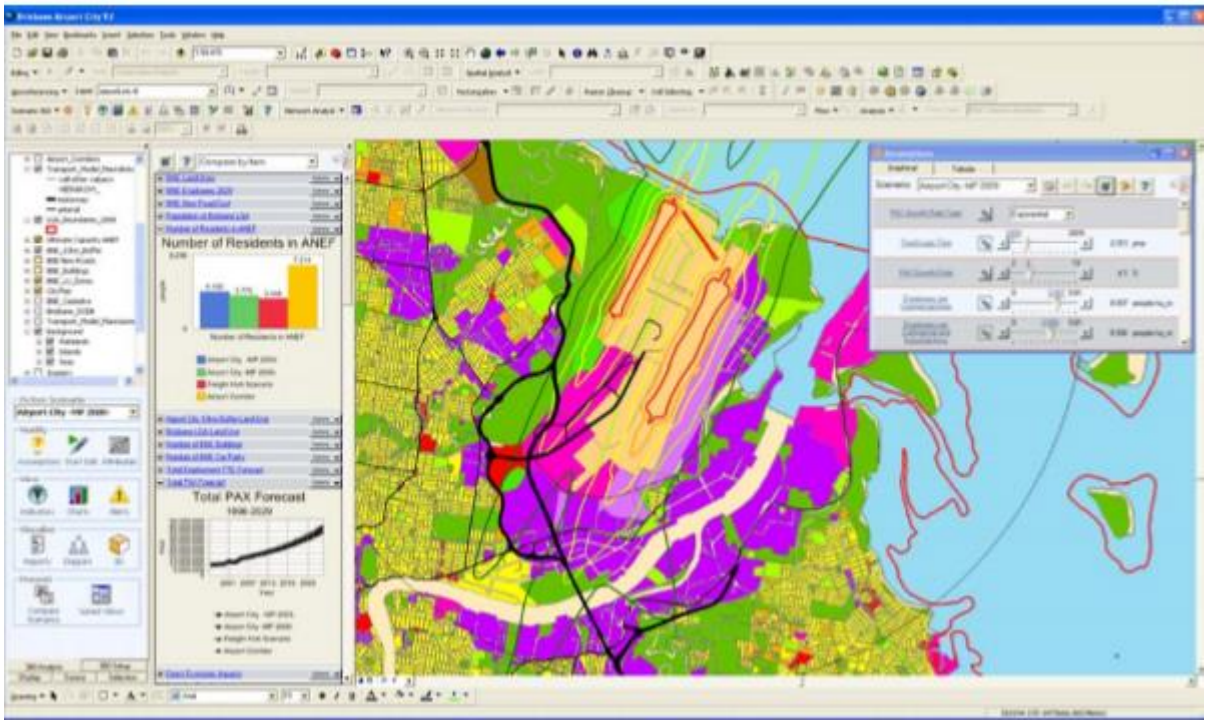


Figure 6: prototype

The prototype PSS has the following functionality:

• Scenario planning that allows the user to create and analyse alternative land-use plans for Brisbane Airport and compare them side-by-side;

• Land use, transport and economic modelling that will a allow dynamic analysis of plans (i.e., on-the-fly changes to a plan will automatically cause recalculations of impacts); and

• A standard set of sustainability indicators that are clearly understandable to stakeholders, decision makers and public.

3.2.4. MODELLING

Table 4 shows the main models that have been implemented in the prototype PSS. Various methods were used to develop the models. These included utilizing Trans CAD's software development kit to create Trans CAD models within the ArcGIS interface. In addition, ArcGIS's model builder and Communities' dynamic attributes were used to create models. Existing Community Viz tools like the Build-Out Wizard were also utilized. The models were enhanced through considering the spatial relationships between datasets. These models need further calibration and testing but serve as a good starting point for the prototype PSS.

Some of the models rely on a set of initial assumptions. These assumptions have been calculated from historical values and validated with expert knowledge. The assumptions are dynamic and can be changed interactively within the PSS as shown in top right section of Figure 6.

Model	Description	Tools
Road transportation model	The transportation model is a simplified version of the Brisbane Strategic Transport Model (BSTM) (Queensland Government, 2008b). Brisbane City Council originally developed the BSTM. This simplified model comprises 5,376 links and 46 zones and utilises a combined model to compute network utilisation.	TransCad soft development k (GISDK)
Development suitability model	A weighted multi-criteria analysis framework was implemented to produce a polygon feature class that indicates where certain types of development should occur given stakeholder input.	Combined Arc model builder CommunityVi dynamic attrib functions
Direct economic impact model	An input-output model derived from an airport commissioned Access Economics Pty Ltd (2008) Report. The models predicts the direct economic impact of in AU$ as the airport develops over the 20 year planning period.	Combined Arc model builder CommunityVi dynamic attrib functions
Building build-out model	The existing CommunityViz Build-Out tool was used to visualise the amount and location of bulding develop given the different stakeholder policies. The floor space ratios used were obtained from a survey of existing airport developments.	Built-in CommunityVi function

Table 4 : Implemented Models

3.2.5 SUSTAINABILITY INDICATOR

Most of the indicators were selected from the SEQ regional plan (Queensland Government, 2009) with a few extras added during the stakeholder workshops. The indicators are listed in Table 5.

Economic Impact Airport's financial performance Regional economic growth Employment levels Tourist visitor numbers PAX	**Environmental Impact** Air quality Greenhouse gas emissions Extinct, endangered an species and ecological com
Social Impact Total number of dwellings Number of dwellings (within ANEF) Education access and affordability Education attainment Housing access and affordability	**Integrated Transportation** Road congestion Access to PT Mode share Freight movements Number of cars

Table 5 :Sustainability Indicators

3.2.6 SCENARIO DEVELOPMENT

Scenarios are descriptions of alternative futures which are likely to occur for the study area. Scenarios are made up of a series of external factors which are out of the control of the stakeholders. The scenarios themselves provide important inputs and

assumptions to the models within the PSS and are a critical part of the policy analysis framework as described by Wijnen et al., (2008) and Walker (2000).

The scenarios were developed utilising a similar process to that described by Van der Heijden et al. (2002). This process involved obtaining a list of external factors from the stakeholders through a series of small workshops. The stakeholders were required to rate the external factors in terms of uncertainty and impact on the system model. After this evaluation, the external factors that have both high uncertainty and high impact were clustered together to produce the scenarios for the case study. The following scenarios were developed:

SCENARIO 1: Placid Brisbane In this scenario,

population growth for Brisbane is non-existent and global environmental concerns have not eventuated. The war on terror has past and international communities are more focused on their own economies an interfering with problems of other countries. Due to lack of growth in the region, labour and accessibility costs have remained low and demand for developable land is very low. Brisbane demography is has remained constant and is very supportive of airport development, as the population believe this could improve the economic prospects for Brisbane. Infrastructure charges like road pricing have not eventuated. The cost of green energy remains high with very little motivation to pursue this type of technology.

SCENARIO 2: Booming Brisbane In this scenario,

population growth for Brisbane is extreme, but global environmental concerns have not eventuated. The war on terror has past and international communities are more focused on their own economies an interfering with problems of other countries. Due to extreme growth in the region, labour and accessibility costs are extremely high and demand for developable land is high. Brisbane demography is extremely diverse but is unsupportive of airport development, as the population believe Brisbane is developing too fast. Infrastructure charges like road pricing have been introduced as a way to reduce road congestion. The cost of green energy remains high with very little motivation to pursue this type of technology. The aviation demand in the region is high and a second Brisbane airport is planned.

SCENARIO 3: Overwhelming nature In this scenario,

population growth for Brisbane is non-existent and to make matters worse global environmental changes have placed additional pressure on the region. The sea level rises gradually but the region's economic situation prevents any real solutions to the problem being implemented. Storm activity has increased and is affecting the operation of the airlines. The Australian Government has enforced strict environmental regulations. These restrictions decreased the attractiveness of the city, which also has affected business, industry and leisure activities. The war on terror

shows no sign of ending and terrorist mitigation places additional operational costs on the region. Due to a lack of growth in the region, labour and accessibility costs have remained low and demand for developable land is very low. Brisbane demography has remained constant and is very supportive of airport development, as the population believe this could improve the economic prospects for Brisbane. Infrastructure charges like road pricing have not eventuated. The cost of green energy has become cheap through the government's pursuit of this type of technology. However, fossil fuel energy has become extremely expensive, but some industries are still struggling to migrate to green energy.

SCENARIO 4: Brisbane versus nature in this scenario,

population growth for Brisbane is extreme and global environmental changes have placed additional pressure and opportunities on the region. Due to extreme growth in the region, labour and accessibility costs are extremely high and demand for developable land is high. Brisbane demography is extremely diverse but is unsupportive of airport development, as the population believe Brisbane is developing too fast. Infrastructure charges like road pricing have been introduced as a way to reduce road congestion. The aviation demand in the region is high and a second Brisbane airport is planned. The sea level rises gradually but the region's economic situation has allowed novel solutions to be implemented. Storm activity has increased and is affecting the operation of the airlines. The Australian Government enforced strict environmental regulations before other countries so Australia's economy has benefited greatly for exporting this technology. The cost of green energy has become cheap through the government's pursuit of this type of technology. However, fossil fuel energy has become extremely expensive but the prosperous economic climate has allowed industry to make a gradual transition to green energy. The war on terror shows no sign of ending and terrorist mitigation places additional operational burden on the region.

3.2.7 AIRPORT AND REGIONAL PLANNING POLICIES

The main policies that were initially built into the PSS were related to land use zoning, transportation infrastructure and mode share options. One of the main airport stakeholders mentioned the need to test policies on the fly in real time was a priority for him. In general terms the policies inputted into the PSS mainly illustrated various investment options that the main stakeholder, Brisbane Airport Corporation, could make as it developed its airport into an airport city. In addition, the land use zones policies from both the 2003 and 2009 airport master plans were compared against each other.

3.2.8 APPLICATION AND USE OF PSS FOR BRISBANE case STUDY

The prototype PSS has been demonstrated to most of the Brisbane case study stakeholders. These demonstrations have taken place at research advisory committee meetings and in small focus groups. The initial feedback on the system is good but more functionality is still required. The main advantages of the PSS are:

• The PSS provides support for Airport Coordination Forums;

• The main stakeholders currently maintain GIS datasets for planning support and spatial analysis tasks, therefore, the adoption of a GIS based PSS required little extra data requirements;

• Likely impacts of airport developments of the surrounding environment and communities can be visualised and quantified in the PSS;

• The PSS has an improved understanding in the relationship between transportation network and land use plan;

• The PSS will facilitate more effective engagement with communities through real-time evaluation of planning policies; and

• The PSS provides a transparent decision-making process.

3.2.9 CONCLUSION

The prototype PSS provides a holistic approach to airport and regional planning through integrating multiple models into one decision framework. It provides a system that can inform all stakeholders of the impacts and consequences of alternative planning policies thus facilitating greater stakeholder participation in the planning process.

The Communities software package was easily extensible and provided a good foundation to develop a planning support system. As most of the planning stakeholders were utilizing GIS for a planning tool, the supporting planning data was readily availability and required minimal manipulation for use in the prototype PSS. The goal of any PSS is to make it easier for all stakeholders to reach consensus on planning decisions.

In conclusion, as airport-regional interactions become more complex, a broader understanding of trends, problems, challenges and sustainable policy solutions becomes increasingly important for public and private policy makers. Modelling these interactions and integrating them into one system has provided invaluable support for stakeholders grappling with the challenges of new airport city type developments. Finally, although the prototype PSS is still under development, the current system provides a good foundation for further work in this area.

3.2.10 FUTURE WORK

With the basic PSS completed, the next stage of development will focus on improving the models within it. In addition, further consultation with stakeholders will be conducted to establish a full suite of indicators and policies to be tested on the Brisbane case study.

3.3 SABIHA GÖKÇEN INTERNATIONAL AIRPORT

THE TURKISH CONTEXT

Sabiha Gökçen International Airport (SAW) is the second airport of Istanbul which was built in Pendik district (Figure 7). It took the name from the world's first combat pilot Sabiha Gökçen. Construction of the airport started in 1998 and finished in January 2001 with the cost calculated as 550 million dollars. Sabiha Gökçen operated by the company named Malaysia Airports. Ground services, cargo and security operations conducted by Istanbul Sabiha Gökçen Uluslararası Havalimanı Yatırım Yapım ve İşletme A.Ş. (ISG). Sabiha Gökçen International Airport was selected as the second busiest airport in Turkey.

PICTURE6 :Location of Sabiha Gökçen Airport- Turkey.

Main purpose of building the second airport in Istanbul was a part of Advanced Technology Industrial Park (ITEP) project. ITEP project was the second only in scale of investment to Turkey's South-East Anatolia Project (GAP) in 1980s.

Firstly, airport has been built so to provide logistic support for other phases of the project (Çelebi, 2001).

3.2.1 LOCATION AND CHARACTERISTICS OF THE AIRPORT

Sabiha Gökçen International Airport is located on the Anatolian side of Istanbul (Figure 8). The Airport occupies an area of 661 hectares in total of 1,300 hectares which is available for ITEP project. It is 95 meters above sea level and 35km away from the city center. Airport is considered as the category of CAT II by the International Civil Aviation Organization (ICAO).

PICTURE 7:Istanbul districts and location of the airport

Sabiha Gökçen International Airport is open to both international and domestic traffic with a capacity of 3 million per year for international, and half million per year for domestic passengers. Cargo terminal of the airport has 90.000 tons per year capacity. Airports, in Turkey, are generally operated by State Airport Management Directorate of the Ministry of Transport. However, Sabiha Gökçen International Airport is operated by the Airport Operation and Aviation Industries Company (HEAS), since it is part of the ITEP project. Main shareholder of HEAS is the Defence Industry Office which is defined as the coordinator of the whole ITEP project (İlhan, 2006).

3.2.2 ADVANCED TECHNOLOGY INDUSTRIAL PARK (ITEP)

In the middle of 1980s, ITEP (İleri Teknoloji Endüstri Parkı) project has been started to be discussed by the authorities in Istanbul. Such projects has already been implemented in other countries such as USA, Germany, Japan, Israel, Finland and France. Prime Minister of Turkey in those years, Turgut Özal, was biggest supporter of the project by offering main idea of ITEP. There were 4 main goals:

- Production of high level technology for air industry,

- Marketing of the manufactured products and creating free trade zone for international relations,

- Institute of Advanced Technology was constituted to support Advanced Technology production with necessary research-development (Ar-Ge) and academic studies,

- Building an airport to support better connections with the new built environment (Erel, 2010).

In October 8th, 1987, with a decision of SSİK (Savunma Sanayii Komitesi Kararı), project has been started to be implemented with the name of İTEP in Kurtköy. In April 20th, 1988, 13 million m2 of land expropriated for the construction of the project with a decision made by Council of Ministers. For the financial scale of the project, SSDF (Savunma Sanayi Destekleme Fonu) was decided to finance İTEP. Moreover, for the planning, coordination, expropriation and infrastructural investments, SSM (Milli Savunma Bakanlığı - Savunma Sanayi Müsteşarlığı) assigned to be in charge of those investments.

İTEP has a main idea of meeting technological necessities of Turkey's from its own national resources. To do so, it is aimed to increase level of dynamic, scientific and 92 technologic infrastructures with İTEP project. Such developments are planned to lead following consequences (Erel, 2010);

- Advancements in Turkey's economic and social structure,

- Improving Turkey's competitiveness in world market,

- İTEP would be a leading model in terms of improving nation's technological infrastructure,

- Increase in local and foreign investments,

- İTEP would finance itself,

- To help to meet the need of after-school research-development (Ar-Ge) and education fields in Turkey,

- To increase the capacity of air travel.

The vision of the project was to be the most innovative, most technologic and most export-oriented production center of the Turkey. It has planned to be finished in 25 years of a period. First master plan of the project has been prepared between April 1990 and 11th of January 1993 by Raytheon and Aer Rianta.

İTEP Master Plan mentions 5 main land uses which are planned to achieve the goal of the project (Yağmur, 2010);

- Industrial Park

, • University and Grad School

- Istanbul Sabiha Gökçen Airport

- Aviation maintenance repair-overhaul center,

- Commercial-Social zone.

PICTURE8 :Master plan of ITEP project

3.2.3ELEMENTS OF ITEP

As it is mentioned before, under the name of ITEP, it was planned to be constructed 5 main elements in order to achieve necessary objectives. For this project, 1,300 hectares of land has been expropriated by SSM as mentioned in Feasibility and Master Plan Study Report.

1. **SABIHA GÖKÇEN INTERNATIONAL AIRPORT:** Istanbul Sabiha Gökçen International Airport (SAW) has been constructed as the first element of the ITEP project. The Airport occupies 661 hectares of land as a part of 1,300 hectares which was expropriated by SSM. SAW operates both for domestic and international passenger and cargo transportation since 8th of January, 2001. It was planned to be built in two phases. Phase I was constructed to meet the capacity of 3.000.000 passengers/year at the International Flights Terminal, and 500.000 passenger/year at the Domestic Flights Terminal. Also, cargo terminal has been built to reach 90.000 tons/year (İlhan, 2006). Some technical numeric data has been given in Table 6 for SAW.

International Flight Terminal	3.000.000 passenger/year (24.647 m^2)
Domestic Flights Terminal	500.000 passenger/year (2.700 m^2)
Runway	45x3000m
Passenger Apron	45 wide body aircrafts (240.000 m^2)
Cargo Capacity	90.000 tons/year
Category	CAT II

Table 6:Detailed characteristics of SAW (İlhan, 2006).

SAW had two terminals which has provided international and domestic service in two separate terminal buildings. After reaching over-capacity passengers, it was decided to be built a new terminal which will serve both for international and domestic under one roof. New terminal was inaugurated on 31 st October of 2009 with a capacity of 25 million passengers annually.

2. **INDUSTRIAL PARK:** ITEP's industrial park project, named as 'Teknopark İstanbul", has been established under the decision of SSİK (Savunma Sanayii İcra Komitesi) in 3 May 1999. Teknopark İstanbul has gained a title of TGB (İstanbul Teknoloji Geliştirme Bölgesi) in 2009. It occupies an area of 355 hectares out of 1.300 hectares which was expropriated for ITEP project. As it was planned for ITEP project to be the most innovative, most technologic and most export-oriented production center of the Turkey, the Industrial Park welcomed technology intensive businesses to carry out a mix of knowledge based innovation functions (İlhan, 2006). Generally, main sectors which are aimed to raise Turkey in advanced technology are as follows;
   - Aerospace,
   - Defense industry,

   Advanced electronics,
   - Marine industry,
   - Industrial software,
   - Advanced materials,
   - Energy,
   - Health sciences (SSM, 2015).

   ITEP Project model has aimed to bring together education, science and industry synergistically together for to produce advanced technology industry. It is crucial to achieve such goals in global economy to be a part of globalization and competition in it.

3. **Technology Institute: The** goal of establishing a special purpose University within the ITEP project was to meet qualified and specially trained labor force demand of high tech companies in the Teknokent İstanbul (İlhan, 2006). However, it has seen that the Turkish University System is not suitable to build such a university in usual ways. Under the light of the ITEP project, a special University was planned to be established to provide for specific Ar-Ge activities with the needs of industry. Teknopark İstanbul has needs of organizational, financial and human resources based establishments which is already available in the universities of Istanbul. After realizing such a point, it was discussed to use existing potential of universities in Marmara Region rather building a new one,

4. **Aviation maintenance** repair-overhaul center (HABOM) Maintenance repair and overhaul center is located at the south-west of the runway and consists of 3 different usages The area of 372.000 m2 was reserved for maintenance and distributed as follows; 65.000 m2 was leased to MyTechnic MRO in 2007, 296.000 m2 was leased to Türk Hava Yolları Teknik A.Ş. in 2008 by SSM, for to build a maintenance & repair center.

5. **Social and commercial zone** Area that have been expropriated for social and commercial zone is about 211 hectares at the northern vicinity of ITEP Project. Social and commercial zone planned to consist of such usages (İlhan, 2006);

- Commercial Area: for retail businesses and professional service sector companies,
- Housing Zone: from apartment to villa housing,
- Hotel Area: includes visitor and conference/fair/exhibition facilities,
- Recreation and Leisure Area: to provide open green areas and facilities.

It is important to build carefully the open spaces and leisure places in such big projects to succeed at all. Space which is provided by this curtain area would give the provision of social and commercial services such as retailing, housing, hotels and leisure areas. Such thoughts are actually forms the image, aims and objectives of the ITEP Project. Also, building such commercial and social areas would gain a specific character to this project.

3.2.4 SABIHA GÖKÇEN AIRPORT AS AN AIRPORT CITY

Sabiha Gökçen International Airport has been built as a part of İTEP (Advanced Technology Industrial Park) project in 2001, even though the first master plan hasbeen completed in 1994. The goal to build an airport was to provide enough investment opportunities in order to finish the whole project. Indeed, project included

industrial park, university, airport, aviation maintenance center and commercial/social zone. In consequence of late opening of Sabiha Gökçen Airport rather than expected, some elements and goals has been changed in time depending on the global market demand. Developers and operators of ITEP have been decided to change the vision of the whole project into so called “Airport City” concept. They realized that most of the characteristics of the İTEP project match Airport City concept. One of the most crucial features that an Airport City should have is the accessibility, as well as the geographical location of the airport. Istanbul has an opportunity to reach 111 countries and 3.1 billion people by using only narrow body aircrafts. In addition, Sabiha Gökçen Airport has enough transportation services available for the passengers to access to the city center such as: highway, seaway, railway and public buses.

İTEP project includes so many usages that airport city concept requires; offices, businesses, hotels, technology park, conference center, medical centers etc (Figure 7). Turkey is considered as a developing country which means that technology is an important investment area. Technopark would be a good idea to invest in to develop more in technology. There has already been a good demand for such innovations and, as a result, it was planned to be built the largest Technopark in Turkey under the name of İTEP project.

Figure7 : PROJECT CONCEPT

Offices are considered as one of the primary components which Airport Cities require in order to process. Therefore, SAW Airport City project also includes businesses and offices in its periphery. By having airport close to offices and Technopark, the popularity of the location would be improved in time to get enough demand for such usages. Moreover, İstanbul already has enough potential for office usages.
Offices, Technopark and businesses should offer necessary recreational facilities in order to be chosen.
Due to the geographical location of İstanbul, city become popular in case of conferences. It is important to meet sufficient amount of conference halls, convention centers and hotels. Airport City concept, in this case, would be beneficial to meet such necessities. Istanbul already has lack of such facilities on the Asian side, especially lack of four and five star hotels. Apart from hotels and convention centers, location advantage becomes internationally crucial in health sector. With the

existence of the airport, easy access to the hospital facilities for patients flown within the country and neighboring countries play a fundamental role.

Every airport city has its own layout and principles. SAW Airport City and İTEP project had been planned to have two milestones; airport and Technopark. Technopark and other usages are planned to be located on the north of the airport (Figure 8). Land which was expropriated for İTEP project was around 1,300 ha, and 127 ha of that land reserved for investment and 142,5ha was reserved as forest area.

