

## Article

# Urbanization and Urban Sprawl Issues in City Structure: A Case of the Sulaymaniah Iraqi Kurdistan Region

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**Abstract:** This novel study explores the driving forces and dynamics of rapid urbanization, highlighting the main causes and effects of urban explosion, environmental disruption, and city pattern transformation. This study was carried out that how urbanization and urban sprawl have influenced the structure of the city of Sulaymaniah in Kurdistan region of Iraq. This is because over the years many urban areas have experienced dramatic growth and population explosion that has resulted in the exhaustion of social amenities in the concerned communities. For this purpose, a qualitative method is used based on in-depth face-to-face interviews with local authority, including planners, architects, and experts of master planning, as well as professors in the academic institutions. This study also utilizes extensive document analysis to present the evolution of urban growth. The findings reveal that the autonomy, political conflict, non-implementation of master plans, and economic prosperity are the driving forces which are accelerating this urbanization process. It is proposed that the practical policies and strategic urban development plans are urgent requirement to control the unplanned urban growth and stimulate the desired sustainable future urban development.

**Keywords:** driving forces; urbanization; population explosion; environmental disruption; structure of the city

## 1. Introduction

Urban sprawl is one of the distinctive phenomena in cities undergoing rapid urbanization processes [1–3]. Studies on the driving forces of urban sprawl provide profound insights in sustainable management of urban changes that alter the cities structure and pattern [1–3]. In response to the population explosion and economic growth, the cities in the developing countries across the world have grown very rapidly [2,4,5]. Thus, with rising overall population and urbanization, the pattern of land use and landscape have been altered and such has led to series urbanization-oriented environmental challenges [6]. Therefore, the urban sprawl consequences have become an increasingly essential concern as a result of continuous trend of world urbanization [7–9]. Land use and land cover is changing rapidly due to several driving forces [10]. Driving forces of urban land sprawl have been classified into direct and potential factors: the direct factors referred to settlement expansion, industry development, and infrastructure construction, whereas the potential factors involved the natural factors, policies, population, economy, and technology [2]. The rapid changes of land cover are often characterized by urban sprawl, farmland displacement, and deforestation, leading to the loss of arable land, habitat destruction, and the decline of natural greenery areas. Sprawl takes place at the urban fringes in the form of radial development or development along the highways with the

elongated urban development [11]. Thus, areas influenced by the dispersed growth or sprawl that suffer from lack in basic amenities such as treated water supply, electricity, and sanitation. In the opinion of [12], the rapid urbanization happens when economic growth and urban job creation are absent in the rural area. Therefore, many rural dwellers would choose to migrate towards the city. As a result of this, in 1991 many rural–urban migrants end up in slums or informal settlement in the boundary of Sulaymaniah city to obtain better job opportunities. Consequently, uncontrolled and inefficient urban dispersion occur in the rural or semi-rural areas that mainly found in peripheral areas.

Urbanization in Iraq, generally does not have clear strategy and the urban policy is absent, therefore, from 1991 different urban policy has been applied in the same time but unsuccessful. There are many alternatives of urban policy: the new town policy is the most important one, as well as growth pole policy [13]. Therefore, managing urbanization and controlling urban sprawl contingent on these policies to guide urban development process and improve slums, in order to prevent the urban area from exploding [14]. After the political events in 2004, Iraq followed a special development plan which adopted a five-year plan. In the case of Iraq, to date there have been very few studies in urbanization issues such as regional inequalities, concentration of economic activities, and population in specific cities, elimination of poverty in rural areas, and socioeconomic problems [13]. Meanwhile, rapid urban growth kept rising into a universal phenomenon: cities in Iraq and Sulaymaniah in particular have possibly experienced quick urban growth in the developing world [6]. Uncontrolled and unplanned urbanization and population growth has been a major factor driving the growth of the cities in Iraq generally and Sulaymaniah particularly. Urban sprawl has been one of the most characteristic phenomena in Sulaymaniah city: in the Kurdistan region of Iraq, Sulaymaniah city passed a tremendous urban pressure as a result of rapid population growth in 2000 caused by the enormous migration from other unsafe inner parts of Iraq and neighboring areas, many urban areas have experienced exhaustion of social amenities in the concerned communities. Urban chaos and uncontrolled growth have been irreversible phenomena in the structure of the city, likewise, significant damages appeared environmentally and ecologically [14].

Immigration from rural to urban areas in Iraq and Sulaymaniah is another main issue. Since Iraq is the plateau of serious political and economic changes because of possessing the most valuable natural resource which is oil, that is considered as a main sponsor of job opportunities and development funding [15]. Movement from rural to urban areas causes substantial changes that create many urban problems. The drastic rural conditions together with the attractive modern life style in the urban areas are the two powerful factors that drive the rural to urban immigration, for instance, the huge differences between the inner condition of the city and outer country side that surrounded the city, the lack of services, and severe way of life are significant factors to prompt people to immigrate from rural to urban areas, whereas, and service provision pull the rural community to live and settle in the city. Thus, the urban settlements' spatial growth is characterized by expansion, while rural settlements shrink rapidly and lean towards being scattered [16].

In the less and more developed countries, the researchers have mentioned that undertaking research in the field of urbanization presents certain challenges [16]. The most daunting task of grouping urban environments is due to a non-existence of international standard. In addition, most countries differentiate the urban and rural population, but the description of what constitutes an urban center differs among countries and in certain instances it even differs over time within a single country [1,17,18]. Before, the urbanism was supported by the urbanist development in communities with a greater number of local environmental organizations or a higher proportion of democratic voters and with more stringent land-use regulation. New urbanism supported by the socio-economic status of residents in more environment awareness within the communities of high household income, smaller number of family households with children, warmer, dense, newer, and faster increases in home prices [19].

Nonetheless, an urban settlement could be described in numerous ways such as population growth rate, population density, administrative or political boundaries, and economic function

of the city. Some countries define urban settlement as those people residing within an identified administrative boundary [20]. Whereas, increasing population in urban areas is not only the indicator for urbanization, but also the economic activities and spatial distribution of the population. As in the case of China, as the largest share of investment specify the urban investment accounts during the process of rapid urbanization, thus the reasonable output in planning is obtained by addressing the dynamics distribution [21]. The majority of Chinese cities are expanding by the way of edge-expansion, but cities in the western region and some cities in the eastern region grow through dispersion. In addition, the cities with high economic development level have opportunity to control urban sprawl [22]. However, the context of primary element such as the growth rate or population density could be used as preferred by some countries in grouping urban population [23]. In addition to this, some locations perceived to be grouped as urban in one country may be classified as rural in another [10,16].

In another dimension, transportation and communication technology innovations have also contributed to the spread of urban functions over wide geographic areas, resulting in settlement systems that are not easily captured by a simple urban–rural structure [24,25]. In addition, some areas with zones of huge intense economic activity have emerged in the intersection between cities and rural areas that are neither urban nor rural. In the traditional sense they contain essential elements of both. This has resulted to be the scene and setting of huge social, economic, and political transformation. The physical dimensions of urban development and sprawl, socioeconomic elements such as population, gross domestic product, and public facilities associated with urban land have effectively been considered when defining and measuring urban sprawl issues [26,27]. Therefore, the new urban cores in less dense areas are considered as the starting point for future urban development. The analysis of urban sprawl and its indicators provides a deep insight in addressing the main issues related to the land use and land cover features. In fact, through the indicators of urban sprawl, and to the consistent assessment of the situation, it is possible to understand the dynamics of landscape capacities of peri-urban areas around urban agglomerations and therefore to reform the planning instruments [28,29]. However, the process of accelerated growth in many cities of developing countries has a significant impact on the urban landscape of these cities. These problems seriously threaten human environment as well as socioeconomic sustainable development [30]. In view of this, the science-based effective control of urban growth has become an important component in the city planning that must be considered in urban planning and policy design.

