ARRY ALI MAHMOOD

AN ANALYSIS OF URBAN MORPHOLOGY AND HOUSING TRANSFORMATION IN ERBIL, NORTHERN IRAQ

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A THESIS SUBMITED TO THE GRADUATE SCHOOL OF APPLIED SCIENCE OF NEAR EAST UNIVERSITY

By
ARRY ALI MAHMOOD

In Partial Fulfilment of the Requirements for the Degree of Master of Science in Architecture Department

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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To my parents…

ABSTRACT

As a notion, Urban Morphology is the evaluation of the development of settlement form process inductively with cultural, geographic and historical factors. In a macro scale, morphology is an important study area to make urban typology readings. In line with this explanation, the city of Erbil which has been chosen as the study area is the limits of this study. Finding out the morphologic changes of the city of Erbil and its houses throughout the years is the main content of this study.

Erbil Citadel is the first settlement of the city. The city developed around the Citadel and its reflections. The Citadel and its surrounding structures reflect the traditional urban fabric and constitute urban structural characteristic of Erbil. The city of Erbil is a clear example of organic growth in the world. Political and economic reasons experienced in different periods have created different developments in the city and enabled it to reach its current image. In recent years, new building characteristics, new materials, modern structures and multi-story houses has been built. In the city, where the climate, geography, history and cultural traces can be openly read, effects of the physical and social changes on life are clearly read.

All development areas are analyzed with maps, drawings and literature search and explained. In the conclusions part the positive and negative sides of the changes and developments of the city of Erbil been given. Suggestions has been made to maintain the urban characteristic of the city and to systematically regulate the housing developments in the city.

Keywords: Urban; urbanization; morphology; housing; citadel; city of Erbil

ÖZET

Kent morfolojisi kavram olarak yerleşim formunun gelişim sürecini; kültür, coğrafya, tarih gibi etmenlerle parçadan bütüne doğru farklı ölçek grupları ile değerlendirme dalıdır. Morfoloji, makro ölçekte, kentsel tipoloji okumalarının yapılabilmesi için önemli bir çalışma alanıdır. Bu açıklama doğrultusunda, çalışma alanı olarak seçilen Erbil kenti çalışmanın sınırlarını oluşturmaktadır. Erbil Kentinin ve konutlarının yıllar içerisindeki morfolojik değişiminin ortaya çıkarılması çalışmanın esas içeriğini oluşturmaktadır.

Erbil kalesi kentin ilk yerleşim alanı olma özelliğine sahiptir. Kent kale etrafında ve kalenin yansıması şeklinde gelişim göstermiştir. Kale ve civarı yapılar geleneksel kentsel doku özelliğini yansıtmakta ve Erbil kentinin yapısal özelliğini oluşturmaktadır. Erbil kenti dünyada organik büyümenin açık bir örneğidir. Farklı dönemlerde yaşanan siyasi, ekonomik sebepler kentte farklı gelişimler yaratmış ve günümüz görüntüsüne ulaşmıştır. Son yıllarda yeni yapı karakterleri, yeni malzemeler, modern yapılar, çok katlı toplu konutlar inşa edilmiştir. Özellikle iklim, coğrafya, tarih ve kültürel izlerin belirgin bir şekilde okunduğu kentte fiziksel ve toplumsal değişimlerin yaşam üzerindeki etkileri açık bir şekilde okunmaktadır.

Tüm gelişim alanları haritalar, çizimler ve literatür taraması ile analiz edilmiş ve açıklanmıştır. Sonuç kısmında Erbil kentinin yaşamış olduğu değişim ve gelişimlerin olumlu ve olumsuz yönleri ortaya konmuştur. Kentin sahip olduğu yapısal karakterin devamlılığı ve konut gelişiminin kent içinde sistemli bir şekilde düzenlenmesi için öneriler getirilmiştir.

Anahtar kelimeler: Kent; kentleşme; morfoloji; konut; citadel; Erbil kenti

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INTRODUCTION

1.1 Background of the Study

Basically, morphology in geological terms refers to the study of how land forms are structured and evolve over time. The term urban morphology which has been derived from the Greek word 'Morph' meaning 'form, shape' and was coined by Johann Wolfgang von Goethe (Gauthiez, 2004), and is considered to be the study of the nature of human settlements and how they have transformed over a given period of time. This definition implies that the notion of urban morphology is concerned with physical structures such as buildings and their transformation. Study of urban morphology is important in so many aspects, for instance, Barke (2018) contends that urban morphology offers huge practical, cultural and philosophical benefits, this is because a significant number of historical, social, cultural and economic changes are reflected through urban morphology. Hence, it is often difficult to separate urban morphological developments from a list of major events such as industrialisation and globalisation which are shaping the modern environment that we are living in. Furthermore, contemporary economic developments are relatively linked to urban morphology, this can be supported by insights which depict that human beings will always demand more and better-looking housing structures following an increase in their disposable income, this is significantly impacting human settlements and urban design. Furthermore, social changes caused by an increase in population are also increasingly altering the evolving form and structure of human settlements, this can be supported by observations made by Conzen (1978) which depicted that there are numerous and diverse morphological changes that are being triggered by a surge in population growth.

On the other hand, housing transformation refers to the modification, extension and alteration of a house that takes place over a given period of time. Housing transformations

can either be spontaneous and non-spontaneous housing transformations, the major difference is that spontaneous housing transformation is unplanned and tends to poses a lot of problems which include among others, an increase in waste, high demand for infrastructural services, congested and poor housing structures. Despite, the fact that non-spontaneous housing transformation is more desirable than the spontaneous one, both of them have been noted to be increasing at an alarming rate. Hence, there is a need to further examine how housing transformation has evolved in a determined location so as to ensure that it is carried out in a sustainable way that positive impacts the modern-day environment, positively.

Due to the fact that urban morphology deals with the study of urban forms and structures and how they have evolved, it is directly linked to housing transformation. This is because housing transformations, spontaneous or non-spontaneous, are responsible for changes in urban morphology. Hence, any desirable urban planning and development strategy that can be implemented must take housing transformation into consideration.

In Erbil city, Northern Iraq, the subject of this study is important because very significant urban morphological developments have taken place between 1947 to 2017. Such developments can be attributed to social changes which are characterised by an improvement in economic conditions and disposable incomes among north Iraq citizens. Furthermore, morphological developments that took place in Erbil especially between 1980 to 2003 were mainly driven by political effects. These include the war between Iraq and Iran which resulted in a displacement of a large of people. However, a lot of immigrants started flocking back to Iraq soon after the war and this imposed a lot of pressure on housing demands. Also, a lot of illegal and unplanned structures started mushrooming following an increase in the number of immigrants return back to Iraq after the war. Meanwhile, cultural effects northern Iraq people of having a lot of family members staying together, resulted in significant unplanned and undesirable housing transformations. This imposes huge implications on Erbil's planning objective to ensure that urban designs in Erbil continue to match and reflect international urban and housing standards. Hence, there is a greater need to ensure that urban

morphological developments being caused by housing transformations are well examined and addressed. This can be made possible by studying human settlements and how they have transformed over a given period of time. Conzen (1978) contends that there is a greater need to continuously devote time and effort to the study of urban morphology. Therefore, the purpose of this study is therefore to the nature of patterns of urban morphological developments and housing transformation that have taken place in Erbil, North Iraq.

The above-mentioned ideas pointed out on general grounds the importance of studies on urban morphology. In the case of Erbil, being one of the main Cities in Northern Iraq, the objective is therefore to study and analyse the urban morphologies of the past changing under the effects of various periods each of which has had its own particular characteristics is very significant. In addition, the City of Erbil, as a whole, is undergoing a serious transformation which are much different than the previous ones in terms of its context, speed and possible impacts in the future. Therefore, this thesis is intended to generate a platform for examining the past, discussing the present urban morphologies for deriving hints and recommendations for the future developments in this regard.

1.2 Research Problem

It is unarguably obvious that changes in urban morphology being observed in the City of Erbil in North Iraq are being triggered by housing transformations. But there remains an inadequate number of studies that can establish the reasons behind such causal effects. This situation is made worse by the fact that there are contrasting ideas which explain the possible effects of housing transformations on urban morphology. Most importantly, Mahta (2009) consider that changes in human settlements such as housing transformations are as a result of changes in human needs, tastes and preferences. However, arguments provided by Ozo (1990) show that this is not always the case. The reasons being that there are factors which influence housing transformations and other urban morphological developments. For instance, Baper (2013) contends that governmental influence through urban planners tends to shape a country's urban morphology. Ahmadi (2009) considers that globalisation is an

increasingly dominating element which is triggering urban morphological transformations. As a result, there is little or no common agreement as to what is exactly causing changes in urban morphology, notably housing developments.

The other major challenge is that Conzen (1978) highlighted that urban morphologies of the past cannot be separated from present urban morphologies. This implies that the effects of housing transformations on urban morphology in Erbil, North Iraq can be examined by looking at both its past and present urban morphologies. This is important because each of these periods is possibly characterised by different events and features. Hence, there is a greater need to look at how urban morphology has changed in Erbil, North Iraq. This is important especially with regards to Erbil, North Iraq where a lot of urban morphological developments and housing transformations have taken place over the past two centuries. Conzen (1978) also contends that this helps in developing structures and settlements that do not only meet human being's needs and wants, but that are also sustainable. Therefore, this study seeks to serve this need with special reference to Erbil, North Iraq by looking at its past as well as present urban morphological and housing developments and how they have transformed over the past years.

1.3 Research Objectives

The main focus of the study is to examine the nature of patterns of urban morphological developments and housing transformation that have taken place in Erbil, North Iraq. This will involve studying and analysing the urban morphologies of the past and the present situation, changing under the effects of various periods and how housing transformations have been necessitating such changes. This serves an important purpose of attaining the following aims;

- To examine factors that have triggered urban morphological and housing transformation in Erbil, North Iraq in the past.

- To identify possible challenges that are associated with the identified present urban morphological patterns and housing transformation in Erbil, North Iraq.
- To find possible measures that can be used to develop and maintain sustainable urban morphological structures in Erbil, North Iraq.

1.4 Research Questions

Research questions were proposed in line with the need to examine the nature of patterns of urban morphological developments and housing transformation that have taken place in Erbil, North Iraq. As a result, the study provides answers the following questions;

- What is the nature of patterns of urban morphological developments and housing transformation that have taken place in Erbil, North Iraq?
- What could have possibly triggered urban morphological and housing transformation in Erbil, North Iraq in the past?
- What are the possible challenges that are associated with the identified present urban morphological patterns and housing transformation in Erbil, North Iraq?
- What are the possible measures that can be used to develop and maintain sustainable urban morphological structures in Erbil, North Iraq?

1.5 Significance of the Study

Northern Iraq in general and Erbil in specific, are experiencing rapid urbanization along with the social, cultural, political factors triggered by the existence of natural petroleum resources, in the background. Therefore, studies on why's and how's as mentioned above are needed for developing and maintaining effective and sustainable urban morphological structures, as they can serve as part of efforts to promote sustainable urban development in Erbil and the country. This study, therefore, is significant to contribute to the relevant field of research.

1.6 Limitation of the Study

It is unarguably obvious that changes in urban morphology being observed in the City of Erbil in North Iraq are being triggered by housing transformations. But there remains an inadequate number of studies that can establish the reasons behind such causal effects. This situation is made worse by the fact that there are contrasting ideas which explain the possible effects of housing transformations on urban morphology.

In the case of Erbil, being one of the main Cities in Northern Iraq, the objective is therefore to study and analyse the urban morphologies of the past changing under the effects of various periods each of which has had its own particular characteristics is very significant. In addition, the City of Erbil, as a whole, is undergoing a serious transformation which are much different than the previous ones in terms of its context, speed and possible impacts in the future.

Therefore, this thesis is intended to generate a platform for examining the past, discussing the present urban morphologies for deriving hints and recommendations for the future developments in this regard. The study focuses on urban morphological development and housing transformations that took place in the City of Erbil. This was accomplished by looking at the morphological developments that took place in Erbil City, their years and periods, describing maps, drawing and reviewing literature supported by the information revealed. The morphological development of the City of Erbil and its houses constitute the main framework of this study.

1.7 Thesis Methodology

The study focuses on urban morphological development and housing transformations that took place in the city of Erbil. This was accomplished by looking at the morphological developments that took place in Erbil city, their years and periods, describing maps, drawing and reviewing literature supported by the information revealed. The morphological development of the city of Erbil and its houses constitute the main framework of this study. The study consists of 5 chapters;

In Chapter 1, the aim of the study, its scope, methodology, study boundaries, study framework and working problem are explained.

In Chapter 2, the literature review provides a description of the concepts which constitute the basis of this study. This was done by asking questions; what is a city, what is urbanization, what are the reasons behind urbanization, what is morphology in the field of architecture, what are the morphological development concepts, the information that constitutes the main scope of the study and it is explained in this chapter.

Chapters 3 and 4 constitute the main part of the study. In Chapter 3, the urban development of the city of Erbil was revealed using maps, drawings and explanatory information. It also looks at the urban form morphology of Erbil including its road access development and directional expansion. Chapter 4 the housing development was explained according to the years.

Chapter 5, dwells on conclusions and recommendations made from the study. In this chapter, the development years of the city and housing were summarized, positive and negative aspects were explained and suggestions were introduced.

CHAPTER 2
LITERATURE REVIEW

2.1 City, Basic Concepts and Features of Urbanization

The resultants of human efforts put into geographical environment, and they have also played very significant role in determining the morphology of urban settlement of the region. The detailed study of their influences is revealed as follows;

2.1.1 What is the city

The concept of the city, in particular the administrative boundary politically and administratively and which also has a management, a large number of physically and consisting of way for buildings and transport used for different purposes, social organized in terms of usage and is described as areas where economic activities. Cities are in constant social development. And the community of settlements, work, rest and leisure, which meet the commuting needs, the village settlement areas which are relatively denser in terms of population (Hussein, 2017).

2.1.2 Urbanization

A lot of results on existing urban migration in rural areas in terms of population growth and urbanization illustrate the concept of space. The village is gradually transformed into the city as a result of the growth of the number of cities and towns and other settlements in this ultimately leads to increased mainly the national income is a universal process of digitalization and the related shift from agriculture and industry. Urbanization is the most common expression, refers to the increase in the number of people living in the city. Urbanization is not only the demographic situation. Economic, political, social, is also the

expression of a cultural process. Urbanization is only the perception of the people remain a draw for the area referred to as urban form of the city's people's way of life, come on inside Getting adoption. Urbanization public social, political, economic and cultural transformation. Turned into an urban society of rural areas and urban areas, it is the process of evolution of the area. In summary urbanization; We can define and increase the number of cities with a population of accumulation process of economic and political development of the condition (Ibrahim, 2013).

2.1.2.1 Demographic aspects of urbanization

Countries or regions where the population did not show improvement in terms of economics and industry 30%, on 100 thousand density in that region or country has shown "excessive non-industrial urbanization" by means facing. Another factor is the high net population increase of excessive urbanization. Such work shows the density of farmland in the country or region. And it works in the densely populated farmland. One of the other important factors of urbanization are also demographically migration from outside. It leads to a rapid increase in urbanization. Migration of population growth did not correspond with the sociological aspects of urbanization. Therefore, in such a situation swelling demographic, population growth, population concentration, conceptual explanations, such as the accumulation of overpopulation can be made. The city or the region, a qualitatively in terms of social and economic transformation process pass is not urbanization (Ibrahim, 2013).

2.1.2.2 Social aspects of urbanization

New ones come to replace the old traditions as conceptual urbanization from a social perspective, is the city's centre of social change, to act outside the town of changes in the social sense, the size of the infrastructure services, to take effect on the behaviour of people living in the cities, the increase in infrastructure quality, the individual and the city and urban culture it is shaped to dominate its corporate relations. (Ibrahim, 2013).

2.1.2.3 Economic aspects of urbanization

A programmatic and skilled work force was needed to make the increase of the role of labour in the manufacturing sector in the eighteen and nineteen century technology and modern industry has changed and so has productive capital investments in urban areas according to demand. The industrial revolution of the raw material used outside the city founded by the development of existing industries, energy sources, transportation vehicles, people and places that are cheap can live cheap and easy is easy to set up. Thus, industrialization and urbanization were inseparable connected to each other. Urbanization economic sense as the realization of the ideal, the commercial property industry and urban transport causes of accumulating masses of people in the city urban development without a social identity. This incident points to the cultural alienation or arabesque culture. Industrialization in areas where development is literally can be mentioned in unplanned urbanization and cultural backwardness. Social - cities that are concerned with the economy is formed by the following communities; agriculture cities; mining, logging, fishing communities are composed of. trading cities. The main function is to collect and distribute agent who constitute the community. City of Industry; industrial production consists of dealing with the community. Tourism and Education based in cities; Entertainment, recreation, are attracted to cities within the educational community.

Social - economical related cities are comprised of the following communities;

- **Agricultural cities;** Consists of mining, lumbering and fishing communities.
- **Trade cities;** Consists of communities whose main duty is to collect and distribute fundamental materials.
- **Industrial cities;** Consists of communities who are interested with industrial production.
- **Cities centred on tourism and education;** These are cities which attract communities for amusement, resting or education purposes (Sun, 2013).

2.1.3 Causes of urbanization

The main causes of urbanization are explained below;

- **Hardships of the rural life;** One of the most important factors is that the rural areas are unable to sustain the population and cannot provide substitution in its own structure. This comes up as the most important cause for migration from rural areas to urban areas.
- **Life opportunities of the cities; C**ities offer richer life opportunities, chances and possibilities compared to rural areas. A wide variety exists in terms of education, culture and health areas. And cities offer more quality service.
- **Technological reasons and possibilities;** Economic development and population rise has created new business lines and improved the already existing ones. All these developments are causing population rise in the cities.
- **Political reasons;** Political developments can be considered one of most important reasons for urbanization. Administrations sometimes promotes urbanization but sometimes they remain hesitant about it.
- **Socio-psychological factors;** These factors derive from differences between village and city life. Cities usually have more attractive features. Cities really have various cultural and societal opportunities. These opportunities are the biggest reasons of urbanization.

Sometimes people migrate from villages to cities just to feel like living in a city. This condition happens in individuals as a way of promoting themselves (Caniggia, 2001).

2.1.4 Positive and negative effects of urbanization

Positive effects of urbanization;

- **Provides more living space;** This effect, states a horizontal development on urbanization, rather than vertical development.
- **Increase in energy activity;** Urbanization and urban development increases energy activity for various reasons.
- **Efficient solid waste management systems;** Recycling centres in cities, rather than gathering garbage from a certain place and collect it, exploring the ways of recovering it and recycling it.
- **Providing better social opportunities;** One of the benefits of urbanization is that it causes increase in education level.
- **Job opportunities;** Cities provide better opportunities to individuals with regards to finding a job.

Negative effects of urbanization;

- **Negative effects of urbanization on climate;** Excessive structuring due to urbanization causes too much heating. Roads, pavements and buildings store energy throughout the day. This energy storing causes climate to heat.
- **Air pollution in cities;** Air pollution is one of the main problems of cities. Industrial establishments and car exhausts are one of the main causes of air pollution.
- **Effects of urbanization on water resources;** One of the biggest problems of urbanization is the decrease and contamination of water resources. There is an excessive water consumption especially in big cities and this threatens the water resources. Unplanned development in the cities disrupts the hydraulic cycle of the water resources. Sewage water is the biggest factor in the contamination of water resources.

- **Soil and dirt lands;** In our current age, cities made the 1% of the total land. If the current pace of the developing cities continues, it will cause the livable places on earth to decrease (Jiang, 2002).

2.2 Urban Form

The term urban form is much restricted to the study of the physical features that characterise or form built-up areas with regards to the way settlements are arranged, their density, size and shape. Urban forms can be observed to exist in different scales such as street, block, neighbourhood, urban and regional scales.

The most distinctive feature of urban forms is that, it is composed of two major elements which relate to buildings and outdoors space, of which both buildings and outdoors space tend to influence other urban elements, but the formation and transformation of urban forms is what gives rise to urban morphology. Hence, it is worthy to note that there exists a relationship between urban forms and urban morphology (Valente-Pereira, 1982).

2.3 Urban Morphology

Urban morphology is a concept that deals with the examination of the city's shape and physical structure. That is, it involves the study of how cities have developed and changed over time as well as reasons behind such developments and changes, this entails examining the structural features of a city, their formation and transformation over a given period of time, such an examination covers a lot of physical forms such as heritage structures, streets, buildings, parks and the process of physical development of cities.

However, Levi-Strauss contends that cities are composed of a complex interaction or combination of human artefacts and natural elements. As a result, urban morphologists engage in the study of how cities have evolved over a given period of time to their succeeding changes, classifying and examining their elements and aspects. Jiang contends that cities are

an integration of small and individual group of activities and are controlled by cultural values, influenced by economic and social elements.

With regards to a town, Jiang contends that urban morphology is simply the concerned with the causes of urban land use and conversion. Most importantly, urban morphology centres on physical economic and social outcomes, how they occur and affect cities.

Meanwhile, morphological analysis encompasses things such as monuments, parks, streets, gardens and buildings. Caniggia consider these elements to be like organisms which are always in use and under constant transformation. In addition, the existence of these elements also contended to be characterised by a strong changing interrelationship between open spaces and building structures, of which open spaces are considered to be influencing or shaping the surrounding building structures. Also, the way cities have changed over time including their inherent interrelationships have a resulted in the term urban morphogenesis being used as a description of their study (Lovra, 2016).

2.4 Geography and Architectural Approaches in Urban Morphology

2.4.1 Geography approaches in urban morphology

The concept of urban geography morphology approach in the context of today's era of functional character of a settlement by social and economic factors are also considered. Urban geography approach under study is the creation of the most important goals of the urban morphology of what the general inventory of residential areas as the answer to the question here. The historical process of morphology, geography level viewing theorists and approaches are shown in Table 2.1 (Whitehand, 2001).

Table 2.1: Urban morphology evolution in terms of geographical approach (Whitehand, 2001)

Geographers	Year	Country	Approach
Schluter	1899	Germany	-The morphology: cultural research as a cultural landscape morphology. - Settlement: establishes relationships between land use and communication lines. – The form and function of the time course.
Hassinger	1912	Austria	-Draw attention to density residential land use and structure to solve the problems associated with the protection of cities.
Geisler Martiny	1918	Germany	- Examine the types of buildings and city plans in a morph graphic classification. - Topographic and geographic definitions of urban perspectives.
Bobek	1927	Germany	- Reviewing the key features of cities change over time depending on the form and function.
Scharlau	1941	Germany	- The city plans to investigate the formation of and use cadastral plans.
M.R.G. Conzen	1949	Germany England	- To draw forms and interpret the underlying process of shaping. - Examine the structural condition of the existing town planning by examining the historical development.
Whitehand	1967	England	- Structural analysis of tissue changes, combined with the work of other individuals, architects and developers.

2.4.2 Architectural approaches in urban morphology

Architectural approaches in morphology are made up of two streams; first current typological approach and the second approach is the current urban fabric. This approach also aims to reveal the rediscovery of the urban purpose of typologies especially typological studies which provide an important insight about the effects of the need to create typologies.

In the architectural field, urban morphology started with the trilogy of Vitrivius. Utilitas (usability), Firmitas (durability) and Venustas (beauty) are disclosed by form. Firmitas involves the correct use of materials to be fitted with a solid foundation of basic and, Utilitas looks at the building style, the spatial layout of the meaning and the functioning of eligibility, and Venustas which based on the idea that a certain proportion of the structure of the building element carries the meaning to be held in a beautiful view. Vitrivius is related to the function of those types of typological classification. The historical process of morphology, architecture level viewing theorists and approaches are shown in Table 2.2 (Whitehand, 2001).