Figure8

Sabiha Gökçen Airport City schematic land use (Özdemir, 2014)

Technopark and hotel, residential, health center are separated by the KurtköyPendik road. On the West side of the Kurtköy-Pendik road, it is planned to be the actual Technopark (İstanbul Teknopark), and in the same cluster, conference center and offices were thought to exist (Figure 9). When it comes to accessibility point of view,

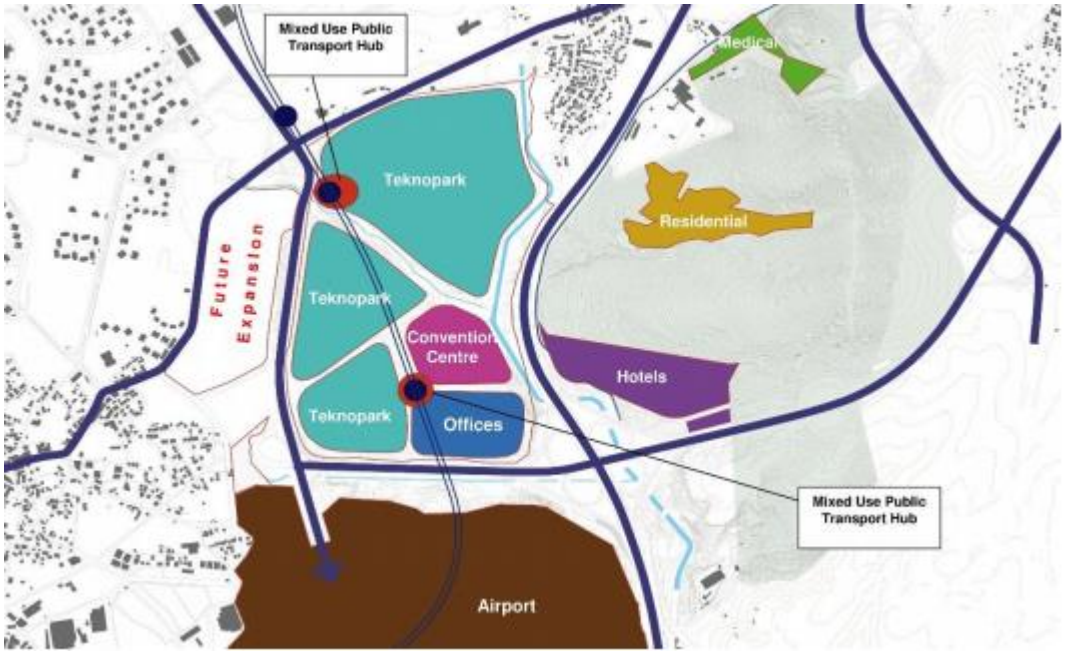


Figure9 :INVESTMENT AREAS LANDUSE AND TRANSPORTATION NODES,2014

municipality plans to build subway which connects Sabiha Gökçen Airport to the Anatolian center of İstanbul; Kadıköy. In addition, it is planned to be built extra mixed use public transport hubs inside Technopark area which will increase the connection between city center and Technopark. Technopark part of the project has been started to be discussed on 12th of February 2009 with an agreement between Savunma Sanayii Müsteşarlığı, İstanbul Ticaret Odası ve İstanbul Ticaret Üniversitesi. Technopark named as Teknopark İstanbul. Layout plan of Teknopark İstanbul has been prepared by İTÜ Nova A.Ş. and applied under circumstances of that plan (Figure 10). As the first phase, only 5 buildings has been built.

Figure10 :Layout of diverse functions; technopark, offices, recreational areas, medical center, hotel, convention center etc. (Özdemir, 2014)

Teknopark İstanbul's master plan shows some clues about the working principles of its own. It is clearly seen that on the West side of the campus, main entrance has been located for cars, which is connected with Havaalanı Yolu. Master plan shows that there would be another entrance on the East side of the campus which will serve as the second entrance. It would have its connection from the Kurtköy-Pendik road. As yet, only connection with Sabiha Gökçen International Airport is seem to be only by Havaalanı Yolu. Teknopark İstanbul is mostly surrounded by forest areas, few residential and industrial areas.

4 SITE SELECTION

4.1INTRODUCTION

SELECTION OF A SITE FOR THE AIRPORT

Airport-generated traffic in combination with other traffic often creates congestion on access roads, thereby increasing the total time of the air travel trip. Because sites for new airports require huge amounts of land and relative separation from surrounding development, most will be constructed at some distance from population centers with a corresponding increase in the ground transportation problem. An airport is a gateway to a city. Because of this reason, airport and airport's environment become important. In addition, it is huge investment for the city. It is a brand of the city and it is development tool. Because of these, its location become important. In this paper, the airport site selection criteria, the effects of airport and site selection by planners are explained.

Evaluation of alternative sites for a new airport based on aeronautical, cost, environmental and other parameters. The process involves significant community and resource agency coordination. Final approval of a site is often a technical/economic and political decision

Selection of a suitable site for the airport should begin with an assessment of any existing airport and its site. It is nearly always easier to modify an existing airport than to create a new one on land that has previously had a different land use designation. The assessment is made in the light of the

prospective passenger market, its growth rate and any limitation of the growth resulting from, for example, a demographic shift of population. The refore the prognosis of the growth of a number of passengers and volume of air cargo in the catchment area of the airport is one of the key elements in planning the airport development

After the proposed airport's size and layout has been approximately determined by a preliminary study, possible sites for the development of the airport are assessed in several steps, the principal ones being:

- ⇒ approximate determination of the required land area
- ⇒ assessment of the factors affecting the airport location
- ⇒ preliminary selection of possible localities from maps
- ⇒ survey of individual sites
- ⇒ assessment of impacts on the environment
- ⇒ revaluation of the selection of possible sites
- ⇒ production of site layout drawings

⇒ estimate of costs, revenues and discounted cash flow
⇒ final selection and assessment of the preferred site
⇒ elaboration of the final report and recommendations.

The same procedure is followed in principle when assessing the development of an existing airport, though some of the steps may be omitted. The number, location and orientation of the runways and of the taxiway system should meet the following criteria:

the availability (the usability factor) of the runway system should be acceptable, considering the losses which would result from the unavailability of the airport

obstacle restrictions defined by the obstacle clearance limits should be respected

ideally, the final capacity of the runway system should meet the predicted demand in the typical peak hour traffic in the far future

the site selected for the airport should be considered not only from the viewpoint of obstacle clearance limits and environmental requirements but also from the viewpoint of achieving a functional layout of the aerodrome facilities

the ground transport access to the airport and the urban development plans in the airport vicinity should be efficient and sustainable

4.2 SITE SELECTION

One of the design alternatives for the future of an airport may be to design a new airport on an open, or greenfield, site. If this is the case, the first and perhaps most important step in this process is that of proper site selection.

The most general factors in airprt site selection :

4.2.1 RESIDENTIAL AREA

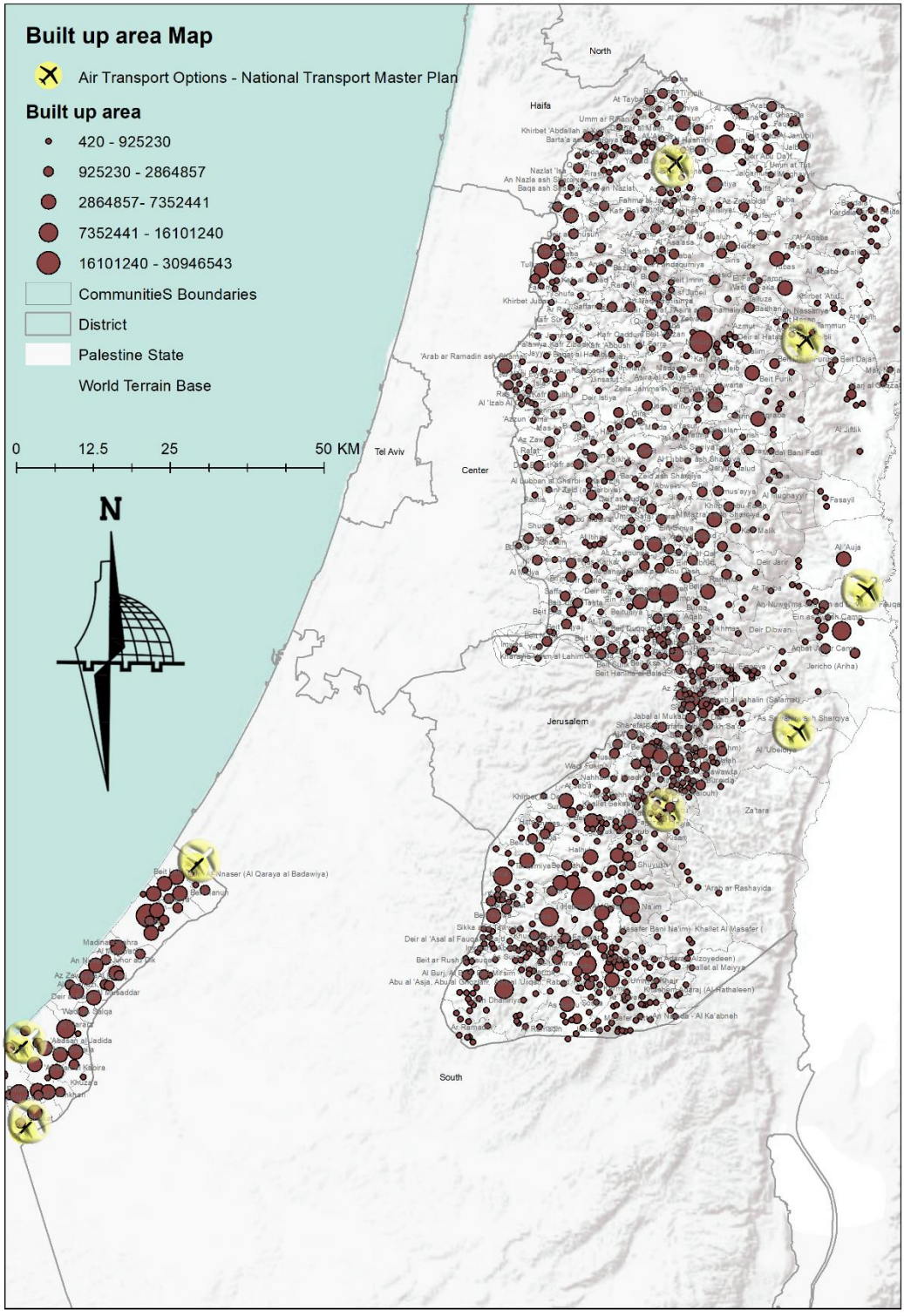
This factor examines the magnitude of property to be acquired for each candidate site. The airfield layout, the size and shape of existing parcel ownership, and other impacts to neighboring parcels can affect the amount of property necessary to be acquired. Also included for consideration under this category will be residence acquisition.

Map 1 show us the most population density concentration area in Palestine.

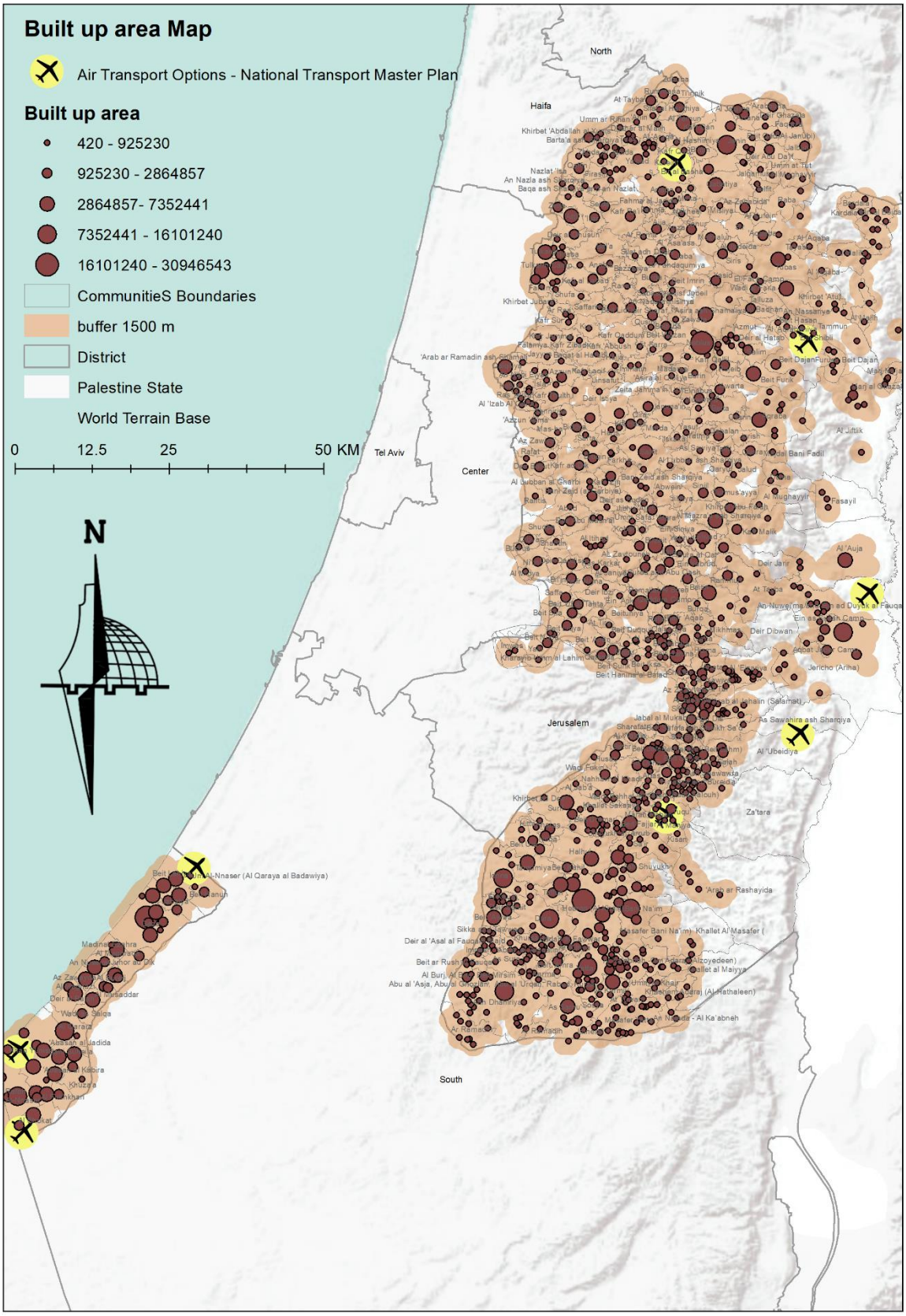
MAP1 : POPULATION DENSITY MAP

The sites should be eliminated if there is more than 10 households due to decrease cost of expropriation. Because of that, the minimum approach distance to residential area is 2500m as shown in map 3 .

Map2 show where and how built up area with its size distribute in wet bank and GAZA district:



MAP 2 : Built up area in west bank and Gaza



MAP 3: built up area with buffer 2500 m

4.2.2 ACCESSIBILITY

One of the most important factors influencing the selection of an airport site is its accessibility to the destination and source of the passengers and cargo. This is a particularly vital consideration for commercial airports since one of the great advantages of air travel is its advantage of shorter travel time over other means of transportation. To provide maximum service to an area, an airport should be located in reasonable proximity to the population center it is to serve. The location in relation to business and industry should also receive attention. Preferably,

the airport should be located adjacent to and visible from a major highway route map(4) show the highway in west bank . It is easy to access by using local and transient roadways. Driving time and distance to the center should be maximum sixty minutes.. The new airport should be within the distance from highway 5000m as shown in map (5) , 1. Degree road 1000m., and 2. Degree road 500m.

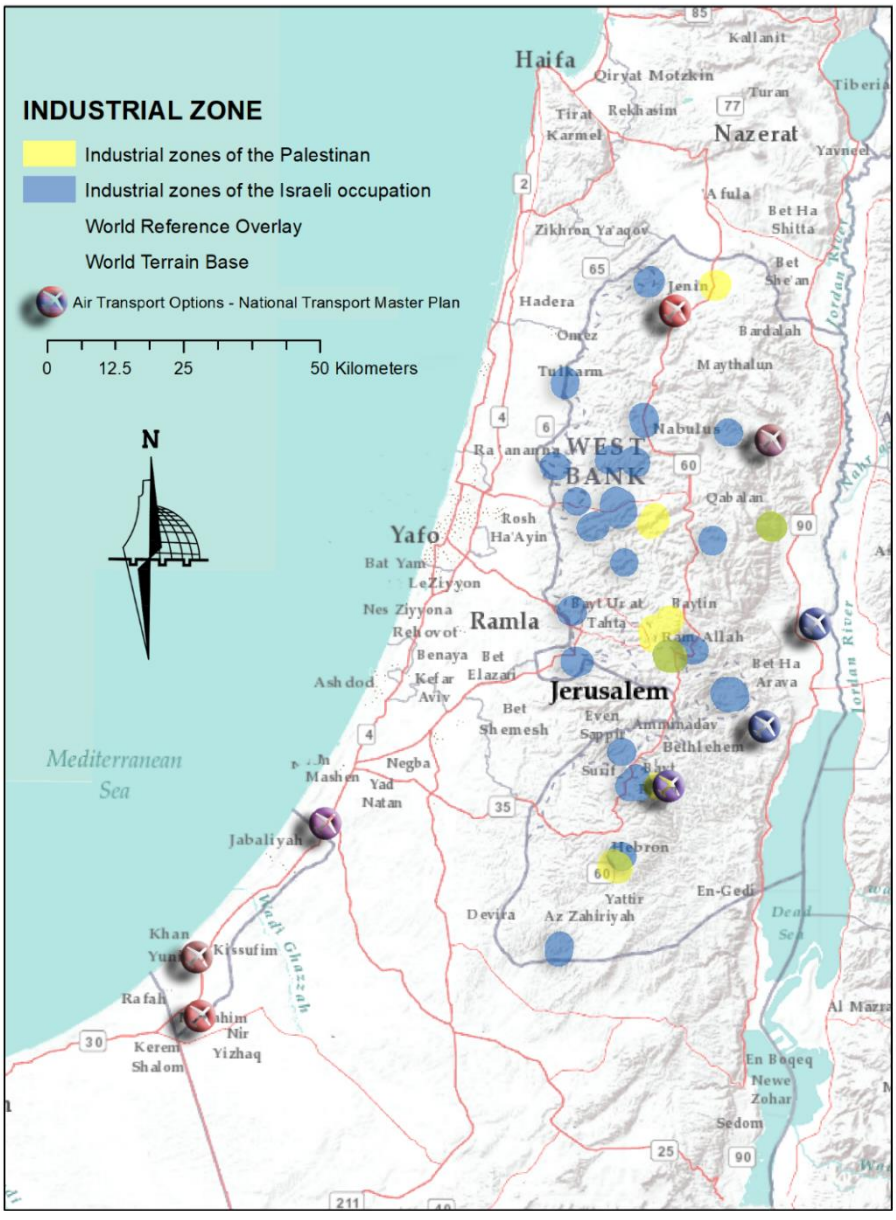
MAP 4: Highway map in palestine

MAP 5: Highway with buffer 5000m

4.2.3 INDUSTRIAL

The advantages of an industrial location near an airport are great enough to be significant. A nearby airport would provide an accessible transportation outlet for executive and sales personal travel and would necessitate only a short haul for air freight; however, for most industries, these factors would not be important enough to seriously influence the location of the industry unless other industrial location factors compare favorably with alternative areas. On the other hand, the airport would not appreciably benefit from nearby industries from an economic viewpoint since it would usually got the industries' air cargo business in any event.

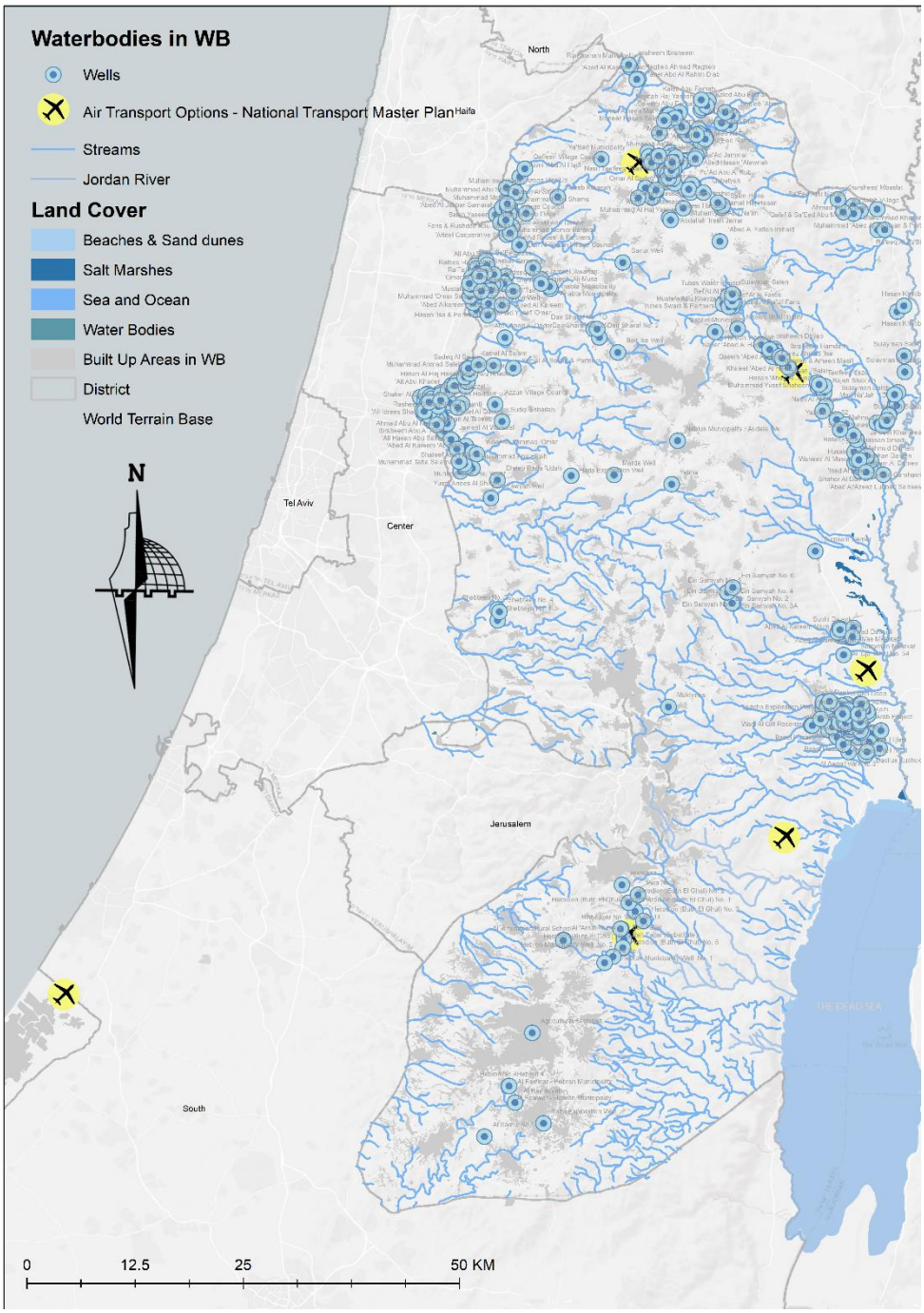
Minimum limitation of the approach from the industrial area is 2500m shown in map (6).