To date, generally, a significant body of research is available on urban growth, which widely acknowledge the importance of the factors behind the urban development but few of these researches are about Iraq and especially on the city of Sulaymaniah. However, based on a review of the relevant literature, ample evidence has shown that the use of quantitative technique such as remote sensing, geographic information system, and landscape pattern analysis in researches on urbanization and urban sprawl have been conducted. Recently, GIS technique and associated analytical software have been used in landscape urban transformation in Latin America [31], evaluating the transformation of urban configuration in Eastern Europe [32], the effect of urban sprawl on rural settlement in Changchun-China [17] and spatial pattern analysis and driving forces between urban and rural settlement in the coastal region of Ningbo-China [16].

Nonetheless, there has been an observed inadequacy of empirical investigations implementing a qualitative technique to understand the urban sprawl patterns and the connections between changes in the city structure of developing countries [33]. Hence, some theories regarding urbanization, urban sprawl and city structure should apply a qualitative approach aimed at eliciting firsthand information from concerned stakeholders about their real-life experience regarding reasons, causes, and effects of urban sprawl in the developing countries in general and Sulaymaniah in particular. Accordingly, this study has adopted the qualitative method based on face-to-face interviews with experts in the master plan committee and academic institutions in order to gain the study objectives. In addition, the qualitative approach will also help to explore the current development modes of

Sulaymaniah city, and find out how political and economic structures of Sulaymaniah city affects urban sprawl. Hence, the main objective of this study is to explore about urbanization and urban sprawl issues and how it influences city structure in Sulaymaniah in Iraq Kurdistan Region.

This study investigates the urban sprawl driving forces, causes, the effects of rapid development, and city structure transformation to address the main powers which derived the city rapid urbanization, moreover to understand the effects of these changes on the city structure and its pattern in the case study area. Identifying the driving forces are useful concept for exploring urban sprawl. This requires an understanding of causes and effects on the structure of the city. This paper seeks to explore these driving forces through collecting the opinion and sights of planners, architects and experts in the master plan committee (local authorities) and academic institutions in the city of Sulaymaniah. Furthermore, the study reveals the connections between these driving forces and its effects on the city pattern, highlighting the most significant factors such as economic and political issues.

Keeping above in a view, in order to understand the focus of study area in relation to urban sprawl phenomena, driving forces, causes, effects of rapid development, and city structure transformation as a consequences of population explosion and economic prosperity in Sulaymaniah city in the north of Iraq, have been carried out by collecting data through the qualitative method of (face-to-face) interview which is clarified in detail in the following sections.

## 2. Materials and Methods

### 2.1. Study Area

This paper is a case study undertaken in Sulaymaniah which is one of the cities of Kurdistan region in the north of Iraq. Sulaymaniah city is known for its abundant cultural features and credible intellectual human resources. The economic flourishing after the series of political events in 1991 accelerated the urbanization process. Hence, the population of the city increased from 1.36 to 2.2 million in 1991 to 2018. This was paralleled by a rapid urbanization, transportation, and growth in industrial activities. Characteristically, urban landscape, ecological and environmental problems have been the main challenges because the urban growth increases gaseous, particulate emission from the industries, residential activities, waste management, and transportation, which regularly exceeds environmental quality standards. Whereas, this city is considered as an attractive area for tourism, with its huge resorts, breathtaking mountain nature, and ancient archaeological locations dating back to thousands of years. (Figure 1) shows the map of Iraq and Sulaymaniah.

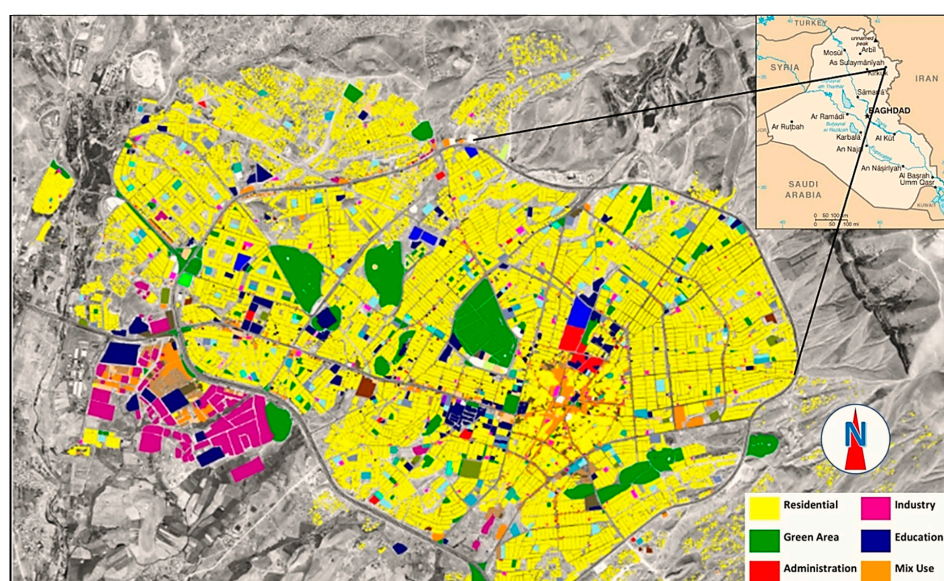


Figure 1. Map of Sulaymaniah city (left)—Iraq (right).



The urban growth dynamics of Sulaymaniah city comprise the big changes in the economic state as a result of political events that took place in Iraq generally and particularly Kurdistan region in 2004 when the region got autonomy from the central government. This administrative autonomy resulted in prosperity in the city activities. Furthermore, the war in the south and central Iraq led to substantial migration from those regions to Kurdistan region and this resulted to a huge increase in land value of Sulaymaniah city, its environment, and a boom in real-estate business. The aforementioned prosperity reflected in industrial, agricultural, and commercial sectors of this city. In addition, the prosperity of the city also led to high demand for farmland and establishment of new factories. This encouraged growth of the city, due to which most of the new areas sprawled along with the main corridor and city entrance which led to a significant change in the structure of the city.

Urban sprawl in the Sulaymaniah city is a consequence to the wide spread uncontrolled building development into the vicinity of the city, especially into the foothills of the surrounding mountains. New buildings are being vastly constructed in all directions across the ring road sides. It is happening due to rising population density, increase in demand for residential apartments, rising income of residents, and influx of new investment capital from foreign companies. Due to this mass influx, a big change in the residential complexes style has been observed. In addition, the area of the city has been increased substantially.

## 2.2. Research Methodology

In this section, the methodology of the study is discussed. The qualitative research approach was deployed to collect multiple sources of evidence [34,35]. The qualitative case study allows to explore the behavior of humans in their natural settings, such as social, cultural, and political atmosphere in which they exist [36]. This exploration could be carried out by using a variety of techniques, such as interviews, historical methods, case studies, and ethnography [37]. In qualitative study, a number of research strategies could be implemented consisting of face-to-face interviews analysis as used in this study. Nonetheless, considering the suggestion of [38], about 9 to 20 in-depth interview cases could be adequate to obtain the most insight from the informants. The authors discussed that collecting data through this approach does not necessarily dictate a certain desirable number of informants to obtain understanding. Nonetheless, researchers could use a higher recommended number of respondents, if more informants are available and willing to be involve in the study [39]. In view of this, the researchers in current study decided that 45 participants will be sufficient to create a viable data set. Thus, through snowball sampling 45 professionally and academically qualified persons were selected for interview to collect the data about the influence of urbanization and urban sprawl on city structure in Sulaymaniah city. The technical data sheet of the conducted survey is provided in Supplementary Data. The conceptual framework of the research methodology involving a sequential explanatory is explained in (Figure 2).

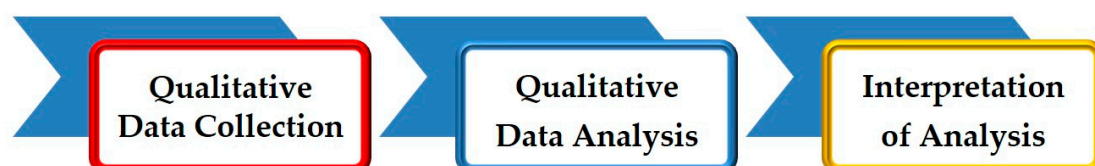


Figure 2. Framework of sequential explanatory design [37].