Table 2.2: Urban morphology evolution in terms of architectural approach (Whitehand, 2001)

Architectures	Year	Country	Approach
Durand	1780	France	- Language is a merger of repetitive static form, dysfunctional or formal restrictions.
Blondel, Boulle and Ledoux	1828	France	- Based on the architecture reveals a type of function.
Muratori	1910	Italy	- Analysis of the built environment concept at various scales. - Typo-morphology studies.

Caniggia	1933	Italy	- Typological process of urban development in the evolution of form component types and components of context.
Argan	1960	Italy	- The formation of specific types of structure occurs due to a series of functional and morphological similarities between them.
Rossi and Krier	1970	Italy America	- Study of the urban texture of typological process and how it affects building structures.
Moudon	1980	America	- Ideological, cultural and economic variations in form which differs according to the city in time.
Hillier	1980	England	- Connected to each other in the axial analysis method based on its spatial relationship to each other and the urban fabric of premises.

2.5 Conzen and Caniggia Approaches

The approach of Caniggia to architecture urban morphology, Conzen's approach to urban morphology development in the context of geography. Both researchers were in different countries and leading theorists in the field of urban morphology, despite dealing with different disciplines. Conzen with the work of "Alnwick, Northumberland; A Study in Town-Plan Analysis" and thinking about urban form" as the most important work in terms of studies to reveal the Conzen morphological approach in 1960. Caniggia's "Architectural Composition and Building Typology; Interpreting Basic Building" study is important for understanding Caniggia's approach (Kropf, 2004).

2.5.1 Conzen approach in urban morphology

Conzen, revealed in the context of geography about urban morphology as a systematic analysis of the formation and development of a city in the historical process has been examined by a geographical concept.

Morphology of branches, horizons are described with five general headings such as in open Alnwick work.

- Location
- Function
- City view
- Social and economic contexts
- Development

City view is divided into three separate form complexes in itself;

- City plan
- Building
- Land use pattern texture

The city plan is divided into three different components within their own;

- The road / street pattern
- Island / parcel pattern
- Building design

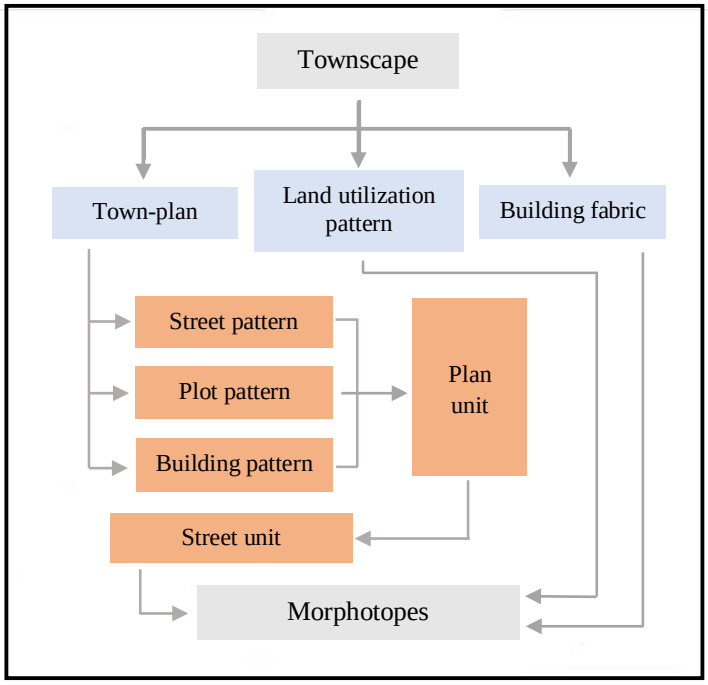


Figure 2.1: Conzen the townscape morphological analysis process (Yaygın, 2016)

Conzen analysis was centred on the examination of the most essential components of urban morphology while the other approach was a "belt area" approach. Generation areas were first introduced as a concept by Louis in 1936 in Berlin's city structure, urban and environmental uses of date represent that a number of land use and the built-up area separates the old and new residential areas has made identification. Louise adopted the "urban generation" concept from Conzen and changed this concept by developing it on the basis of urban morphological growth. Conzen generation's interest in the concept stemmed from him not wanting to put this concept as an editing tool into the complexities of urban development. In other words, Conzen strongly posits that urban development is surrounded by a lot of complexities which hinder the effective application of the urban generation concept in the study of urban morphology.

Belt areas represents an important condition in the city's inner structure. belt area of the threshold line (fixation line) is displayed in cases where a strong strength. Threshold line (fixation line) limits the growth of the city and generally in the form of linear space. this limiting the growth of urban areas, slowing or stopping can occur from natural or artificial

threshold. Belt area concept is important for the city's physical form and understand the growth process. Transportation models, socio-economic development, more impermeable construction vehicle traffic, land use, vegetation density, pedestrian access, topography and land improvement, are important factors affecting the formation of generation areas. Belt areas arises spontaneously. Belt areas such as continuity of socio-economic formation is related to the functioning of the physical or cultural factors (Kropf, 2004).

Conzen with the work of “Alnwick, Northumberland; A Study in Town-Plan Analysis” and thinking about urban form” as the most important work in terms of studies to reveal the Conzen morphological approach in 1960, as shown in Figure 2.2 and .2.3.

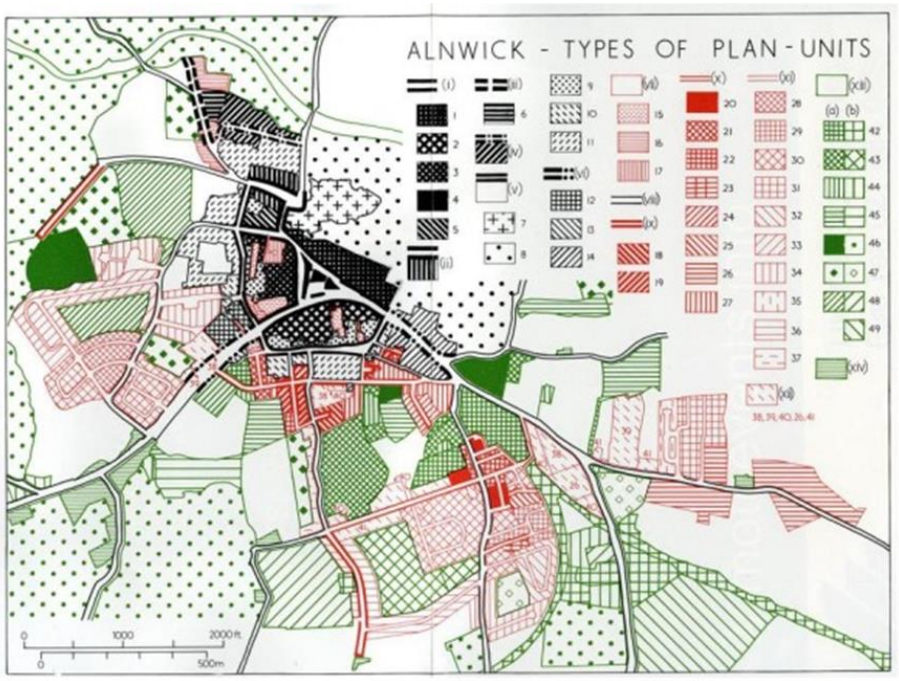


Figure 2.2: Conzen Alnwick in 1960, Northumberland: A study in town-planning analysis Alnwick-types of plan units (Kropf, 2004)

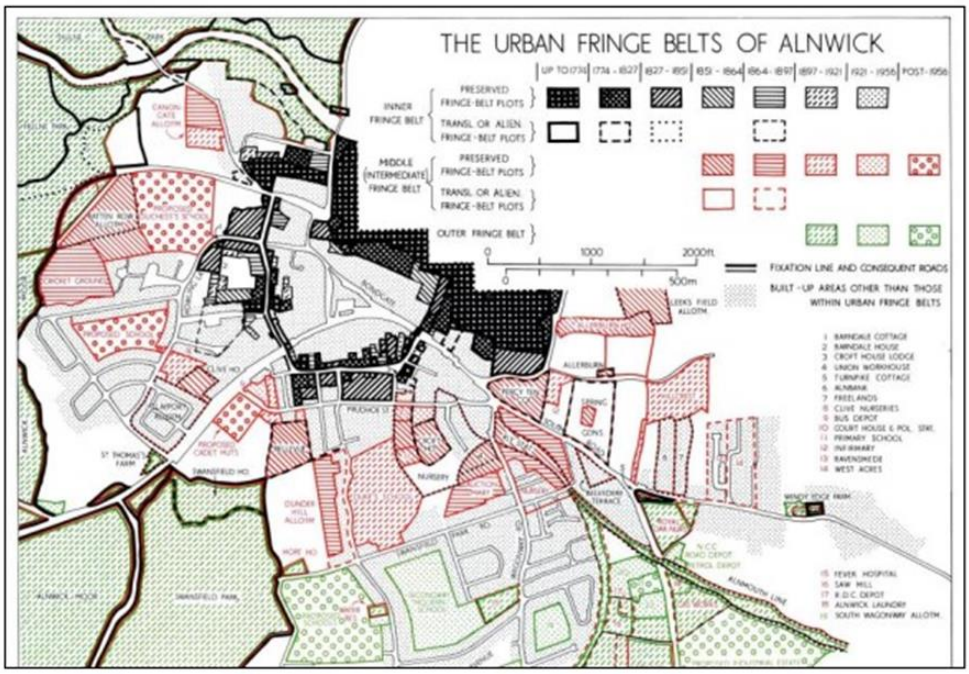


Figure 2.3: Conzen Alnwick in 1960, Northumberland: A study of town-planning analysis in the urban fringe belts of Alnwick (Kropf, 2004)

2.5.2 Caniggia approach in urban morphology

In urban morphology studies, typological process is based on the work of Italian architect Saverio Muratori. Gianfranco Caniggia developed his concepts based on the work that was done by Muratori and focused on the typological process approach which sought to identify the best work of architect and urbanist. Thus, Caniggia considered form and shape to be the basic elements of urban structure and that changes in functional forms were as a result of the influence physical and cultural processes.

Caniggia approaches the historical process of formation of the built environment by examining the detailed architectural structures and urban proposals. Respectively spatial correlation (compresence) and temporal correlation (derivation) methods began with the distinction between a general spatial and temporal variable. element structure in urban context, typically made as a batch or batches of said group or urban tissue. The structures of urban scale system are a combination of tissue-forming unit or adjacent neighbourhoods, when taken together, it forms an urban settlement (Kropf, 2004).

2.6 Urban Morphology in the Branches; Schools of Morphology

In the world, there are three major schools conducting important research that contributes significantly to the study of urban morphology and these are England Birmingham University, School of Urban Morphology in Italy and the School of Architecture of Versailles in France. The main approaches to urban morphology of school are explained in Table 2.3.

Table 2.3: Schools of urban morphology (Kaushik, 2019)

English school	Italian school	French school
Urban form studies include descriptive and explanatory purposes on the development of the urban structure theory.	Urban form studies include descriptive purposes on the development of urban design theory.	Urban form studies include objective assessment of the impact of past structures in urban design theory
Question: how the city was built and why?	Question: How cities should be built?	Question: How should the city be built and the fact that when it was built?
Geographers	Architects	Social Scientists, Architects, Urban Planners
Conzen and Whitehand	Muratori, Caniggia and Rossi	Henri Lefebvre, Panerai, Castex, to Depaul

In urban design schools, morphology is mainly based on the concept of morphology in British schools. The origins of this school constitute the work of the German geographer, Otto Schulte and Conzen. Conzen who played a formative role in laying the foundations of the British world of urban morphogenesis. The most important contribution it has made in

this area relates to the concepts of (burgage cycle, urban fringe belts and morphological region).

The burgage cycle was made up of parcels found in the medieval city and construction that occurred in the backyard and referred to the cleaning work based on this structuring. "Urban fringe belts" (generation urban area); interesting or slow growing peri-urban areas in the state generation is defined land use. "Morphological region" (morphological region); which differs from the structure in the vicinity as the character of settlement and often has been described as showing characteristics different than the surrounding structure (Kaushik, 2019).

English schools in the field of urban morphology, focused on the impact of urban areas on the form of the future of urban planning cases. The Italian School, Muratori, Caniggia and Aldo Rossi also focused on the morphology studies. Italy typo-morphological studies began in the 1940s with Saverio Muratori's modernist architecture and modernist urbanization criticized the adoption of sustainable urban planning and architectural tradition from antiquity that dominated until the 1930s.

According to the British School in buildings with Typo-morphology studies focused on typological change by doing detail work. These changes extend the typological research involving materials covering the whole building.

Italian School defends the culture of the place where the construction of new buildings will be provided by the continued planning. 1960's emerged in France at the end of the third school representatives; Jean Castex, Philippe Panerai and Depaul. This school has taken inspiration from the Italian school and showed reaction to modernist architecture. This school was thick in both English and Italian schools of design and has been the subject for the city's construction process in both. Special areas of social life in this area each of the collective space and public space was meant to demonstrate that they are associated with evaluating the practical context.

In the field of urban morphology, three schools from the city's built environment created an intellectual framework for the historical context. English School, made offered a research-based approach to environmental production, Italian School has provided the basis for the planning and design of traditional structures and the French School is the discipline that combines the built environment studies with a critical assessment of the design theory is a framework. Morphological researches are explained schematically in Figure 2.4 according to the thoughts formed by these schools. In this graph, the morphological hierarchy layout of the urban system and the typo - morphological order systems are explained (Kaushik, 2019).

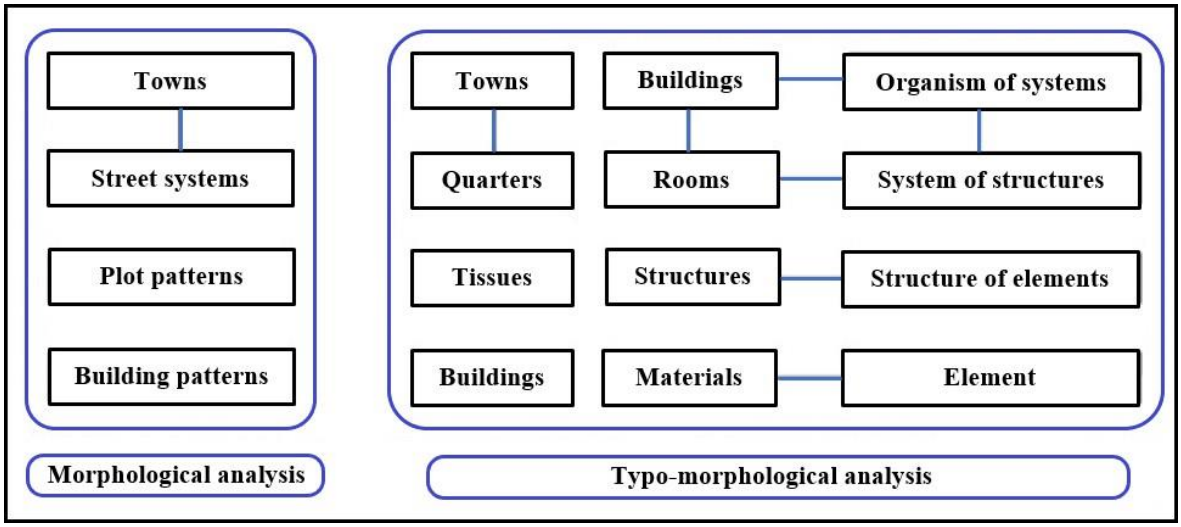


Figure 2.4: Typo-morphological and morphological analysis (Kaushik, 2019)

Morphological analysis is developing and changing in the urban transformation process in a different way, which is an integral part of urban planning, street system, it is involved with the plot and structure of the tissue. Typo-morphological analysis; It showed differences in the classification of sub-section on urban systems. In this analysis, the details regarding the city and building applications; elements of structure and the structure treats the organism urban construction components. The structure elements while expressing the elements and building materials for each structure is analysing all details of the building of the wall.

2.7 Theoretical Explanations of Morphological Pattern of a City

Cities are presumed to have morphological patterns that are explained by theoretical ideas and theories on urban morphology are further presumed to exist in four distinct types as follows;

1. The Concentric Theory.
2. The Sector Theory.
3. Walter Firey's criticism of Hoyt's theory.
4. The Multiple Nuclei Theory.

2.7.1 The concentric theory

Kang in 2012 highlights that any developmental pattern of a city that expands in circular form outwards from its central point are explainable and this was developed by Burgess. E. W in 1923. Burgess considered that the city is divided into concentric zones known as concentric zones which exist in five parts as follows:

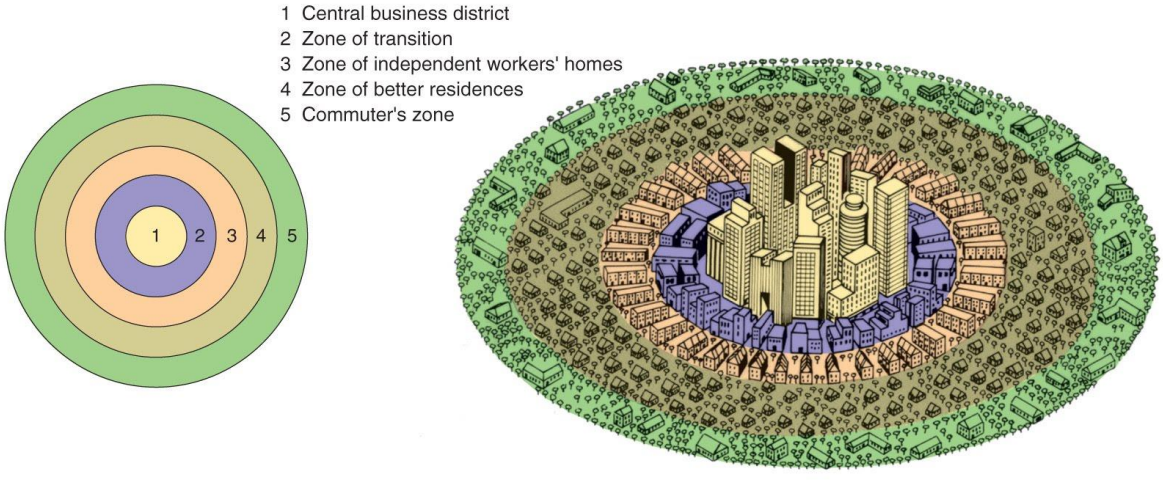


Figure 2.5: The concentric theory of urban structure (Gauthiez, 2004)

- **Zone 1 (CBD);** Is made up of a downtown retail district and wholesale business district encircling the downtown.

- **Zone 2;** is where one finds old house which are divided into small residential units encircling the CBD and is otherwise known as the 'zone in transition'. This is the area that is mostly resided by immigrants and goes through a transitional period and hence it is known as the transition area. It is considered that crime and poverty are high in this zone which is also deemed to be the city's slums.
- **Zone 3;** this zone to constitute houses residential units known as (workingmen's homes) which are owned by social working classes who are financially stable. This zone also represents migration patterns of people who move from zone 2 to zone 3 so as to stay close to their work places.
- **Zone 4;** this where professionals and small business owning residents reside (middle-class) and their residential areas are so spacious as compared to those of zone 3.
- **Zone 5;** is made up of dormitory places, town and small cities and is far from the CBD. This zone is distantly situated from the CBD such that people need at least one hour to get to the CBD. In other words, places found in zone 5 are sometimes called rural.

The notable benefit of using Burgess' theory in this study is that it is highly utilised in a lot of contemporary studies and hence using it in this study offers a good way of making comparisons. In addition, this theory highly reflects the urban morphological patterns in Erbil City. However, scholars like Kang criticise Burgess' theory on the following basis;

- Concentric zones do not have a standard pattern.
- Every transformational and industrial area in each has poor housing standards.
- Industrial units do not always follow railways or located near water and transportation.
- Business and commercial areas do not always extend radically away from the CBD especially along streets.
- The size of the CBD is not always circular but rather rectangular or irregular (Gauthiez, 2004).

2.7.2 The sector theory

This theory was developed by Homer Hoyt in 1939 who made observations that the American city's layout had changed and made changes to the concentric theory, this led to the development of what is now termed the sector theory. The main focus of this theory was that there were a lot of changes in the CBD, has been in increase in land usage, increase in access to other town areas and an increase in automobile.

Hoyt was in support of the idea that an expansion of city was more likely to cause a similar expansion in transportation sectors related to certain land usage. This can be illustrated using Figure 2.6, this theory is mainly confined to land use and contends that sectoral patterns will form in reflection of rent areas in cities as opposed to concentric zoning. As shown in Figure 2.5, high standard residential units are situated at the outskirts of the city (outward sector) whilst medium-quality areas are found in the inner sectors with a series of old houses. Also, some sectors will have highest rent areas as opposed to others.

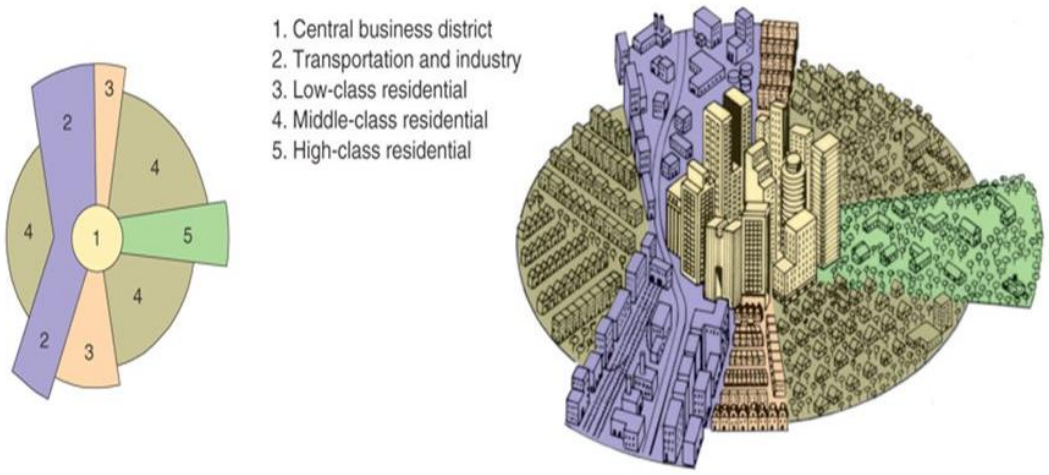


Figure 2.6: The sector theory of urban structure (Gauthiez, 2004)

Figure 2.6 therefore implies that the city will grow following a similar path in response to changes or movements in high rent areas. This restricts a continuous ring of High-class housing and causes them to be concentrated at one side of the city. But a concentric arrangement is more likely to be observed to take place in reflection of changes in the building's age. It is worthy to note that ideas by Hoyt's theory are just an improvement of concentric zoning ideas and not a complete radical change of the theory (Gauthiez, 2004).

2.7.3 Walter Firey's criticism of Hoyt's theory

This theory was developed by Walter Firey in arguments against the sector theory and was based on the idea that social factors were the main reason behind high land use. Firey believed that there are a number of factors that influenced changes in the city's pattern which are not just restricted to waterfronts or relief. But rather he considered that there are social elements involved in explaining changes in the city's pattern which required an abstract examination of people. This is also because there are cultural conditions that govern land use. In some cases, rich people can opt to reside in any place and not follow any concentric or sectoral approach or ideas (Ahmadi, 2009).

2.7.4 The multiple nuclei theory

This approach is based on presumptions which highlight that radiating sectors or concentric zoning are effective in explaining changes urban growth and development by using geometric designs. This is based on the argument that urban growth and development are a representation of broader aspects which cannot be easily explained by geometric designs. Jiang also considered that land use is governed by social, administrative, cultural, industrial and commercial factors and hence deemed not to be singular and simple.