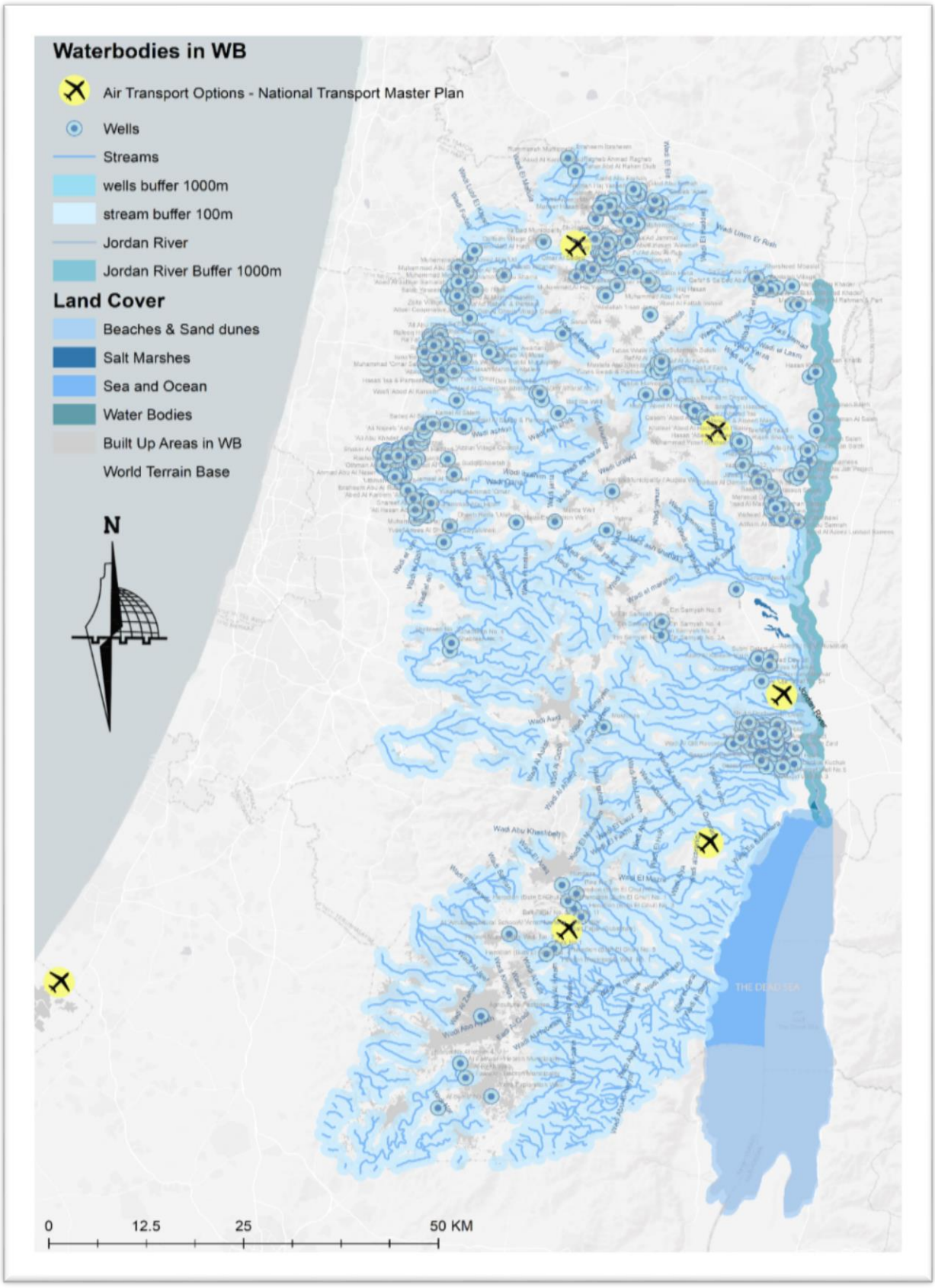
MAP 6:industrial area in west bank with buffer 2500m

4.2.4 WATERBODIES ANALYSIS

The minimum limit of the approach to the hydrology area is 1000 m shown in map (8). Except for irrigated farmed area and forestry area are available for this project. In this way rivers and agriculture area will be protected.



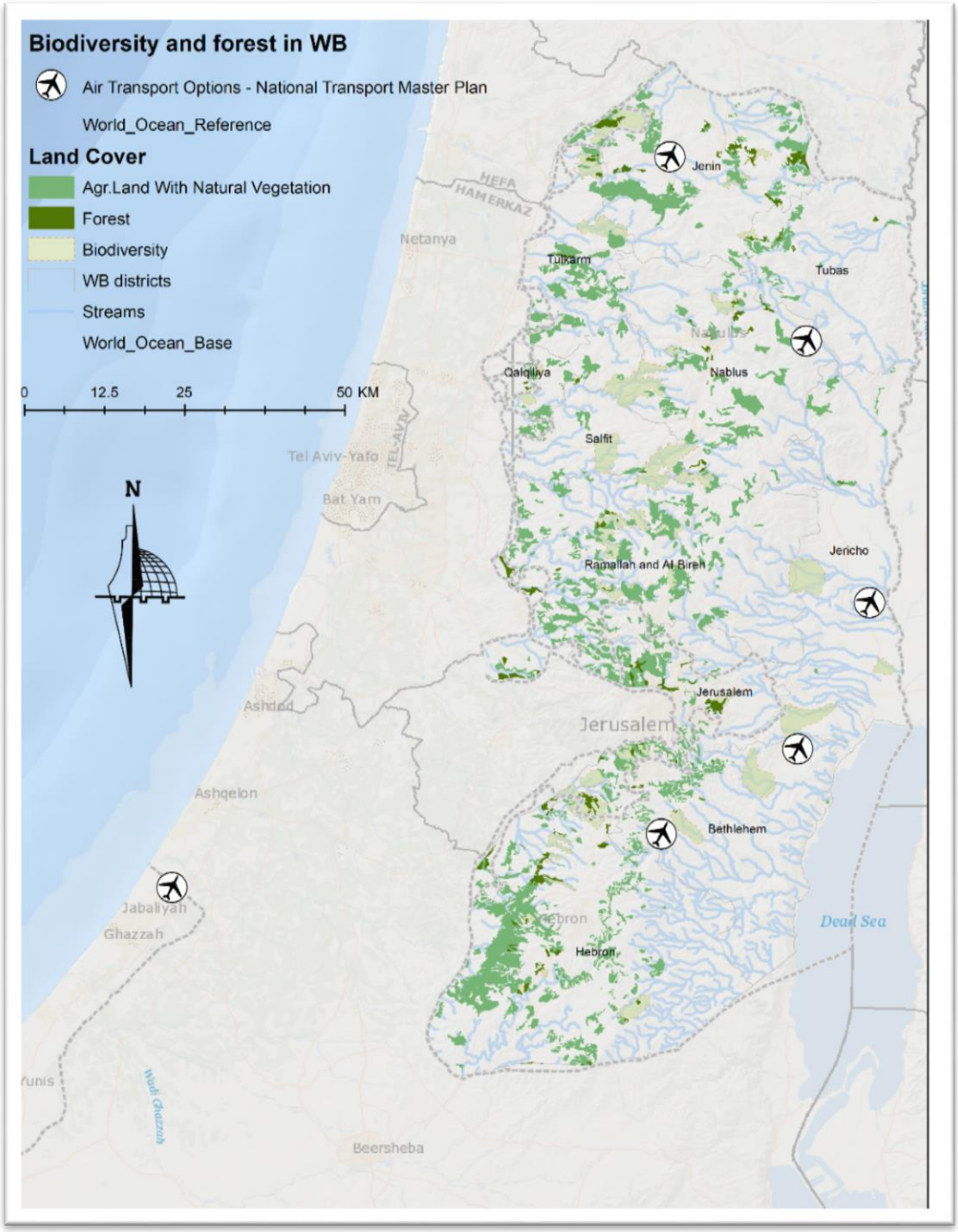
MAP 7: waterbodies in west bank



MAP 8: waterbodies with buffer 1000m

4.2.5 BIODIVERSITY ANALYSIS

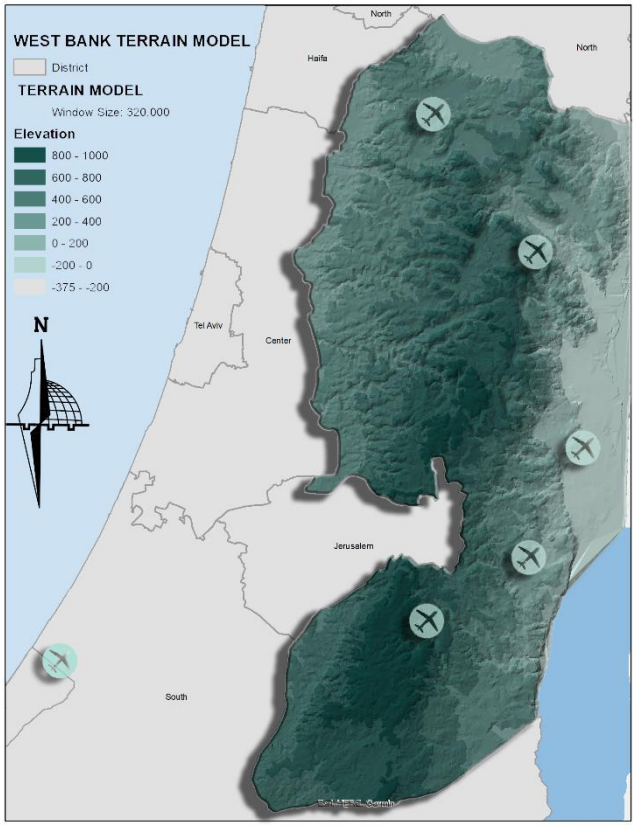
The minimum limit of the approach to the biodiversity ,forest and agricultural area is 1000 m . Except for irrigated farmed area and forestry area are available for this project. In this way rivers and agriculture area will be protected shown in map (9):



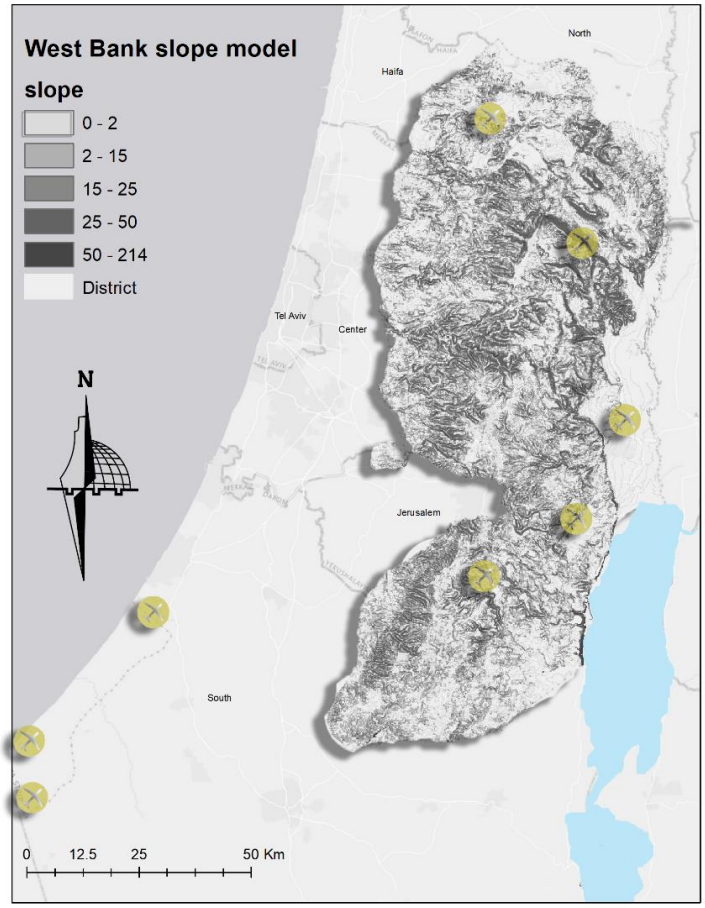
MAP 9 : green area in West bank

4.2.6 TOPOGRAPHY ANALYSIS

Slope is important for both infrastructure and accessibility. For this reason, slope should be maximum 0-2% for our project. The map (10) shows elevation in Westbank according to geology of the area. The map (11) shows slope.



MAP 10: west bank elevation map



MAP 11 : west bank slope model

4.3 DEFINE THE SITE

After doing all these analyses, using ArcGIS (weighted overlay tool) by collecting theses layer's and give it a value as shown in the figure below :

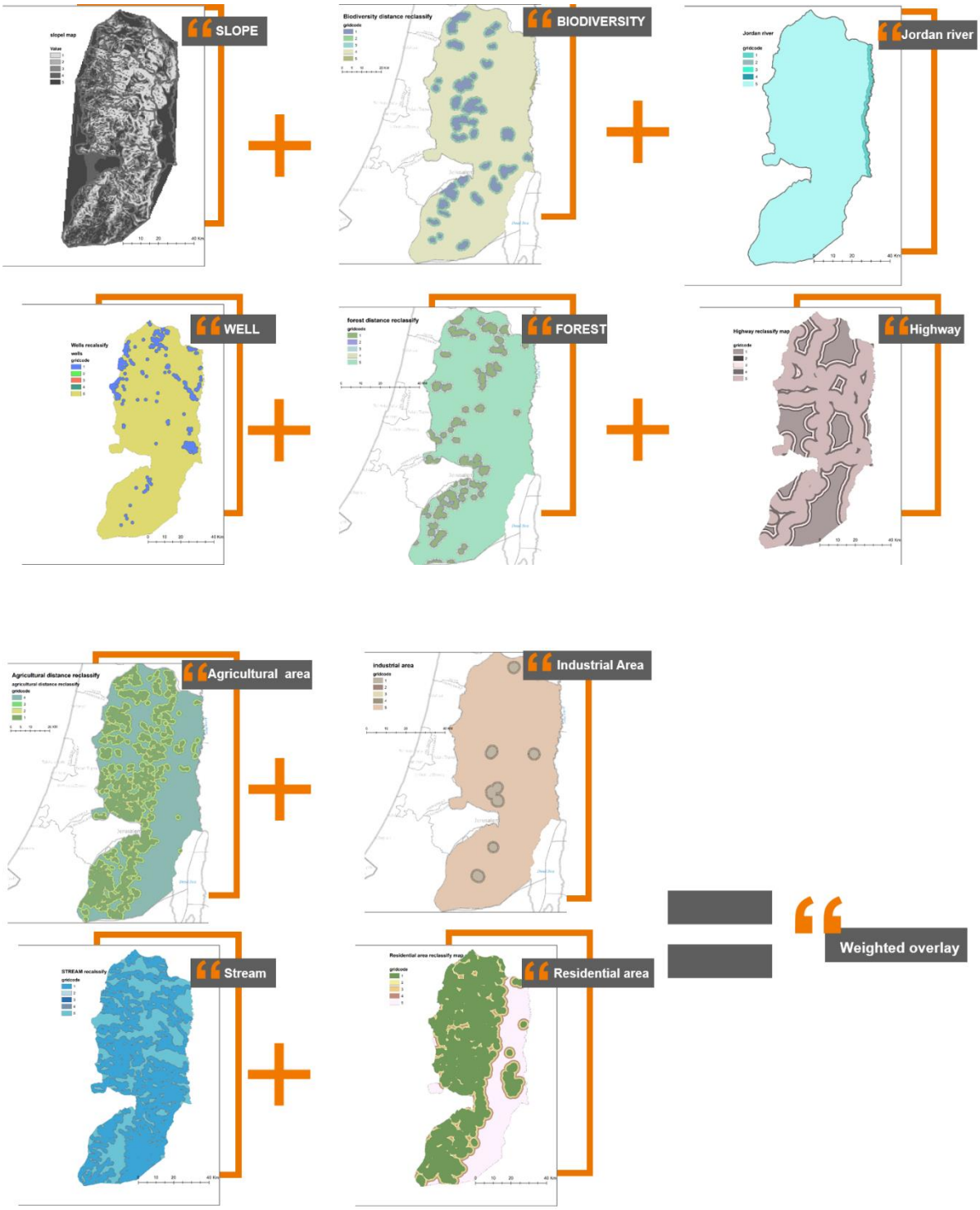
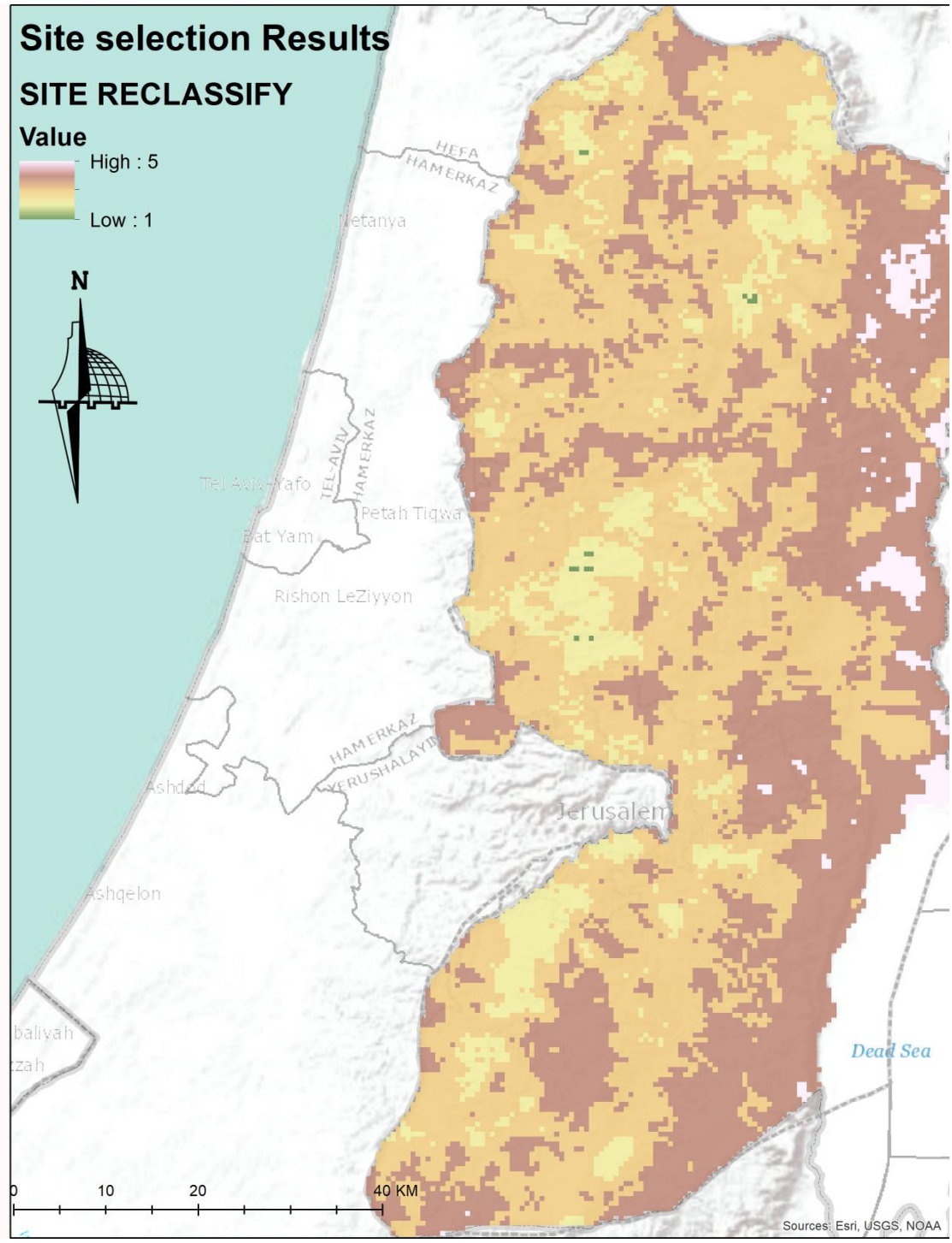


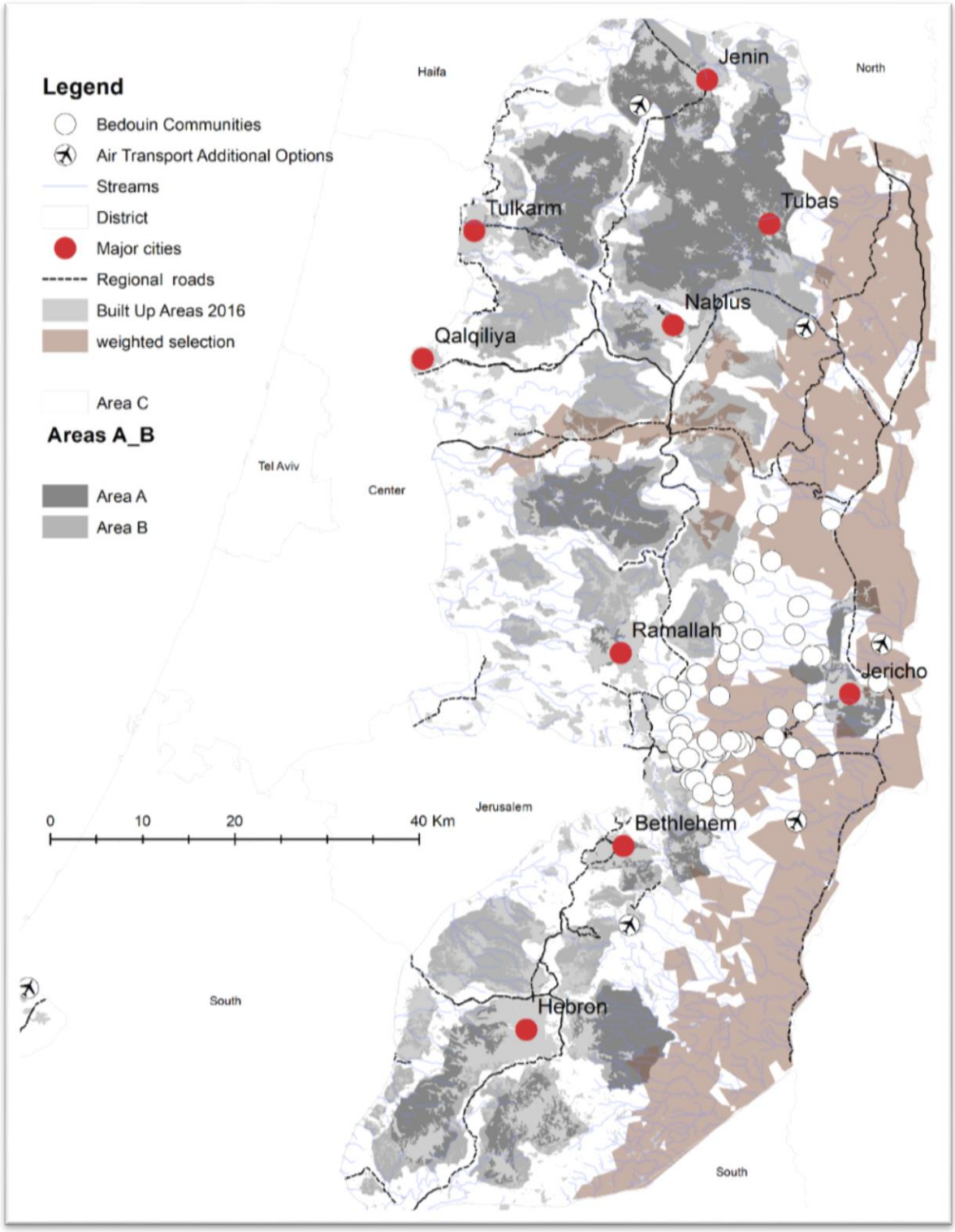
Figure 11 : factors as a layer in ArcGIS

The result shown in map (12) which is the area with high value is the best location for the new airport.