## 2.3. Qualitative Data Collection

In this study, systematically qualitative collected data were analyzed through extensive content analysis that was derived inductively in the study area. This data is presented through a narrative of the circumstances that has been explored from the interviewees. A semi-structured technique was used to prove that interview guide strategy fulfills the study requirement [38,39]. The authors were advised that the issues on the interview guide must not be picked in any particular format.

Therefore, comprehensive inquiry was conducted. To ensure the covered important themes of this research as in the (Figure 3).

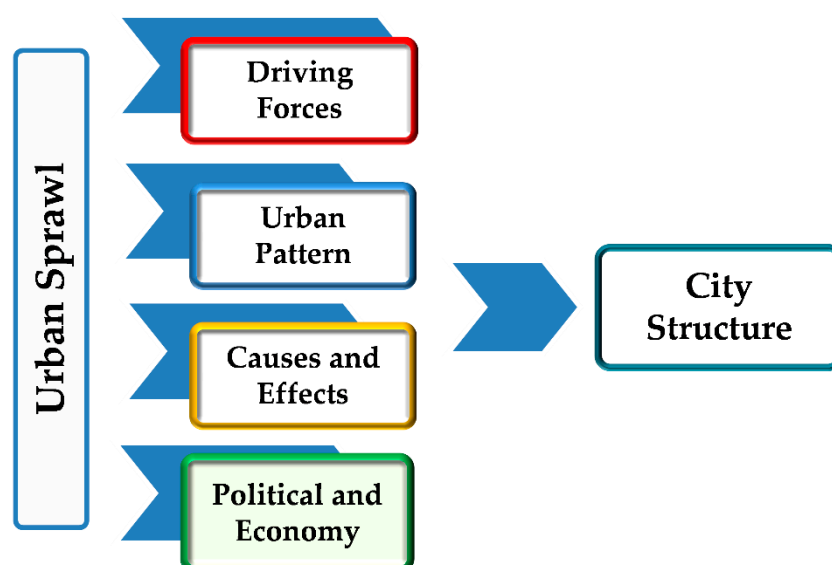


Figure 3. Conceptual framework of the study.

In other words, the interviewers could better perceive the interview guide questions as a checklist, which have been provided to the respondents earlier. Hence, we have presented the definitions of driving forces, causes and effects of urban sprawl, pattern, and economic and political impacts in the (Table 1). The checklist of relevant questions and objectives designed in an interview guide format is also added. The purpose is to understand how these concepts can be used in the interpretation of participants' respondents [40].

Table 1. Operational framework of the study questions and objectives.

Main Theme	Driving Forces of Urban Sprawl
Definition	The powers to which they share in terrain change varies; land pattern terrain, government plan, and residents [29].
Research Objective	To carry out a detailed analysis of the existing problems through finding out the main driving forces of urban sprawl that have resulted in a significant change in the city structure.
Research Question	What are the main problems and driving forces of urban sprawl that have resulted in a significant change in the city structure?
Hypothesis Testing	No hypothesis testing.
Methods	Data collection, data analysis with qualitative technique, interview, and content analysis [35,41].
Main Theme	Pattern of City Development
Definition	The way in which the urbanization components arrange, sprawl as a pattern or a process is to be distinguished from the causes that bring such a pattern about, or from the consequences of such patterns [42].
	To assess the current pattern of the city on the basis of analyzing the series historical development stages.
Research Question	What are the specifications of current and original pattern of the city?
Hypothesis Testing	No hypothesis testing.
Methods	Data collection, data analysis with qualitative technique, interview, and content analysis [35,41].

Table 1. Cont.

Main Theme	Causes and Effects of Urban Sprawl
Definition	Causes: The force that accelerate the growth in urban areas and the causes that are responsible for undesirable pattern or process of urban growth [43]. Effects: The consequences of urban growth may have both positive and negative impacts; however negative impacts are generally more highlighted because this growth is often uncontrolled or uncoordinated, therefore the negative impacts override the positive sides.
Research Objective	To identify causes and effects of urban sprawl in the city.
Research Questions	What are the causes of urban sprawl in the city? What are the effects of urban sprawl in the city?
Hypothesis Testing	No hypothesis testing.
Methods	Data collection, data analysis with qualitative technique, interview, and content analysis [35,41].
Main Theme	The influence of economic and political structure on urban sprawl
Definition	Economic impacts: Expansion of economic base (such as higher per capita income, increase in number of working persons) creates demand for new houses or more housing space for individuals [18,22,24,33]. Political impacts: Political events in which the competitors (government and/or private sector) hold a variety of expectations for the future development demands. Often these competitors can take decisions at their own to meet their future expectations and development demands [13,26,43].
Research Objective	To investigate the influences of economic and political structure of the city affect urban sprawl.
Research Questions	How does the economic has influenced on urban sprawl? How does the political has influenced on urban sprawl?
Hypothesis Testing	No hypothesis testing.
Methods	Data collection, data analysis with qualitative technique, interview, content analysis [35,41].

#### 2.4. The Interview and Interviewees' Background

This section presents the participants real life experience involved in the planning and design of the city of Sulaymaniah. In this study, thorough data were collected by face-to-face interviews with planners, experts, architects in the municipality, and the master plan committee of Sulaymaniah city. Further, the professors and experts in the academic institutions have played a great role as respondents in the interviews. Appointments have been arranged by making calls and visiting the officials' offices. The participants were ensured their profiles would be kept confidential. Therefore, their names are not declared as individual. The interviews were conducted in the Kurdish language because the respondents' language was Kurdish. Then, the recorded audio data was translated to English. Notes and main points have been highlighted during the interviews. The data has been classified and arranged according to the research questions and objectives. Then, the data passed by coding process in order to categorized the variables in the study. In addition, the coded data has been analyzed and interpreted to obtain the study objectives.

In view of this, more dynamism in the interview sessions could be implemented. Nonetheless, the dynamism is essentially important since the informants are volunteers. Therefore, there is no need to bore them with a standardized question–answer interview session. Hence, the construction of the interview schedule is aimed to keep track of the questions asked and the issues raised during the interview. Generally, the participants cooperated with the researchers in a good-mannered way. Furthermore, the aim of the interview was to get the authentic and sincere answer based on their real-life experiences. Each of the questions was followed by another question with a higher standard of complexity.

In this study, 45 volunteers have participated in the interview session. A brief profile of participants is provided in (Figure 4) to keep track of each participant. The least-educated participant was a graduate degree holder (BSc), while the highest was doctoral degree holder (PhD). This indicates that all the participants have the requisite educational knowledge in the field of this study. The researchers believed that the participants have provided realistic and honest answers to questions asked. Furthermore, they frequently shared their experience because they all occupy relevant positions of authority in that area which was under investigation. The interview sessions commenced in March and April, 2018. The interview process was carried out at a time and place that was adjudged convenient to the participants. The maximum interview period was between 1–1.5 h.

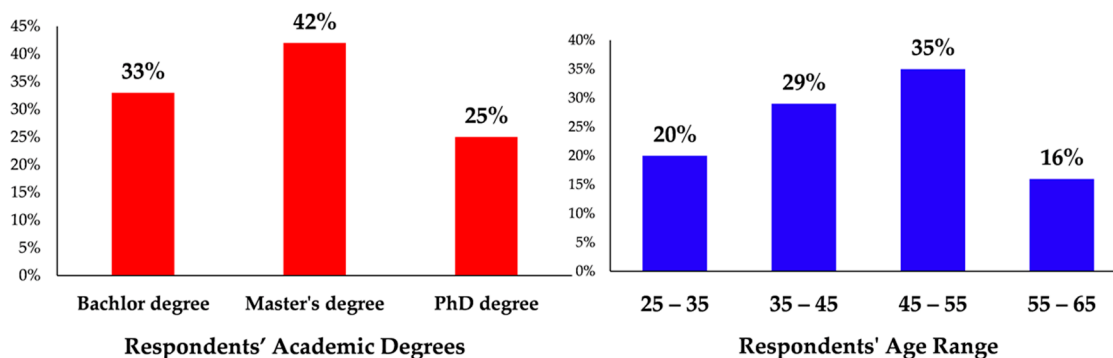


Figure 4. Respondents' profile.