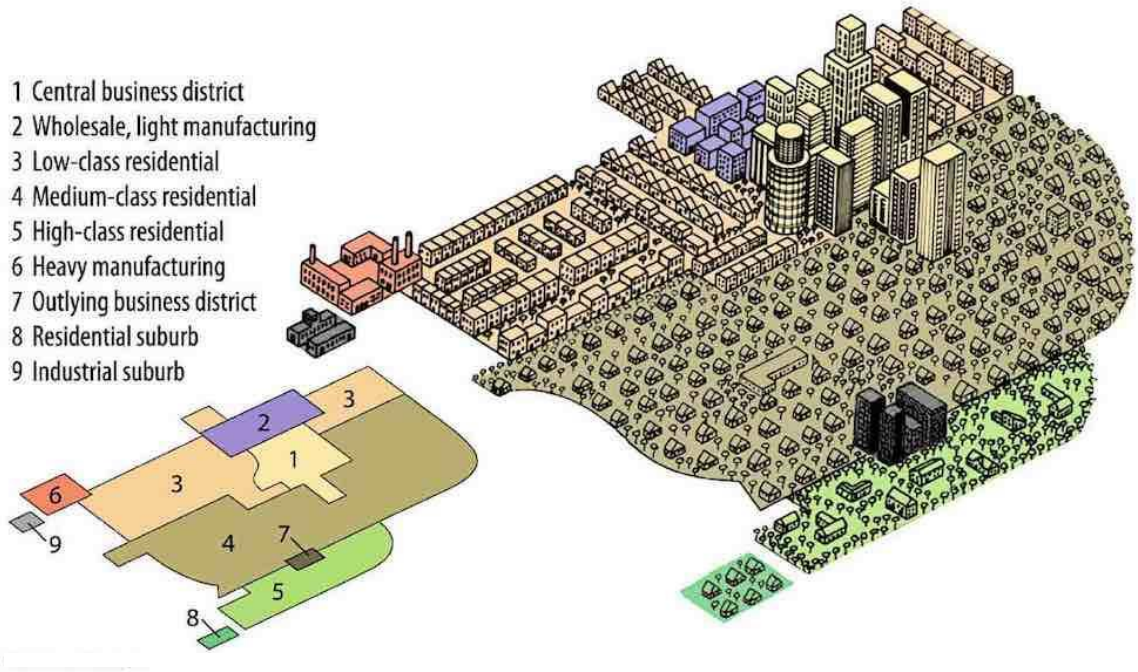


Figure 2.7: The multiple nuclei theory of urban structure (Gauthiez, 2004)

As such, it is therefore argued that a city's morphological development will never be unicentric and that its changes will also never be an outcome of group of sectors or zones. This therefore argues that land patters and use will develop around numerous individual nuclei. Jiang further outlined that an increase in individual and distinct nuclei is influenced by the concentration of human activities in a city and that the underlying group of factors are in four groups:

- Those activities which cannot fund rental payments will be located in far corners of the nuclei.
- Activities that affect each other will not be situated in the same nuclei but rather will seek different nuclei and this applies to high-class residential areas and industrial activities.
- There are certain activities which need to be coerced and such as clothing which can benefit a lot from cohesion as a result of the inner-city districts having a lot of people.
- Maximum accessibility is needed for an effective functioning of the CBD.

These economic, cultural and social factors are what influence the number and structures of nodes of the urban landscape. Batty asserts that nuclei are either as a result of a shape forming during the city's origination and as a result of the expansion of the city. Hence, this theory can be said to offer important descriptions about how site and history affect morphology. The theory can also be considered to offers ideas about the difficulties involved in examining urban structure as a result of historical developments which influenced land use during the course of history. On the other hand, some cities have numerous sub-centres around nuclei and this occurs despite the fact that they have one CBD.

Caniggia criticised this theory and asserted that it does not constitute what is termed a theory and does not bring out new ideas. Furthermore, they also argued that this theory also contends a lot of sector and concentric model features. As a result, the multiple nuclei theory ought to be examined as an insight to urban morphology and not as an inflexible generalization about urban form (Gauthiez, 2004).

CHAPTER 3
URBAN MORPHOLOGICAL DEVELOPMENTS OF ERBIL CITY

3.1 Location of Study Area

Erbil governorate is located at the northern part of Iraq country. It is about 350km north of Baghdad the capital city of Iraq. Erbil City is occupying the central part of Erbil plain between the lesser zab river and greater zab river, as shown in Figure 3.1 (Al-Hashimi, 2016). The Erbil master plan area till 2019 is to be located on large area of Erbil plain between; Bastora river at north, greater zab river at west, lesser zab river at east and Awana hill or relief at south.

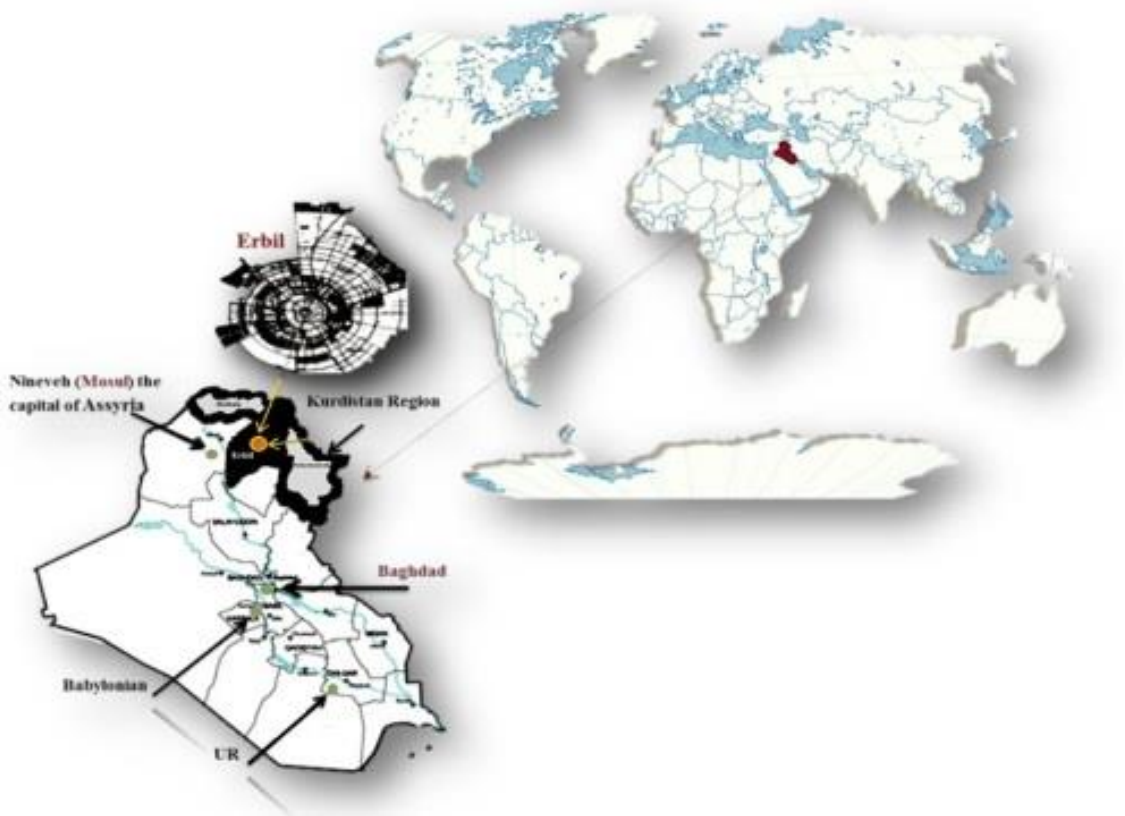


Figure 3.1: Location map of Erbil urban zone (Al-Hashimi, 2016)

Astronomically the center of Erbil City "Erbil Citadel" is located in the intersection of latitudes (36° 11') north and longitudes (44° 00') east. Topographically the highest crest elevation of the upland is located at north-east part of the Erbil City with a dense drainage pattern that form the source area of most of the valleys in central part of the Erbil City, this area has the elevation of about 960m A.S.L, around the Sharabot village. The lowest elevation is restricted at south-west corner of about 260m A.S.L, as shown in Figure 3.2 (HCECR, 2009).

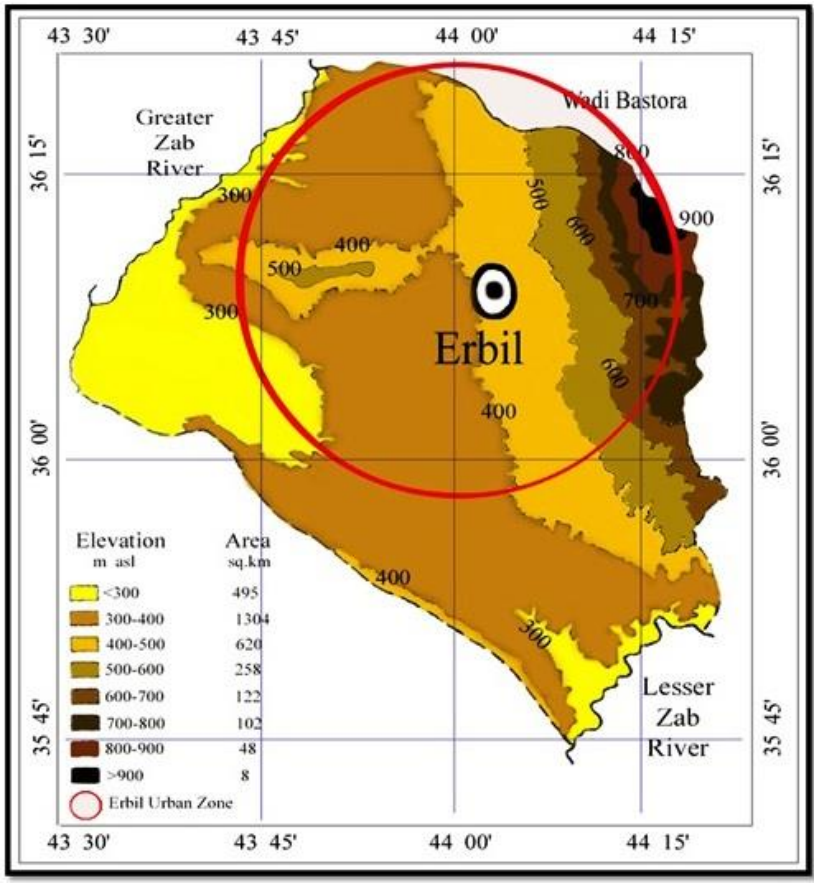


Figure 3.2: Topographic land map of Erbil City (HCECR, 2009)

Direction of surface slope is from the north-east towards the south-west which is controlled by the structure position and geological formation. The surface runoff of the Erbil City in northern part has higher velocity than in the other part and the drainage pattern has a high density.

3.2 Historical Background of Erbil City

The historical background of Erbil City dates back before 2048-2095BC. During this period city was operating under the name of "Urbilum". Al-mudaris, (2003) contends that much of the historical importance of Erbil City began to emanate from the 7^{th}-10^{th} century Neo-Assyrian period, during which the city was being referred to as the 'city of the four gods' "Arba-ilu". On the other hand, UNESCO, (2012) posits that Erbil became significant follow the building of a 22km aqueduct which supplied the city with fresh water. Apart from all this, Erbil was being well known for its astronomical observatory.

Arbela was later given to the control of the Medes by King Cyaxares after the Assyrian Empire had collapsed in the later year but fell into the control of the Persians in the following year HCECR, (2007). In 216AD, the city became an administrative area of the Adiabene and was renamed to "Arbira" and it is during this period that the population began to increase with a lot of people having a strong eastern christian background. But of the city's developmental activities were evident in 1295 when Jacobite ethnic people were allowed to move to Erbil following Tadj Al-Din's order. A lot of historical building and structures were destroyed in 1310 after a war broke out in Erbil against christians. A series of fighting continued to take place which included the battle of the Zab, and political stability ensued in 1534 after the successful dominance by Sultan Suleyman of an Ottoman origin. Subsequently, Erbil was later under the control of what is now called Iraq in 1638 under the ruler ship of Sultan Murad IV. (UNESCO, 2012).

Notable historical developments began to emerge in the 20^{th} century following the Muslim religious operational activities conducted in the Citadel by Mulla Effendi. This was followed by the establishment of the parliament of Kurdistan Region of Iraq in 1992 during which Erbil became capital city of Kurdistan (Shwany, 2015). This was necessitated by conflicts that emerged between the Kurdistan democratic party and the Iraqi government. Ever since, the Kurdistan regional government started operating independently from the Iraqi government, notable urban morphological developments having in Erbil City.

3.3 Urban Morphological Developments of Erbil City

The urban morphology study received a clear indication of the internal structure nature of the city, and the stages that has passed through different periods of time with the changes that occur when the urban land used as a result of growth and development which has left its impact on the city, the residential use of the Erbil City and the extension trends and patterns that contributed to give morphological identification to help understand the present development of Erbil City.

Erbil City has undergone expansion process in residential use at the expense of the surrounding lands in order to meet the requirements of its population which are increased, so it extends across different spatial frameworks that influenced by the political and economic situation of the city with each morphological stage expansion. In order to illustrate the residential development in the region, this study based on the results of its population pluralism which based on documented numerical values.

1- First phase (from development till 1947)
2- Second phase (1947-1957)
3- Third phase (1957-1977)
4- Fourth phase (1977-1987)
5- Fifth phase (1987-2017)

Table 3.1: Population, total land area and constructed land area of Erbil City from 1947 to 2017 (Adopted Municipality of Erbil, 2018)

YEARS	NUMBER OF DISTRICTS	NUMBER OF POPULATION	TOTAL LAND AREA (KM^2)	CONSTRUCTED LAND AREA(KM^2)
1947	9	25487	2.89	0.91
1957	12	39913	8.41	0.96
1977	31	193558	37.76	12.34
1987	63	445912	80.51	35.92
2017	111	932800	2303.42	213.34

Table 3.2: Increases of population, total land area and constructed land area of Erbil City in the end of each phases (Author, 2019)

PHASES	NUMBER OF DISTRICTS	NUMBER OF POPULATION	TOTAL LAND AREA (KM^2)	CONSTRUCTED LAND AREA(KM^2)
1st phase	9	25.487	2.89	0.91
2nd phase	3	14.426	5.52	0.05
3rd phase	19	153.645	29.35	4.38
4th phase	32	252.354	42.75	23.58
5th phase	48	486.888	2222.91	177.42

3.3.1 First phase (from development till 1947)

This phase is among the slowest and longest phase in Erbil City history, Erbil is an old city that did not got benefit of large population, the population began to grow in the second half of twentieth century. Erbil Citadel was the main place in Erbil City in the beginning of its inception and for a long time, however, some of the studies suggests that Erbil Citadel represented the whole city itself till the first half of nineteenth century.

Erbil City population was fluctuated between contraction and extension, since, it has received degree of highness and honor in the two covenants, First; in the reign of Atabak 12^{th} century. Second; in the Soran emirate 19^{th} century. In the reign of Atabak, Sultan Muzaffaruddin Alkokbri in 1190 had a significant role in the expansion of Erbil City through housing, residential and cultural aspects, since, he established Muzaffaria Minaret, mosques, shelters, social, health and educational institutions (Al-Mudaris, 2003).

The largest urban expansion in the history of Erbil City was in 1233 since the population migrated from the Citadel to the surroundings towards south and south-east direction, the historical landmarks of that period still remained including; Al-Muzzaffaria Minaret and Khanaqa district, Erbil City was surrounded by walls from all sides, as shown in Figure 3.3. The Mongols conquest in the city didn't allow civilization and evolution, however, it only remained inside the Citadel. Erbil Citadel represented the whole city itself until nineteenth

century, then began to expand again outside the Citadel due to the availability of security and stability during Soran emirate in 1822, during that period a population was between 4500-5000 people with 700-800 residential units in 1837, city was composed of six residential neighborhoods, three of which were located inside the Citadel including; Saray, Takiyah and Topkhana. And three were located outside the Citadel including; Khanaqa, Taajil and Arab (Shwany, 2015).

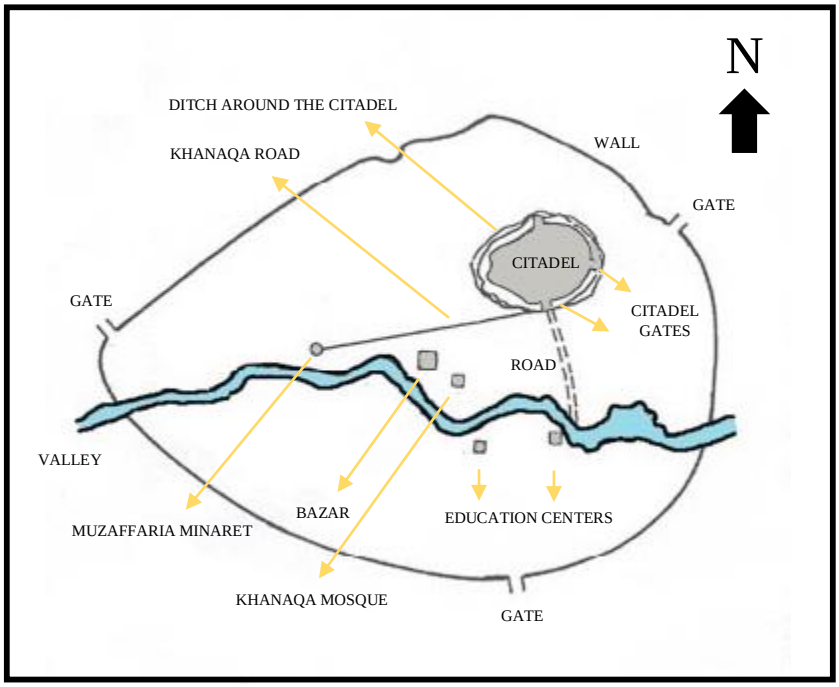
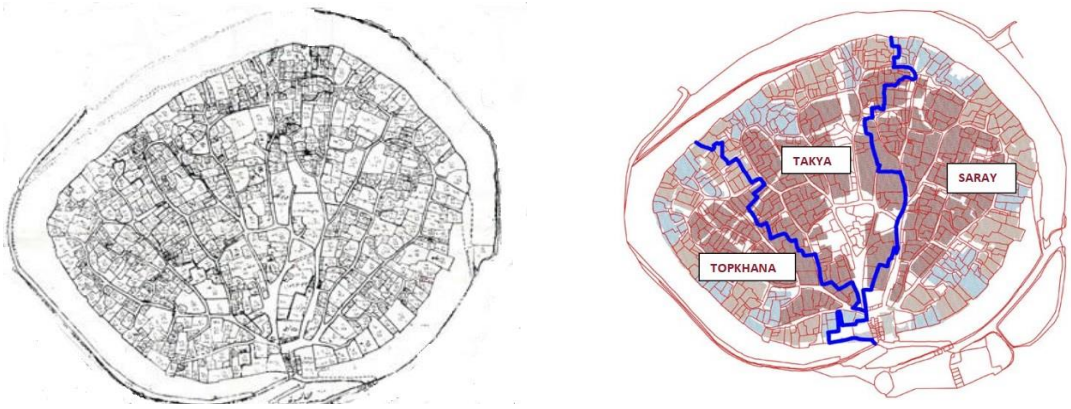


Figure 3.3: Erbil City during 1233 (Adopted Shwany, 2015)



(a) Patterns of Erbil Citadel (b) Districts inside Erbil Citadel

Figure 3.4: Citadel town in Erbil City (Al-Hashimi, 2016) (UNESCO, 2012)

After the first world war in 1920, the city of Erbil was placed under the control of the British and this led to the establishment of the state of the Iraq which was three provinces (Naqshbandi, 2016). This imposed severe restrictions on both existing and future housing designs and structures. The building regulations were imposed in 1935 and placed limits on housing and roads development through the use of System No. 44 as shown in Table 3.3 (Sabr, 2014). This is because the size of the land on which houses were to be built was also regulated. Having restrictions on the minimum land area on which houses can be built on as well as observing a predetermined distance from the street has effects on houses. This is because it imposes limits on the capacity of house to sustain the number of people living inside them. As a result, the extent to which people may alter or modify the original structures will be limited, as shown in Figure 3.5.

Table 3.3: Minimum allowed area of plots and front setback distances according to the system of roads and buildings No.44 in 1935 (Adopted Sabr, 2014)

Category	Minimum plot area	Minimum plot width	Distance from street
First	100 m²	-	0
Second	200 m²	-	0
Third	300 m²	15 m	2.5 m
Fourth	600 m²	20 m	4 m
Distinct	800 m²	25 m	5 m
Special	2000 m²	25 m	5 m

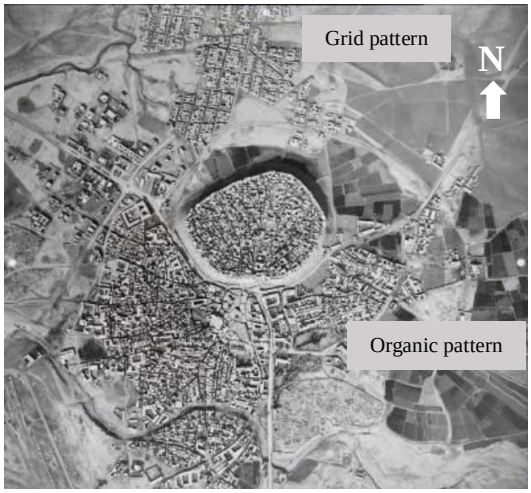


Figure 3.5: Erbil City after British control during 1940s (UNESCO, 2012)

Erbil City was composed of eight residential neighborhoods, three of which were located inside the Citadel including; Saray, Takiyah and Topkhana, with 500 residential units. And five were located outside the Citadel including; Khanaqa, Islamic-Taajil, Jewish-Taajil, Arab and Saadunawa, with 2400 residential units, as shown in Figure 3.6. The city expanded towards south direction which made Erbil City to have a longitudinal figure.

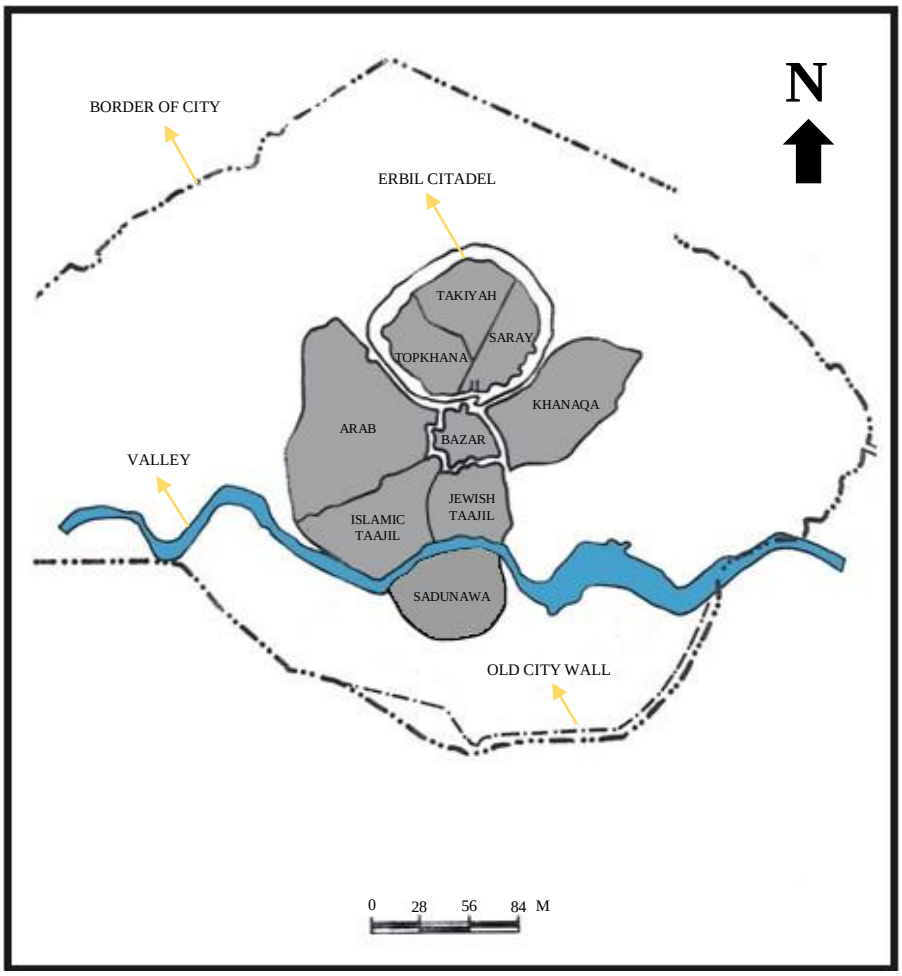


Figure 3.6: Districts of Erbil City during 1920 (Adopted Al-Mudaris, 2003)

In the mid-1930s appeared Al-Mustawfi residential neighborhood which is the first expansion of the city to the north side (Abbas, 2015). Because of the continuous increase in the population due to the health situation improvement after the second world war, Erbil City population reached 25.487 people and 2.629 residential units in 1947, and the total area of Erbil City was 2.89km², while the constructed land area was 0.91km² as shown in Table 3.1.