MAP 12 :site selection result

To define the specific location for the airport, There are some criteria for the Palestinian situation shows in map(13) :



MAP 13 : criteria for define the location of the airport

These criterial are:

4.3.1 GEOPOLITICAL REASON

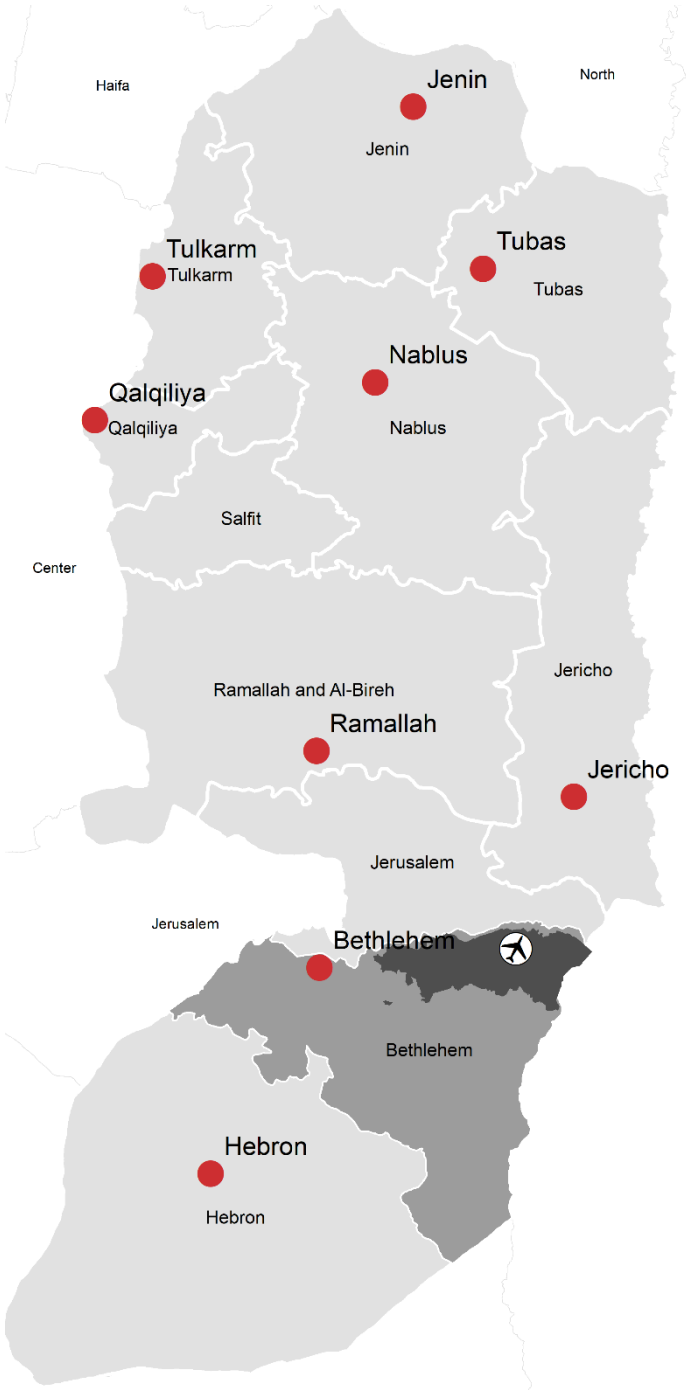
1. located in area c
2. separate gathering settlement

4.3.2 SOCIAL RESON

1. serve Bedouin communities

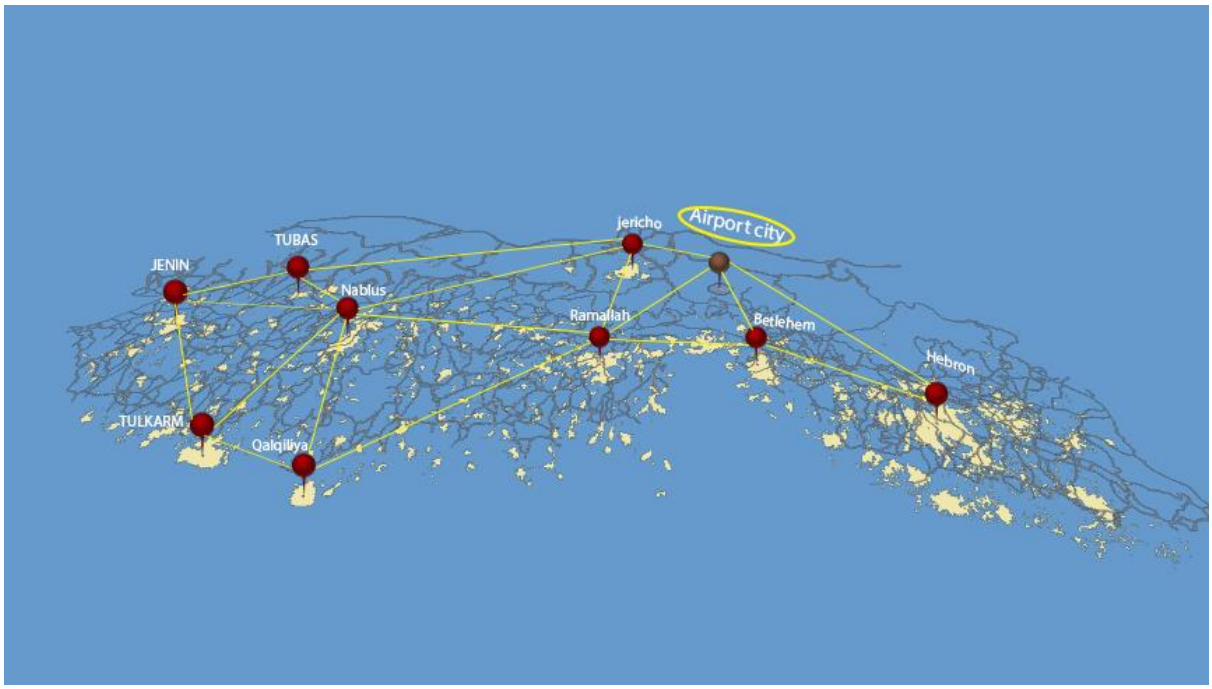
so the best location for the new airport is in the south of Jericho at Bethlehem government shows in map (14) .

at al-Ubeidiya village shown im map (15).

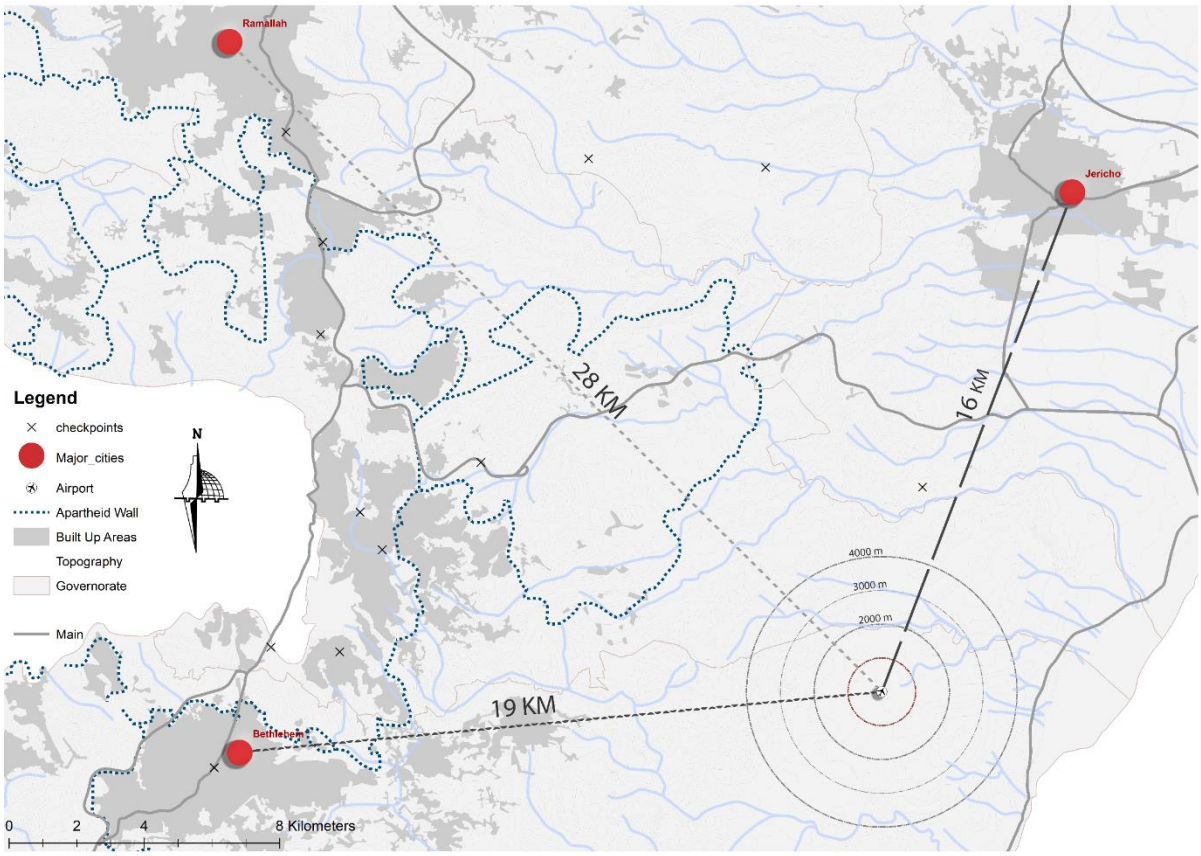


MAP 14 : airport location

MAP 15 : location of the airport



MAP 16: location according to major cities



MAP 17: distance from nearby cities

4.4 SITE ANALYSIS

The major factors that require careful analysis in the final evaluation of airport sites include runway orientation and wind analysis, airspace analysis, surrounding obstructions, availability for expansion, availability of utilities, meteorological conditions, noise impacts, and cost comparisons of alternative sites .

4.4.1 RUNWAY ORIENTATION AND WIND ANALYSIS

Planning an airfield with respect to runway orientation is a nontrivial task. Runway orientation planning consists of three tasks:

1. Identifying the Airport Reference Code (ARC) on the basis of an airpo1t's critical aircraft.
2. Analyze historical wind data for the airfield.
3. Apply the Airport Reference Code and historical wind data using a wind rose to find the appropriate orientation of the primary runway and any necessary crosswind runways .

Identifying the Airport Reference Code on the basis of critical aircraft Eve1y aircraft in use today is limited by the amount of crosswind that may exist in order to land or takeoff. This limit may be found in an aircraft's operating handbook. In general,

however, aircraft with shorter wingspans, and slow approach speeds have lower crosswind tolerance limits .

4.4.2 AIRSPACE ANALYSIS

In major metropolitan areas, it is not uncommon for two or more airports to share common airspace. This factor might restrict the capability of any one airport to accept IFR traffic under adverse weather conditions. Airports too close to each other can degrade their respective capabilities and create a serious traffic control problem. It is important to analyze the requirements and future needs of existing airports before considering construction sites for a new airport.

4.4.3 SURROUNDING OBSTRUCTIONS

Obstructions in the vicinity of the airport sites, whether natural, or proposed man-made structures, must meet the criteria set forth in Federal Aviation Regulations Patt 77-0bjects Affecting Navigable Airspace, as described in Chap. 4 of this text. The FAA requires that clear zones at the ends of runways be provided by the airport operator. Runway protection zones (RPZs) are areas immediately off the approach ends of runways.

4.4.4 AVAILABILITY FOR EXPANSION

Available land for expansion of the airport is a major factor in site selection; however, it is not always necessary to purchase the entire tract at the start because adjacent land needed for future expansion could be protected by lease or option to buy. The Airpo1t and Airway Development Act of 1970 first established funding for communities to acquire land for future airport development.

4.4.5 AVAILABILITY OF UTILITIES

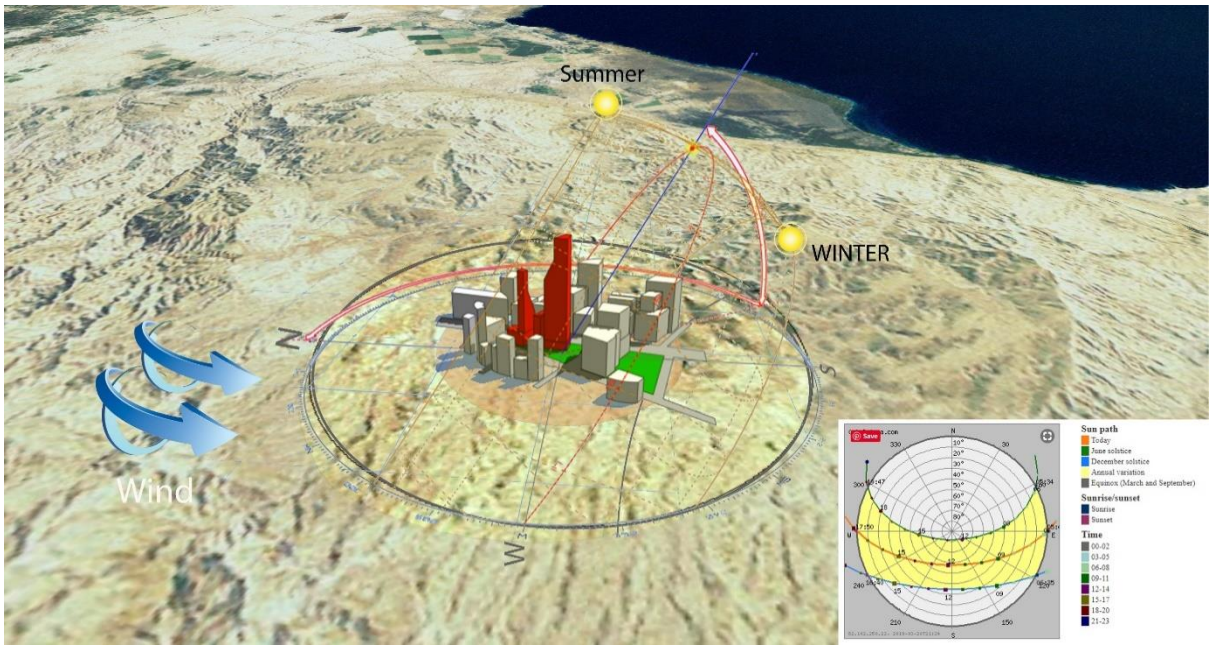
Consideration is always given to the distance that electric power, telephone, gas, water, and sewer lines must be extended to serve the proposed site. Cost of obtaining utilities can be a major influence on the site selection.

4.4.6 METEOROLOGICAL CONDITIONS

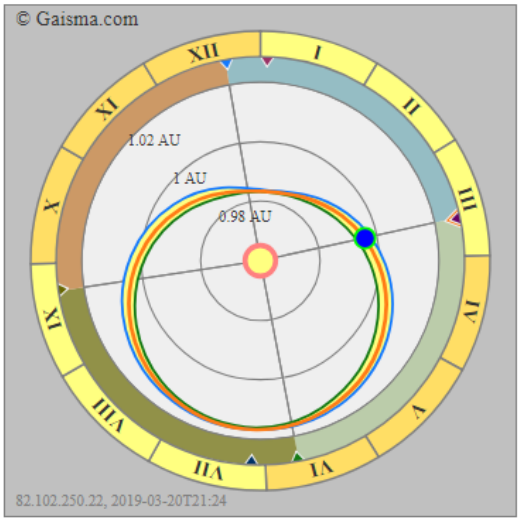
Sites must be carefully investigated for prevalence of ground fog, bad wind currents, industrial smoke, and smog. A study of wind direction on a year-round basis is always made because prevailing winds will influence the entire design of the airport.

4.4.7 ECONOMY OF CONSTRUCTION

Soil classification and drainage can have an effect on the cost of construction. Similarly, sites lying on submerged or marshy land are much more costly to develop than those on dry land. Rolling terrain requires much more grading than flat terrain. The site that is more economical to construct will be a deciding factor in the final selection.



MAP 18:sun path in the site



Events
- Today
- December solstice
- March equinox
- June solstice
- September equinox
- Perihelion [?]
- Aphelion [?]

Earth's orbit
- This year
- Min, years 1600–2600 [?]
- Max, years 1600–2600 [?]
- Variation, years 1600–2600

Seasons
- Winter
- Spring
- Summer
- Fall

Variable	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Insolation, kWh/m²/day	2.56	3.29	4.56	5.93	7.04	7.66	7.55	6.89	5.84	4.37	3.11	2.42
Clearness, 0 - 1	0.47	0.48	0.53	0.59	0.64	0.67	0.67	0.66	0.64	0.59	0.53	0.47
Temperature, °C	10.50	11.10	13.64	18.42	21.81	24.22	26.14	26.51	25.07	21.74	17.04	12.40
Wind speed, m/s	6.02	6.19	6.26	5.65	5.28	5.36	5.45	5.18	4.73	4.67	4.80	5.57
Precipitation, mm	136	111	88	28	3	0	0	0	0	19	60	111
Wet days, d	10.3	9.5	7.9	2.9	0.9	0.0	0.0	0.0	0.1	2.6	5.1	9.1

Figure 12 : Seasons graph and Earth's orbit "These data were obtained from the NASA Langley Research Center Atmospheric Science Data Center; New et al. 2002"

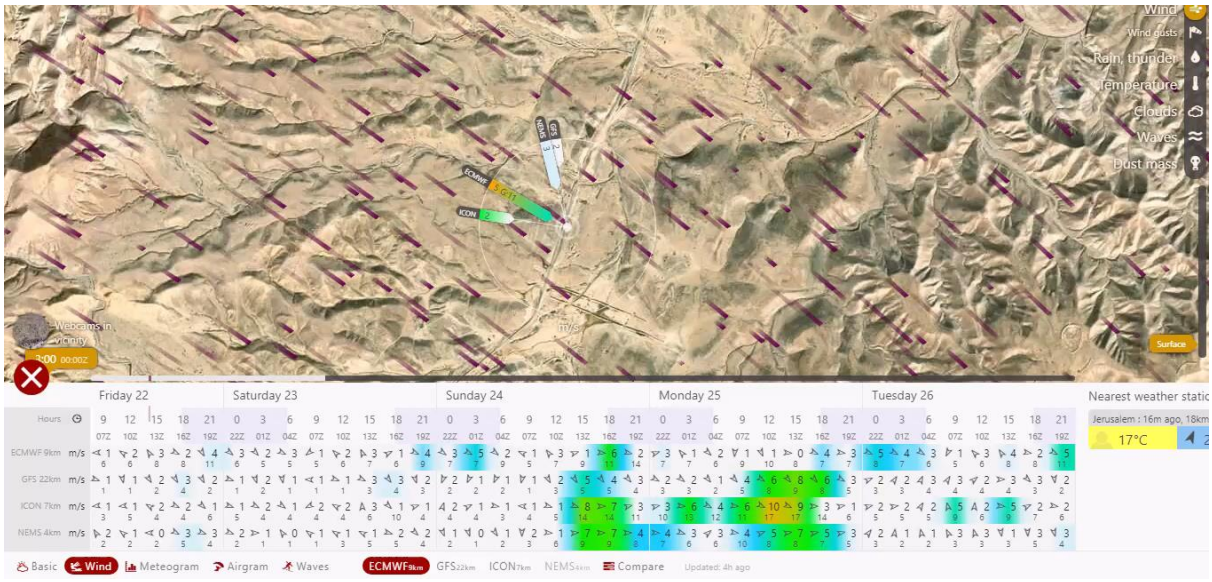
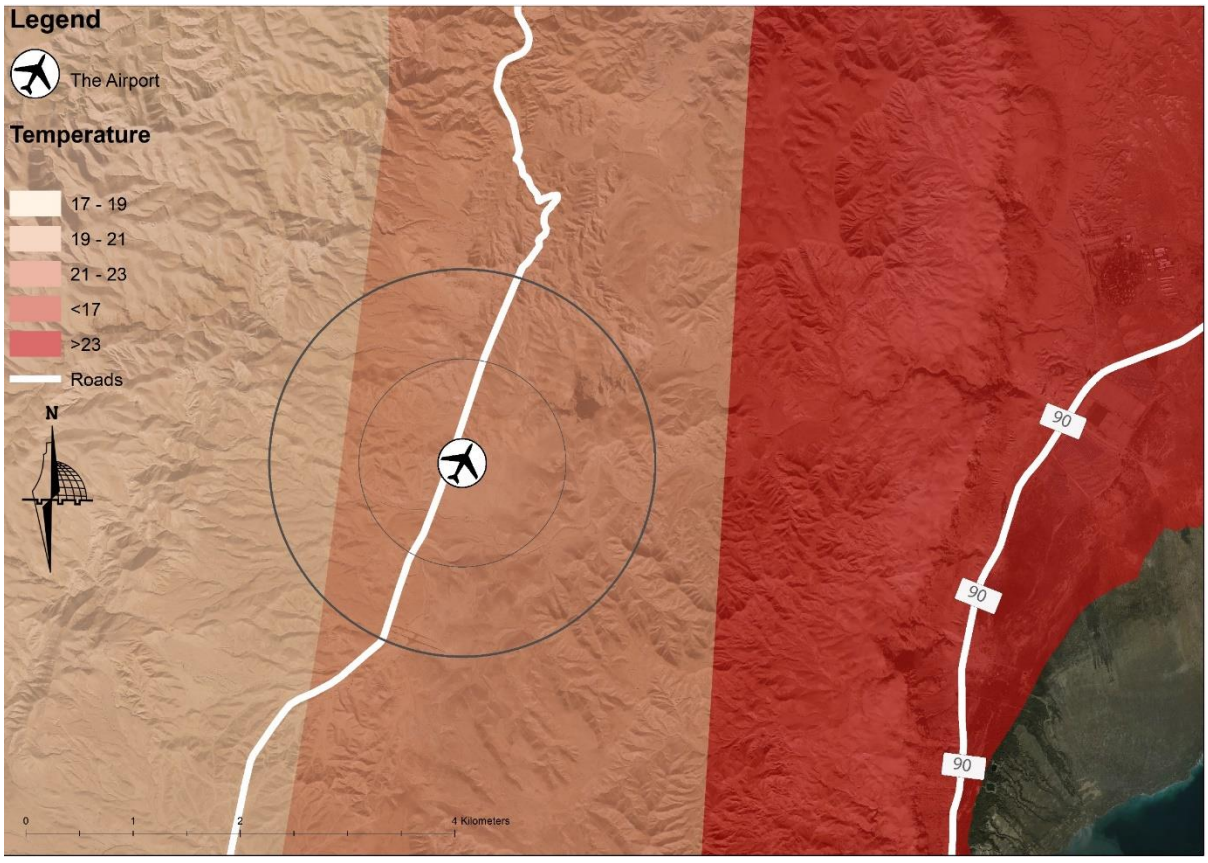