### 2.5. Qualitative Data Analysis

The evidence found in content analysis is carefully examined to recognize the categories of data that describe the incidents [44]. However, on the basis of inductive interpretation, the main categories of classification were inferred from theoretical models. Thus, the objective of content analysis is a grouping strategy to obtain insights concerning the frequency and patterns of factors that influence the scenario under study. Hence, the interviews were guided by a checklist of questions. It also combines some areas of semi-structured interviews with probing questions. The interviewer began each interview by introducing and explaining the objective of the interview to the participants. The essence is to describe to the participants that how this gathered data from the survey will be used and to get permission from them for digital audio recorder. In this study, the interview technique was chosen to obtain a response to research questions 1–4. The aim was to ensure an understanding of how urbanization and urban sprawl issues influence city structure in Sulaymaniah. Nonetheless, as much as the data was collected via digital audio recorder, it was possible to examine them in their transcribed form.

The strategy involves a four-step processes of grouping large chunks of data into rational categories. The information in the form of transcribed interviews was coded. The coding process abides by the guidelines suggested by Campbell et al. [45]. This technique separates to group data which is based on responses to similar questions [37,38]. It is because the open-ended questions posed to the interview participants were mostly the same for all respondents. The responses were similar enough in most instances to draw comparisons based on the generated answers. On top of this, through the process of frequently comparing the data and categories during and after the data collection process, important themes emerged from the data. The emerged themes are discussed in Section 3 of this study. Other sections of this study are topically arranged. The topics build upon each other to establish a better understanding of urbanization and urban sprawl issues on city structure in Sulaymaniah from the perspective of senior academics and senior municipal council officials in the field of architecture and urban and regional planning. At the end of all sections, the findings are presented and discussed which shows the detailed themes about the interviews. The content and thematic analysis strategy was adopted to analyze the data derived from the semi-structured interviews. Based on the document analysis, 5 inter-dependent sub-categories within the context of urbanization, urban sprawl, and city structure were uncovered and interrogated. These were driving forces for urban sprawl, pattern of city development, causes of urban sprawl, the effects of urban sprawl, and the political and economic influence of urban sprawl on city structure. However, from these themes, other sub-themes emerged as grounded in the transcribed data as can be seen in the charts and figures presented in Section 3.



### 3. Results

#### 3.1. Interview Analysis

This section contains a series of different themes intended to give the reader insight into the experience of academic professors and senior municipal council officials who were interviewed regarding to the driving forces, causes, effects, and the influence of economic and political structure on urban sprawl. Each section presents a summary-level description of the designers and planners' endeavor, including the under-mentioned themes which emerged from the objectives and research questions of the study. (1) Background and key characteristics of the participants. (2) Driving forces for urban sprawl. (3) Pattern of city development. (4) Causes of urban sprawl. (5) Effects of urban sprawl. (6) Political/Economic influence of sprawl on city structure. The following sections have been divided by subheadings. They should provide a concise and precise description of the experimental results, their interpretation as well as the experimental conclusions that can be drawn.

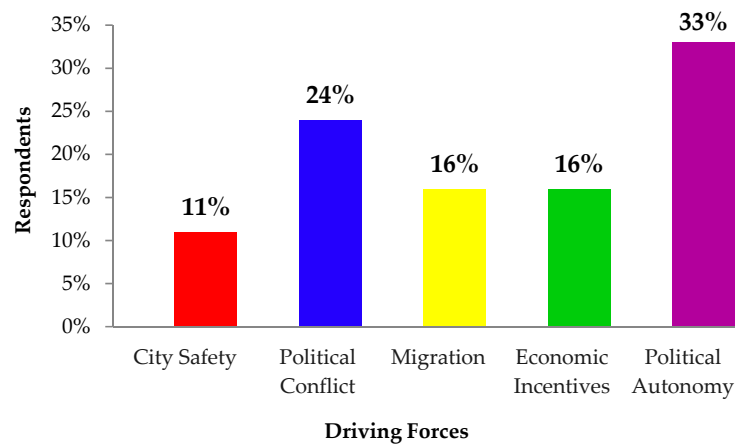
#### 3.2. Driving Forces for Urban Sprawl

This section aims to find out the driving forces for urban sprawl that has resulted to significant change in the structure of Sulaymaniah city. Based on a comprehensive review of the literature, the driving forces have been classified into two main types, socioeconomic and physical. The physical driving forces are determined by environment biophysical characteristics, for instance natural disturbances, climate, topography, soil type, and spatial configuration [16,30]. The socioeconomic driving forces can be determined by land resource utilization to replenish the human requirements. This type can be categorized into four types: economic, political, technological, and cultural. These driving forces are clearly interrelated to each other, such as economic and political. However, previous studies have identified the driving forces in various ways depending on different case studies, such as the decentralization process after economic reform, demographic changes and population growth, foreign direct investments, rise in urban resident incomes, lack of urban management tools, poor law enforcement, increase in demand of housing units, rapid economic development, and transition in land use regulation [1,46]. In order to address the first study objective, the research question posed: "What are the main problems and driving forces of urban sprawl that have resulted in a significant change in the city structure?". In view of this, Figure 5 shows that total 45 participants were surveyed for this study. Among them 33% were of the view that political autonomy is the top of the reasons behind the urban explosion, while 24%, 16%, 16%, and 11% were of the view that political conflict, migration, investment, and city safety separately are responsible for urban sprawl and that has significantly resulted to the alteration of the city structure.

As per one of the respondents: "The main reasons behind Sulaymaniah sprawl can be the big change in the economic state as a result of political events that took place in Iraq generally and particularly Kurdistan region in 2004 when the region got autonomy from the central government. This administrative autonomy resulted in prosperity in the city activities" (Male, aged 54, 18 April).

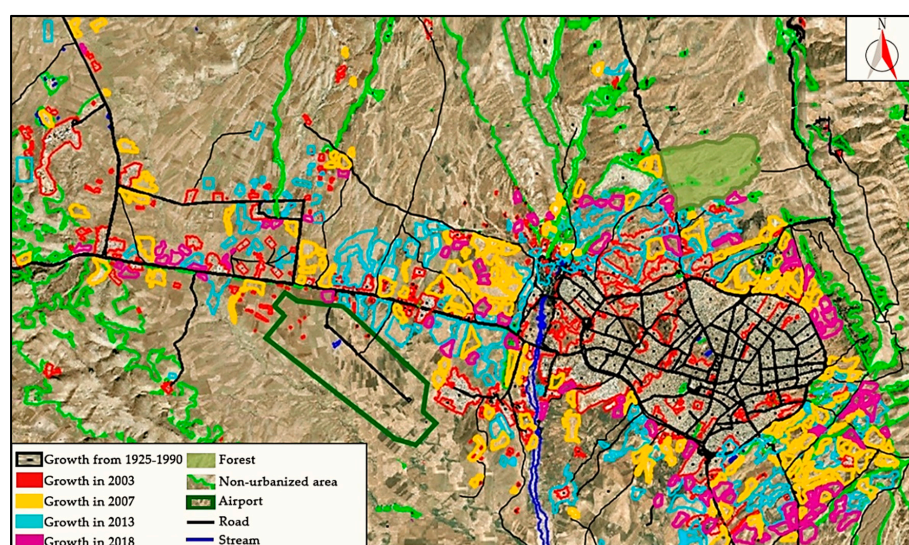
The majority of the respondents were of the view that the political conflict in the decisions is the main acceleration power of Sulaymaniah sprawl, especially, in the case of lack proper planning policies and poor law enforcement. After the alteration of the political system in 1991, Kurdistan region in the north part of Iraq separated from the central government of Iraq. The region has structured its own autonomous government. Therefore, the administrators follow a new strategic policy in building relationship with other countries. Oil investment is among the most powerful market that shape this international interrelationship. Migration is another force that prompt the sprawl of Sulaymaniah, in the view of some respondents. This is due to the war that lead some parts of Iraq to be not safe enough to live in. Therefore, Sulaymaniah has become the destination for many immigrants who were looking for a secure city to settle in, not only from the other parts of Iraq but from the neighboring countries too. In addition, the population growth resulted in increasing the demand of dwellings

and rising the land value of Sulaymaniah city and its surroundings. The aforementioned prosperity reflected in many sectors of the city in areas of industry, agriculture, and economic incentives.



