

Original Research

## URBAN CONTEXT ANALYSIS ACCORDING TO THE CONCEPT OF SPENCER'S BIOLOGICAL THEORY USING GIS: BALAD CITY CASE STUDY

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**Abstract:** Concepts of evolution theory (by Herbert Spencer) were analyzed using a Geographic Information System according to living notions in the context of an urban city. The idea of the theory was applied to the society within the context of Balad city to find out whether the concepts of contrast, integration, specialization, and exclusivity on which the theory is based have an impact on the services in the city and an effect on the structure of the social elements and the stages of its development. The research problem centered on the shortcomings of the theory in predicting and explaining the morphological and functional structure of the city, while the main objective is to analyze the concepts of biological theory according to the requirements of the context of the study area. The analysis results of the living context notions present in the city were compared with the urban housing standards using GIS to determine the extent to which the context conforms to the concept of Spencer's theory. The research found the inability of the biological side of the theory to explain the population concentration in residential neighborhoods, as well as the lack of reliance on the concepts of contrast and integration in predicting the reasons for the growth and expansion of the city, and that the city neighborhoods showed a variance in their services without showing integration and exclusivity in these services, that is, the lack of integration organic between the biological parts of the city.

**Keywords:** Balad city; biological theory; city context; Herbert Spencer's theory; spatial analysis

### 1. Introduction

A theory is an intellectual construct according to an integrated system that is based on the relationship between facts, evidence, and hypotheses and pushes to describe or deal with a phenomenon or several phenomena [1]. The theory is based on one of the most important connotations, which is a social fact, social reality, individual and collective behavior, the nature of the regime, politics, and other connotations that branch out from these concepts. It attempts to pinpoint or gather a vision, position, or behavior that can take its impact or respond to it in the context or interact with it to develop and pass through all stages of development and construction and take its impact in the spatial environment. Or this concept may die because it does not meet the notions of context [2].

Based on this concept of the theory and the extent of its impact in the context, we will address the evolutionary theory of the philosopher and sociologist (Herbert Spencer),

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who is considered one of the determinants and theorists in modern sociology [3].

Herbert Spencer's biological theory, often applied to social evolution, offers an interesting perspective when placed in the context of an urban environment. Spencer likened society to an organism, noting that societies, like biological entities, evolve through the process of natural selection and adaptation to their environment. In the urban context, Spencer's theory suggests that cities, like living organisms, undergo continuous development and specialization to meet the needs of their residents. The growth and diversification of urban functions, institutions, and structures can be viewed as adaptive responses to the challenges and opportunities presented by the dynamic urban environment [4].

This perspective supports the idea that cities should develop organically, as individuals pursue diverse interests and contribute to collective progress. The complex web of social relations within cities reflects Spencer's awareness of cooperation and interdependence among individuals [5].

Applying his biological metaphor to urban contexts prompts reflection on the organic nature of urban development, the balance between individual agency and collective development, and the dynamic interaction between cities and their inhabitants as they adapt to changing conditions [6]. Whether as a theoretical framework or a starting point for discussion, Spencer's biological theory offers a lens through which the development of urban life can be measured according to living concepts aligned with the city context [7].

The research problem in this paper lies in a deficiency in the most important characteristics of biological theory (on which the master plan

for the city of Balad was based) in terms of the ability to predict, interpret, and logically relate to the growth and development of society in terms of morphological composition and function. The research hypothesis is that specialization and exclusivity constitute a source of weakness and disintegration of society, leading to its disintegration, contrary to Spencer's theory of evolution, which is based on the idea of variance and integration. The objectives that the research seeks to achieve are to analyze and interpret the most important concepts of biological theory according to the requirements of the urban context adopted by the master plan of the city of Balad in city planning to measure the strength of the concept and the extent to which it is compatible with the urban context.

## **2. Principles of Evolution in Spencer's Theory**

The “evolutionary principle” is the real basis of the "Spencer" doctrine, which depends on the laws of evolution in general. In his book *First Principles*, which is considered the first of three volumes, in its first edition published in 1862, he formulated three basic laws of evolutionary reality, which are the summary of his idea of the comprehensiveness of evolution: [8]

1. The law of continuity of forces indicates the existence and continuity of some kind of a final cause that separates knowledge.
2. The law of the indestructibility of matter and the inability to destroy it.
3. The law of continuous motion of things means that energy is transformed from one form to another, but it continues in this process.