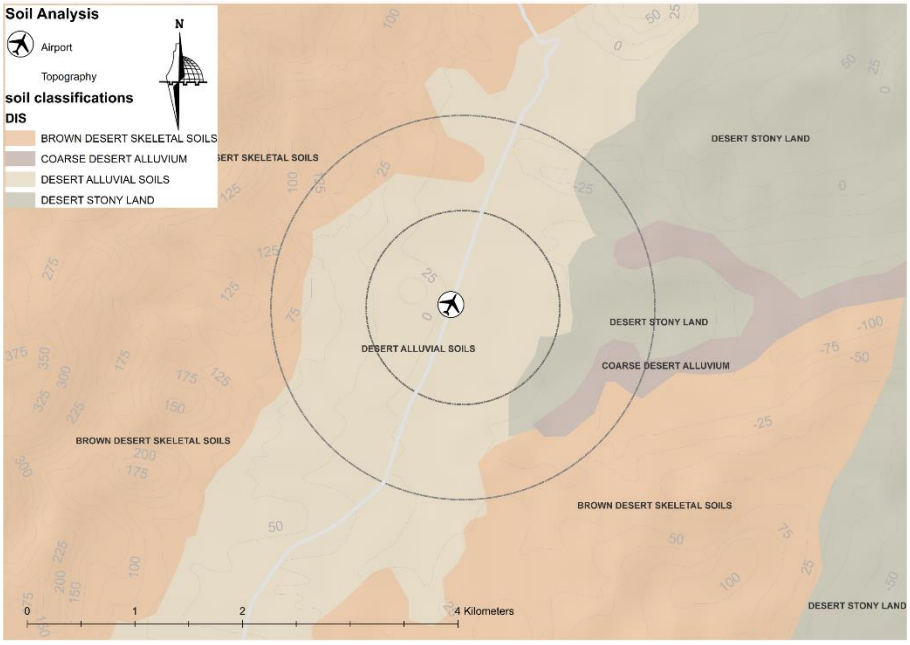
Figure 13: wind direction

Figure 13) show the wind direction on the site which is north west

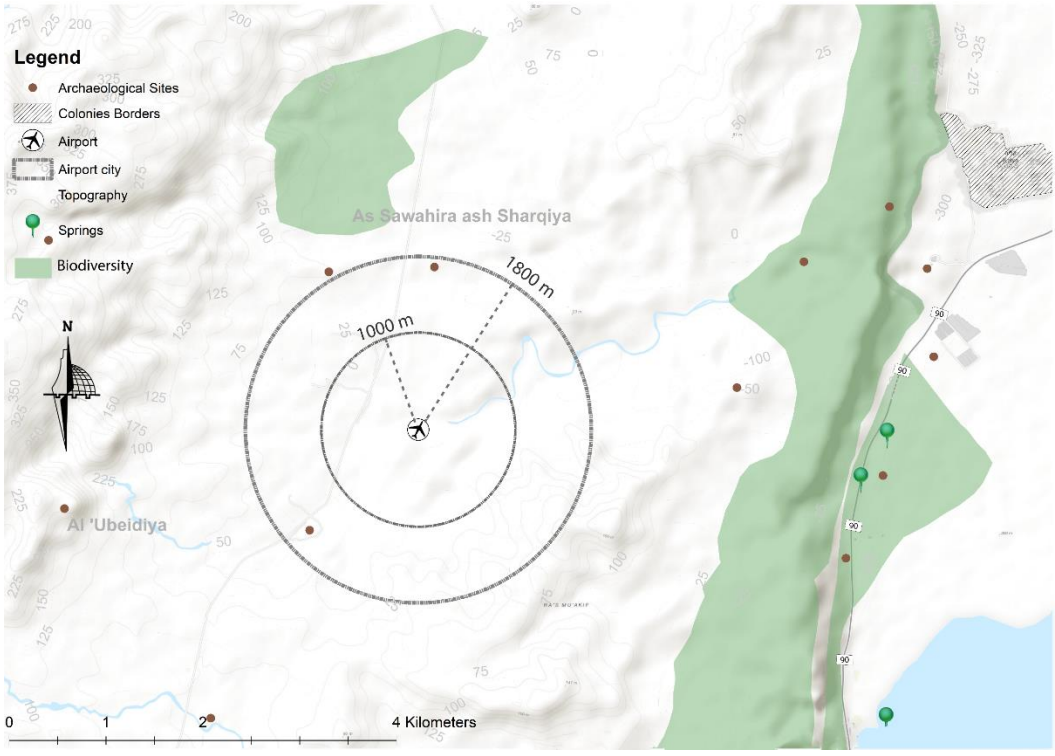


MAP 19:TEMP. analysis

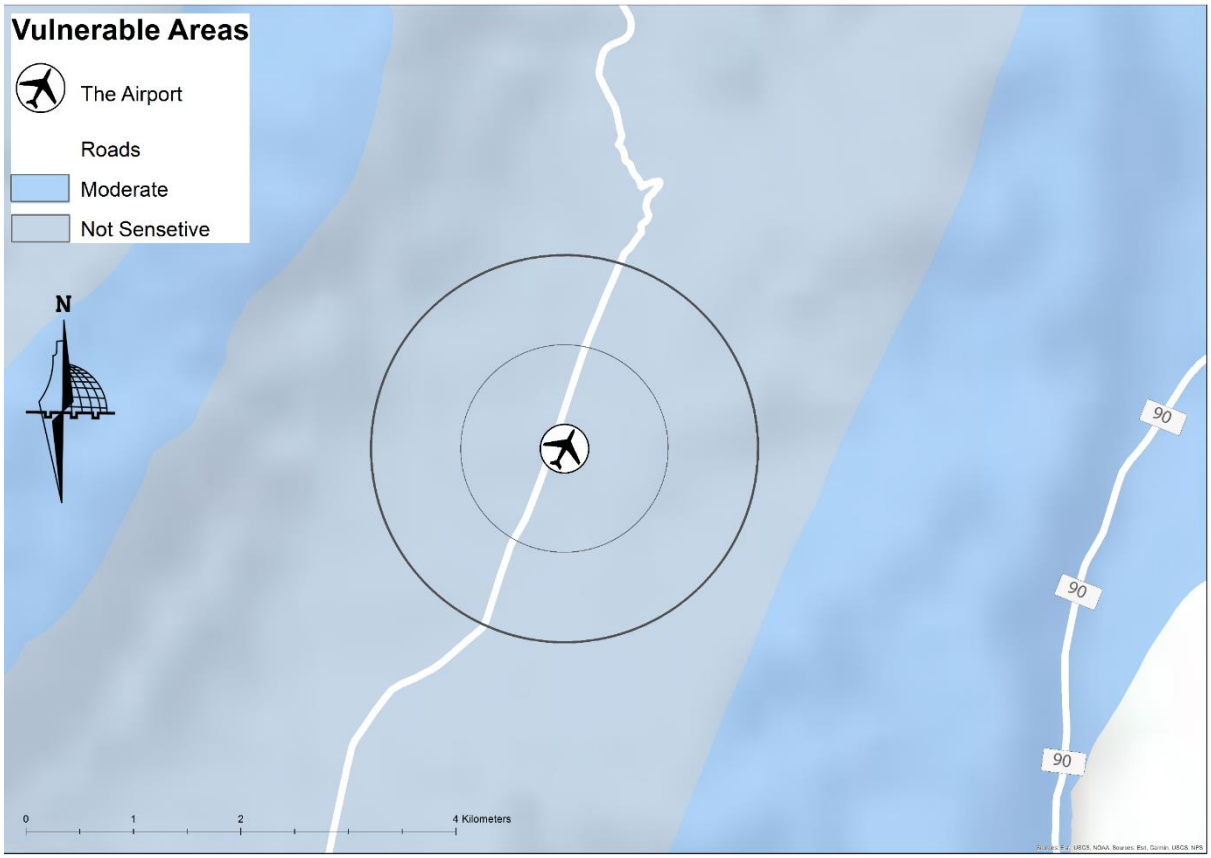
1.4.8 MORE SURFACE ANALASIS



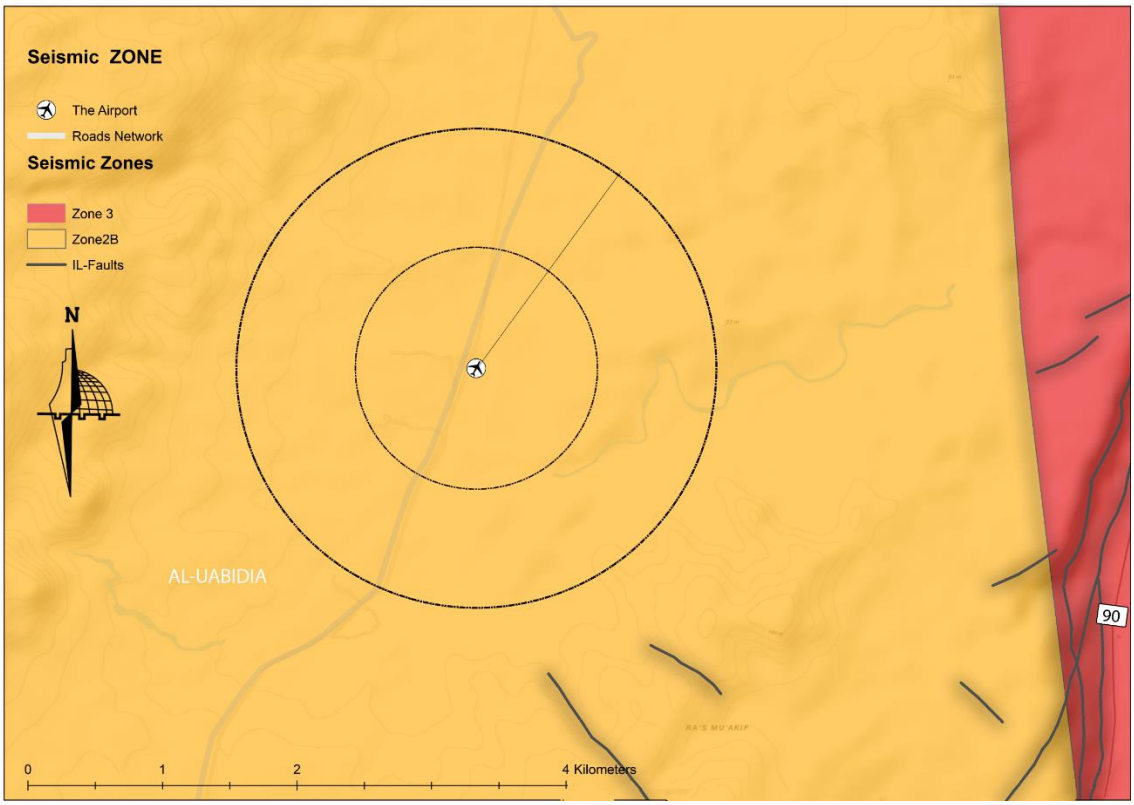
MAP 20 : soil analysis



MAP 21 : archaeological site



MAP 22 : vulnerable areas



MAP 23 : seismic analysis

5 AIRPORT CITY CONCEPT

5.1 DESIGN BRIEF

The proposed aerotropolis will be recalled that Palestinian Government intends to transform the Palestine Aviation sector into a —one-stop shop for travelers, tourists and commercial purposes alike through Aerotropolis concept‖.

That transformation would maximize the contribution of the industry to the socio-economic development of Nigeria through increased trade.

In light of this, proposing to establish an aerotropolis where airports will be major drivers of urban form, economic activity and city competitiveness.

The aerotropolis project will comprise large business cities with retail opportunities and corporate headquarters and bring greater revenue via non-aeronautical avenues.

This project would provide life-sustaining facilities to accommodate the forecasted growth in air traffic to Palestine and within middle east region.

The client intends to have a new facility at the most effective cost, which shall become a standard for newer class of facilities that would follow this in the nearest future.

The aerotropolis design project that includes the passenger‘s terminal and freight facilities and other major amenities such as hospitals, fire station, and hotels will also be on site, along with cinema complexes, shopping malls, and recreational facilities and schools. All in all, the aerotropolis zone will be the ultimate location to live, work and play as shown in figure (14)

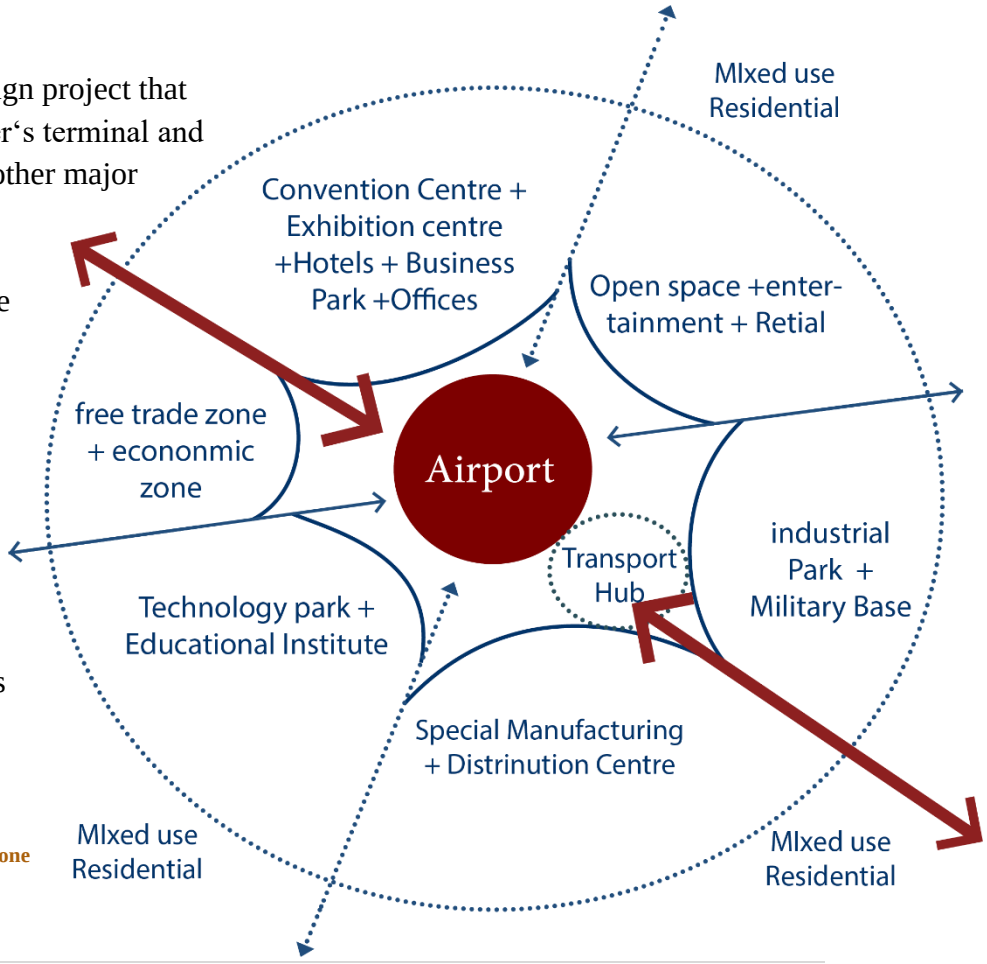


Figure 14 : the aerotropolis zone proposing concept

. The essential criteria for which the design shall satisfy is the creation of facility that‘s aimed at bringing together airport planning, urban and regional planning, and business-site planning, to create a new urban form that is highly competitive, attractive, and sustainable. It is a business planning model aimed to bring clusters of travel-related businesses like tourism, hospitality, shopping, fashion and others together within an airport environment. Shows in figure 15

The building so designed shall be sustainable and innovative in the use of material and construction method.

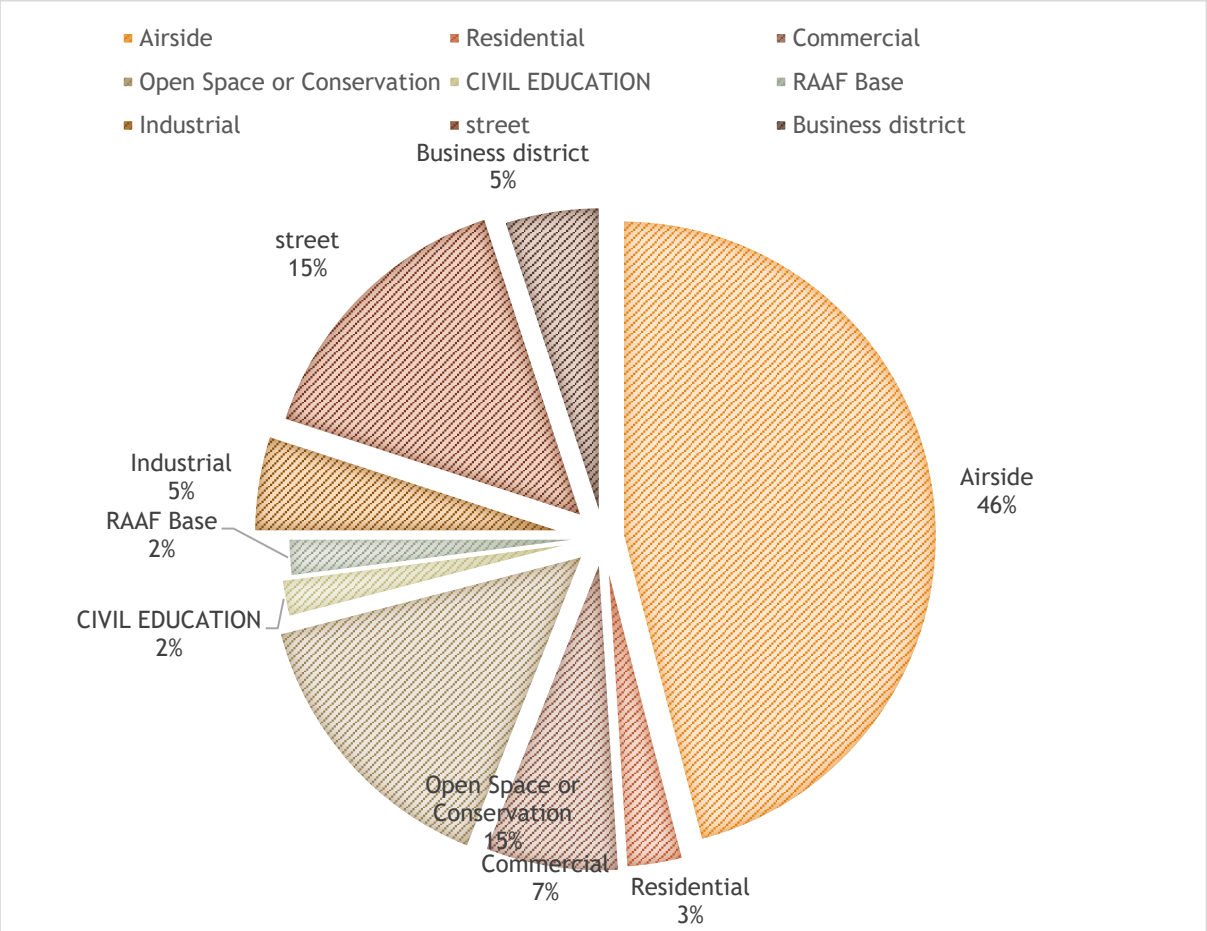
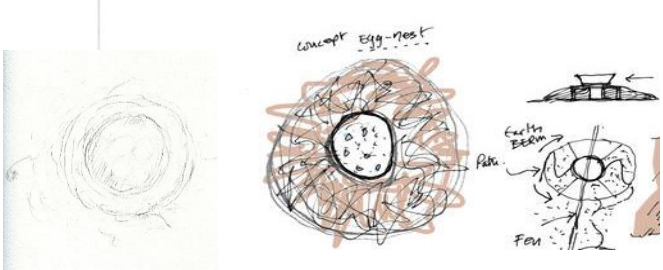


Figure 15 Land use zoning percentages

With total area $10\ km^2$.

The design concept for aerotropolis came from the bird nest shown in pic (16)



5.1.1 TO FLY

The design concept for the proposed Gateway International Airport, is **"To Fly".** Defining this phrase in relation to Airport, to fly can mean the following;

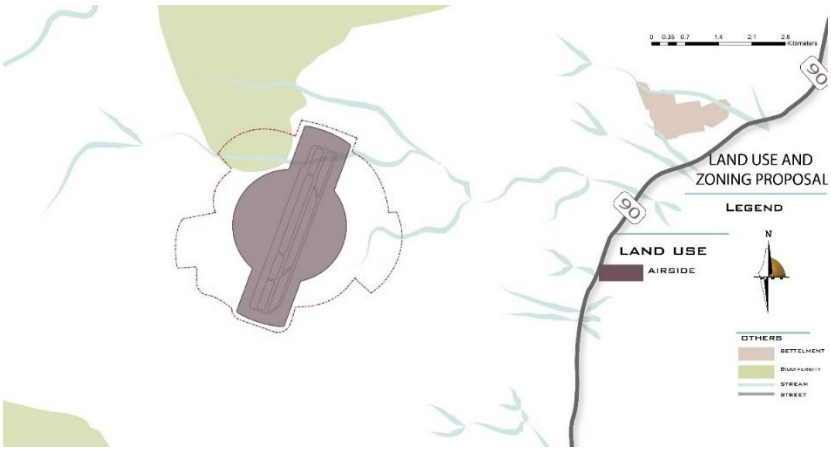
- To move in or pass through the air with wings
- To move through the air by means of wings or wing like parts
- To travel by air
- To engage in flight.