**Figure 5.** Driving forces for urban sprawl.

There were progressively fewer fragmented urban area in early stage of urbanization between 1925–1990, as shown in Figure 6, where the city area in different stages have presented by different colors. The urban area of the city has increased substantially during 1990–2018 when the series political events befell. Urban sprawl mainly occurred along both sides of the main entrance roads in west part of the city of Sulaymaniah after 2003. Furthermore, the results from this section show that un-regulated and un-planned development have been diffused in different access outside the city, especially in the urban periphery. The lack of well-defined land policy, law enforcement, and inadequate planning control tools are considered as the main factors which impelled the sprawl in Sulaymaniah city. Therefore, Sulaymaniah has suffered from unbalanced and inadequate development. Nonetheless, that sprawl often occurs when urban planning is not well managed [47], turns open spaces into built spaces, as a long-term consequence, leads to negative effects on the environment, in particular soil sealing, and pollution. In summary, urban sprawl takes place at the urban fringes in the form of radial development or development along the highways with the elongated urban development as in Sulaymaniah city [48].



**Figure 6.** Map of Sulaymaniah city showing the growth areas.

### 3.3. Pattern of Development of Sulaymaniah

In this study, understanding the urban growth pattern is important to plan forward the future urbanization. In addition, defining the spatial development structure is helpful to develop the guidelines to increase the capabilities of monitoring urban expansion [49]. The original pattern of Sulaymaniah city was a compact organic arrangement in 1925 which occupied the current city center [40]. In general, currently the dominant pattern in the city of Sulaymaniah is grid-iron pattern. The original pattern was organic pattern in 1925, which is transformed to irregular and strict grid-iron pattern in the new development area. The previous urbanization pattern of the city (organic pattern) has failed to adopt the new urbanization. The confrontation of the villages in the surrounding area of the city with the new development creates a pattern that cannot be classified either in urban or in village patterns.

The main intent of this section is to explore about the current pattern of progress and historical development of the city of Sulaymaniah. However, in order to address this objective, the research question posed is “what is the current pattern and analysis of progress that has resulted in the development of the city?”

In view of this, (Figure 7) shows that total 45 participants were surveyed for this study. Among them 35% were of the view that disordered pattern is dominant on structure in the city development. While 23%, 20%, 17%, and 05% were of the view that organic pattern, geometric pattern, sub-urban pattern, and village pattern separately are the main pattern in the city. Nonetheless, there are other themes mentioned in this study that are important to the pattern of city development, those presented in this section. As asserted by one of the participants: “The new road networks and massive infrastructure built have also grown to comprise of new sectors and a city totally different from the original one. This could be perceived as among the reasons for the distinct transformation in current city pattern. Furthermore, the current city pattern could be described as confusing because it is comprised of a mix between original city pattern which is organic in nature and chaos and rigid new pattern” (Male, aged 43, 21 April).

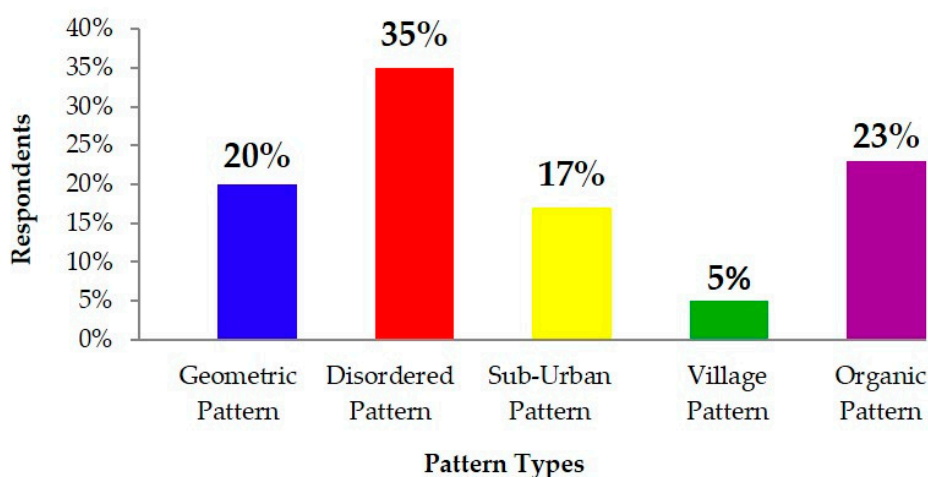


Figure 7. Pattern of development of the city.

Therefore, from this study’s findings, it is interpreted that two dominant types of pattern could be distinguished in the entire city of Sulaymaniah; the disordered pattern and geometric or grid iron pattern. Both are located in the new neighborhoods and boundary areas of the city which referred to the sprawl area. While the organic pattern is dominant in the structure of the city center, which referred to densely urbanized city, it is the original pattern (organic pattern) of Sulaymaniah city which is commonly found in the historical and traditional area of the city. Although outside the city, the sub-urban and village patterns are suffering due to the pattern transformation in the boundary area of the city. Both the sub-urban pattern and village pattern cannot be classified as geometric or organic

patterns: this is due to the various features, which sometimes carry both characteristics. This has led to emerging settlement systems that are not easily captured by a simple urban–rural dichotomy. The location of the informal settlements in the edge area of the city causes a combination between new urbanization and unplanned existing area. It can be concluded that the master plan of Sulaymaniah city has failed to accommodate the rapid and unexpected growth of Sulaymaniah. Thus, due to intense economic activities, some areas have emerged in the intersection between the cities and the rural areas that are neither urban nor rural but contain both characteristics.

### 3.4. Causes of Urban Sprawl

In this part, the main intent is to identify causes of urban sprawl in the city. However, the causes of urban sprawl are quite similar with urban sprawl driving forces. Both the driving forces and causes of urban sprawl are highly interrelated. Though, it is important to differentiate that driving forces prompt the growth with or without the occurrence of sprawl, but the cause for urban sprawl must induce unexpected and non-controlled growth [24,42,43]. In order to address this objective, the research question posed “What are the causes of urban sprawl in the city?”. In view of this, (Figure 8) shows that total 45 participants were surveyed for this study. Among them 22 % were of the view that non-implementation of master plan. While 17 %, 11%, 25%, and 25% were of the view that expulsion from villages, un-affordability of residential apartments, political decision of leaders, and population explosion (separately) are the most significant cause for urban sprawl in Sulaymaniah city. Although there are other themes that emerged from this study indicating the causes of urban sprawl, those factors also very important. One of the respondents has mentioned that: “There are too many reasons behind the urban chaos or sprawl of Sulaymaniah city. Among them could be: missing clear guideline that can drive the city growth to the right path, unexpected and sudden growth of the city, high rate of immigration from the middle and south of Iraq to the north including the city region, rural urban migration” (Male, aged 48, 20 April).