Erbil City was composed of nine residential neighborhoods, inside the Citadel including; Saray, Takiyah and Topkhana, while outside the Citadel included; Khanaqa, Islamic-Taajil, Jewish-Taajil, Arab, Saadunawa and Al-Mustawfi, as shown in Figure 3.9. This expansion accompanied by significant development in the uses of land in terms of quality and quantity (Municipality of Erbil, 2018).

The districts of Erbil City at this phase had organic streets which are characterized by narrowness, twisting and lack of integrity, and some of them it's closed from one of the endings, this type of street was suitable for simple transport agents and animals at that time as shown in Figure 3.7, however there was also narrow paved roads which connected the urban centers to the Erbil City including Erbil-Mosul road, Erbil-Shaqlawa road and Erbil-Kirkuk road, the first was a military road extending through camp grounds, the second was an extension of Hamilton road connecting the Iraqi-Iranian border and the third was a railroad (Al-Mudaris, 2003).

(a) Roads of Erbil City (b) Patterns of Erbil City

Figure 3.7: Roads and patterns of Erbil City during 1947 (UNESCO, 2012)

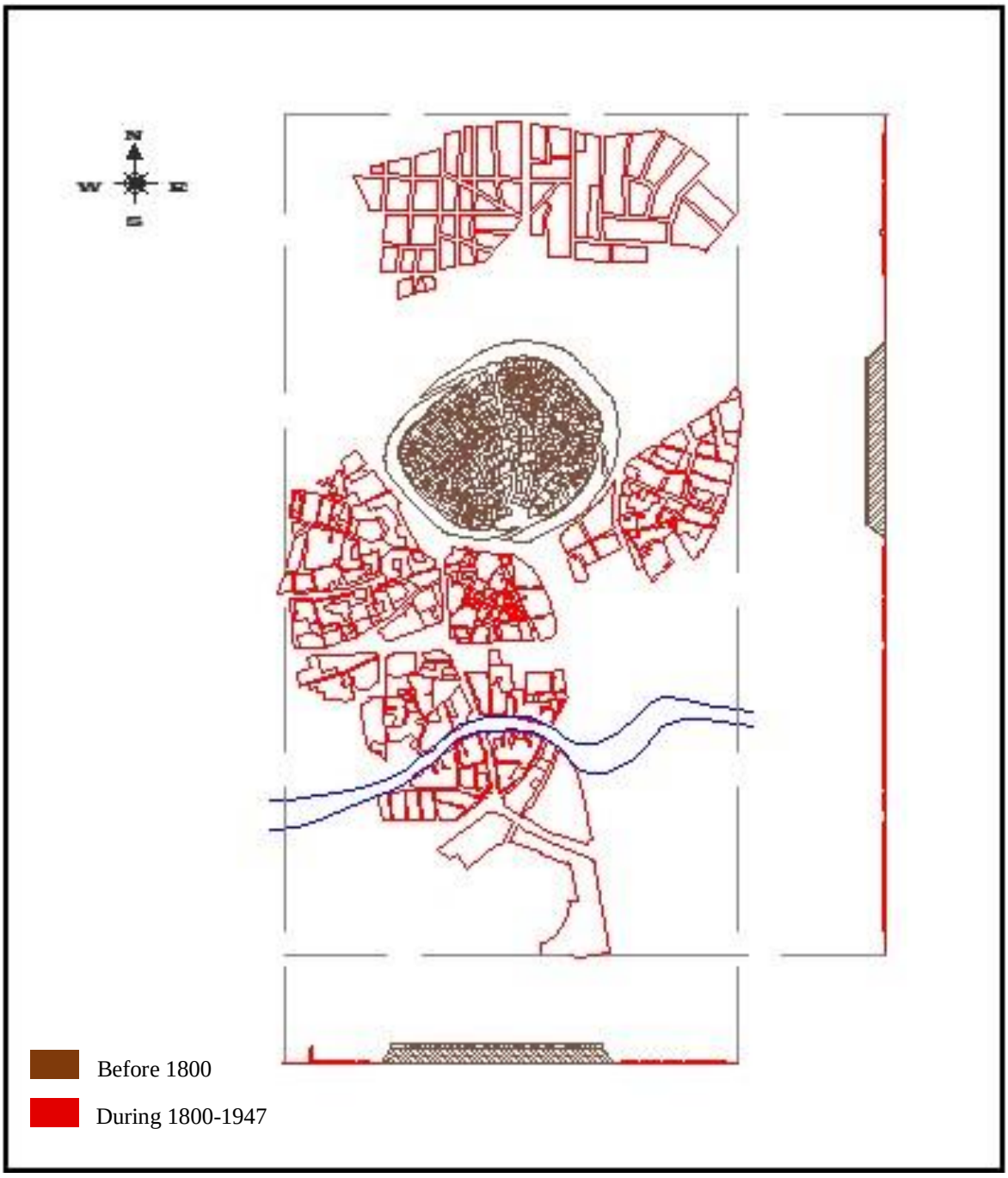


Figure 3.8: Erbil City map and sections during 1947 (Author, 2019)

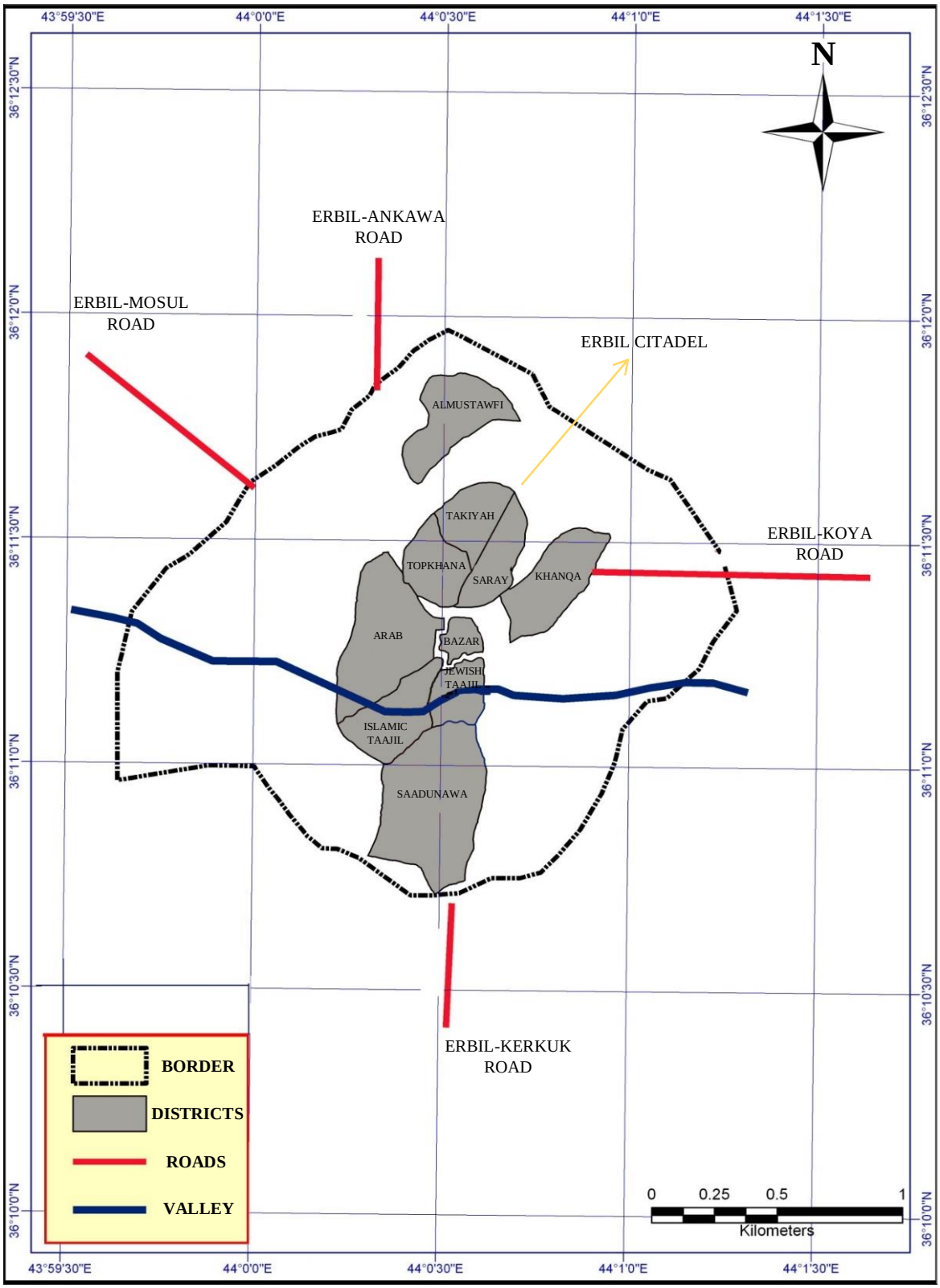


Figure 3.9: Districts of Erbil City during 1947 (Adopted Abbas, 2015)

3.3.2 Second phase (1947-1957)

There is a clear growth in population of the city in 1957, since it has increased from 25.487 people and 2.629 residential units in 1947 to about 39.913 people and 4.999 residential units in 1957 it's clear that 14.426 people and 2.370 residential units increased. The total area of the city in the end of this phase was 8.41km², while the constructed land area was 0.96km², with an increase of 5.52km² and 0.05km², respectively compared to first phase as shown in Table 3.1. Erbil City was composed of twelve residential neighborhoods inside the Citadel including; Saray, Takiyah and Topkhana, while outside the Citadel included; Khanaqa, Islamic-Taajil, Jewish-Taajil, Arab, Saadunawa, Al-Mustawfi, Railway Station Workers, Military and Saidawa, as shown in Figure 3.11 (Municipality of Erbil, 2018).

Erbil City expanded during this period towards south-east direction, the Saidawa district had established, the area expansion was about 0.14km² which is 16% more than the total area of the city, the number of residential units in Saidawa district was 300 houses. In this phase the farmers upraised against the Dizayee sects in 1953 in villages, which had a prominent role in migration towards Erbil City. The residential areas in the districts of Saidawa and Railway Station Workers has been expanded due to the internal migration towards Erbil City (Shwany, 2015).

Due to the residential use expansion led to departure of new shops from the city center towards the suburbs which led to development of new passenger transport services in 1956, with establishment of new internal transport lines within the city, the presence of Erbil Citadel had a clear effect on the streets in the sense took that the streets assumed a circular pattern around the Citadel, the first circular street named Sultan-Muzaffarddin street, and the second circular street named 30 m street, which all of these streets ended at the beginning of third phase, there were other roads which connected the Erbil Citadel with the other districts (Al-Mudaris, 2003).

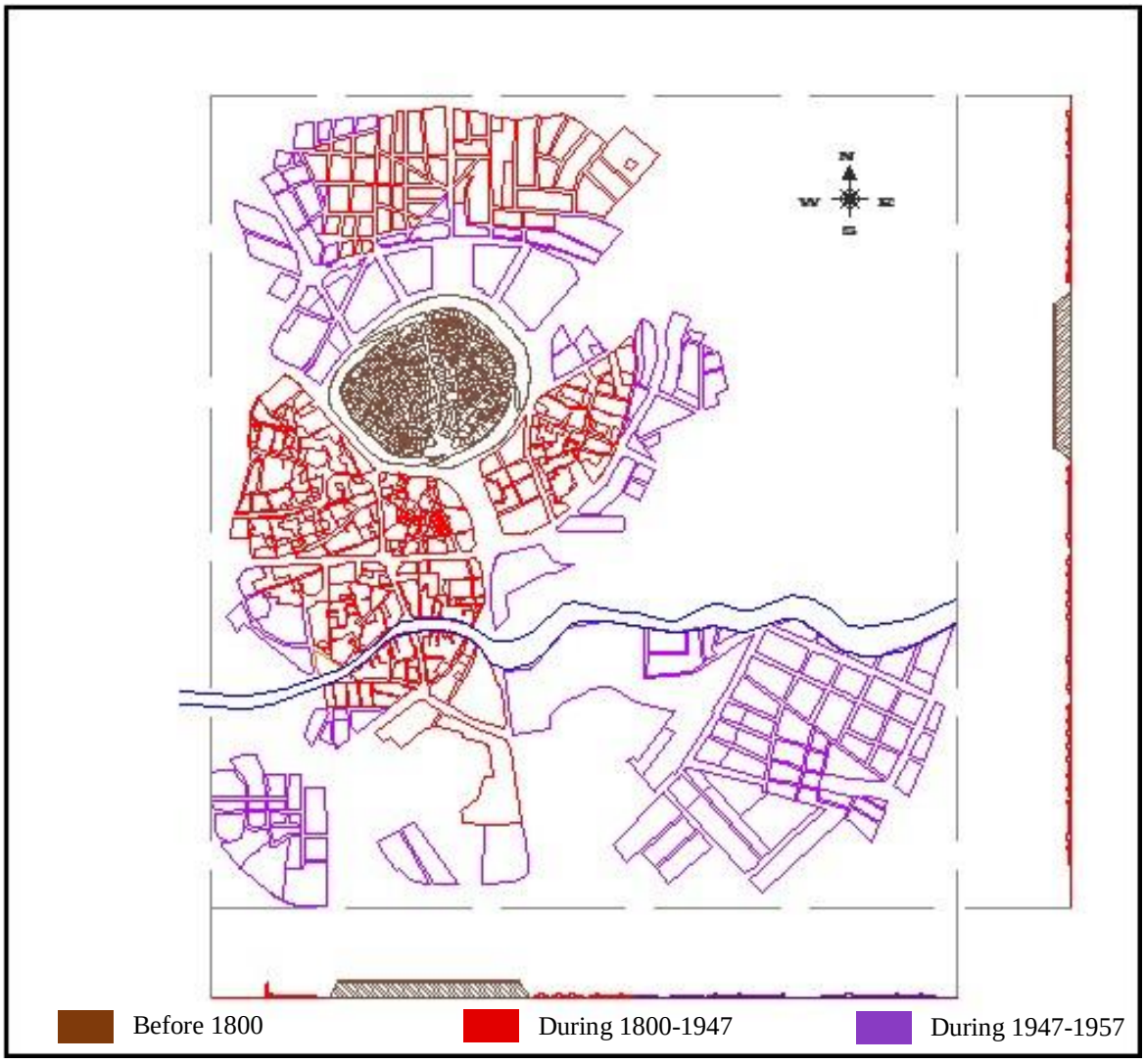


Figure 3.10: Erbil City map and sections during 1957 (Author, 2019)

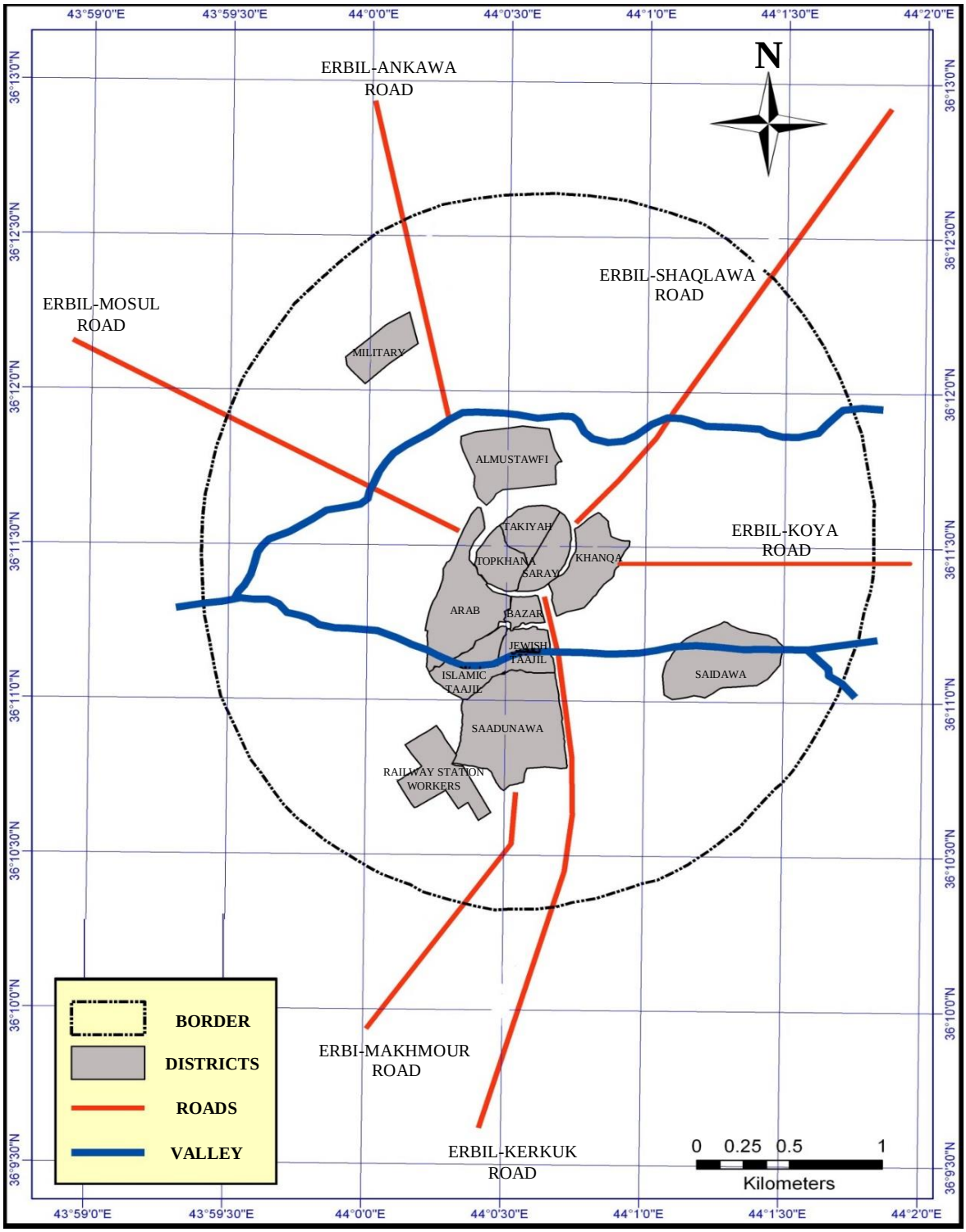


Figure 3.11: Districts of Erbil City during 1957 (Adopted Abbas, 2015)

3.3.3 Third phase (1957-1977)

This is one of the most important phases in Erbil City's history since the change of governance rule from a royal to a republic government after the revolution in 14 July, 1958. The population and urban projects increased in all of the cities in Iraq, especially Erbil City. This period was associated with a change in urban design regulatory frameworks. Such changes involved new rules and regulations being set up in respect of roads and building structures in 1958 and 1964. Hence, gave more room for people to modify original housing structures as well as develop house (Akram, 2016).

The end of the Kurdish revolution in 1961 led to the displacement of many Kurdish families from villages to Erbil City, because of war in the villages. Then the Iraqi government displaced the inhabitants of the villages in the Iraqi-Iranian border within a distance of 20km. In 1975 the Algiers convention led to increase of population in the city (Abbas, 2015).

The population growth in the city affected by several events including;

- The political events that took place between 1961-1974 led to migration of population from countryside to the city, especially those on Iranian border.
- The statement that issued on 11 March, 1970, brought peace to the majority areas in north of Iraq.
- Iraqi oil nationalization in 1972 greatly increased the individual income of living.
- The autonomy laws that released in 1974 which allowed Erbil City to be self-governed.

As a result of these events the administration importance of Erbil City increased which attracted the population, its regional evolution also enhanced by expansion of new transport roads linking Erbil City to the other urban centers especially; Erbil-Ankawa road, Erbil-Koya road and Erbil-Makhmour road, also one of the transport roads was inside Erbil City third ring road named 60m street (Al-Mudaris).

The population and residential units increased from 39.913 people and 4.999 residential units in 1957 to about 193.558 people and 27.953 residential units in 1977, it's clear that 153.645 people and 22.954 residential units increased during this phase. The total area of Erbil City in the end of this phase was 37.76km² with an increase of about 29.35km² compared to the second phase, while the constructed area was 12.34km² with an increase of about 4.38km² compared to the second phase as shown in Table 3.1. This increase in population affected the development of constructed land on the studied area.

The proportion of city population to the total population of province increased. This led to emergence of new neighborhoods in north and north-east direction including; Shorsh, Tairawa, Brayati, Salahaddin, Poultry Factory Workers, Cigarette Factory Workers, Basta-Piaza, Setaqan, Shuhadaa Setaqan, Hand Carpet Workers and Kilkand. Neighborhoods in east and south-east direction including; Ashti, Ronaki, Jumhuri, Iskan, Mufti, Balashawa and Mantikawa. Neighborhoods in south and south-west direction including; Nishtiman, Azadi, Kuran and Zanyari. A new neighborhood at the end of this phase appeared in west and north-west direction including; New-Arab, as shown in Figure 3.13 (Municipality of Erbil, 2018).