5.2 MASTER PLAN

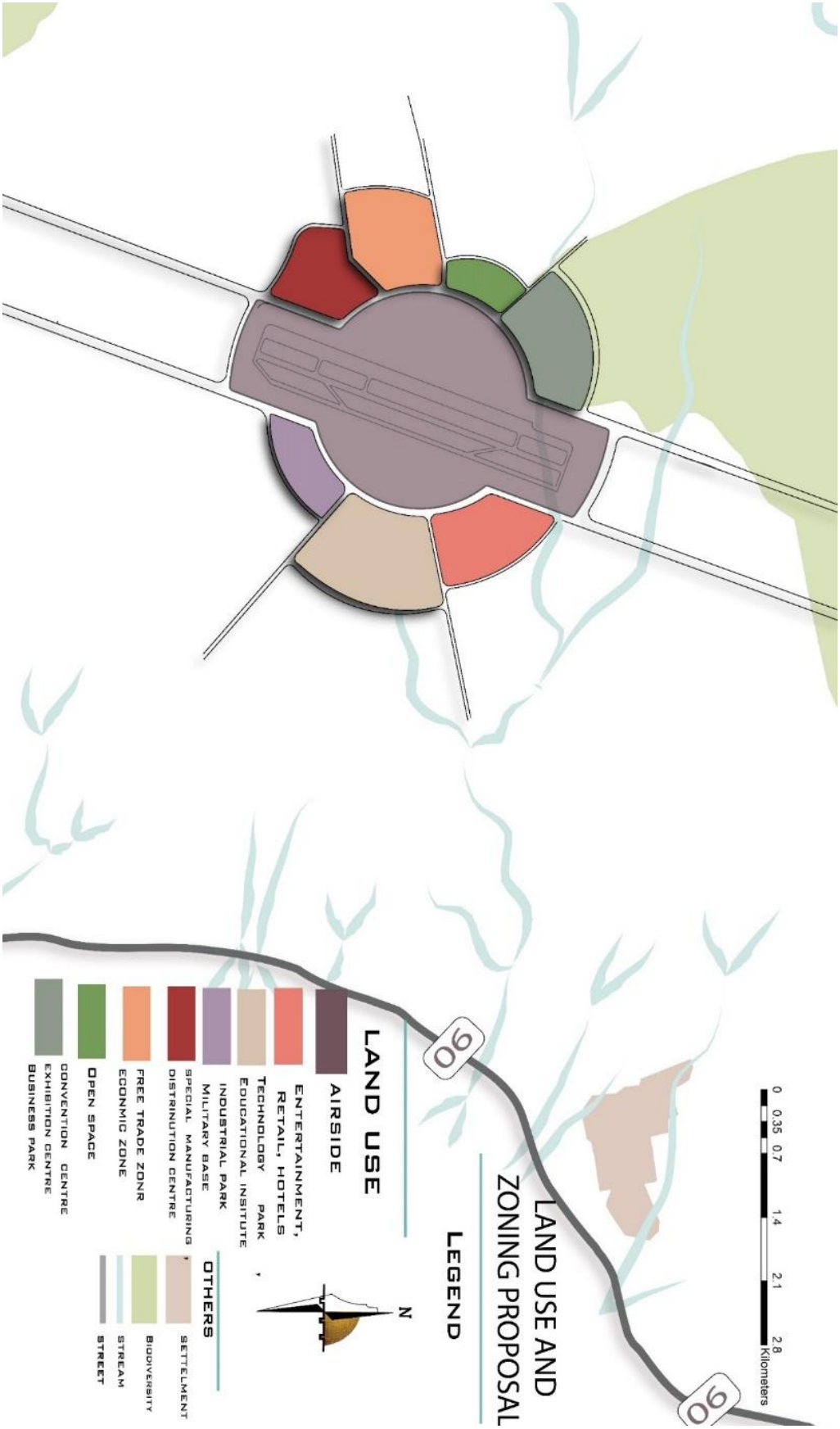
Local land use authorities are responsible for ensuring compatible land use and appropriate zoning requirements around airports. incompatible land uses adjacent to airport lands — irrespective of their relationship to the operational needs of airports — may result in the loss, or significantly impede, of some of the airports within the state aviation system. This loss would endanger the state's mission to preserve a system of essential public facilities that provides access for all regions of the state to the nation's air transportation system, emergency management, and needed support for local economies.

5.2.2 LAND USE

land use compatibility program protecting airports from encroachment by incompatible land uses. The primary function is to provide technical guidance to customers through advocacy. Requests for assistance continue at an accelerated rate. A large percentage of requests relate to facilitating communication between airport sponsors and neighboring communities. The program emphasizes bridging communication linkages where gaps exist, and is intended to encourage a cooperative spirit between local governments and airport sponsors to work through..

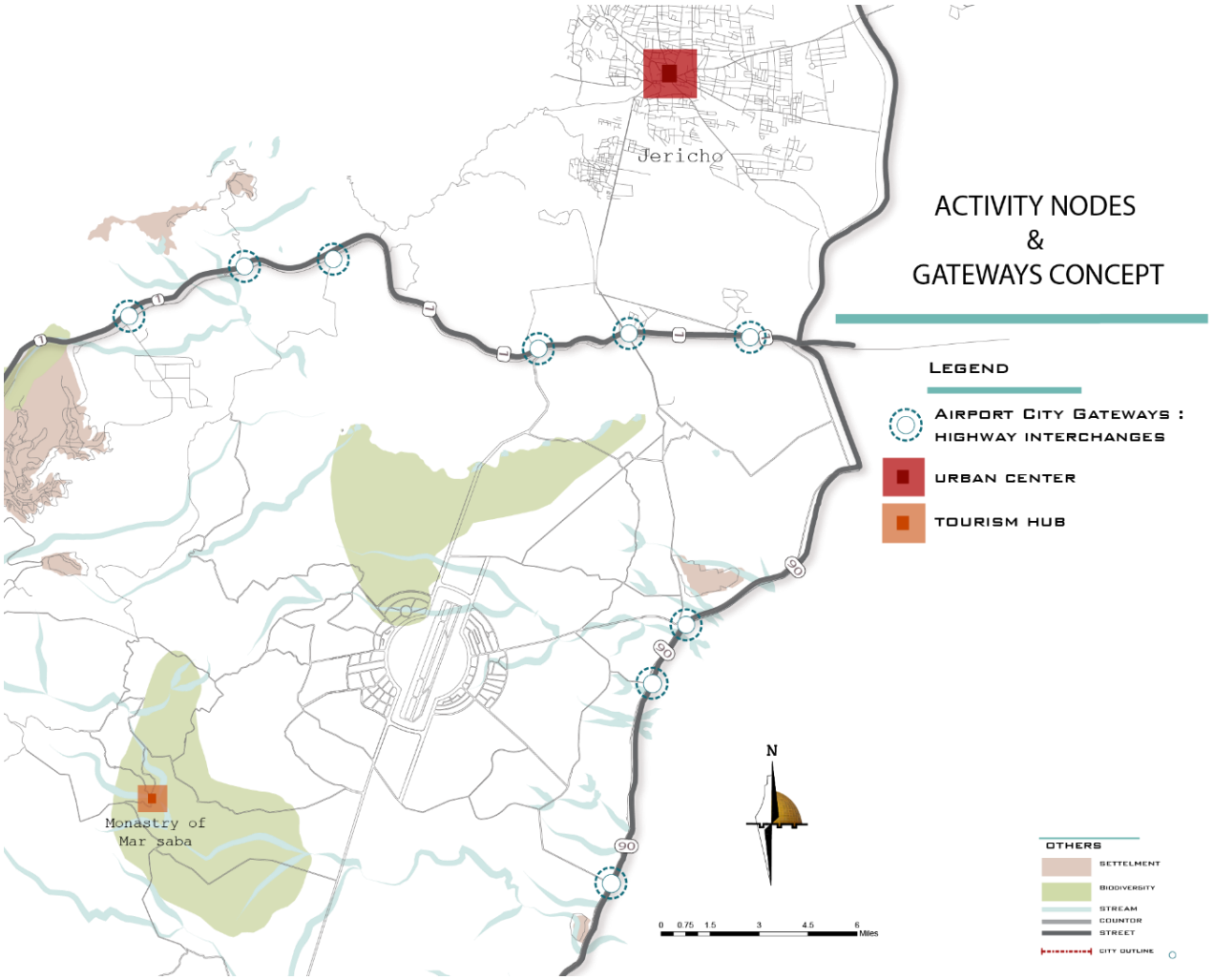


MAP 24: airside and outline for airport city



MAP 25 land use proposal

5.2.3 ACTIVITY NODES & GATEWAYS CONCEPT

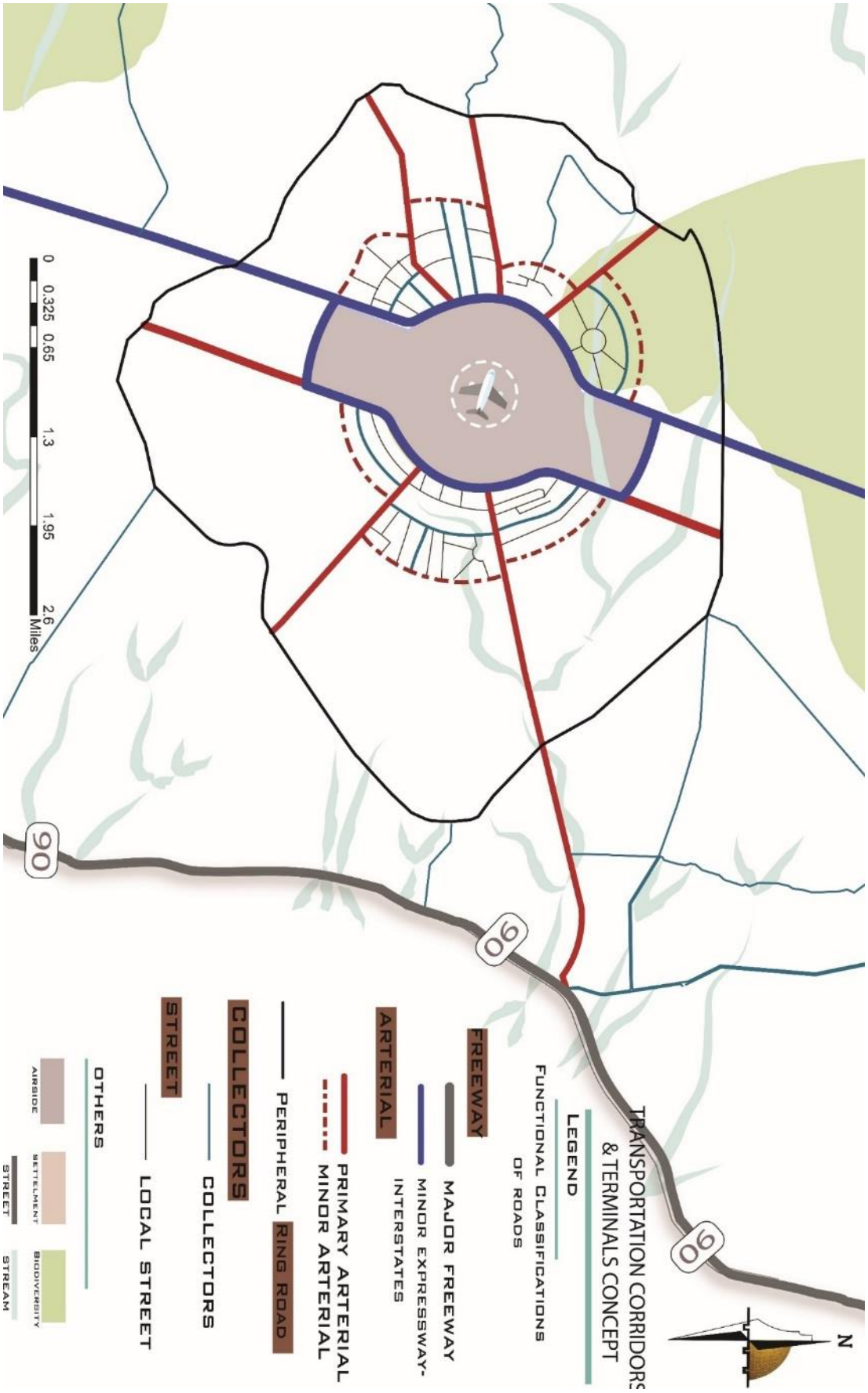


MAP 26 ACTIVITY NODES & GATEWAYS CONCEPT

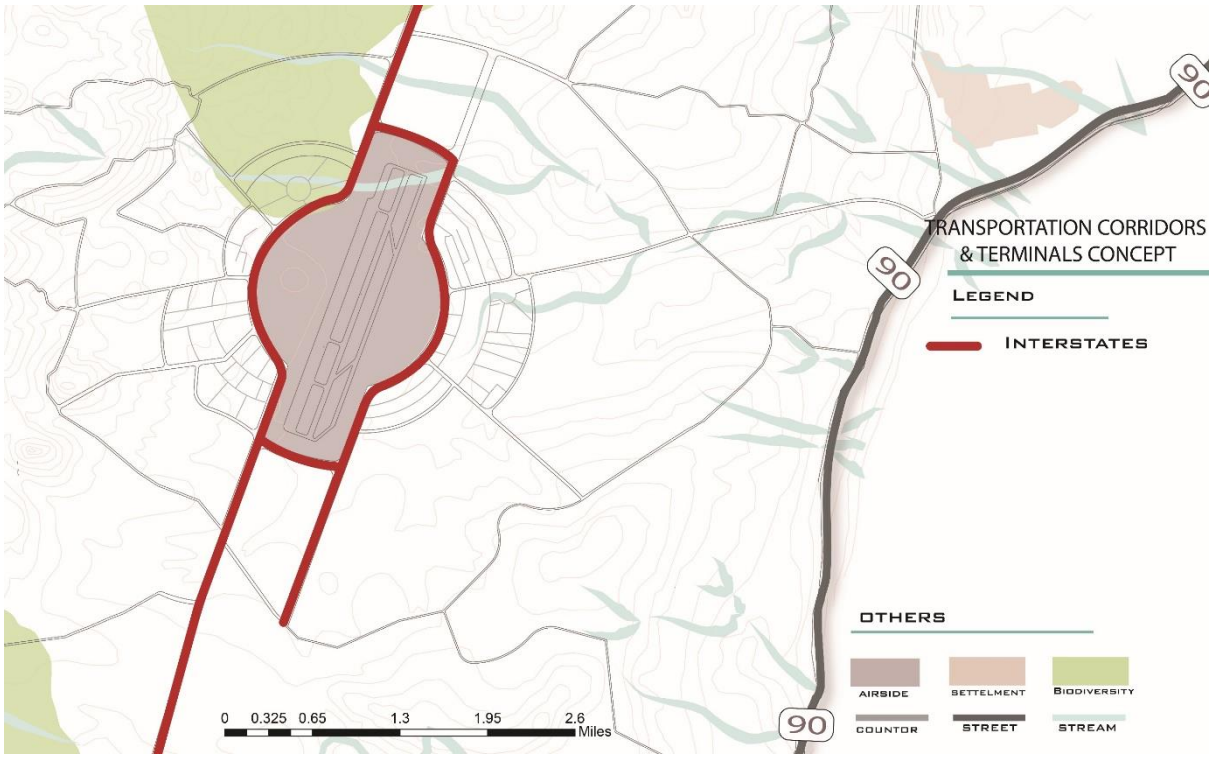
5.2.4 TRANSPORTATION CORRIDORS

They address the safe, efficient and clean movement of commuters and freight along major corridors, incorporating some technologically advanced solutions, as well as enhancements to the transit system and alternative modes of travel

Map 27 shows how street type distribute on airport city in deferent type width and uses .

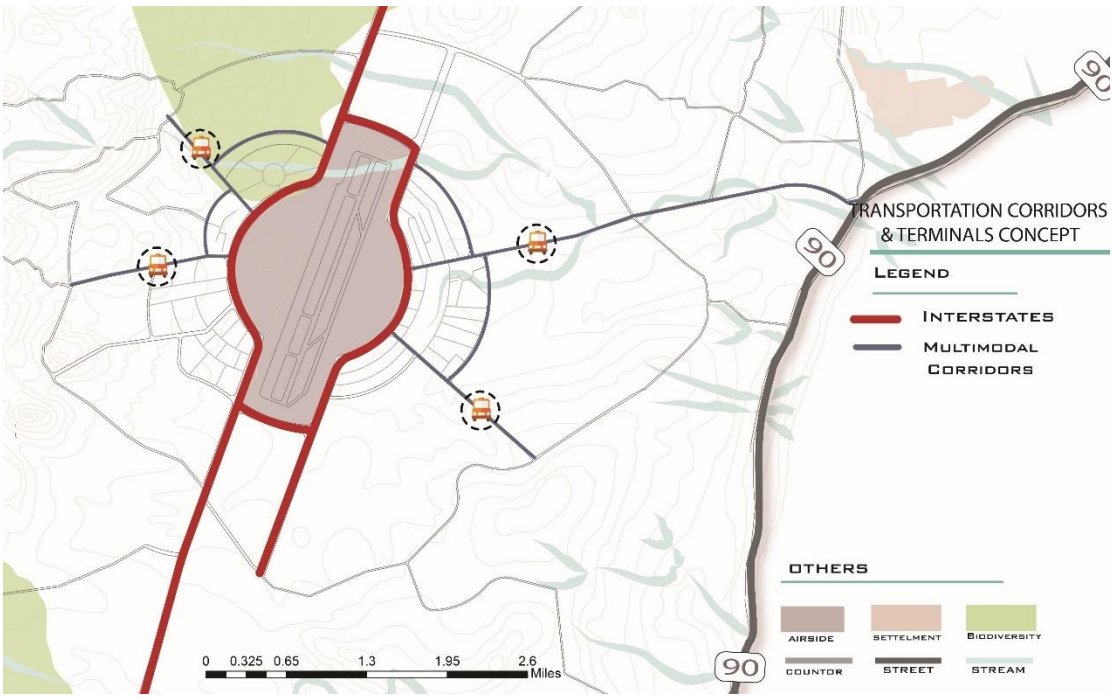


MAP 27 TRANSPORTATION CORRIDORS



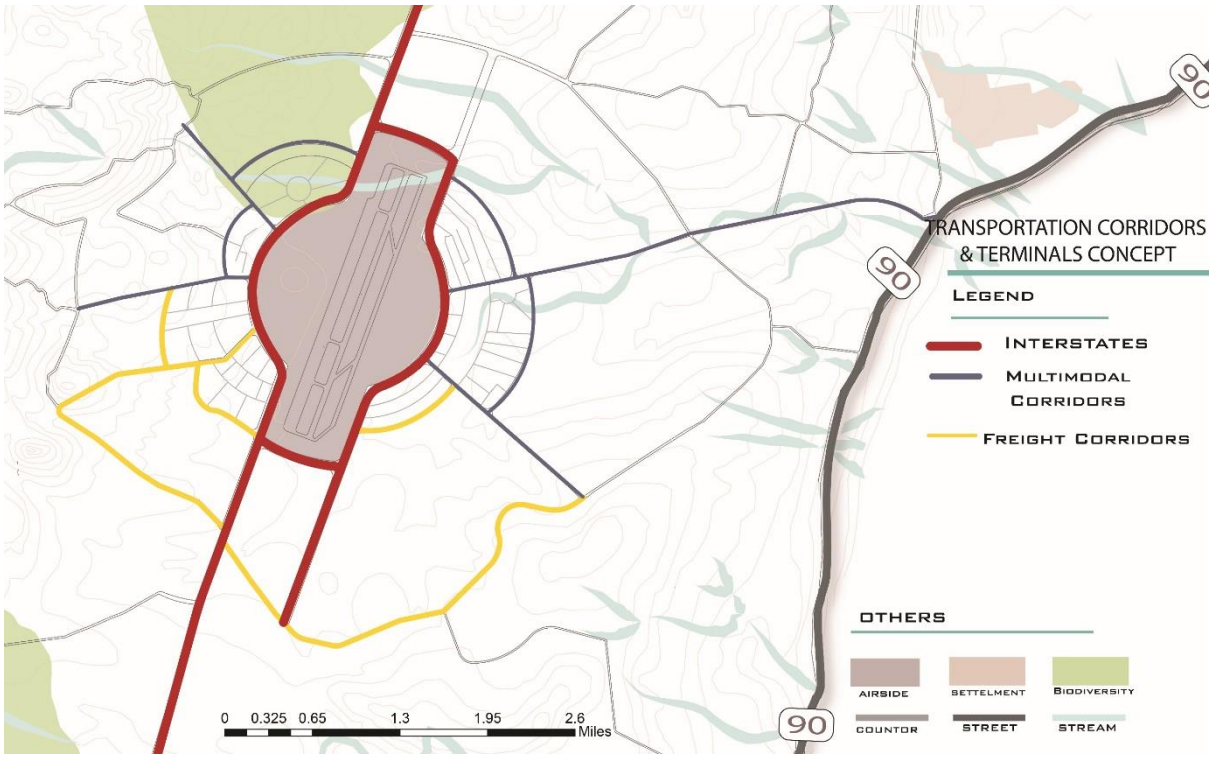
MAP 28 interstate street

Interstate street :are critical to the region's freight movement, offering high capacity, high speed travel with limited access. TDOT has programmed both near-term and long range capacity improvements for I-40 and I-255 as they pass through Airport City.



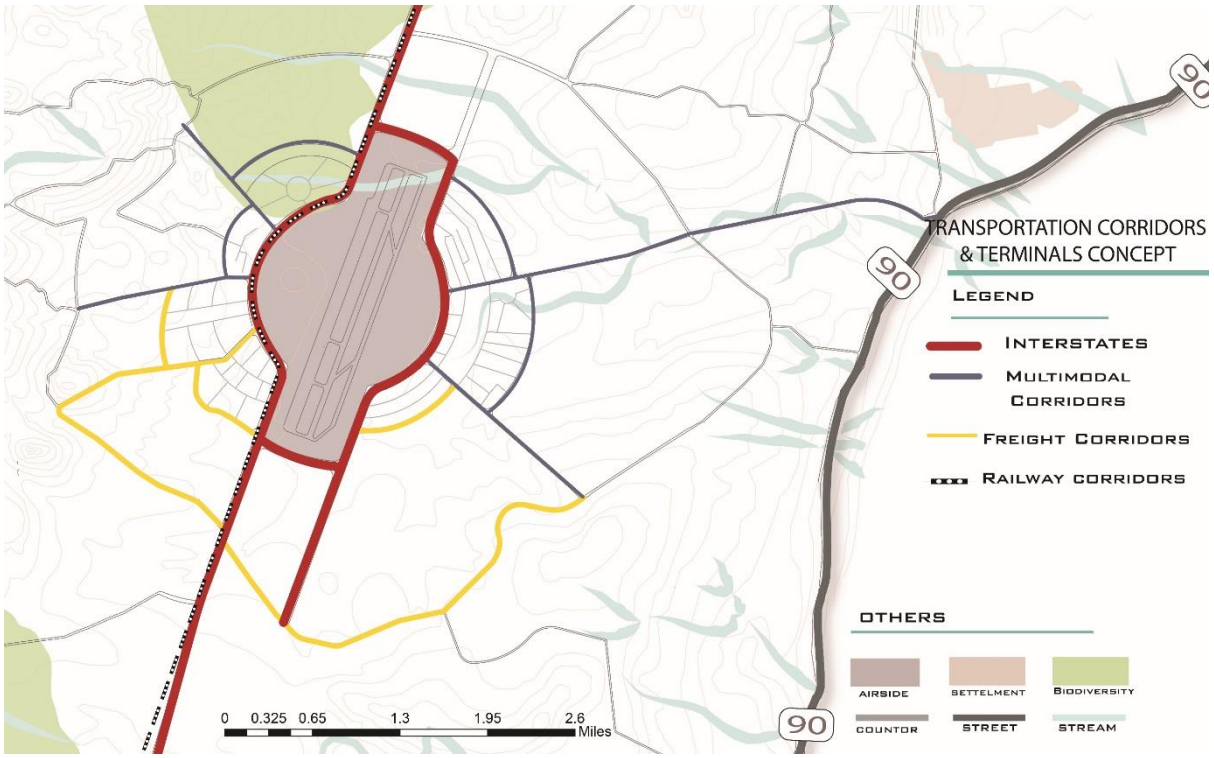
MAP 29 : multimodal street

Multimodal Corridors: encompass arterial roadways that establish essential links between activity nodes and residential neighborhoods, and therefore, are recommended for improvement as complete streets that accommodate automobiles, transit, bicycles, and pedestrians. These roadways should incorporate enhanced transit stops, dedicated bicycle lanes, crosswalk enhancements, and similar improvements that support transit and alternative modes of travel.