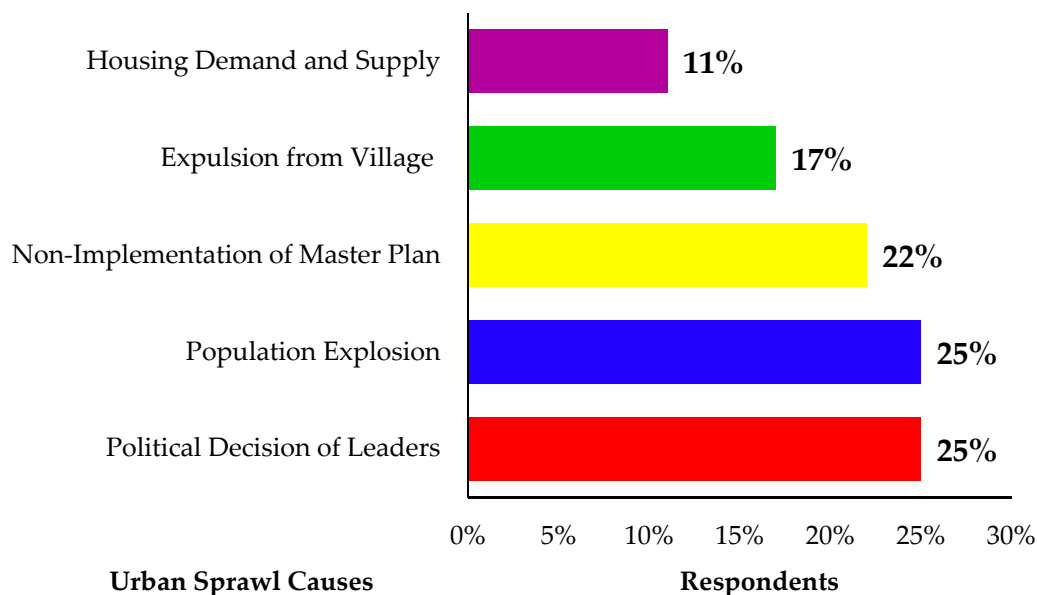


Figure 8. Causes of urban sprawl.

Inadequate residential mechanisms and increased demands for more housing units have been identified as important concerns in the result of this study. Nonetheless, as a result of substantial alterations in the demography and huge increase in population statistics of the city. It is because of internal and external migrants who were looking for job opportunities, wellbeing, better services, and security circumstance that can be founded in Sulaymaniah, indicating that Sulaymaniah city has become an attractive city for migration. The population dynamics have reflected an important change



in city structure and its pattern, predominantly in the housing sector. The rapid development due to the urban explosion, internal and external migration, modern life style, and rapid economic growth of the city of Sulaymaniyah are essential factors that result in the significant change in the city structure and model of residential areas. These factors contribute to the challenges that government are facing particularly in area of housing sector.

The interpretation from the above findings is that, migration from other regions has come in knowledge to be among the causes of urban sprawl in the city. This is due to expulsion of residents from the villages and their consequent destruction of villages from 1982–1992. Other causes are the rising income of the people, safety issues, demand of more dwellings, and politicians' decision. The intervention by politicians in the planning issues are creating independence of decision: often these decisions may not follow the master plan. Many projects which were not proposed earlier in the master plan have been implemented in the city due to the politicians' decisions. Therefore, uncoordinated and unplanned developments have occurred in the city. Our interpretation is comparable to the case of rapid urbanization happens when economic growth and urban job creation are absent in some areas as there was in Africa and Latin America during the eighties [18]. However, we understand that with rising growth, more jobs opportunities, or higher wages in cities it seems puzzling that so many rural dwellers choose to become urban inhabitants, in a way that is comparable with urban sprawl, that can be caused by a variety of different factors including lower land rates, improved infrastructure, high living standard, lack of urban planning, lower house tax rates, rise in population growth, and consumer preferences [19].

### 3.5. Urban Sprawl Effects

Urban sprawl as an intricate phenomenon has socioeconomic and environmental effects, both negative and positive [50]. Hence it has undesirable influences on public health [51], quality of life [52], rising urban pollution [53], car dependency [54], environmental degradation [8,55,56], and can disturb public amenities and social segregation [57,58]. On the other hand, urban sprawl may have advantages on the sense of economic expansion [59], more living space [44], decreasing crime rates [55], and community extension between inhabitants [60].

This section tries to identify effects of urban sprawl in Sulaymaniah city. To achieve this aim, the question was designed "What are the effects or consequences of urban sprawl in the city?". In view of this, Figure 9 shows that a total 45 participants were surveyed for this study. Among them 18% were of the view that increased property values. While 27%, 35%, 13%, and 7% were of the view that distortion of city master plan, unequal distribution of public amenities, urban explosion, and missing cultural identity separately are involved in the effects of urban sprawl in the city. However, other insignificant factors were mentioned as among the above factors that affect the city structure in Sulaymaniah.

One of the participants posited that: "The city of Sulaymaniah suffers from urban chaos, it is only referred to as a city but actually it has not been designed as such. Although it is the center of Kurdish culture and has historical value but there is a billion of deficiencies in the structure of the city" (Male, aged 39, 2 March).

Distortion of the master plan can be a sign of unsuccessful implementation of the master plan, since the enforcement and planning policy are often corrupt and intermittent in the Sulaymaniah city. Moreover, the interpretation from the above findings is that, inadequate distribution of infrastructure and services, unplanned pattern and structure, rise in real estate value, irregular city growth, unequal municipal services, inefficient public transportation system, non-implementation of the master plan, deformation of the city, and missing identity of the city have been recorded as other effects of urban sprawl in Sulaymaniah city. In addition, traffic conjunction and resources consumption which destroy open spaces and cause loss of farm lands are considered major effects of urban sprawl.



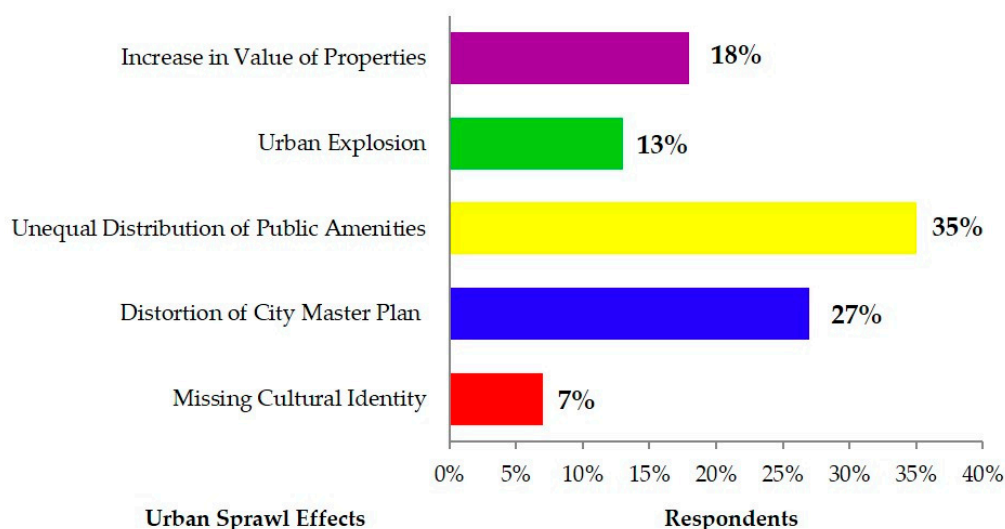


Figure 9. Effects of urban sprawl.