He believes that these laws and what he added to them later could be represented in the law of “evolution”, which for him was the supreme law

of every being. Spencer explains his views, citing social life as similar to biological life. Social development is based on two ideas:

- Variation: It means the transition from homogeneous to heterogeneous, and it was decided in this regard that in life there is a tendency to exclusivity and specialization [9].
- Integration: This phenomenon goes hand in hand with the phenomenon of variance in the sense that exclusivity or specialization does not lead to independence and self-sufficiency. But it leads to solidarity, cohesion, and interdependence of parts and functions on each other [9], [10].

Spencer launched his theory of the evolution and development of society, which is the biological analogy in writing "Social Statics". He built his biological theory after applying it to human society, understanding it, realizing its subjective and objective problems, and knowing the reasons for its transformation from one phase to another [11]. He explained that progress, whether in the field of organic organisms or society, is a development from conditions in which similar parts perform similar functions to conditions in which dissimilar members or parts perform dissimilar functions. That is, from the unified form to the multiple forms or from homogeneity to heterogeneity [12].

Spencer's biological theory attempts to link society to a living animal organism, just as a living organism consists of organs and members, so society consists of social devices called systems or institutions, and social entities called organizations. The institutions and systems of society differ from one another in their goal, such as the economic, religious, and educational institutions. Organizations are of

different types such as families, clubs, farms, factories...etc. Despite the different institutions and organizations, they are similar in their entities, activities, laws, permanence, and degree of integration with the other [13].

Comparing society to a biological organism does not stop at the parts from which organisms reproduce, but rather goes beyond that to functions, integration, and change. The parts of society or its institutions have essential functions that help the perpetuation and progress of society [14]. The institutions of society are complementary to one another; the economic institutions are complementary to the political institutions and the latter is complementary to the educational institutions. This integration in the structural institutions is similar to the organic integration between the biological parts of a living organism. Institutional integration between the structures of society can be demonstrated through the principles of development and change. When the economic or political institution changes, this change must be reflected in the rest of the structural institutions, and thus social change occurs [15].

Spencer crystallized the principle of similarity between society and living organisms as follows: Society is organized in the same way or exactly like the individual so that we can realize what is beyond the similarity between them, as the same definition of life applies to both [16]. Society passes through the stages of growth, maturity, and hierarchy, and this follows the same principles that determine the transformations experienced by both the inorganic and organic systems [17]. Spencer has noticed many similarities between social organisms and biological or organic organisms, and this similarity is one of his important principles, he called it "biological analogy" [18].

This study considers that the ideas of variation and integration are the two most important concepts in Spencer's theory of social development [19]. The variation in society is unique to a specific organization to dominate a specific function and specialize in it in society. The study supports the idea of integration in which the functions of society depend on each other, and a specific organization is not exclusive and dominant except with the help of other organizations [20]. The transition of society from one phase to another does not happen except when a problem occurs in society, and understanding and recognizing the problem leads to knowing the phase that society will transform into. The progress and development of society depend mainly on specialized functions that help in the growth and development of society, especially when there is integration between these functions. Likewise, the principle of "organic similarity", which explains the similarity between the organism and the society, explains the activity and growth of the society. The development of society in terms of size and composition takes place during a certain period of its life. Either it becomes a complex and developed society in structure and construction, or it becomes old and exposed to annihilation just as the cells of a living organism are exposed to death [21].

### **3. Population Biological Theory and its Relationship to the Urban Fabric**

Herbert Spencer believes that societies are classified into four types depending on the statistical determinant of the population, namely, the simple society, which does not exceed a thousand inhabitants, the compound society, which has a population of no more than ten thousand people, and the compound society with a binary structure ranging from 50 thousand to a million [22]. A compound society

with a tripartite structure whose population ranges from one million or more up to 50 million people. Therefore, population growth is what determines the nature of society and determines the state of transition and its transformation from one type to another characterized by sophistication and development [23]. Societies can also be divided according to the degree of their geographical stability [24]. There are simple mobile societies such as Bedouin and pastoral societies, and there are simple stable societies such as agricultural societies, and so on [25].