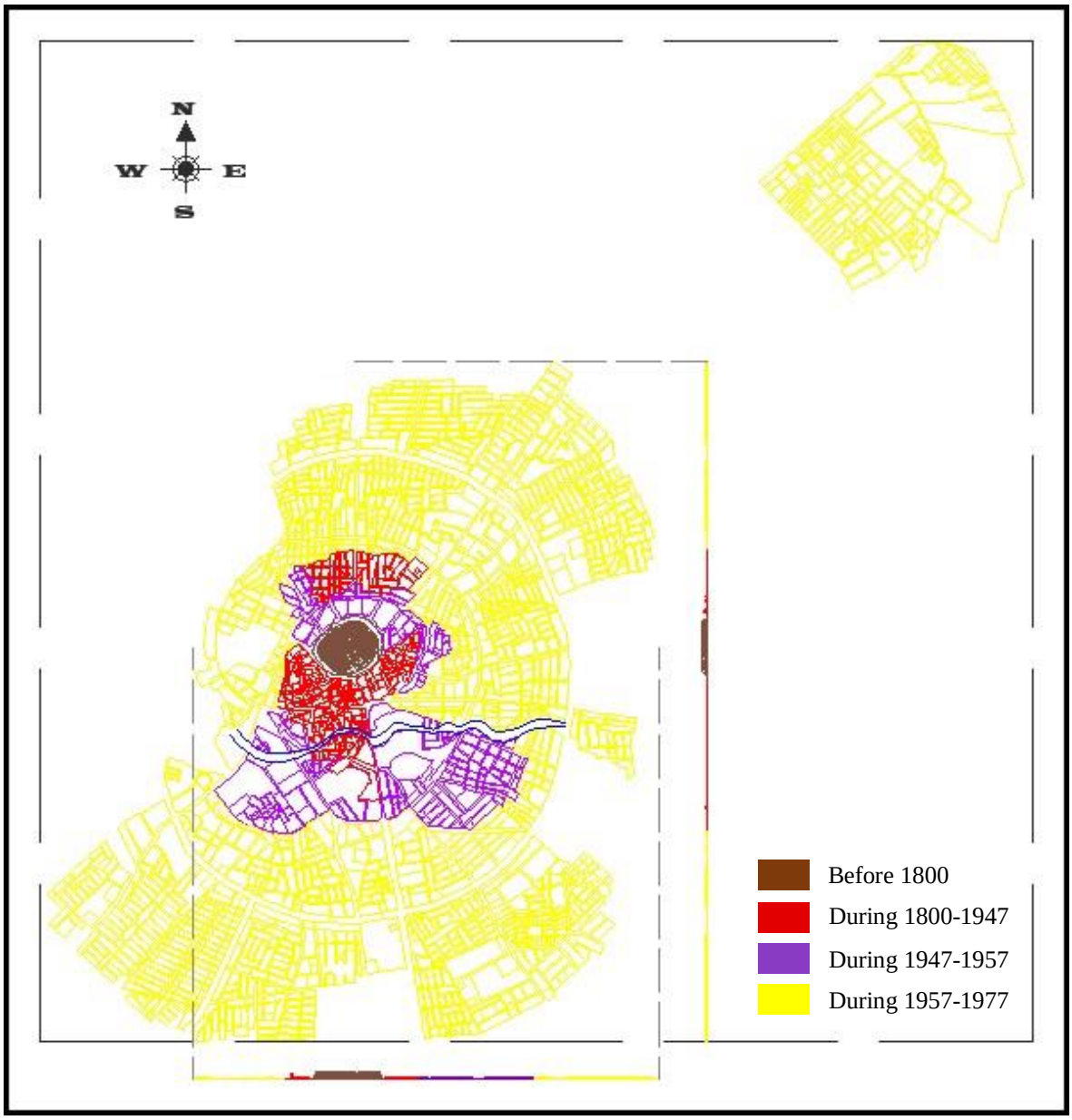


Figure 3.12: Erbil City map and sections during 1977 (Author, 2019)

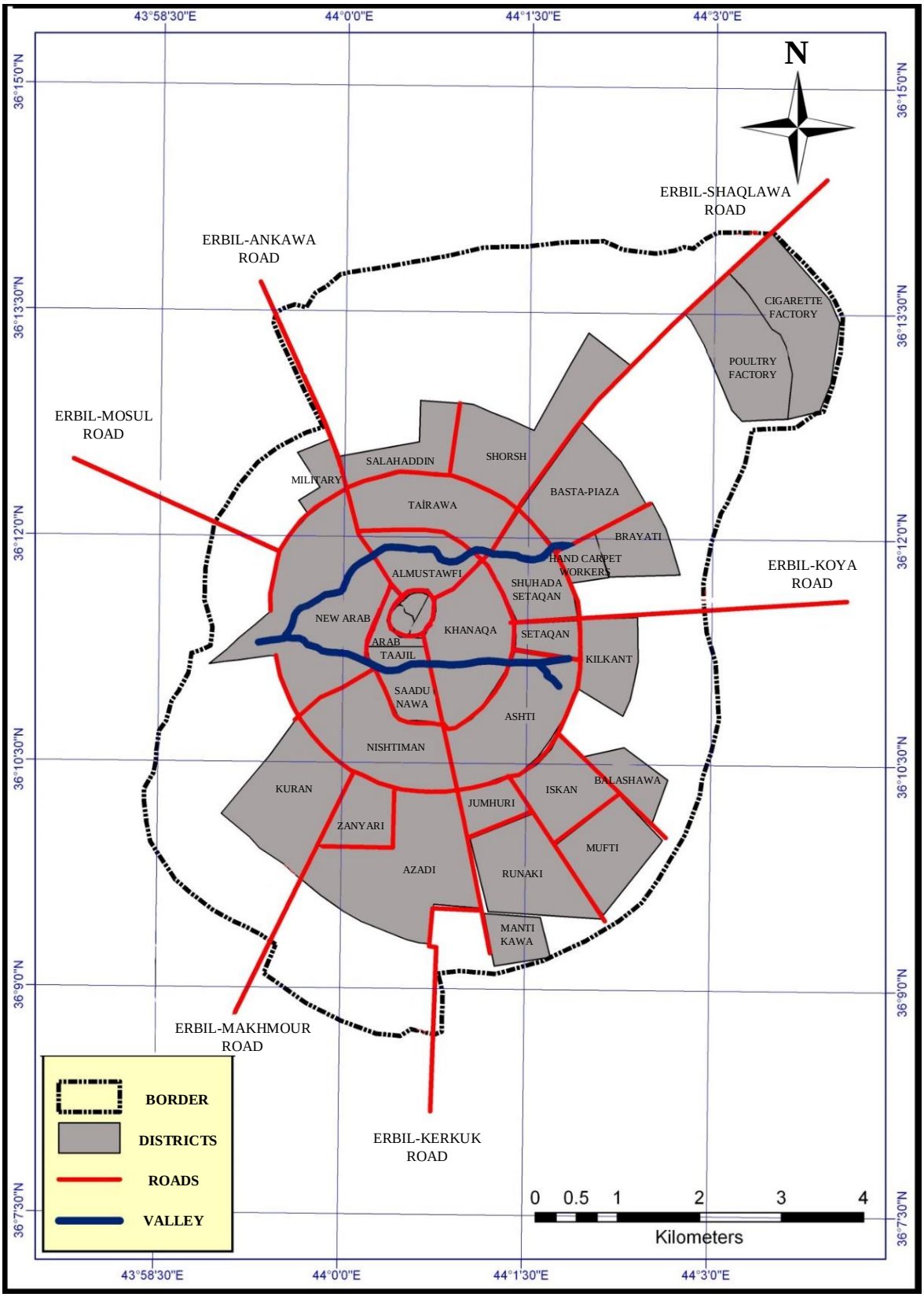


Figure 3.13: Districts of Erbil City during 1977 (Adopted Abbas,2015)

3.3.4 Fourth phase (1977-1987)

In 1979 the decision number 850 was issued and granted approval for the construction of more than one housing units on one plot of land which had a minimum size of 120m² irrespective of the width of the land area. This entails that existing urban plots of 240m² could be developed into two housing units so long at the width of the two structures is more than 6m. As a result of this, two or more houses can be built on such a type of plot (Sabr, 2014).

The Iraq and Iran war that lasted for eight years from 1980 to 1988 resulted in migration and displacement of many villagers and small city populations to Erbil City. The effects of the war had severe negative effects on the demand for houses and this forced a huge development in housing transformations. This had far reaching consequences as evidenced by the emergence of illegal housing structures for example Badawa district see Figure 3.14. Such was being facilitated by increased economic hardships being experienced by people. This was made worse by the fact the government of Northern Iraq was not capable of controlling the increased rate of urbanization, but due to the need to maintain sustainable urban designs, in the end of this phase the government started encouraging the construction of multi-storey building structures. Such structures were much more different from the traditional housing structures (Akram, 2016).

Figure 3.14: Badawa district in Erbil City (Author, 2019)

In 1981 Sulaymaniyah university transferred from Sulaymaniyah to Erbil City, since all these events led to demographic and urban change in this phase that affected the morphology of the city due to increase in population and urban expansion (Naqshbandi, 2016).

The population of Erbil City increased from 193.558 people according to population density in 1977 to about 423.112 people in 1987 it is clear that 252.354 people increased, there were also significant changes in the urban area of the city which was 80.51km² with constructed land area of 35.92km² which increased by 42.75km² and 23.58km² respectively compared to third phase as shown in Table 3.1, due to increasing in population and area expansion.

Figure 3.16, shows that there are new neighborhoods appeared in Erbil City in north and north-east direction including; Qadisiyah, 7-Nisan, Safeen, Shurta and Kani. Neighborhoods in east and south-east direction including; Khanzad, Thubat, Shuhadaa, Tanfizi, Badawa, Muhandseen, Zraa and Khabat. Neighborhoods in south and south-east direction including; Adala, zanko/99, 11 Adar, Factors, Mahabat and Sirwan. Neighborhoods in south-west direction including; Bahar, Umal, Saddam, Askari, Jaish-shabi (Municipality of Erbil, 2018).

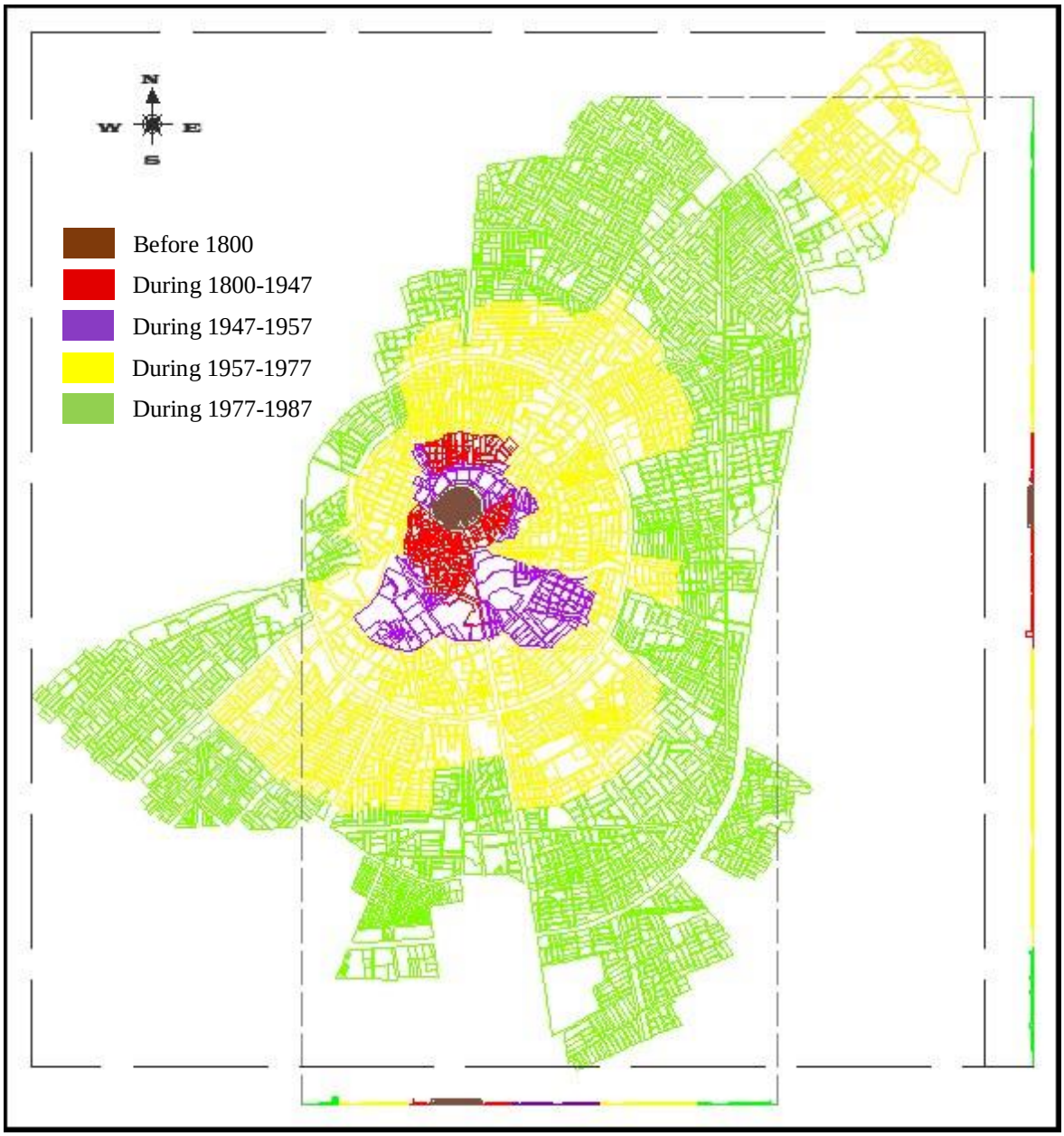


Figure 3.15: Erbil City map and sections during 1987 (Author, 2019)

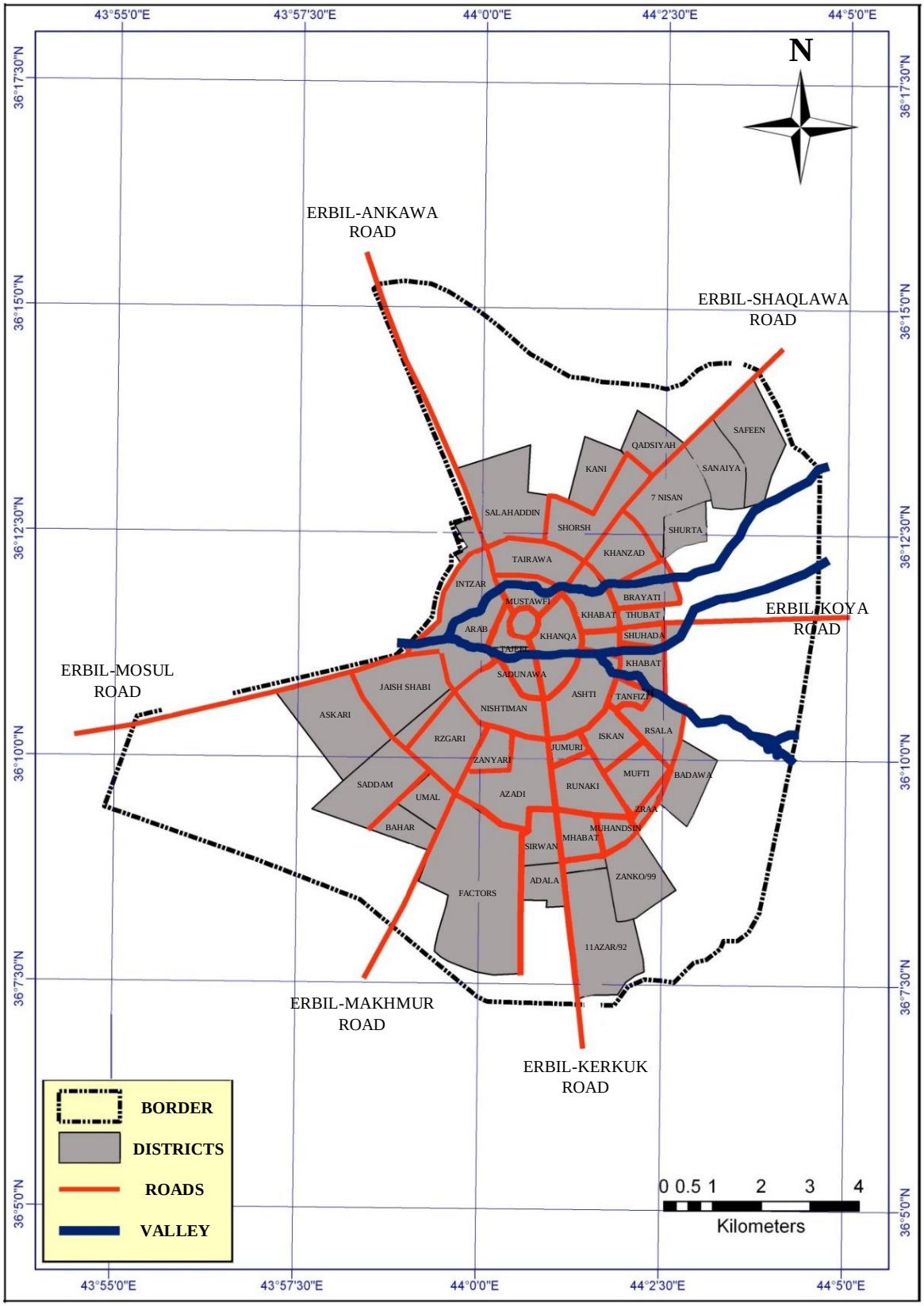


Figure 3.16: Districts of Erbil City during 1987 (Adopted Abbas, 2015)

3.3.5 Fifth phase (1987-2017)

This phase is one of the most important phases in the history of Erbil City, there have been many changes in the morphology because of the continuous population growth and migration during this phase. The most important of which was the uprising of March 1991, and the formation of the Kurdistan Regional Government in 1992, which turned the city of Erbil from the self-governed to the capital city of the Kurdistan region of Iraq. This gave it the importance of administrative and political excellence, and after the fail of Saddam Hussein's rule in 2003, which was accompanied by major improvements in security, political, economic and social stability, and an increase in internal and external investment in this field (Naqshbandi, 2010).

This period was characterized by massive changes in building regulations and investment laws. This saw increased levels of funds being injected towards the development of new housing structures. Consequently, Peace, relative prosperity, and democracy began to grow in the region. This period can be considered as golden era of the city evolution. Many of development projects have been constructed and the urbanization process reached its climax. Most of the housing development projects reflected western concepts and passed over the local traditions. These approaches generate a state of confusion in architectural identity.

The rapid economic developments create new lifestyle which affected the house build area as a result of new functional requirements. As well as the concept of subdivision of a plot of land, this resulted in the development of unusual houses such as the ones which had a width of 5m and were of 100m² big buy built on a 200m² piece of land was the main reason of decreasing the garden area. This period characterizes a major shift in housing transformations observed in Erbil. With the municipal government of Erbil developing a master city plan of Erbil in 2009, new and modern residential complexes began to mushroom throughout Erbil City (Sabr, 2014).

This phase also witnessed a number of variables, the most important of which;

- Erbil Citadel inhabitants migrated outside the Citadel to make it an archeological area.
- Destruction of several districts in the city center due to lack of proper housing facilities.
- Destruction of Haraj market and Balla market turned to Bakhi-Shar park and Nishtiman mall in the city center as shown in Figure 3.17.
- Destruction Military zone in the north-west direction of Erbil City.
- Transferring the Alwa markets from the Saidawa locality to Erbil-Gwer road.
- Transferring industrial uses in Kuran locality, Erbil-Kerkuk road, Badawa locality and Kurani-Ainkawa to south-west industry (southern industrial).
- All of the valleys that passing throughout Erbil turned into an underground water passing.
- Establishment of new internal transport lines 100m street, 40m street and 120m street.

(a) Balla market and Haraj market 1990

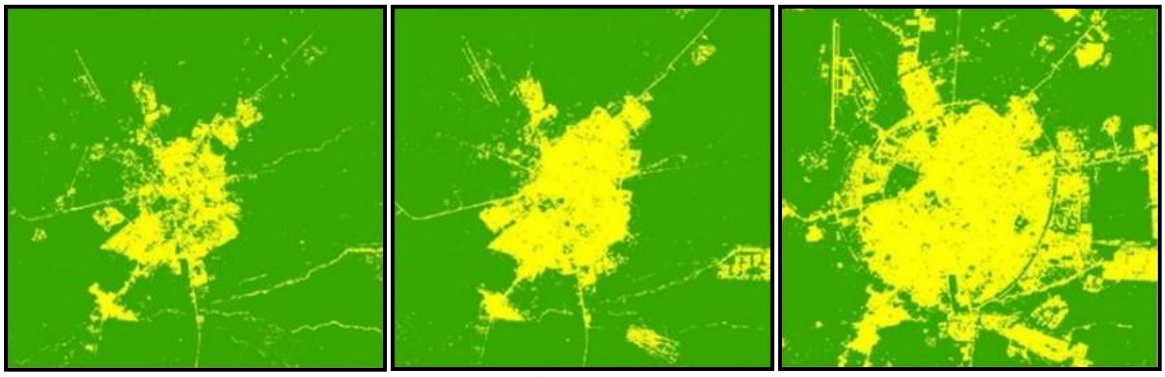
(b) Bakhi-shar park and Nishtiman mall 2010

Figure 3.17: The old and the new situation of the urban core in Erbil City Center (Al-Hashimi, 2016) (Author, 2019)

The population of Erbil City increased from 445.912 people according to population density in 1987 to about 932.800 people in 2017, it is clear that 486.888 people increased, there are also significant changes in the urban area of the city, the total land area of Erbil City in the end of this phase was 2303km² with an increase of about 2222km² compared to the fourth phase, while the constructed land area was 213km² with an increase of about 177km² compared to the fourth phase as shown in Table 3.1 (Municipality of Erbil, 2018).

the expansion that took place during this phase was in all directions even in the west, which was a military zone, from the expansion of areas accompanying the residential neighborhoods within the urban compound of the Erbil City. Figure 3.19 shows that expansion of the area at this stage was a cumulative pattern in all directions and axes especially in the east and south direction.

Figure 3.20 shows that there are new neighborhoods appeared in Erbil City in north and north-east direction including; (Kurani-Ankawa, Birkot, Itaian village-2, Mass city, Future city). Neighborhoods in east and south-east direction including; (Gulan-2, Sruran, Chwarchra, Hawleri-New, Hana city, Mnara, Kamaran city, Zilan city, Hwkari, Sebardan, Hiwa city, Marina city, Berkot-New, Hiwa city-2, Talar city, Floria city, Shahana city, Ashti-2, Mariwan, Azula city, Dashti bahasht, Lava city, Atlantik city, Zhian city, Lam light, Ainda-1, Ainda-2, Kariz, Lawan city, Hawler city, Ashti city, Hiran city). Neighborhoods in south and south-west direction including; (Hamrin, Sharawani, Zanko-2, Roshnbiri, Jihan city, Zhian, Shahidan, Asuda city, Shadi, Mardin). Neighborhoods in west and north-west direction including; (Naz, Bakhtiari, Dream city, Parlament, Sarbasti, Empire, Midia, Park-Sami Abdulrahman).