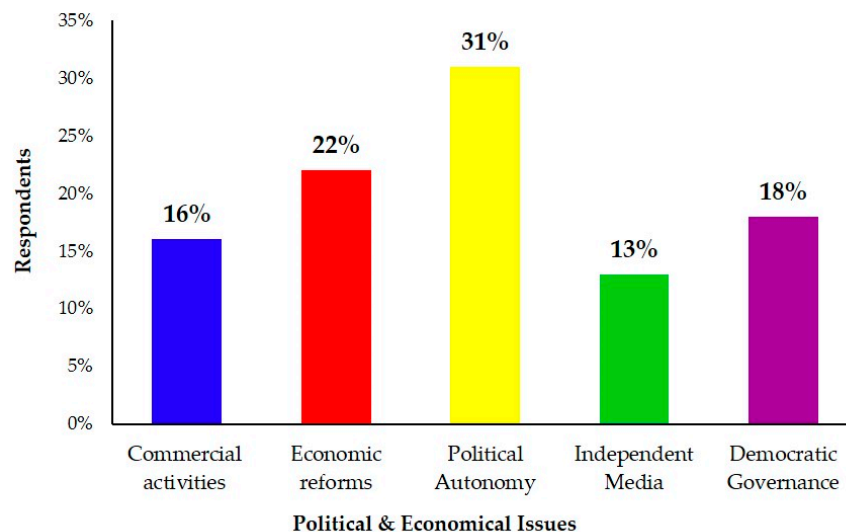
Our interpretation is that in the city of Sulaymaniah, the low-level economic growth in the suburban area accelerates the urbanization process. The same as in case of Altieri et al. [61], they say that on top of the rapid urbanization in the country, there exists low-level economic growth in many of the cities. Frick et al. and Duncan et al. [20,23] were of the same view that such conditions led cities to emerge as unplanned centers dominated by informal settlements haphazardly located close to urban growth centers. Another understanding from the findings is that the implication of the cities has a complex mix of urban land use types such as residential, industrial, commercial, and public areas often displaying disorganized spatial patterns. In the same dimension, He et al. [22] mentions that even though urban centers cover a very small portion of global land surface; the sporadic expansion has substantially changed the natural landscape and created huge environmental and social impacts. Hence, the unavoidable results from this occurrence are the spatial expansion of cities outside their juridical boundaries so as to cater for the growing urban residents.

### 3.6. Economic and Political Influence on City Structure

Expansion of economic base and new industries in countryside dynamic the urban sprawl, rising income per capita, increasing demand of new houses and rapid construction accelerating the urbanization process [43]. Since the region pass by series of political events after 2000. This political reform dramatically spurred rapid urbanization in Sulaymaniah city. The profound changes in political economy of oil investment resulted in a considerable economic incentive [62]. Consequently, many projects and factories have been established in the urban edge where costs are lower.

This section aims to understand how economic and political structure of the city affects urban sprawl. To achieve this aim, the two questions were designed: “How does the economy have influenced on urban sprawl?” and “How does the political sphere have influenced on urban sprawl?”. In this view, as shown in Figure 10, among 45 participants surveyed, political autonomy was mentioned frequently by 31% of the participants as among the outcome of factors that impacted on urban sprawl of Sulaymaniah city. Furthermore, this was a result of the ability of the political leaders of the region to make friendly policies that encourage safety and peaceful co-existence among local and migrant people. Another important factor that was also mentioned was economic reform, 22% of which resulted in a massive attraction of both local and foreign investment. In addition to the earlier mentioned variables, other factors that were found to contribute to change in the city structure are commercial activities 16%, independent media 13%, democratic governance 18%, and other less significant variables. Hence, as per one of the respondents: “The series of political activities that took

place in the region has greatly impacted on the economic status of the city. This impact has positive influence on economic development of the city in general among which is through the establishment of private sector businesses in different industry" (female, aged 51, 12 March).



**Figure 10.** Political and economic influence on city structure.

Interpretation from this study are that the political autonomy granted to the region has led to increase the income and purchasing power of the people. This is because of prosperity in commercial activities and establishment of industries in the city. Therefore, the real-estate market encountered increased prosperity in addition to the fact that several new investments and project have been implemented. Kurdistan has become that part of Iraq with the greatest dynamics in its development, because of its share in the oil revenues and the relative security in the region. Foreign investors are being attracted and the economic boom is obvious. The concentration of investments and new projects in the city attract huge number of migrants looking for jobs. This is not to exaggerate the fact that Kurdistan region generally and Sulaymaniah city in particular have witnessed such unpredicted growth and development that has never been experienced in the past. Nonetheless, the sudden and unexpected growth of the city has invariably resulted to an uncontrolled growth otherwise referred to as urban sprawl. Other factors that influenced urban sprawl are poor low enforcement, lack of policy implementation, rural urban migration, political instability, political conflict, inequality of distribution of resources, and war.

#### 4. Discussion

In addressing the first research question of this study, the results reveal that the main driving forces [1,2] of urban sprawl are the political autonomy: the alteration of political circumstance in 2003 changed the structure of Sulaymaniah city in northern region of Iraq. This has resulted in significant alteration of the city structure which agree with the previous study [33], whereas the city structure and pattern have been investigated in detail in this research. Aside from political autonomy, other important factors that emerged from the study are political conflict, migration, investment, and city safety [62]. In addition, the war in the south and middle of Iraq led to substantial migration from those areas to Kurdistan Region and this resulted to a huge increase in land value of Sulaymaniah city and its surrounding. Due to the rise in land values which is indirectly related to one of the interviewing variables, the immigrants are not able to afford the houses within inner region of the city which forces them to settle down in suburban areas [9,47,63]. As compared to center of the city, the suburban areas have limited public amenities, which is again indirectly related to the intervening variables [9,47,64]. The provision of services and infrastructures have failed to match with the new urbanization requirements. Thus, poor quality of urban life and housing, inadequate

services, and transportation problems have been the main characteristics of new urbanized area, particularly for the periphery areas. On the same lines, the stability of Sulaymaniah city in terms of security affects indirectly the urban sprawl because of the sudden increase in the population. The aforementioned prosperity reflected in many sectors of the city such as industrial, agricultural, and commercial activities. This revival accelerates the city growth but most of the new urbanization that sprawled along with the main corridor and city entrance has resulted in a significant change in the structure of the city.

Moreover, for the second research question of this study, the pattern analysis of the entire city has been considered as an important tool to interpret its structural transformation [1,5,22,27,47]. Therefore, monitoring the city pattern and its aspects is critical instrument from an urban planning perception. In this respect, the city pattern investigations can stimulate further analysis on sprawl phenomena and its driving forces. The results show that Sulaymaniah city involves organic pattern in its center, since the current city center was represented as a whole city in the early stages in 1925. The organic pattern is surrounded by disorder pattern in the area around the city center. In the late 1960s, this type of disorder pattern has occurred and is represented as a connecting area between organic and geometric patterns. The geometric pattern resembles the new urbanization of the city. Due to expansion of the city boundary, areas which was previously village or the area near the boundary of the city have constituted in current structure of sprawled area in the city. Therefore, it is concluded that organic pattern, geometric pattern, disorder or irregular pattern, sub-urban pattern, and village pattern are modes of the city development in Sulaymaniah.

In regards to the third research question the researchers opine that non-implementation of master plan, expulsion from villages, un-affordability of housing, political decision of leaders, population explosion, and other indirect factors such as political autonomy, migration of population, political conflicts between leaders, investment for new projects, city safety constitute the causes of urban sprawl [43] in Sulaymaniah city. Due to the political revolutions which have taken place after 1991 and 2003, the northern part of the country was separated from the southern part bringing more opportunities to expand social welfare, investment for structural development, public amenities etc. [13,55,62]. As per the issues related to the public safety, the majority of the population from the southern part has migrated to the northern part causing the population explosion [15]. Another factor which is indirectly related to the causes of urban sprawl is the existence of independent decision making among the politicians, wherein the new projects have been commissioned for their self-benefits without any prior description in the city master plan.

In addition, the effects of urban sprawl are rising values of the properties, urban explosion, unequal distribution of public amenities, distortion of city masterplan, and missing cultural identity [17,49]. The rapid urbanization, and non-controlled urban sprawl cause disruption in cultural and environmental components and other indirect factors also affect the city structure in Sulaymaniah [55]. As far as the pattern of the city structure is concerned, it indirectly affects the urban sprawl because the original pattern of the city has transformed from the organic to the geometric or disorder pattern. Besides, the suburban pattern, village pattern near the vicinity of urban areas which have been included in the sprawled area. Consequently, some arrangements have also been observed which cannot be classified by aforementioned patterns however also constitutes the total sprawl area. Correspondingly, energy inefficiency, disparity in wealth, loss of farm land, poor quality of urban life, and inflated infrastructure are considered as other significant consequences of urban sprawl.