The simple society turns into a compound society by increasing the population and adopting the methods of division of labor. The complex society is divided into two types:

- The first type is a compound society with a binary structure, which is a society that is subject to the government and has a specific religion, and that regulates the relationship and behavior of social individuals [25]. The influence of customs and traditions in this society is strong and may turn into complex legal laws. These societies are advanced in various fields and contain all the activities that have resulted in the growth of large cities and the development and establishment of roads that connect them and set the boundaries that separate cities and their regions [26].
- The second type of compound society is a compound society with a tripartite structure, which are the complex and sophisticated societies in which ancient civilizations arose, and these societies have a single central government that is subject to it [27]. These societies are characterized by high living patterns, the development of their

complex production methods, and their progress in various scientific fields [28].

Herbert Spencer applied his biological theory to the analysis of the urban context, offering a unique perspective on the evolution of communities subject to a process of natural selection and adaptation within the context of the city through the services provided to its residents. [16]. When examining the urban environment through Spencer's lens, the city can be viewed as a complex organism subject to forces of evolution to meet the demands of the living environment. [29]. In the urban context, this translates into the development of specialized jobs and institutions to meet the diverse needs of a growing population. This means that cities must naturally evolve their services to accommodate the diverse talents and aspirations of their residents. However, he also acknowledged the role of cooperation and interdependence between individuals, evident in the complex web of social relations within urban communities. [30].

Furthermore, Spencer's theory emphasizes the idea that urban development is a continuous process of adaptation to changing conditions. Cities, like living organisms, must constantly adapt and respond to internal and external pressures. This adaptation may lead to the emergence of new social structures, technologies, and cultural practices within the urban fabric [31].

Urban housing standards play a pivotal role in shaping functionality and quality of life within a city. Several key land uses and services are essential to ensuring a well-designed and sustainable urban environment. Residential areas should adhere to standards that promote safe, affordable, and inclusive housing options. Urban planning must give priority to developing

green spaces, encouraging recreational activities, and enhancing public well-being. Also ensuring easy access to goods and services and maintaining a balance between residential and commercial areas, which enhances a sustainable urban economy. Transport infrastructure is a crucial aspect, as well-connected public transport systems reduce congestion and improve accessibility [32].

Education and health care services are essential for a thriving urban society. Establishing standards for the proximity and quality of schools and healthcare facilities ensures that residents have access to basic services. Furthermore, cultural and recreational facilities contribute to the social fabric of the city, enhancing the overall quality of life of residents. In short, a well-planned city that adheres to these standards promotes a sustainable, inclusive, and vibrant urban environment [33].

#### **4. Literature Review**

Among the most important studies that dealt with the biological theory of Herbert Spencer and its relationship to society and the urban environment, can be summarized as follows:

- A study by Heather Winlow, 2020, focused on the social theory aspect within the urban environment. In it, the theory discussed how the individual develops in a society with various measures and focused on the aspect of social solidarity, which he considered a reciprocal relationship between members of society. The concentric area of Borgers was taken as a study area for analyzing the concepts of the theory. The city was likened to a living organism that must grow, so the theory explained the merging of concentric areas into the city and the city grew. Each part of society is symbiotically linked with other parts in the form of a cooperative

network. Humans will shift into different groups and find new places of residence and new occupations in society. Social factors such as discrimination and social exclusion were ignored, and it turned out that the theory supports the capitalist economic system [34].