(a) 1987 (b) 2000 (c) 2011

Figure 3.18: The development of built-up area of Erbil City during fifth phase, from 1987 to 2011 (Ibrahim, 2013)

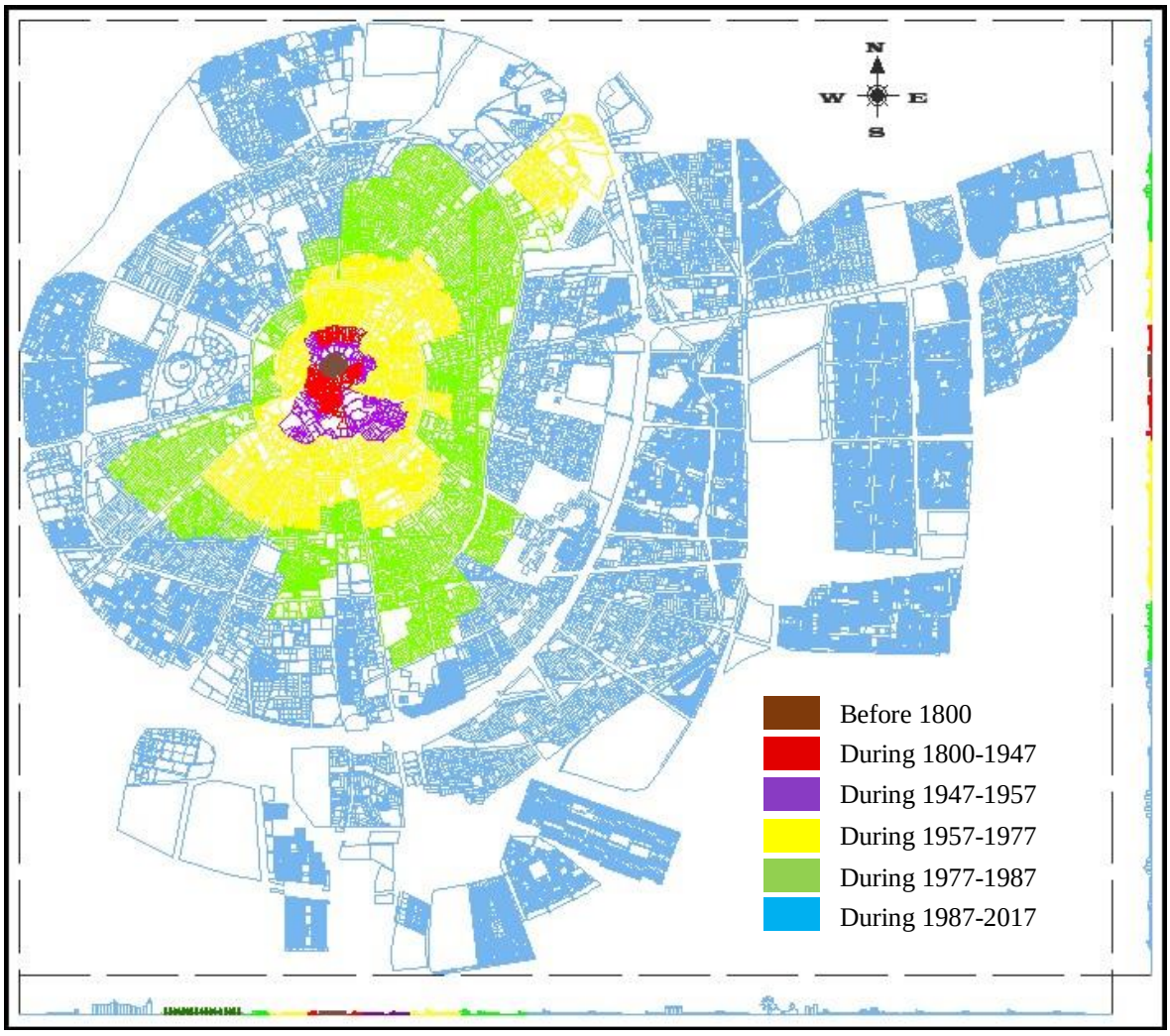


Figure 3.19: Erbil City map and sections during 2017 (Author, 2019)

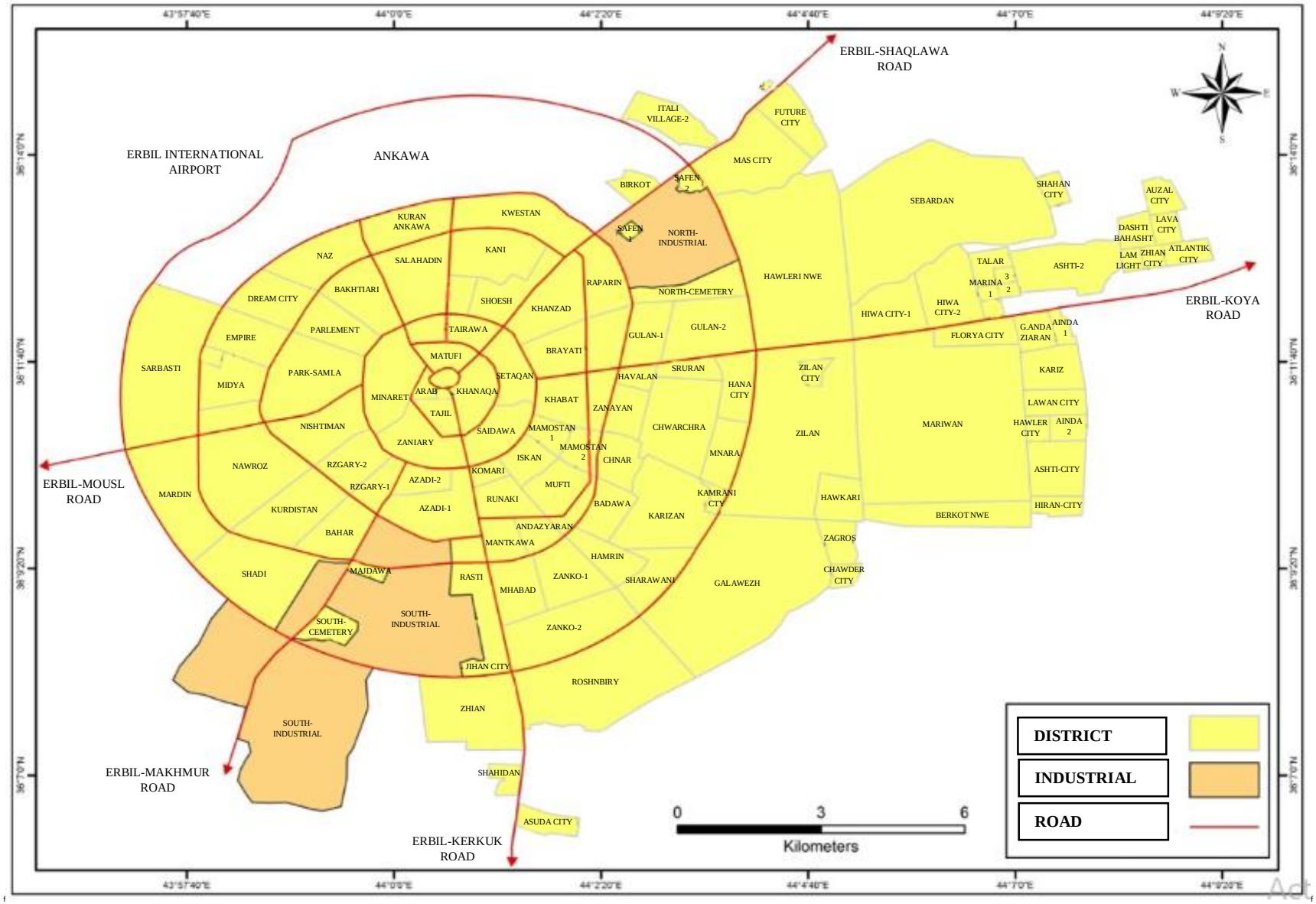


Figure 3.22: Districts in Erbil city during 2017(Adopted Municipality of Erbil, 2018)

3.4 Morphological Developments of Roads in Erbil City

Erbil City have 3 distinct types of streets and these are circular, radial and secondary streets and these were classified according to their nature and form. A description of these street types is here in provided as follows;

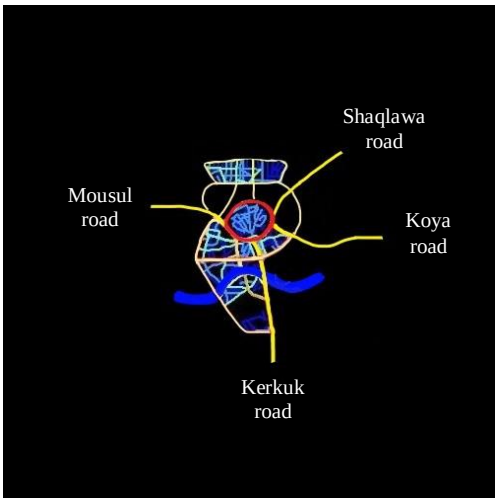
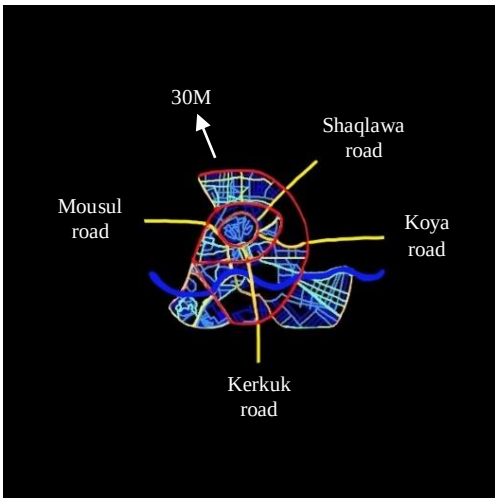
- **The circular streets:** These streets assume a circular or semi-circular shape that goes around the city surrounding the Citadel of Erbil. Notable examples include Citadel Street, Al-Hilali Street, 30m Street, 60m Street, 40m Street, 100m Street and the new one 120m Street.

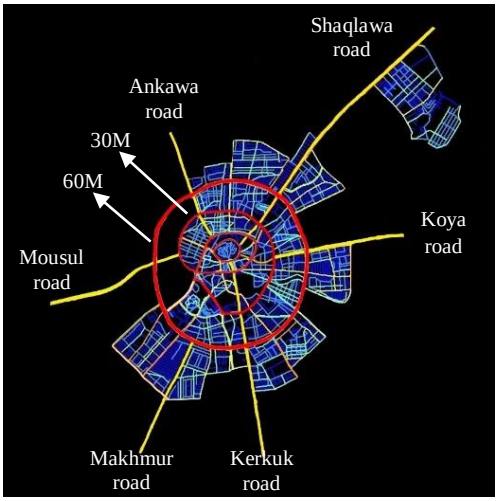
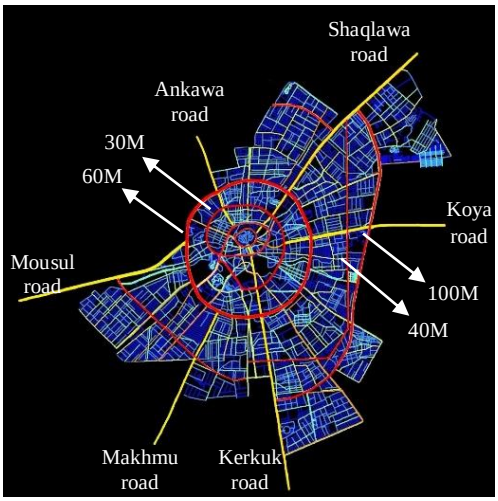
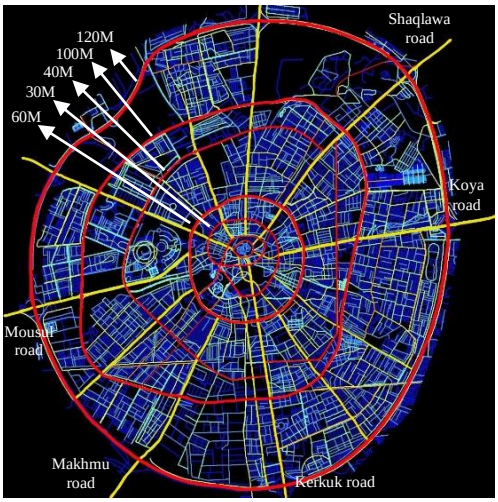
- **Radial streets:** These streets start from the center of the city extending outwards in a radial form heading towards the outskirts of the city. Radial streets serve as a connection or link between all the circular and semi-circular streets. Examples include Kirkuk Road, Koya Road, Shaqlawa Road, Bahrka Road, Ankawa Road, Makhmour Road and Mousl Road.

- **Secondary streets:** These streets are smaller in size and connect small neighbourhoods together and areas such as shops to each other. They are many in number and can be noted to be scattered throughout the city.

It is worthy to note that changes in economic and political factors had a great effect on the development of roads in Erbil City. As a result, the types of streets found in Erbil gradually changed since the year 1947. Table 3.4 provides a description of the development of Erbil City's roads system since the period 1947 to 2017.

Table 3.4: Development of Erbil City's road systems from the year 1947 to 2017 (Author, 2019)

Periods	Erbil street maps Circular streets Radial streets Secondary streets	Explanation
First phase (before 1947)		Before 1947, Erbil City had organic streets which were characterized by narrowness, twisting and lack of integrity, and some of them were closed from one of the ends. These types of streets were suitable for simple transport agents and animals at that time. However, there were also narrow paved roads which connected the urban centers to the Erbil City including Erbil-Mosul, Erbil-Shaqlawa, Erbil-Koya and Erbil- Kirkuk roads.
Second phase (1947-1957)		New passenger transport services started developing in 1956, which saw new internal transport lines being established within the city. The streets were in circular form and the first circular street was named Sultan-Muzaffarddin Street, and the second circular street was called 30m Street. All of these streets ended at the beginning of the third phase but there were other secondary streets which connected the Erbil Citadel with the other districts.

Third phase (1957-1977)		The governance rule had changed in 1958. There were a lot of administration improvements that were observed during this period. This led to the development of new transport roads linking Erbil City with the other urban centers in a radial form. Examples are Erbil-Ankawa and Erbil-Makhmour Roads, and restoration of the other radial form roads. Also, development one of the circular street called Kurdistan Street (60m Street).
Fourth phase (1977-1987)		The Iran-Iraq war had negative effects on the economy and the development of social amenities and roads. As a result, informal roads started developing throughout Erbil city. Both the 40m and 100m Streets relatively assumed a circular shape and started developing during this period. But the development of these streets was highly dominant in the southern and eastern sides of the city with little and no possible developments in the other areas.
Fifth phase (1987-2017)		This period was noted to be having a lot of major road refurbishment and development activities such the completion of the circular development of the 40m and 100m Streets. development of the 120m Street also started during this period following the establishment of the Erbil City master plan. The development of modern bridges and spaghetti roads also commenced during this period. Most of the streets in Erbil had restoration during this period.

3.5 Urban Form Morphology of Erbil City

Changes in Erbil's urban form were mainly necessitated huge population growth, high rural to city migration, as well as political and economic challenges. Figure 3.21**,** provides a description of the areal map of each period including the study samples. Samples were shown from Figure 3.21 the related explanations are provided in Table 3.5.

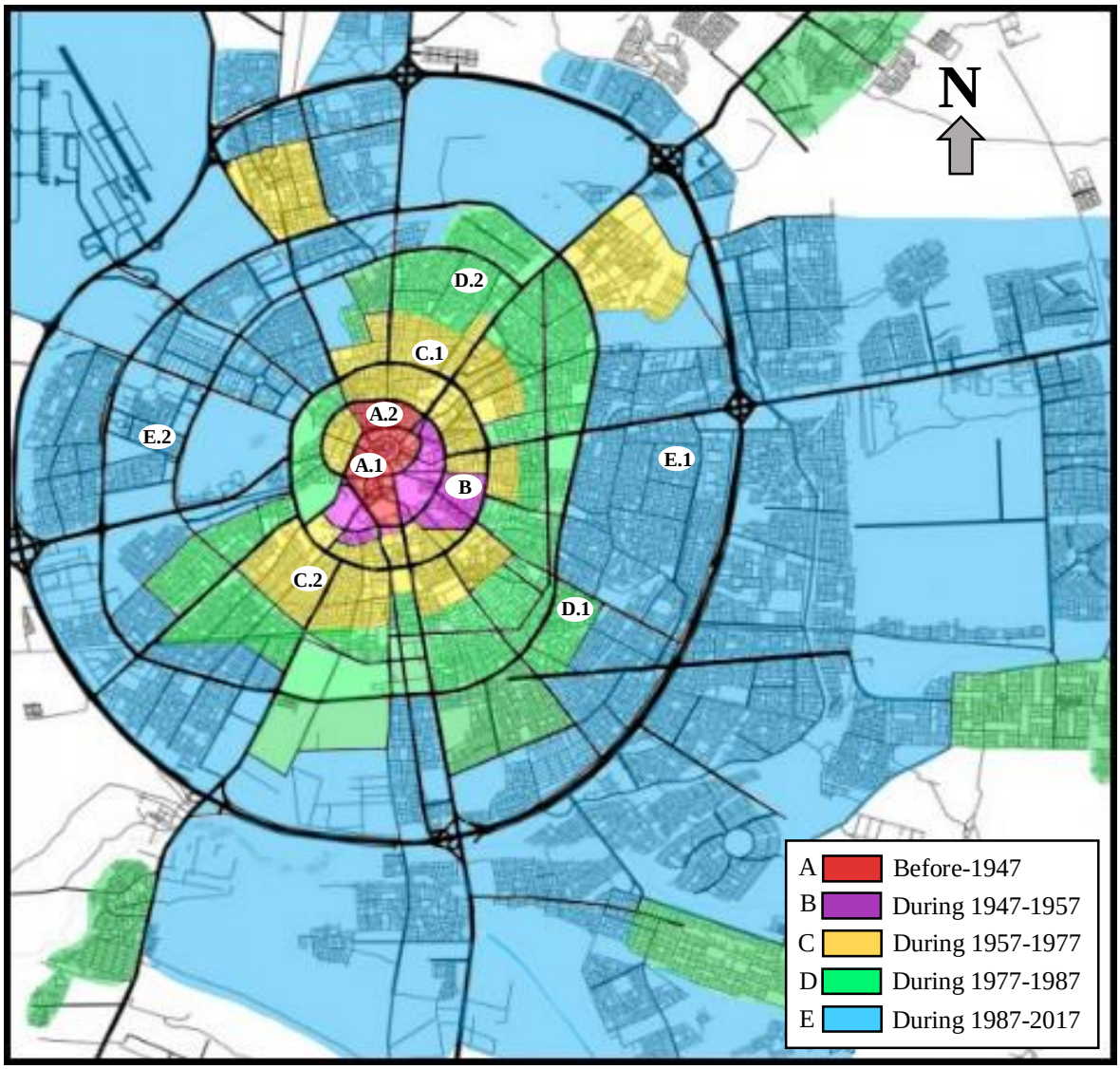
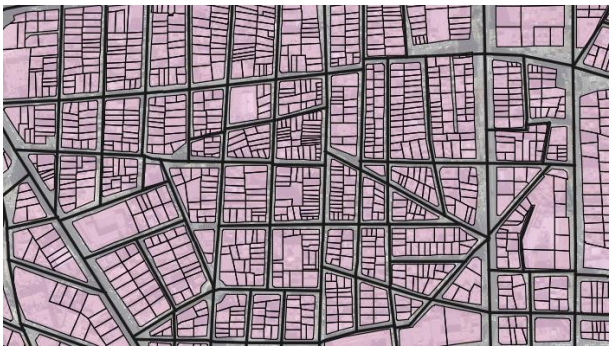
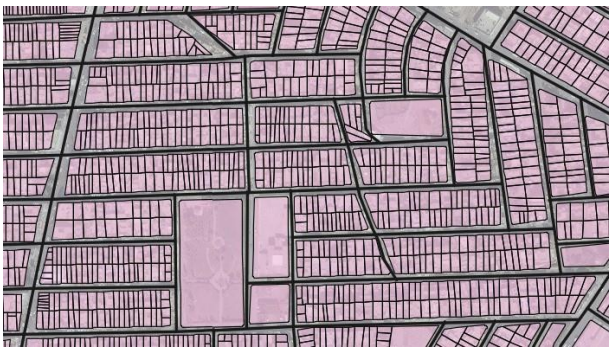
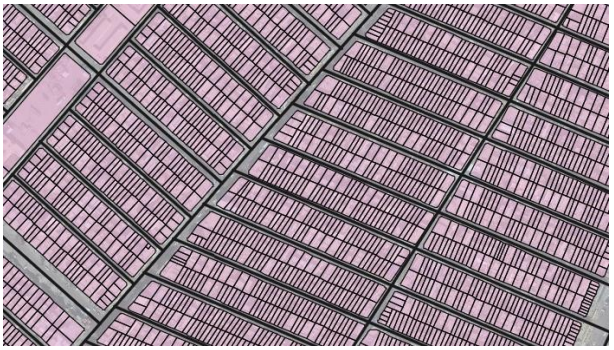
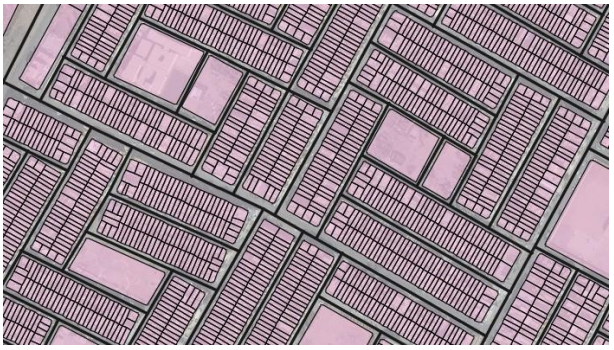


Figure 3.21: Areal locations of each period of urban morphological developments of Erbil City before 1947 until 2017 (Author, 2019)

Table 3.5: The comparative of urban form in different periods of Erbil City (Author,2019)

Periods	Location	Plot examples	Explanation
First phase (before 1947)	**A.1**: Arab district		Arab district was developed before 1920 and had an organic structure. This period had old traditional houses and organic streets which were built closely next to each other with no distance between the roads and the houses.
	A.2: Mstawfi district		Mstaufi district was developed after 1930, following the colonial dominance of the British. The building regulations were imposed in 1935 and placed limits on housing and roads development what was called the System No. 44.
Second phase (1947-1957)	**B**: Saidawa district		This period was not much different from the previous one and continued to be characterized by the same urban development system. For example Saidawa district that appeared after 1947.

Third phase (1957-1977)	**C.1**: Shorsh district		The governance rule had changed in 1958. This period was characterized with major regulatory changes which enacted in 1958 and 1964. These laws had major effects on the classification of towns, land and agricultural reforms.
	C.2: Rzgari district		A huge demand in the housing started occurring during this period and this was mainly caused by a sharp growth in the population. As a result, Rzgari district had limited green spaces and open areas.
Fourth phase (1977-1987)	**D.1**: Bdawa district		After the war between Iraq and Iran in 1980, a lot of people started migrating to the cities. The government could not control the rapid urbanization and a lot of unplanned illegal structures started mushrooming during this period.
	D.2: Kani district		Bdawa and Kani district were all developed in the same period. However, the major difference is that the government started legalizing and controlling the development of some districts for example Kani district.

Fifth phase (1987-2017)	**E.1**: Chwarchra district		After the formation of the Kurdistan Regional Government in 1992, and the fail of Saddam Hussein's rule in 2003. A lot of urban development activities observed in this period were made using urban principles.
	E.2: English village		Urban development activities were now being done using a master city plan in 2009. As result, modernity complexes and malls started developing during this period, for example English village in Erbil City that developed after 2009.

Erbil had its initial master planned developed between the period 2006 to 2009 and subsequently saw the City Centre Master Plan being developed within the same period and focused on issues such as the Investment Law and the first Green Belt of 2006. This period also saw major changes being introduced with regards to the development of residential buildings. As a result, various and a lot of urban complexes were developed during this period. In addition, changes in urban form also greatly impacted the city's urban form. Subsequently, Erbil City was declared World Heritage site and Arab Tourism Council in 2014 (Akram, 2016).