The fourth and last research question yielded that administrative autonomy granted the Kurdistan region, economic reforms, commercial activities, independent media, and democratic government. The interrelationship with neighboring countries is important factors that resulted to urban sprawl and eventually changed the structure of the city [20]. The factors which indirectly related to the political and economic interviewing variables are rise in the real-state business, urban explosion, lack of public amenities, and non-implementation of master plans [62]. For the overall development and modernization of the city, the real-estate business has been substantially raised with non-implementable

master plans forcing the immigrants to move towards suburban areas. In contrast to center of the city, the suburban areas have limited public amenities, which is again indirectly related to the interviewing variables leading to population explosion.

Finally, all the experimental work and results have been summarized in (Figure 11) where, other themes with indirect relation to the main issues that emerged from this study have been shown clearly.

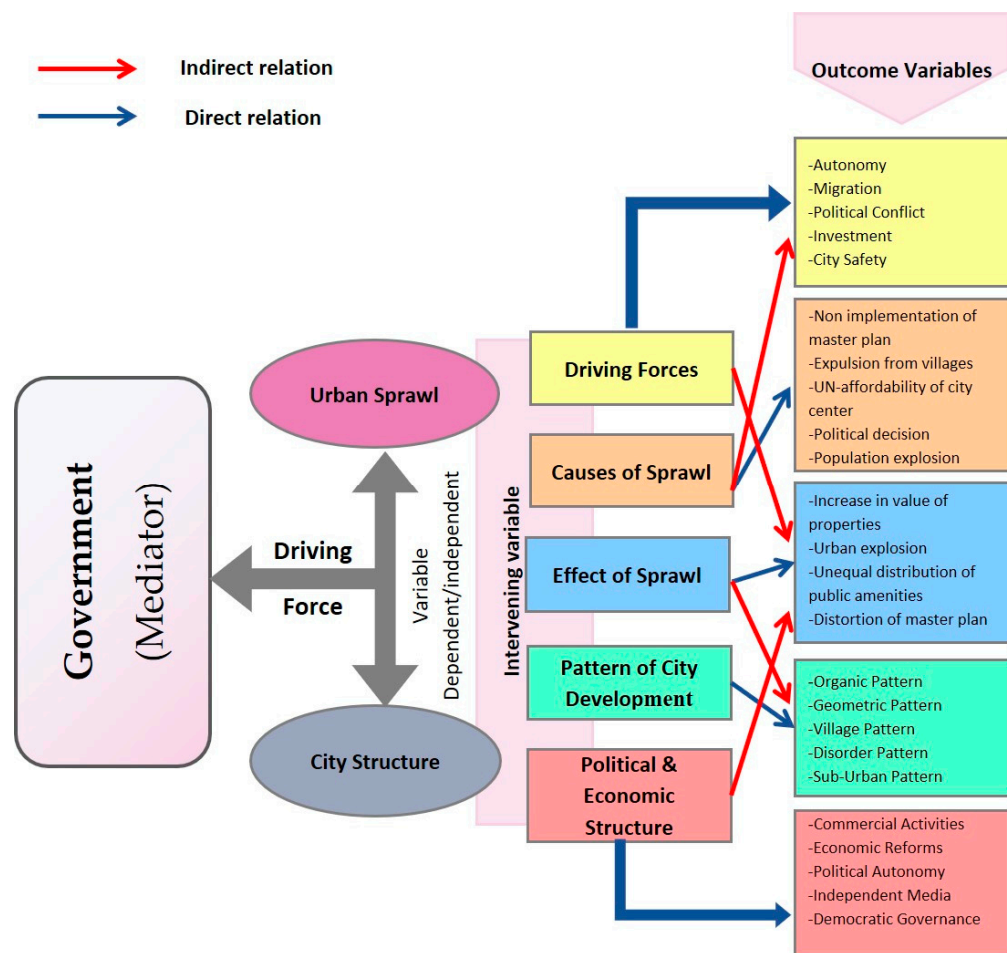


Figure 11. Finalized framework of the study findings.

## 5. Conclusions

Our study shows that, Sulaymaniah city experienced considerable changes between 2003–2013, the dramatic growth in the new urbanization outside the city of Sulaymaniah has been observed. Generally, urbanization is an irrepressible process, therefore the obvious effects of rapid urbanization are undesirable pattern or process of urban growth. Hence, seeking among the actual driving forces for urban sprawl is crucial for understanding the dynamic growth process. Highlighting the causes and consequences behind the urban sprawl provide deeper insights in proposing new guidelines to enable sustainable urban planning for the future. The results of this study indicate that the causes of the rapid and uncontrolled urbanization from 2000 are multiplied and mutually connected to each other. This is due to the considerable alteration in the political system in Kurdistan region in the northern part of Iraq. Thus, urban area increased thrice during 2003–2006, resulting in a significant alteration in the city structure. Overall, urban growth has continued to be fueled by its own dynamics. As can be known from the study that urban growth proceeded in different direction out of the city boundary, especially along the main roads and suburbs area, the urbanized areas are characterized by mixed and complicated sprawl modes, and there was no specific single pattern. Therefore, this fast expansion of

unplanned settlements and neighborhoods raises several urban problems such as low quality of urban life, insufficient services, transportation issues, poor housing, and land consumption.

To achieve the objectives of the study, the qualitative method adopted to assure in depth and in detail examined to the issues. Since the data obtained from qualitative method is more compelling than quantitative data as it is based on human experience which is deliver more powerful understandings. Although, the interviews were not restricted to specific questions but due to substantial open-ended reply and comments that conveyed by the interviewer.

The aim of this study is to enrich the knowledge regarding the urbanization and urban sprawl and how it influences the city structure through launching new guidelines and recommendations. This is in the sense that the factors influencing urbanization, urban sprawl, and city structure have been exposed to a considerable extent. This knowledge would be useful to policy makers both in the public and private sectors to be fully armed at the decision taking time. The study results could be a reference point for city development experts in structuring urban growth policies, especially in the new construction projects around the main city as many individuals and developers find these areas more appropriate for investments.

To sum up, Sulaymaniah city has been growing at a sporadic dimension. The authors suggest that the city requires urgent practical policies and strategic urban development plans that could control the unplanned urban growth. New tools are needed to monitor urban sprawl, measuring the landscape characteristics and their distribution, and the extent of urban sprawl. The role of the local government in urban settlements is important in planning to stimulate the desired sustainable future urban development than being a facilitator for providing public services. Conferring to the study outcomes, the urban growth management in the city of Sulaymaniah was suffering from the lack of policy implementations due to the institutional weakness. A systematic response to the urban growth was missing, and very little consideration has been given to the master plan. Based on the above conclusions, this study can be used as recommendations for Sulaymaniah local authority which help them to produce sustainable managements of urbanization process, by considering all aspects of the development that involve social, environmental, economic, political, and governance consideration. Therefore, equal consideration should be given to the related aspects in order to improve the urbanization quality. Thus, more strategic tools need to be developed in order to control the urban growth dynamics and minimize the undesirable impacts of the rapid developments. There is a crucial necessity to establish effective institutions supported by strict regulations and laws regarding the urban growth management, in order to ensure fully considered re-distribution of urban population, provide adequate and affordable housing, provide better quality of urban life, and enhance sustainable development linkages between urban and rural area. In addition, revising the master plan and consulting experts, academic professional groups, developers, and community groups in order to update the policies and strategies to meet the community new requirements. Hence, policy tools should be clear without ambiguity, planning controls need a good governance which is imperative for managing urban sprawl issues. Therefore, the result of this research is a practical significance for driving the foreseeable urbanization trajectory in overall but specially for Sulaymaniah city.

**Supplementary Materials:** The following are available online at <http://www.mdpi.com/2071-1050/11/2/485/s1>.

**Author Contributions:** The conceptualizing, S.A.J.; collecting data and research methodology, S.A.J. and R.A.; validation and formal analysis, S.A.J. and Z.B.; investigation, S.A.J.; resources, S.A.J.; data curation, S.A.J. and Z.B.; writing—original draft preparation, S.A.J. and Y.L.; writing—review, S.A.J. and W.Y.; visualization, S.A.J.; supervision, Z.B.; project administration, Z.B.

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