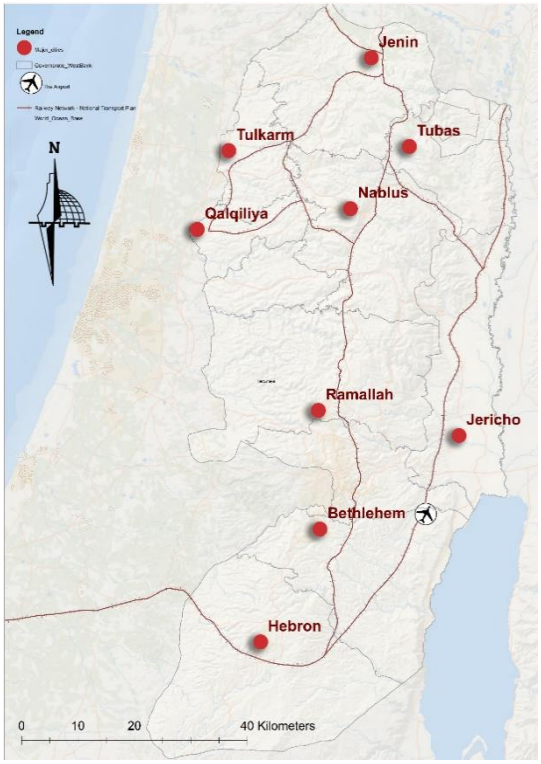
MAP 30 freight corridors

Freight Corridors: encompass arterial roadways that are critical to the efficient movement of freight, providing access to the interstates, the Airport, intermodal terminals, and industrial and warehousing operations. Measures that minimize conflicts between freight and commuter traffic are recommended, including managed truck lanes / express lanes, grade separated interchanges, adaptive signal control, and similar smart corridor solutions.

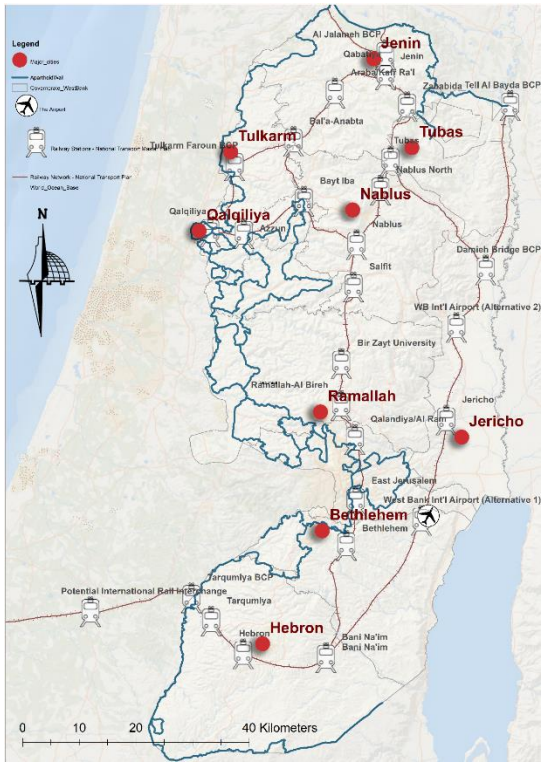


MAP 31: railway corridor

Rail Corridors are critical to cost efficient freight movement. One of five Class-One railways serving the region,

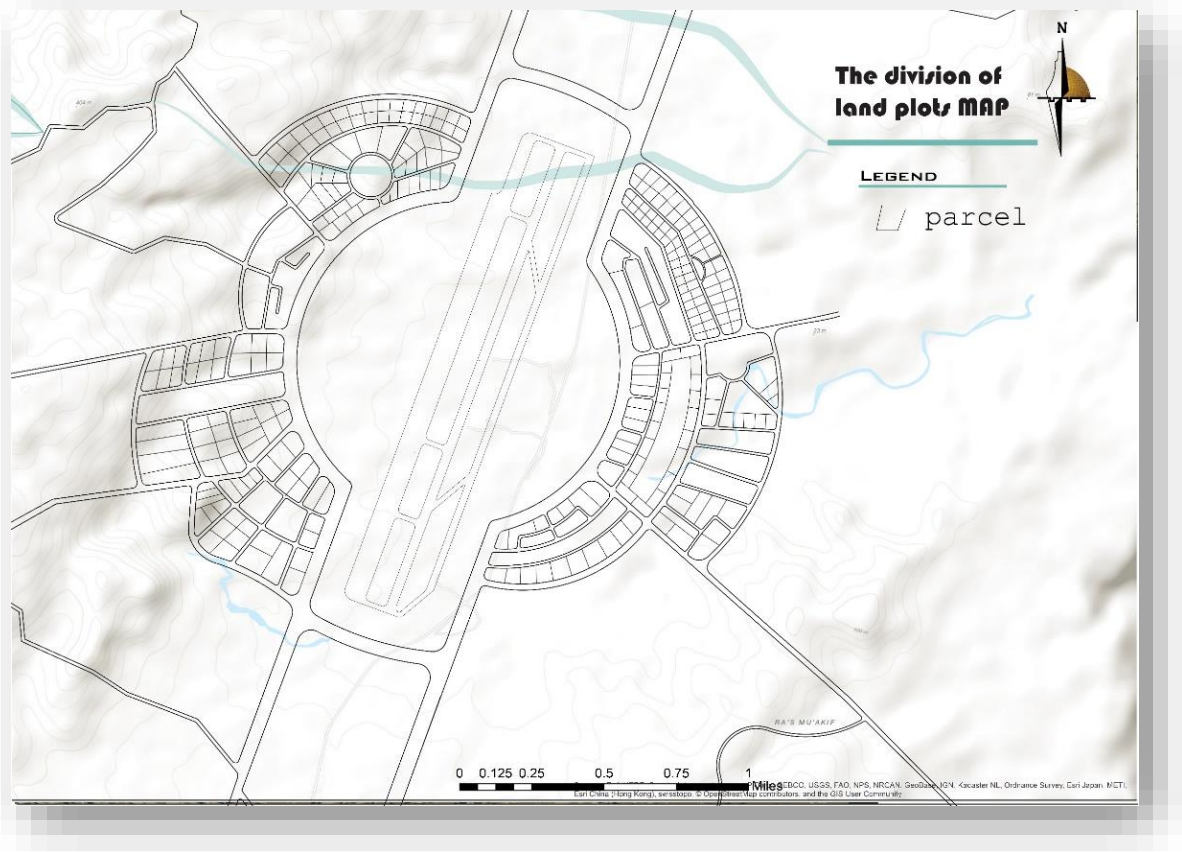


MAP 33 railway in wet bank

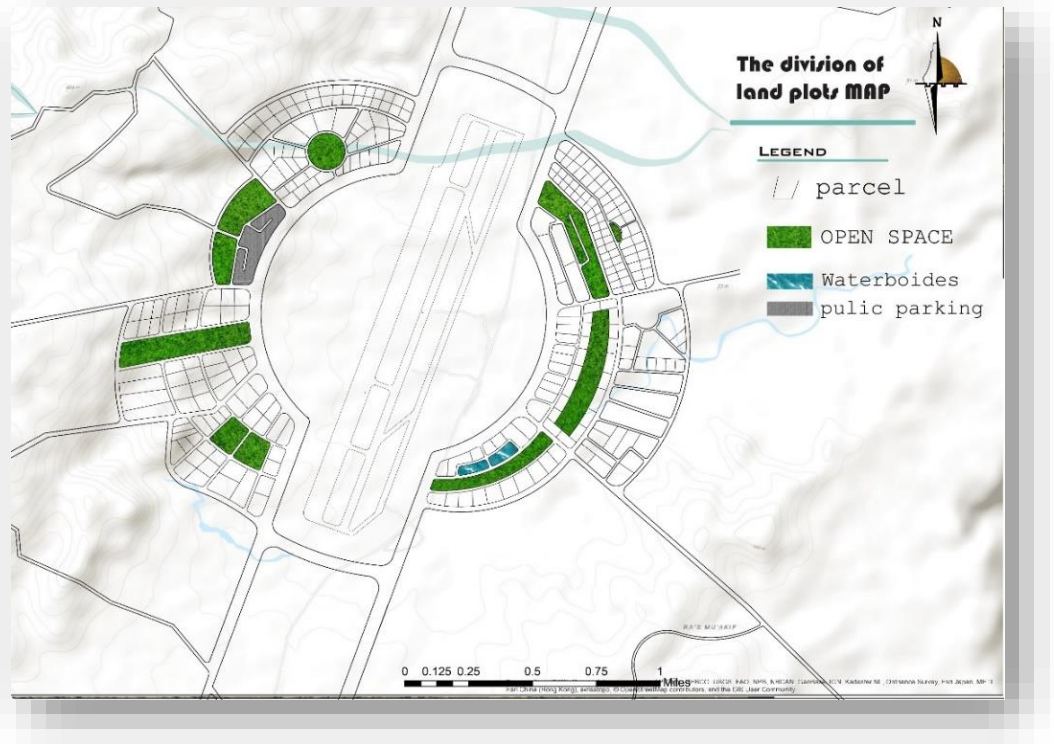


MAP 32 railway station

5.2.5 **PARCELATION AND SPACES CONCEPT**

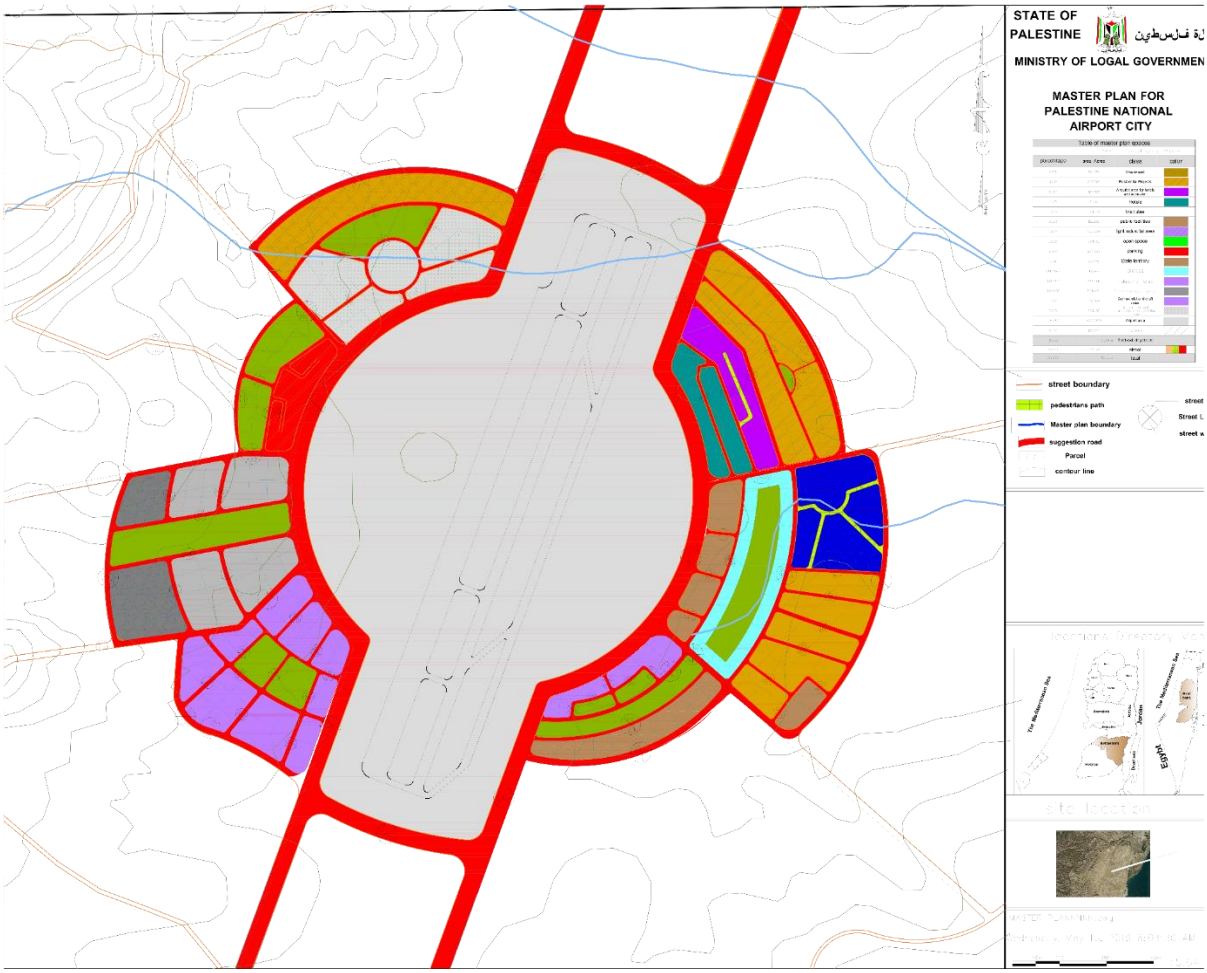


MAP 34 airport city parcel



6.6 MASTER PLAN

The result map of master plan is shown in map 34



MAP 35 master plan

Table 7 : master plan spaces

Table of master plan spaces			
	9184.511	total area /Acres	
percentage	area -Acres	class	color
2.19%	201.076	Residential	
3.13%	287.909	Residential Projects	
1.19%	109.570	A tourist area for hotels and recreation	
1.22%	111.743	Hotels	
2.22%	203.631	Institutes	
1.15%	105.537	public facilities	
1.47%	134.669	light industrial area	
5.70%	523.325	open space	
2.37%	217.333	parking	
1.94%	177.931	State territory	
0.004667	42.867	Water pools	
0.024215	222.406	Industrial area	
0.038951	357.743	Commercial area	
1.73%	158.562	Commercial and craft uses	
3.26%	299.102	Commercial and administrative activities area	
44.45%	4082.398	Airport area	
1.18%	108.822	Railway	
79.97%	7,344.62	Total excluding streets	
20.03%	1839.89	street	
100.00%	9,184.51	total	

5.3 SITE PLAN

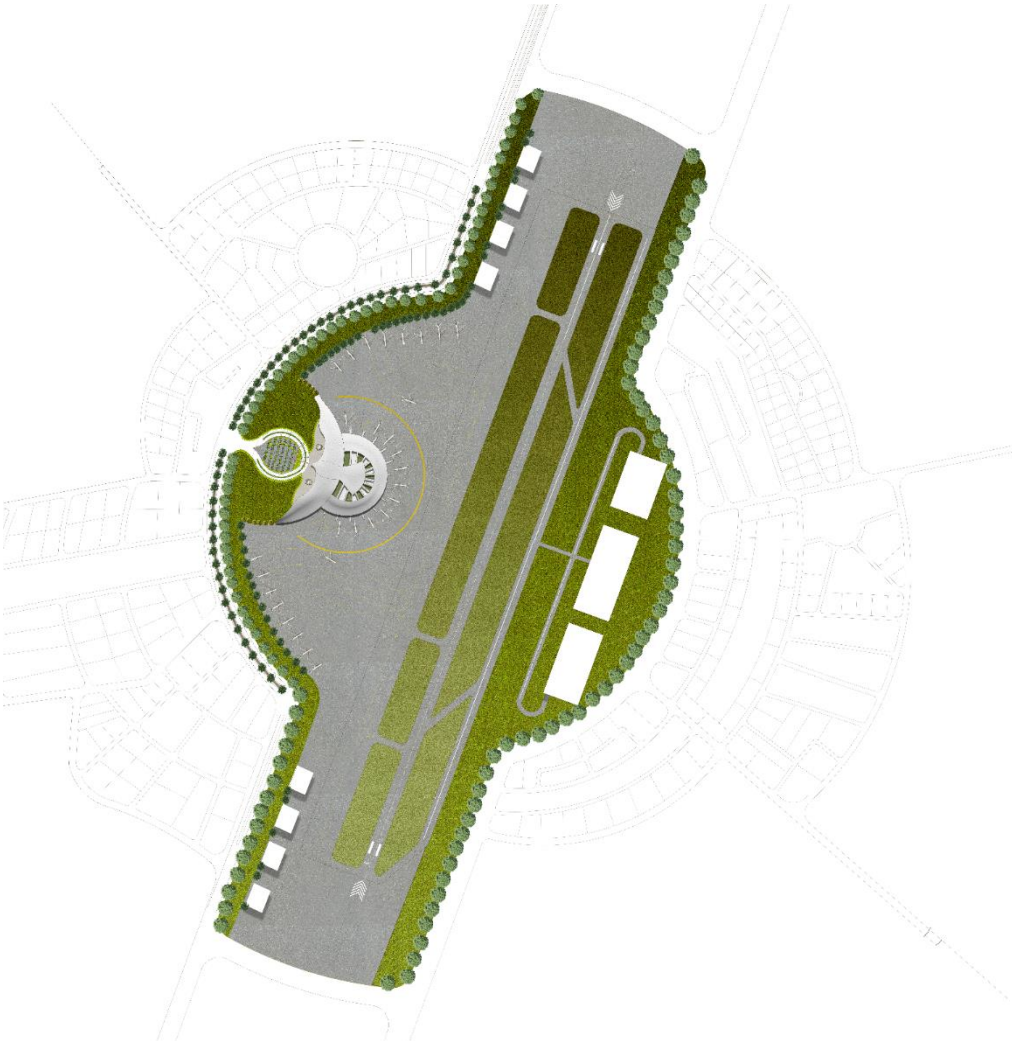
The overall concept looks to improve the character, function and "legibility" of Airport City. It describes major intersections as important centers of activity, and fortuitously, many of these locations present prime redevelopment opportunities. Through targeted infill development and intensification of land use these sites will provide a focus for vital civic and commercial services and amenities that are sustained through linkages to the Airport, surrounding residential neighborhoods and nearby employment zones. Gateways to the community and the Airport, located at highway exits and along major arterials, present a prime branding opportunity for Airport City and are ready for public investment to enhance their visual appeal

Key components:

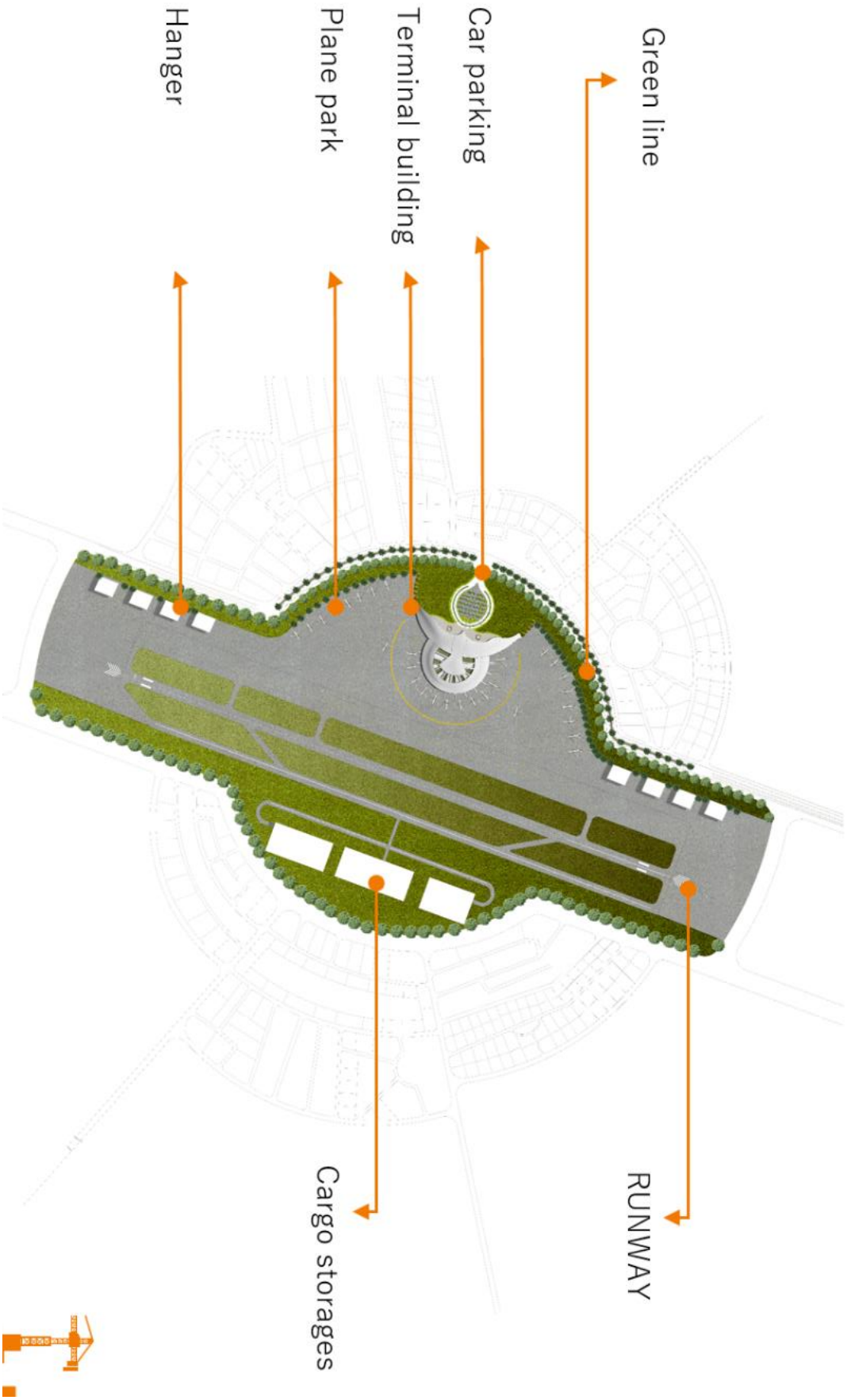
5.3.1.AIRSIDE

Contain from terminal, plane parking
runway with length (4500m)

Cargo storage and hangers



MAP 36 airside plan


Hanger
Plane park
Terminal building
Car parking
Green line
Cargo storages
RUNWAY

5.3.2 URBAN CENTER

Urban Center is the animated core of Airport City, taking advantage of nearby Graceland and proximity to the Airport to create a destination for both locals and tourists that features commercial amenities and attractions and other uses that create a robust live, work, play environment. Key development typologies include low-rise multi-family, residential mixeduse (vertical mixed-use), lifestyle retail center, tourism / entertainment hotel, and other compatible typologies, such as senior housing and community center.