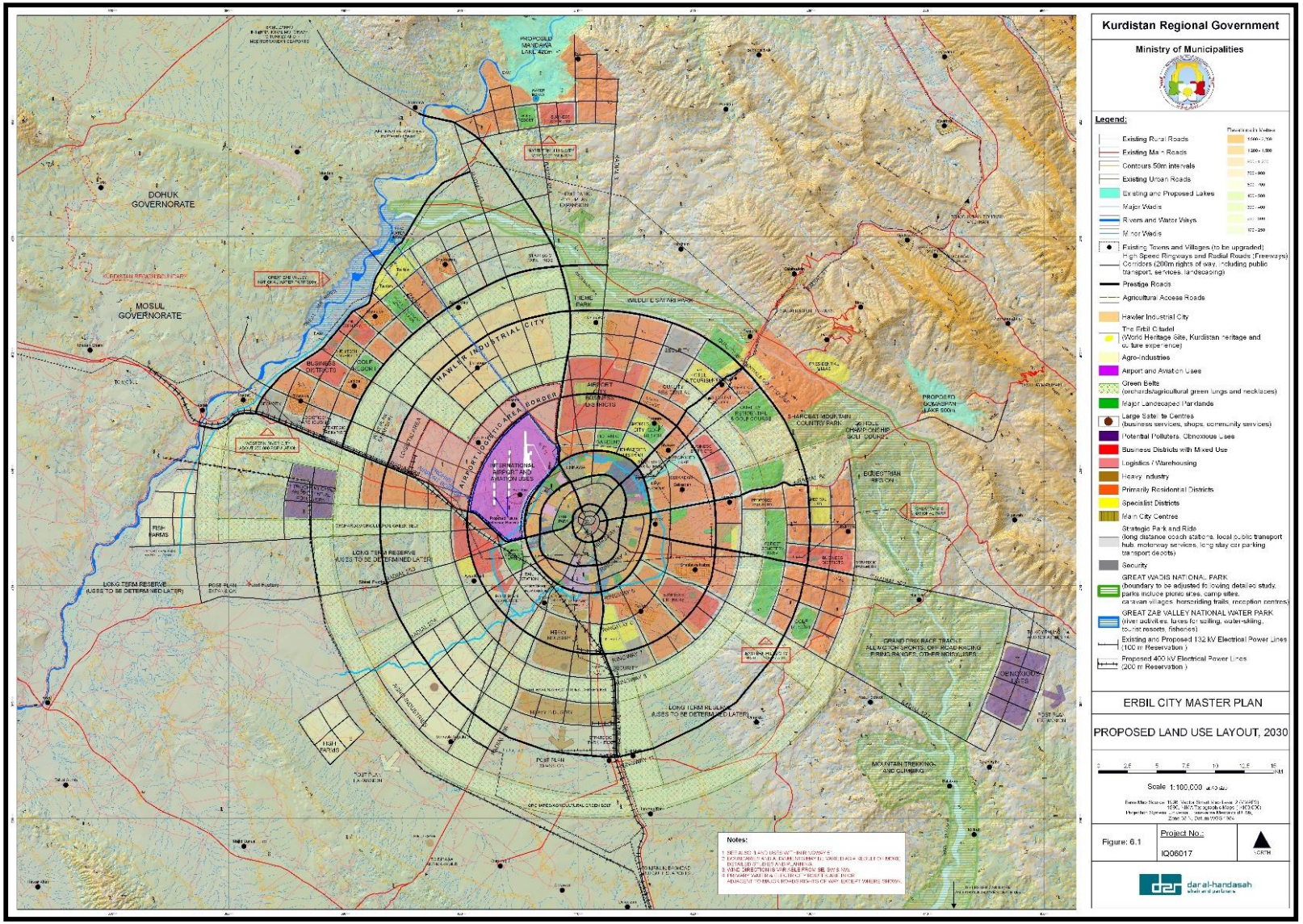


Figure 3.22: Erbil city master plan prepared by Dar-Al-Handasa and accepted in 2009 (Municipality of Erbil, 2018)

3.6 Directional Expansion of Erbil City

The distance of each directional expansion of each phase were computed by the researcher based on sectional analysis of the maps of Erbil as shown in Appendix 1 and 2. During first phase, the most notable expnasion of Erbil City was towards the south direction and expanded by 1.3km from the city center. On the other hand, expnaion of the city towards the north was by 0.65km, east 0.5km and west 0.45km from the city center as shown in Figure 3.23.

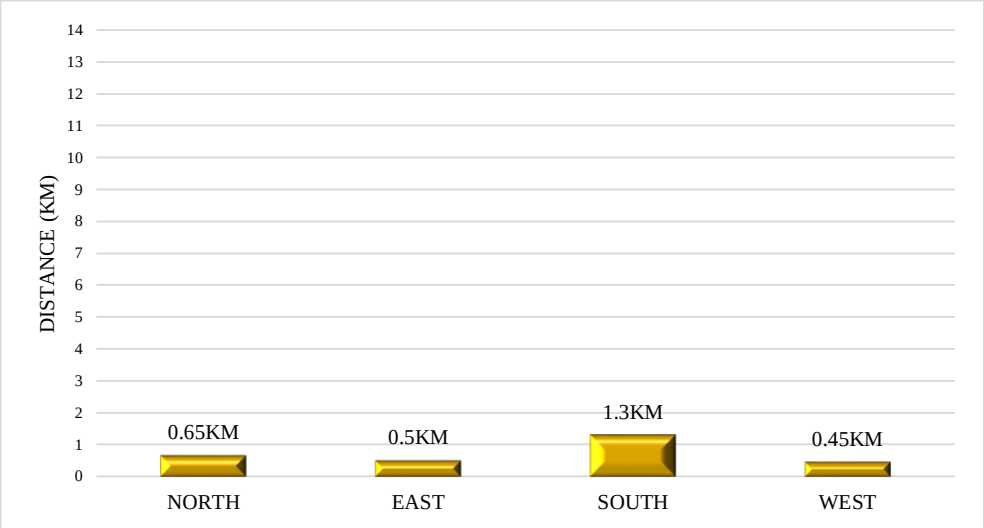


Figure 3.23: Directional expansion of Erbil City during 1947 (Author, 2019)

Meanwhile, the second phase was characterised by huge expansion of the city towards the east direction by 1.3km from the city center. In addition, the second phase can be noted that not have positive expansion to the other directions as shown in Figure 3.24.

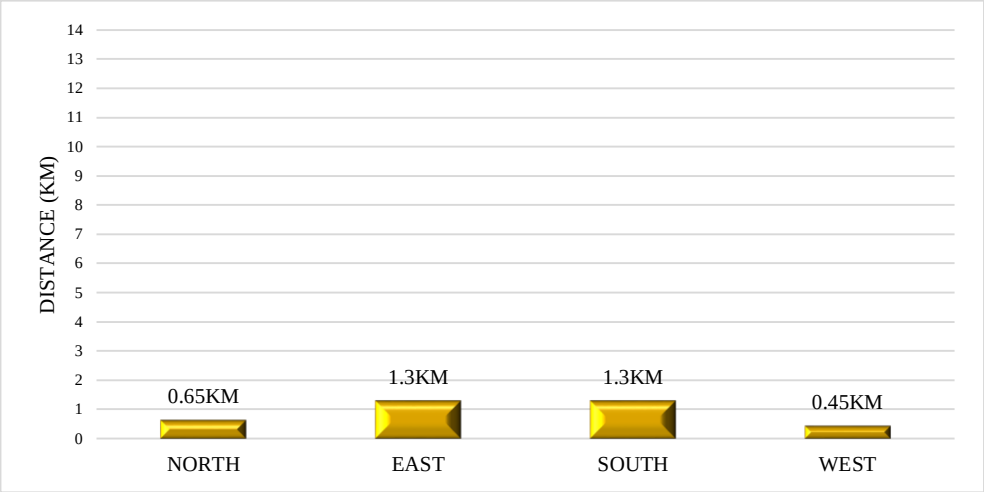


Figure 3.24: Directional expansion of Erbil City during 1957 (Author, 2019)

Urban morphological developments that transpired in Erbil City during the thrid phase can be said to have been more concentrated towards the south direction as it expanded by 4km from the city center. further observations can be made that the east, north and west expanded as well by 2.2km, 2km and 1.1km from the city center as shown in Figure 3.25.

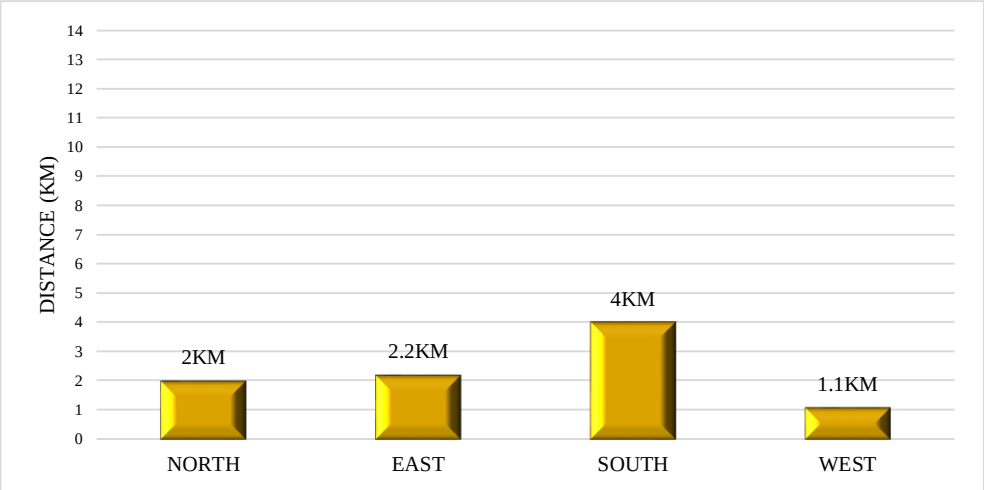


Figure 3.25: Directional expansion of Erbil City during 1977 (Author, 2019)

The fourth phase of Erbil City's urban morhological changes were also noted to be more concentrated towards the south direction by 5km from the city center same as the third phase which saw similar expansion of the city towards the same direction and the expantion towards north, east and west was by 4km, 3.3km and 1.5km from the city center see Figure 3.26.

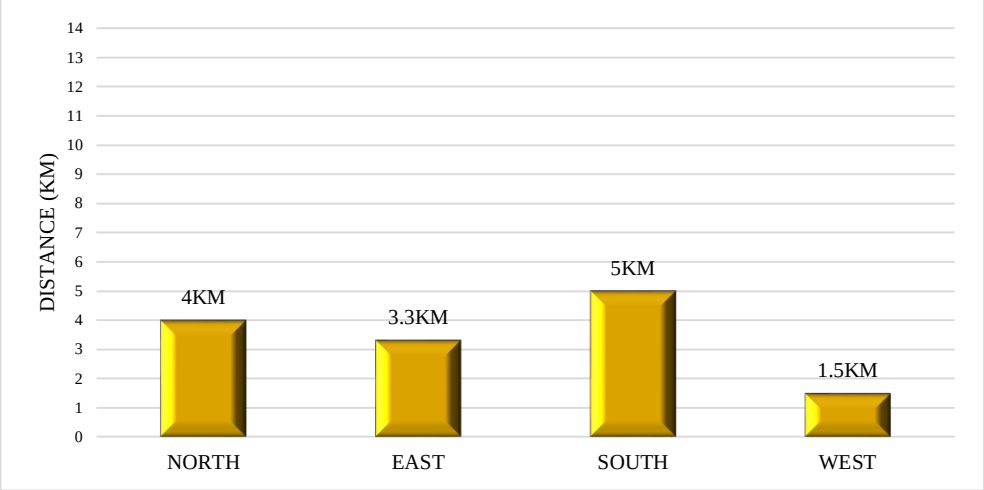


Figure 3.26: Directional expansion of Erbil City during 1987 (Author, 2019)

The fifth phase saw the city expanding notably both towards the east and south direction by 13km and 11km respectively from the city center. However, the Erbil City also expanded towards the north and west direction by 5.5km from the city center as shown in Figure 3.27.

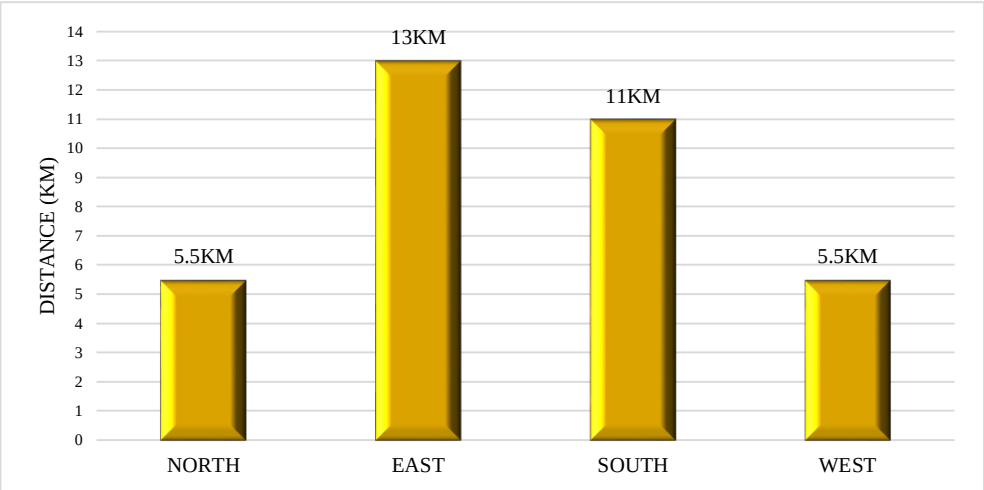


Figure 3.27: Directional expansion of Erbil City during 2017 (Author, 2019)

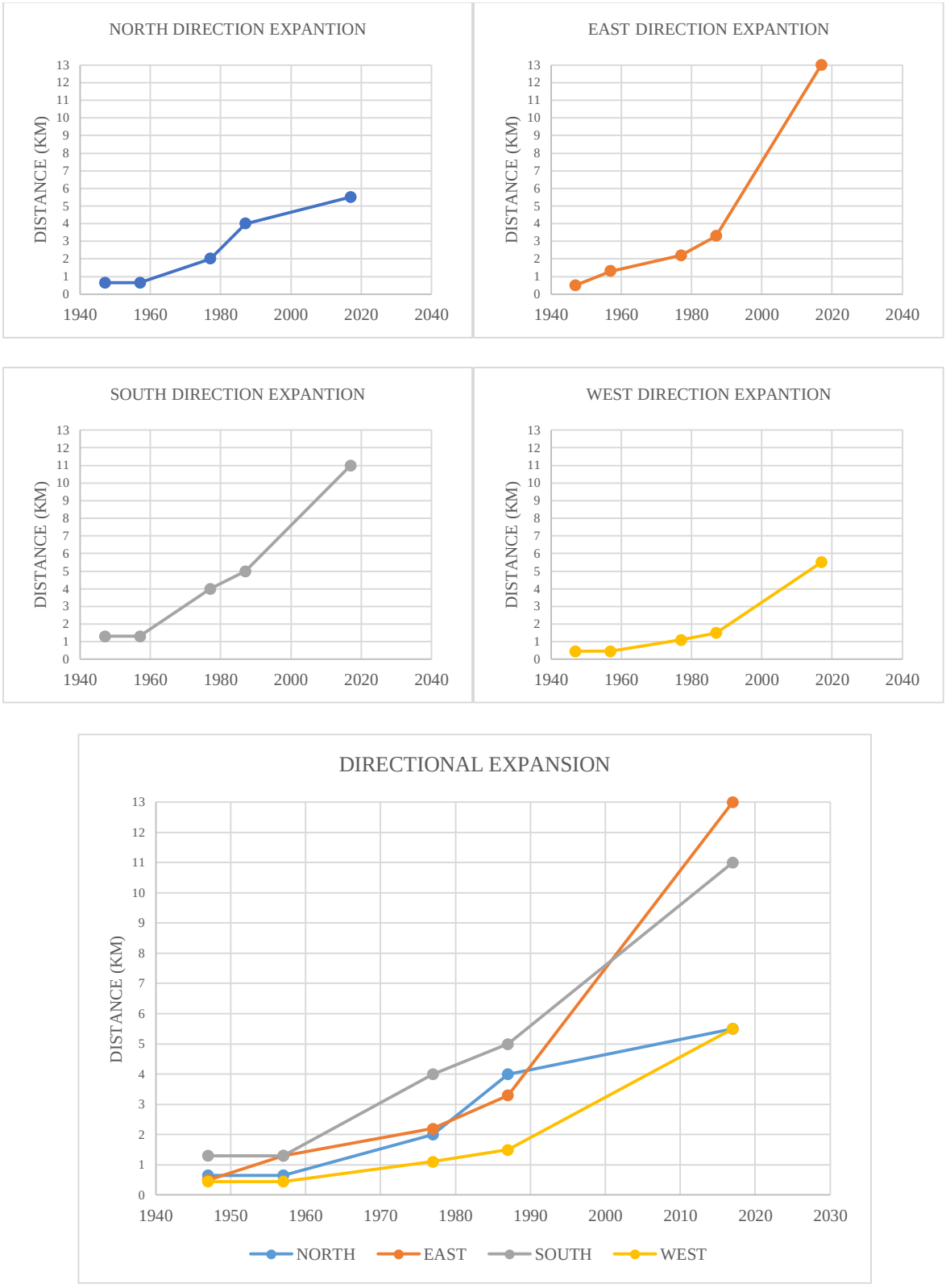


Figure 3.28: Expansion of each directions of Erbil City in different periods (Author, 2019)

3.6.1 Future expansion of Erbil City

As for the directions of the future expansion of the city, it appears through the follow-up of the expansion of the city of Erbil in five phases and the field study conducted by the researcher on the outskirts of the Erbil City, where the expansion trends as follows;

- **The north and north-east directions:** Expansion of this trend, especially on the Erbil-Bahrka road axis, is expected to be a movement, and expansion of this trend is highly likely due to the large flat land in this direction. As for the Erbil-Koya road the expansion is at the expense of agricultural areas, which are open areas where the land is flat.

- **The south and south-east directions:** It is hoped that this trend will witness a significant expansion, especially on the axis of Erbil-Kirkuk road and this is through unlimited expansion in that direction and at the expense of agricultural areas located at a distance from the left and right sides of the Erbil-Kirkuk road. The land is characterized by a very simple and flat topography.

- **The west and north-west directions:** Expansion of this trend to a little probability and the reason is due to the presence of highlands in this axis. And the Erbil International Airport on the north-west direction.

The expansion of the north and north-east directions and the south and south-east direction makes the city of Erbil expand in a triangle form far from the city center.

CHAPTER 4
HOUSING TRANSFORMATION IN ERBIL CITY

4.1 Introduction

It is important to note that houses play an important aspect in people's lives and they constitute a huge part of people's needs. House have a significant influence on people's productivity levels, happiness, health and lifestyle. On the other hand, houses are essential for safeguarding human existence and are more likely to change in responses to changes in people's taste and preferences and self-esteem level. This entails that houses have significantly and will continue to significantly transform as these factors and among others continue to change. This can be supported by ideas given by Mahta, (2009) which showed that major housing transformations witnessed both over the traditional and modern architectural era are as a result of changes in lifestyles.

Meanwhile, the need to examine housing transformations that have taken place over a given period of time in a given area is attached to several importance reasons. For instance, Dunn, (2000) relates the importance of housing transformations to the need to develop sustainable housing designs. Such sees aspects such as environmental protection, accessibility and affordability being looked at. Ozo, (1990) relates the importance of housing transformation to the need to develop international urban forms and structures that are of international standards. Bello, (2003) considers that examining housing transformations is essential towards promoting cultural and historical preservation.

On the other hand, the concept of housing transformation is a broad concept which is composed of many different aspects. That is, from the definition of housing transformation put forward by Ozo, (1990), it can be noted that housing transformation refers to the process through which housing forms are added and modified in a manner that alters the original

structure in a far-reaching way. Alagbe, (2016) extends the definition of housing transformation to include the complete erection of a building structure whether on the same building space on not. Due to differences between these two definitions and circumstances that have been observed in Erbil, the definition of housing transformation will therefore be operationalized. Hence, in this study housing transformation will be taken to mean to the process through which new housing forms are added and modified in a manner that alters the original structure in a far-reaching way. This operational definition matches what has been observed in Erbil and covers an empirical gap on the need to observe the development of new structures as part of housing transformations.

Cases of huge housing transformations observed in Erbil are as a result of huge changes in urban form and urban development. Also housing transformations in Erbil accounted for 90% of the developed urban areas between 1920 to 2014 (Baper, 2013). Such reinforces the importance of the need to examine the driving force behind housing transformation in Erbil. This also extends the need to include the possible housing transformation patterns, their related social, cultural and economic benefits and challenges.

Housing transformation patterns observed in Erbil have been attributed to urban development and changes in urban form. This reinforces the positive relationship that exists between urban morphology and housing transformation. This is one of the aims of the study to establish the link between urban morphology developments and housing transformations observed in Erbil, North Iraq.

4.2 Housing Transformations in Erbil City

There are a number of factors that can be listed as the cause of housing transformations but these factors can vary from one location to the other. This is notably applicable with regards to Erbil city whose architectural identity classification is presumed to have been triggered by distinct factors (HCECR, 2009). These factors can be listed as follows;

- Extension of ring roads and implementation of Erbil City master plan.
- Horizontal proliferation as a form of city sector development.
- Changes in demographic patterns.
- Changes in social distribution patterns.
- Positive improvements in economic developments.
- Improvements in the political landscape.

These factors are the key triggers of housing transformations observed in Erbil City and such transformations took place in stages which are described as follows;

4.2.1 First period; before 1930 (Traditional period)

The traditional period is mainly characterised by old urban structures which continue presently continue to house a significant portion of Erbil's populace. Yildiz, (2004) considers this period to be famously known for the development of one of the world's ancient urban structure known as the Citadel town of Erbil. What makes this traditional period distinct is a series of well-connected alleyways and traditional courtyard houses, walls that surround narrow streets and various building structures see Figure 4.1.

Figure 4.1: Citadel town in Erbil City (UNESCO, 2012)

Al-Janabi, (1987) noted that houses constructed during period had façades with small openings and none of them surpassed one-storey. Mud and timber roofing were also some of the prominent features that characterized houses constructed during this period.

Houses constructed this period were mainly intended to provide comfort, shelter and warmth and little attention was paid to the width of the house façade see Figure 4.2 and 4.3.

Figure 4.2: Traditional courtyard house plan example in Erbil Citadel (UNESCO, 2012)

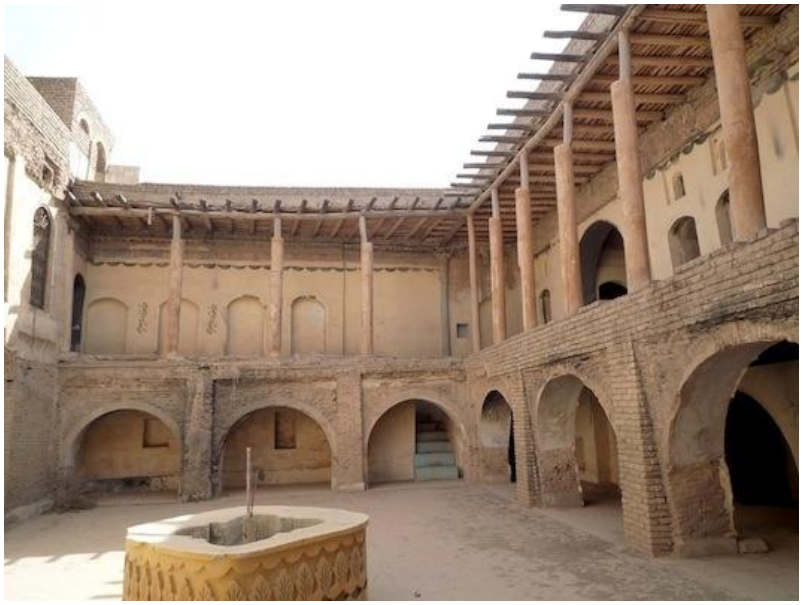


Figure 4.3: Traditional courtyard house example in Erbil Citadel (Author, 2019)

4.2.2 Second period; 1930-1980 (Modification period)

The instrumental factor which shaped both the size and design of houses constructed during the modification period is the British colonial control of Iraq (Gunter, 2004). Furthermore, Gunter also highlights that the colonial effects resulted in industrial capitalism which grew to pose positive cultural and social changes. That is, modern house designs began to emerge during this era, and they were uniquely different from traditional housing designs, as shown in Figure 4.4.

Figure 4.4: House example during modification period in Erbil City; Shorsh district (Author, 2019)

According to Al-Sanjary, (2008), expansionary developments of Erbil City became prevalent following a shift in economic, cultural, social and political aspects. This was marked by shifts from arches in buildings, the use of pure brick vaults, innovative improvements in building strength, span and roofing style. Much of these changes were driven by changes in immigration and population growth patterns.

Meanwhile, the use of internal courtyards remained relatively high and whilst the use of plaster decorations, doors, new paving tiles and large external windows rose dramatically. This also includes the use of paintings colors, transparent windows, reinforced concrete slabs and blocks and significantly distinguished tradition from modernity.

Figure 4.5: Internal courtyard house example during modification period in Erbil City; Khabat district (Author, 2019)

4.2.3 Third period; 1980-2003 (Transitional period)

Ideas by Stansfield, (2003) clearly highlight that the effects of war and sanctioned imposed on Iraq had stern effects on Iraq. As such, political tensions stirred huge rural to urban migration patterns which imposed demand on existing and limited urban settlements. Failed efforts by the government to meet the increased demand for urban settlements resulted in the immigrants constructing their own illegal building structures. This greatly changed the physical or urban appearance or streetscapes of Erbil City. Stansfield, (2003) also highlighted that houses began to lose their aesthetic value as a result of the mushrooming of illegal structures with poor streetscapes and façades see Figure 4.6.