MAP 37 urban center plan

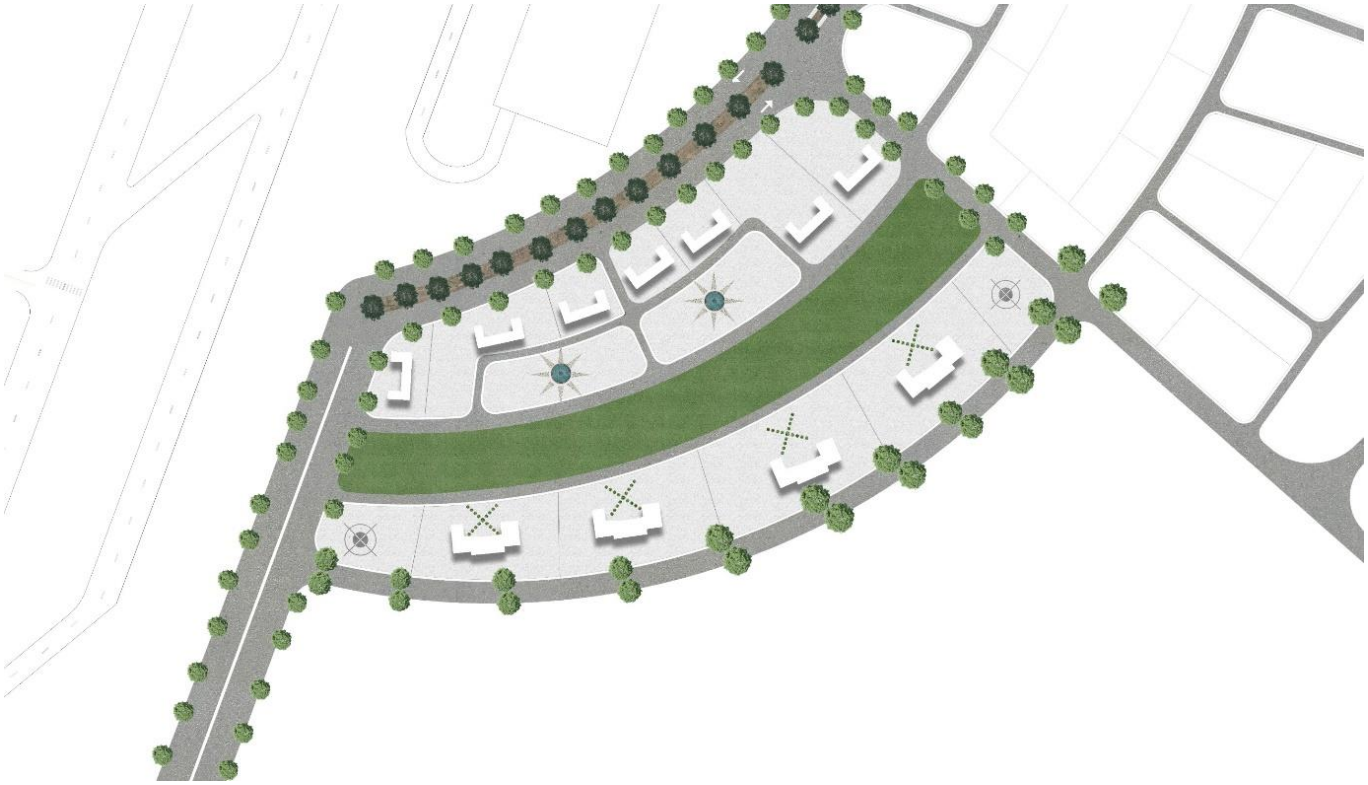
5.3.3 TECHNOLOGY PARK AND EDUCATIONAL INSTITUTE

Creative Center nurtures an airport-centric, knowledge based economy, integrating office campus / office park, incubator / discovery park, single and multi-tenant flex space, corporate hotel and conference, and other compatible development typologies that will benefit from congregating near the Airport, including convenience retail.

MAP 38 technology park plan

5.3.4 INDUSTRIAL PARK AND MILITARY BASE

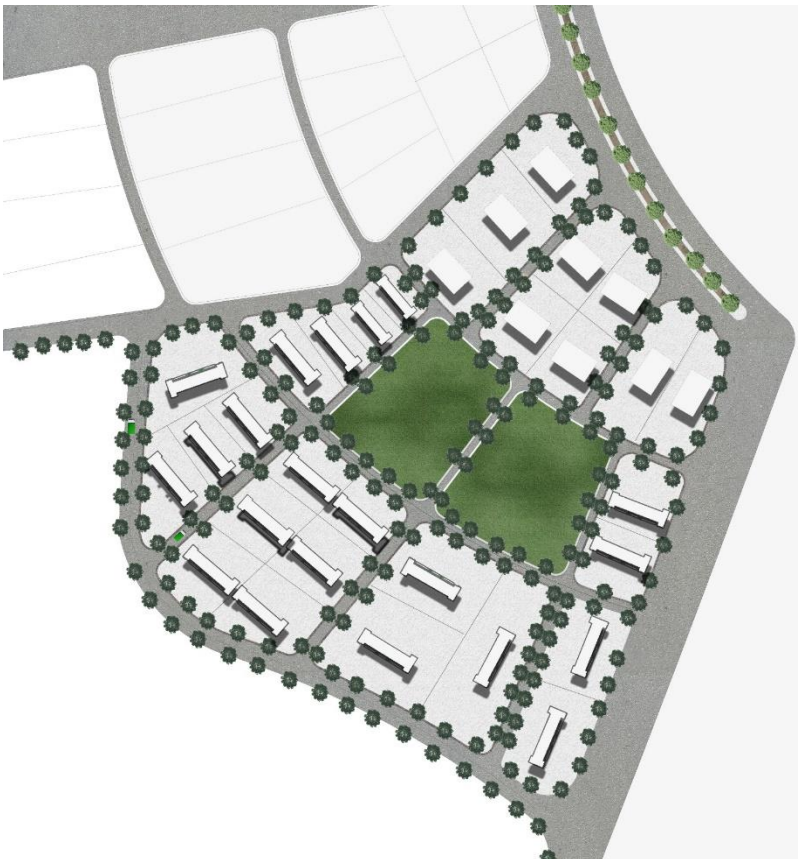
Contain of helicopters base and state building and some of light industry uses .



MAP 39 military base plan

5.3.5 SPECIAL MANUFACTURING AND DISTRIBUTION CENTER

Employment Hubs address the demand for state-of-the art logistics and distribution facilities, and provide necessary space for emerging sectors of the local economy that rely on Airport proximity, in particular, advanced manufacturing and bio-life sciences. Key development typologies include single and multi-tenant light industrial, single and multi-tenant flex space, airside-groundside logistics facility / air cargo terminal, warehouse / distribution center, as well as necessary support activities such as convenience retail.



MAP 40 SPECIAL MANUFACTURING AND DISTRIBUTION CENTER

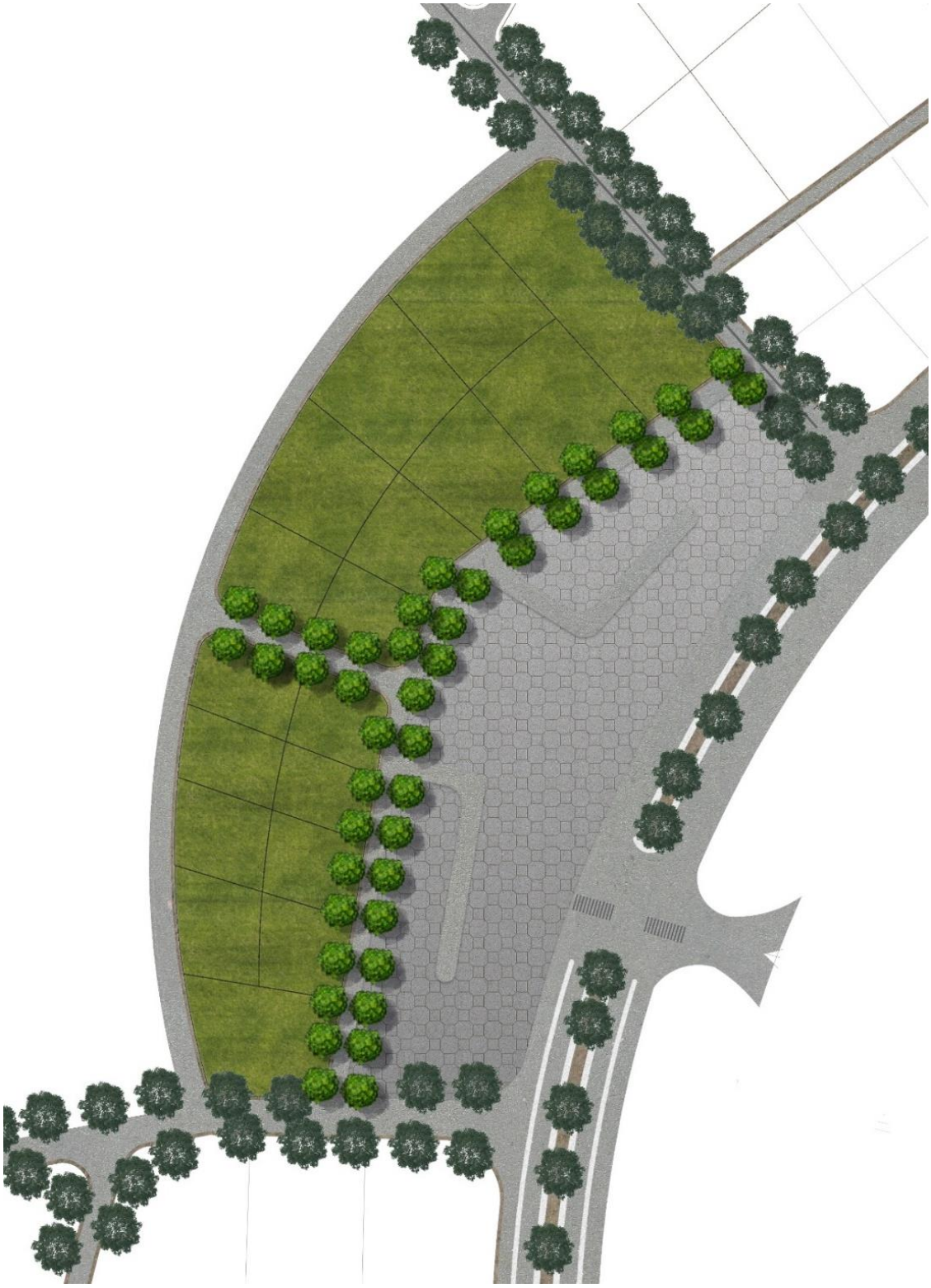
5.3.6 TRADE ZONE

Commercially Oriented Intersections accommodate concentrations of civic and commercial support services for surrounding residential neighborhoods and employment zones, incorporating convenience retail, neighborhood /community shopping center, and other compatible development typologies.

MAP 40 trade zone plan

5.3.7 OPEN SPACE

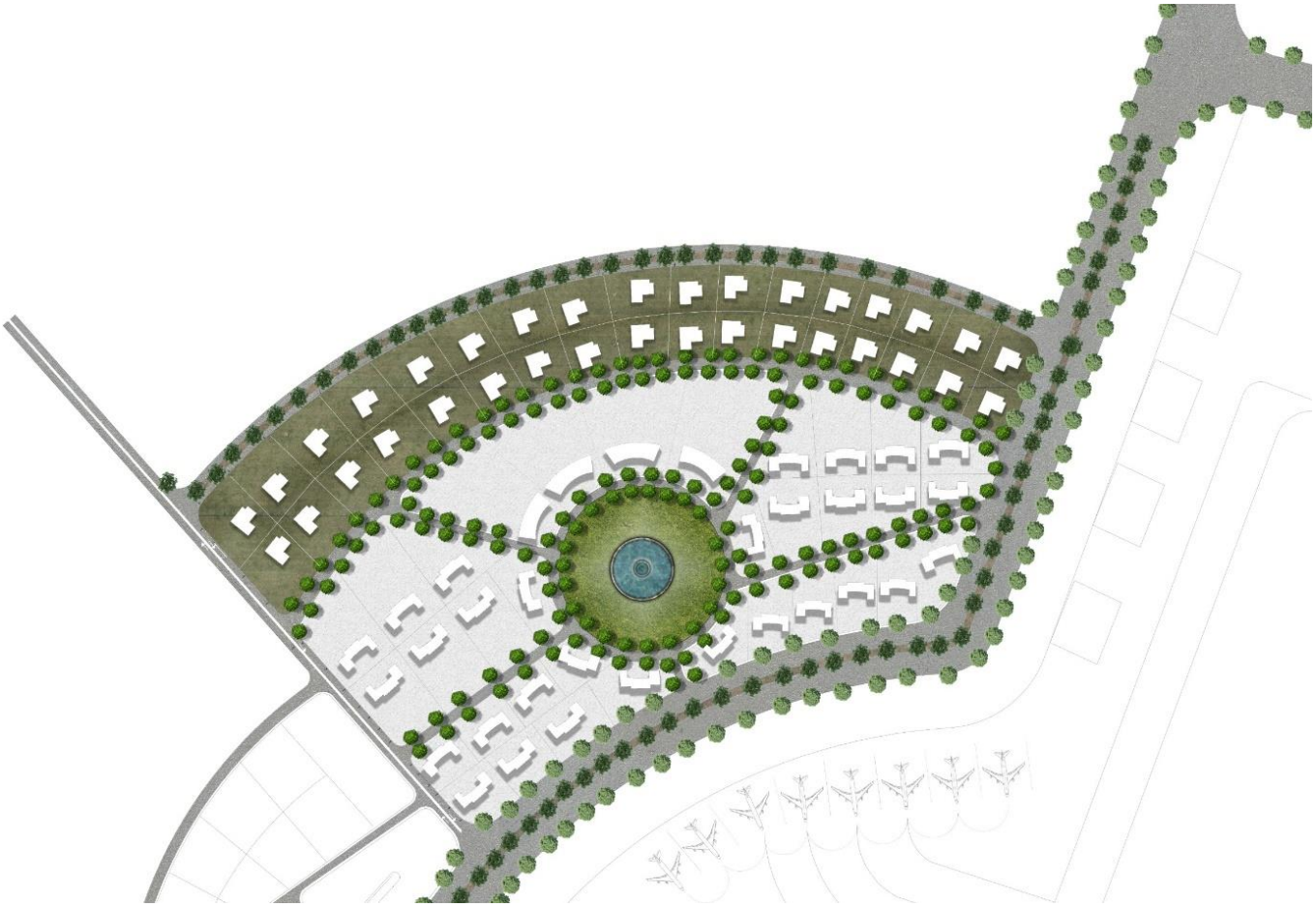
Prominently located at highway interchanges and along major arterials, these are valuable components of a public realm improvement program, integrating gateway monuments, public art, and landscape enhancements.



MAP 41 open space plan

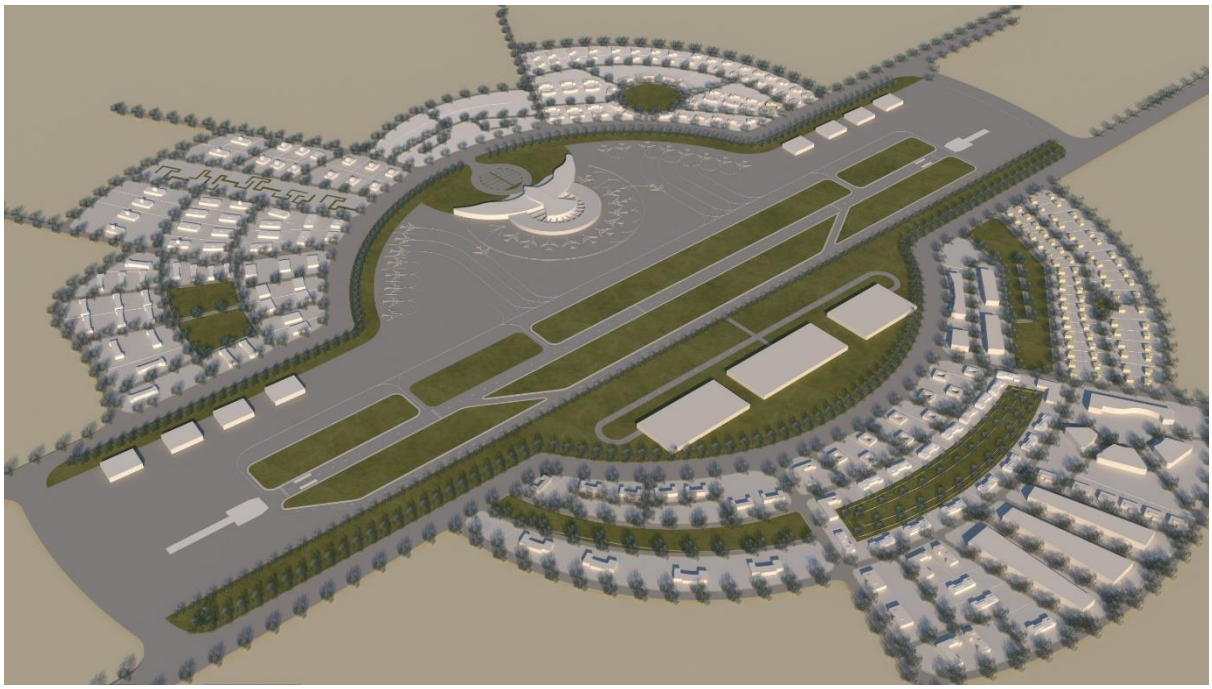
5.3.8 EXHIBITION CENTER AND BUSINESS PARK

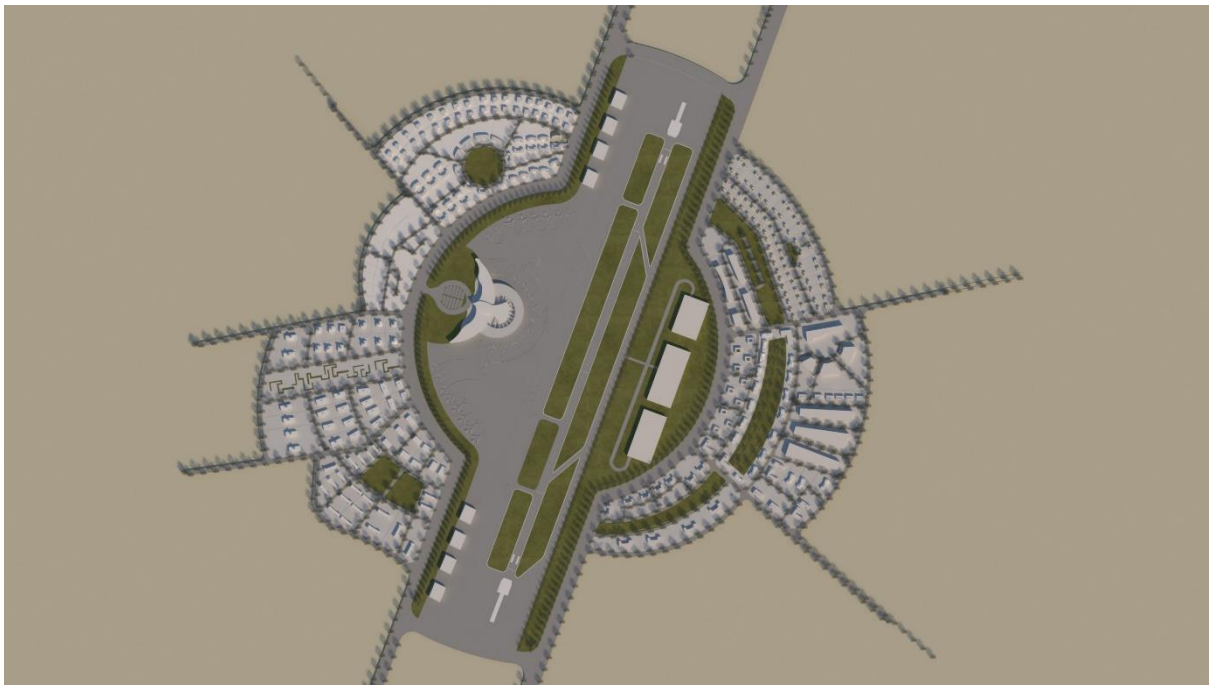
Creative Center nurtures an airport-centric, knowledge based economy, integrating office campus / office park, incubator / discovery park, single and multi-tenant flex space, corporate hotel and conference, and other compatible development typologies that will benefit from congregating near the Airport, including convenience retail.

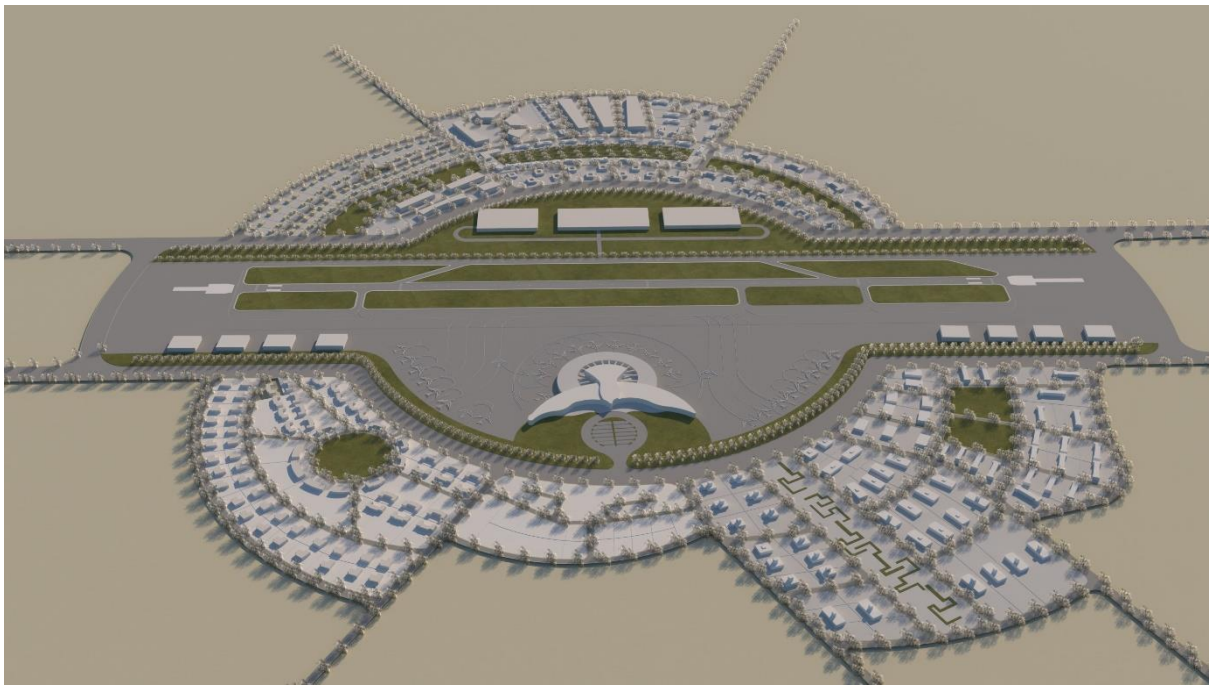


MAP 42 EXHIBITION CENTER AND BUSINESS PARK plan

Site plan shots:







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