(a) Example house in Badawa district (b) Example house in Raparin district

Figure 4.6: House examples during transitional period in Erbil City (Author, 2019)

4.2.4 Fourth period: After 2003 (Modernity period)

This period was marked with huge architectural developments which were mainly stirred by positive economic developments, these were also necessitated by improvements in the political outlook. Hence, the rate of urbanisation of Erbil City became predominantly high during this era as the number of infrastructural developments projects began to also rise (Baper, 2013). With an increase in globalisation and industrialisation, the widespread infiltration of western architectural styles rose significantly to become a prominent feature of modern architectural identity in Erbil City. Thus, building structures began to assume and fulfil new functional requirements (leisure, entertainment, status-quo and prestige etc...), see Figure 4.7 and 4.8.

Figure 4.7: Modern house example in Erbil City; Bakhtyari district (Author, 2019)

Figure 4.8: Modern housing complex in Erbil City; Vital village (Author, 2019)

However, the continued influx of Kurdish immigrants from Iran who had migrated during the war continued to pose a huge demand on houses. As a result, people were forced to modify their houses to suit the size of their households. This resulted in the development of unusual houses such as the ones which had a width of 5m and were of 100m² big buy built on a 200m² piece of land. That is, the entire 200m² of land was being occupied by 2 housing units each with a size of 100m² as shown in Figure 4.9 (Sabr, 2014).

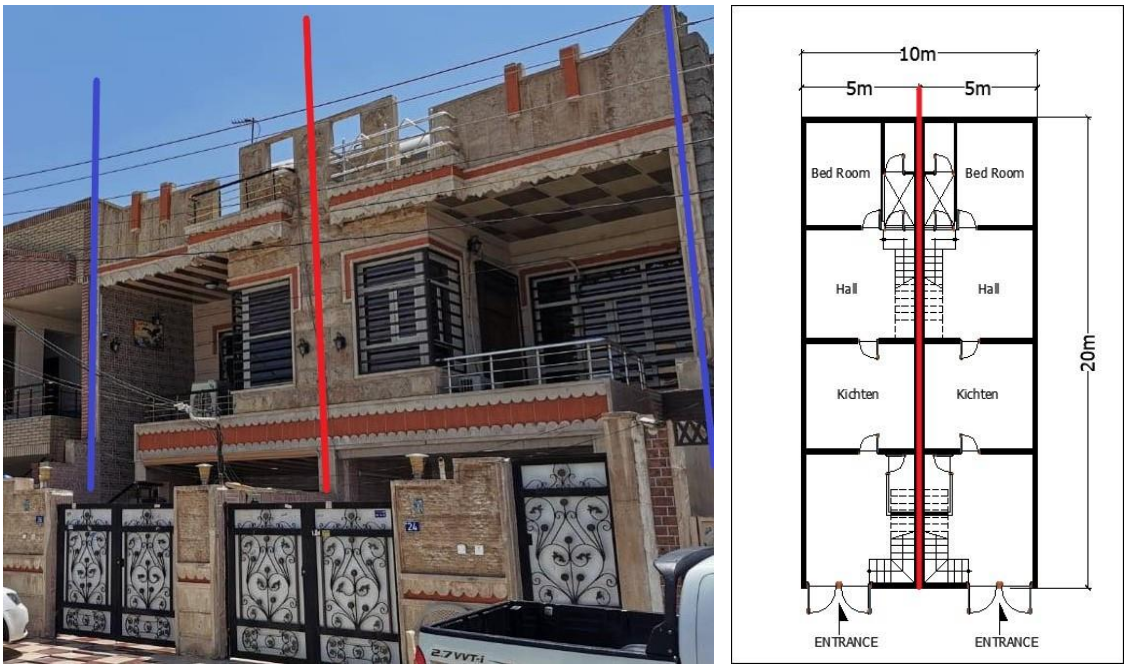


Figure 4.9: Two houses each 100m² that built on one plot 200m² (Author, 2019)

Also resulted in the development of houses which had a width of 5m and were of 100m² big buy built on a 300m² piece of land. That is, the entire 300m² of land was being occupied by 3 housing units each with a size of 100m² as shown in Figure 4.10.

Figure 4.10: Three houses each 100m² that built on one plot 300m² (Author, 2019)

On the other hand, house façades were also observed to have increasingly changed in terms of style and proportion as depicted by Figure 4.11. Houses in Erbil City could now be allowed to have two or more storeys as architects endeavored to continuously develop admirable architectural designs (Sabr, 2014).

Figure 4.11: Two and three floor house types example in one block (Author, 2019)

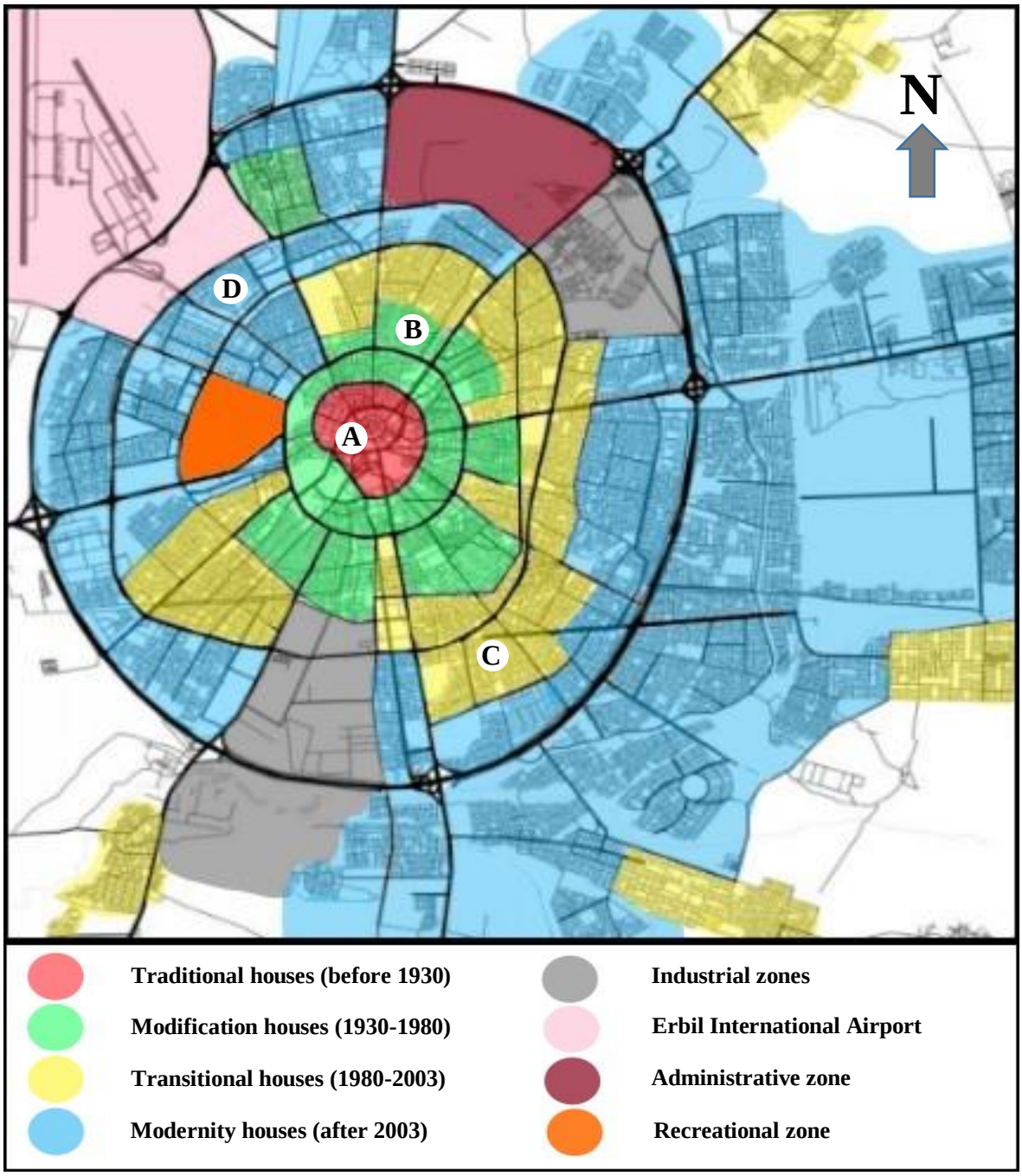


Figure 4.12: Areal locations of the places which went through housing transformations before 1930 until 2017 in Erbil City (Author, 2019)

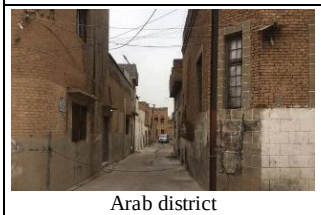
The area of each period of housing transformation in Erbil City is indicated on the map drawn in Figure 4.12. Housing samples were taken from each period and the comparison was made in Table 4.1. Material, elevation, construction system information is given in the comparison table.

Table 4.1: Comparative of houses in different periods in Erbil City (Author, 2019)

Periods		House examples	Explanation
Traditional period (before 1930)	**A**: Arab district	 	Case A has its location depicted in figure 4.13 and is a traditional house that was constructed before 1930. The construction of the houses was done using sustainable local materials such as bricks and cement while the roofing was done using matt and timber. The housing façade had flat roof within simple mass. The sizes of the windows were also small and matched the local architectural style. The garden was located inside the premises and the entrance was situated right at the front façade next to the road. There is no space between the road and the houses.
Modification period (1930-1980)	**B**: Shorsh district	 	This represented a major change from the traditional houses as the new houses could be built up to two-storeys. Majors changes were also observed in relation to roofing materials which involved the use of concrete slabs and traditional jack-arch. Building materials relatively changed but not much as most buildings were built using bricks. The façades began to have steel columns while the garden was located at the front of the house. The distance between the house and the roads also increased. The size of the windows changed from small to medium.

Transitional period (1980-2003)	**C**: Zanko-1 district	 	Minor changes were made in relation to the size of the windows which increased to large sizes and this also included the design of the façades which changed a lot. However, other features such as the roof, building materials, position of the entrance and the front garden remained relatively the same. But there was increased use of paint which enhanced the colour and attractiveness of the housing designs.
Modernity period (after-2003)	**D**: Naz district	 	Significant changes were introduced this period as house were designed using western architectural styles. Major changes were also made to the façades with the windows having huge screen glasses but the shape of the windows remained rectangular. Major changes were also introduced with respect to colouring which began to include a mixture of artificial colours which were mixed with natural colours. There was also increased use of reinforced concrete especially in the construction of the roofs. The streets began to have decorative attachments. Meanwhile, the entrance remained a focal point in front façade.

Table 4.2: Example houses in Erbil City according to each period (Author, 2019)

Traditional Period before 1930	**Modification Period 1930-1980**	**Transitional Period 1980-2003**	**Modernity Period after 2003**
 Arab district	 Shorsh district	 Raparin district	 Dream city district
 Arab district	 Runaki district	 Mufti district	 Bakhtiary district
 Arab district	 Shorsh district	 Chnar district	 Zanko-2 district
 Khanaqa district	 Shorsh district	 Mufti district	 Sarbasty district
 Khanaqa district	 Azadi district	 Rzgari district	 Kwestan district
 Citadel town	 Brayati district	 Sharawani district	 Rzgari district
 Citadel town	 Khabat district	 Badawa district	 Hawler-nwe district

CHAPTER 5
CONCLUSION AND SUGGESTIONS

5.1 Conclusion

The city of Erbil has been exhibiting significant features of urban developments for long years before reaching it is current status a good example of organic growth among the cities of the world. Political, economic and migration based reasons experienced throughout the years have been important factors that affected the city's urban and housing development.

Meanwhile, the Erbil Citadel is a unique testament to the origins of urban life and human civilization, therefore it plays an important role as the central place for Erbil City and its citizens. The Erbil Citadel has been a notable place in Erbil City since the beginning of its inception up to its present status. After the population migrated from the Citadel to the surrounding areas at lower part in the second half of nineteenth century, people started to gradually build houses and roads which took an asymmetrical circle shape which was parallel to the Citadel's shape. Houses and roads of this period were made using traditional building techniques. Narrow streets, houses with inner courtyards, small span windows and adobe material were the architectural features of this period.

After the first world war in 1920, the City of Erbil had gone under British dominance which resulted in the establishment of new urban development regulations. This imposed severe restrictions on both existing and future housing designs and structures. Modern house designs began to emerge during this era and this was uniquely different from traditional housing designs in terms of the use of pure brick vaults, innovative improvements in building strength, span and roofing style. During this period city started to grow in an organized and planned manner.

After 1958, Iraq has moved from monarchy to presidency. In these years, the Northern Iraq economy had started to develop much better because of the political and economic stability. Migration started from villages to the city, the population and urban projects increased in Erbil City which caused the city to rapidly grow. This period was also associated with a change in urban design regulatory changes. Such changes involved new rules and regulations being set in respect of roads and building structures.

The Iraq-Iran war started in 1980 and continued for 8 years. In these years, the economy had worsened and these problems continued until 2003. During these years both urban and housing development had become irregular and unplanned. Housing and urban areas which developed against set state rules were completely considered as unplanned structures. This was made worse by the fact the government of Northern Iraq was not capable of controlling the increased rate of urbanization.

After 2003, Erbil City began to experience rapid urban expansion in a number of successive and different sectors up until 2019. This is what we can call a Golden period of urbanization in different directions, (east, west, south and north). Erbil City expanded rapidly reflecting most modern urban design in relation to it being a cultural, tourism, official, commercial, educational and security hub. The city had also started to develop modern structures, multi-storey buildings and modern site settlements. These were the most important years that affected the morphologic change of the City of Erbil.

The City of Erbil experienced tremendous development and growth towards the east and south side. In comparison to the north and western side, this side developed more and grew horizontally. The most important reason behind this horizontal expansion is that the western side was being used as a military base. After the removal of the military zones, modern construction designs began to develop in this region. The constructed structures were developed modernly and vertically. This included a big airport which was constructed in the north-west side in 2004. This airport comprised of a big space and became a barrier for development and this situation affected the region's development.

Development in the east and south side have continued horizontally for many more years and as such, have caused that the development of structures that are distanced away from the city center. Meanwhile, one side of Erbil City showed significant patterns of horizontal development, while the other side has showed vertical development patterns. This uneven development between the regions has disrupted the organic growth of the city. Also, neighborhoods in the city of Erbil had different characteristics and architectural features. Renovation work had already been done in these neighborhoods in recent years. Older buildings were demolished and the new ones were made. The height of the building storey's of the surrounding buildings had not been taken into consideration when these practices were done. Therefore, storey imbalances and visual differences distinguished these buildings.

5.2 Suggestions

The city of Erbil has developed as a reflection of the city Citadel and continued to develop organically. The organic style of the city of Erbil shows its structural form and forms the characteristics of the city. It is therefore necessary to maintain and protect this form. The newly developed structural spaces are directed towards the east, south, north and west. There is a horizontal development in the east and south side which causes the city of Erbil to expand in a triangular form far away from the city center. But developments in the northern and western sides were slower than the developments in observed in the eastern and southern parts of the city. This was being triggered by the presence of military activities and bases in these areas. In 2000, the removal of military bases, resulted in the development of multi-storey buildings which were a reflection of a prosperous life that was being experienced in the northern and western parts of Erbil City.

Due to a series of high-paced irregular horizontal expansion of the city, care must be placed towards preventing this form of urban expansion. This is because the surrounding areas are green zones which are fertile and being used for agricultural purposes. Hence, allowing this series of high-paced irregular horizontal expansion of the city can impose limitations of agricultural, social and economic development. Hence, regular and planned vertical urban

planning methods are required so as to maintain the city's structural balance and organic growth pattern.

Having noted that housing developments in Erbil City were in four distinct periods with each period having its own characteristics, this stands to be a challenge to maintaining a structural balance in urban development. This is because there were no regulations in storey heights and the renovation of old houses was in contradiction to the desired structural urban characteristics. Renovations made to the sides of the old houses and differences in storey heights of the buildings resulted in uneven height and poor visual quality of the neighborhoods. These problems of uneven structuring and unregulated stories were mostly present in the end of 1980s and caused a disruption of the Erbil City's identity.

The renovations on structures should be planned according to the characteristics of the period and bringing necessary restrictions will prevent the creation of uneven stories and visual differences. This will enable the continuation of the periodic urban housing characteristics. The construction activities within the city must be planed according to the function and storey heights, and all environmental criteria must be taken into consideration before construction. With controlled and planned urban development, the urban structural characteristic will be preserved, and the developments will positively influence urban form.

The city of Erbil has experienced difficult years due to adverse negative political and economic reasons and did not manage to overcome them for a long period of time. But, in 2003, the city of Erbil had experienced rapid development. As a result, positive political and economic developments were observed in Erbil and this was being reflected in the construction sector. Also, the city moved from its old traditional fabric and to a modern city structure. Hence, planned developments in the upcoming years will enable the city to advance further. Thus, regionally developed master plans are needed so as to enable the city to reach future in the most correct and systematic way.

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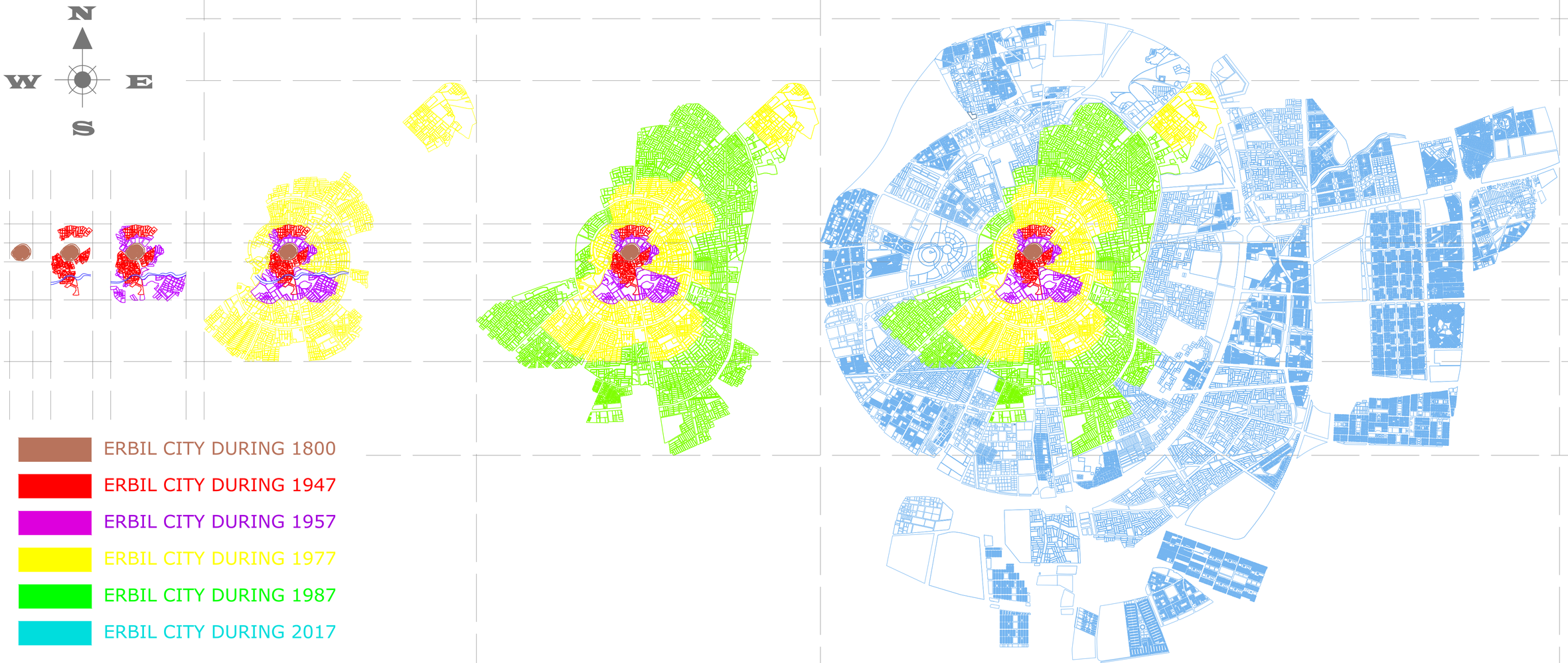
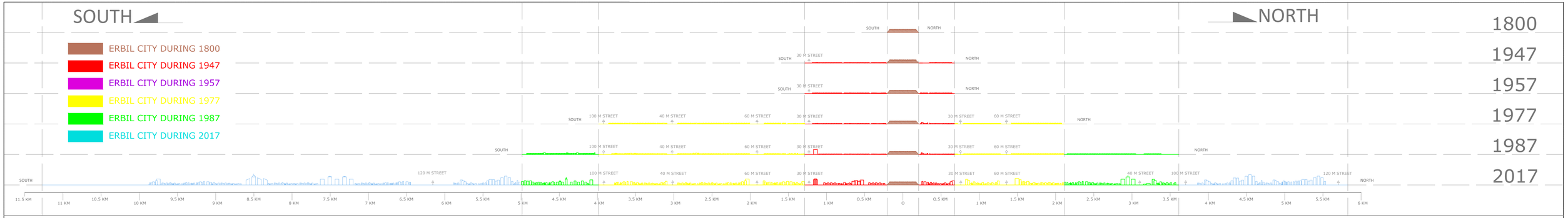
APPENDICES

Appendix 1: Urban morphology of Erbil City in different periods (Author, 2018)

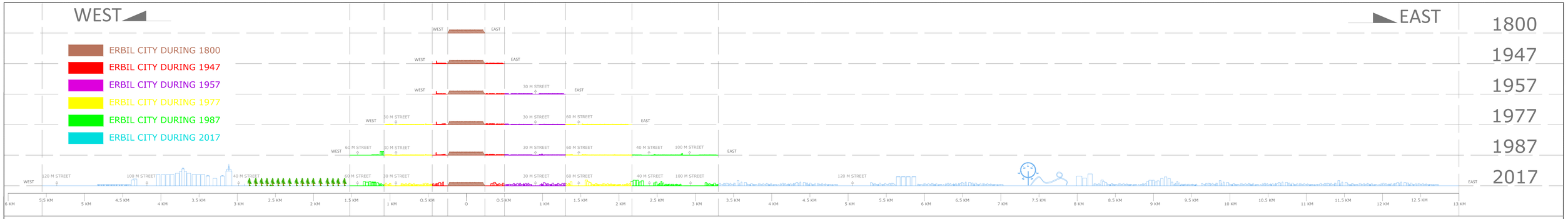


URBAN MORPHOLOGY OF ERBIL CITY IN DIFFERENT PERIODS

Appendix 2: Sections of urban morphology of Erbil City in different periods (Author, 2018)



SECTIONS FROM THE NORTH TO SOUTH OF ERBIL CITY IN DIFFERENT PERIODS



SECTIONS FROM THE EAST TO WEST OF ERBIL CITY IN DIFFERENT PERIODS

turnitin

Ödevler | Öğrenciler | Not Defteri | Kütüphaneler | Takvim | Tartışma | Tercihler

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Bu sayfa hakkında

Bu sizin ödev kutunuzdur. Bir yazılı ödevi görüntülemek için yazılı ödevin başlığını seçin. Bir Benzerlik Raporunu görüntülemek için yazılı ödevin benzerlik sütunundaki Benzerlik Raporu ikonunu seçin. Tıklanabilir durumda olmayan bir ikon Benzerlik Raporunun henüz oluşturulmadığını gösterir.

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GELEN KUTUSU | GÖRÜNTÜLENİYOR: YENİ ÖDEVLER ▼

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