- Jonathan H., 2017 discusses the development of social and cultural phenomena based on the principle of behavioral conflicts in society. Focus on Spencer's concept of natural selection within society, that is, there are supernatural organisms in society that can take root and grow in it. Societies evolve and become more complex with the development of different types of social structures and the acquisition of new cultures. He emphasized that Spencer was stressing about testing his concepts in society under some circumstances. He also stressed that the absence of variables in social structures and cultural coding generates pressure on members of society, leading to its disruption. Testing the concepts of theory in society leads to the discovery of new variables that can solve a real problem [35].
- The study of Beetz, 2010, examined Sencer's philosophical system in the evolution of human societies and considered the concepts of his theory to provide a list of scientific topics that differ from those in the analysis of urban structure. He stressed that dealing with the concepts of Spencer's theory enables us to address the issue of the possibility of applying the theory in the representation of reality and the development of society's functions. This helps in discussing social theories and understanding more if the concepts of

Spencer's theory are analyzed accurately in a realistic environment [36].

- A study by Andrew M. McKinnon, 2010, believed that Herbert Spencer understood the processes of social evolution through a biological metaphor, so he considered energy as the basis for an active and prosperous society. The theory is based on physical principles that apply to inorganic evolution, ie society. He concluded that Spencer ignored in his principles the social use of non-human forms of energy, so he considered it a gap that must be corrected because it would affect the context of the theory. He believes that the theory would be stronger in its interpretation of the development of society if it paid attention to the basic concepts of the theory of social development, namely integration, and variation. He considered Spencer to be the most important theorist for exploring energy and its roles in society and its development and recommended reconsidering the active sociology of energy [37].
- A study by Sandra J., 2005, discusses the transition from the basic instrument to the ordinal instrument in society according to the concept of Sensor. Spencer considered maximizing people's happiness by considering everyone as one and equality between them. Spencer supports increasing the number of ideal people in society to grow and develop. He considered that the hierarchy in society's economy depends on variance and integrity [38].
- Paul Elliot, 2003, studied Spencer's social theory in terms of religion. The stimulation of Spencer's evolutionary tendency was explained by his association with the Derby Philosophical Complex. Discuss his impact

on society through this collection which presented him as a model of biological evolution and evolutionary geology. He concludes that Spencer was a greedy stenographer and tries to derive the word "ought" from "is" in one go. [39]

Most previous studies of Spencer's theory focused on studying the implications of the theory from the biological and evolutionary aspects of human society and how it transformed from one species to another. Previous studies have not focused on whether or not the concepts of the evolutionary idea can survive in the context of the city, or whether the concepts of the theory are consistent with current standards for the development of cities and their communities. Therefore, the main research goal is to analyze the concepts of the theory according to living notions that exist in the context of the city and are needed by society. The impact of the concepts of notion on human activities in the city will also be studied and the urban housing standards adopted as a basis for comparing the results of analyzing the concepts of the notion and knowing whether the concepts of the theory will live within the context of the city or die and turn with time into dead concepts. The GIS program will be used to achieve the objectives of the research, by using the analysis tools in the program to measure the strengths and weaknesses of theoretical theory connotations within the city context and to compare the results of the analysis with urban housing standards. Thus, a research gap that has not been addressed by previous studies will be highlighted.

## **5. Methodology**

About the study methodology, the research will follow the analytical method using the analysis tools in the GIS program. Where the spatial

analysis tool and the network analysis tool will be used to analyze the concepts of biological theory. The land uses of the city of Balad will be analyzed according to the concepts of biological theory and the strengths and weaknesses of the concept in the city will be measured. As well as revealing the reasons for the strengths and weaknesses of concepts in the city and the reason for its development or death. It will also analyze the reason for the concentration of population and services in areas without others, and the transformation of land uses from one use to another that is not in line with the context of the city, by comparing the concepts of theory with the standards of modern urban housing. Thus, the focus will be on the research gap that was not addressed by previous studies, and the achievement of the research objectives. At first, the characteristics of the study area will be studied, and then GIS will be used to analyze the concepts of the theory in line with the characteristics of the study area.

Through the literature presented in the research, the following indicators were extracted to be applied to the study area to achieve the research objectives:

- a- Measuring the statistical factor of the population.
- b- Measuring the concept of function, variance, and integration.
- c- Measuring the concept of specialization and uniqueness of services in the city
- d- Measuring the strength of biological theory concepts in the context of the city.
- e- Measuring the concept of the strength of interconnection and interaction between parts in the context of the city.

### 5.1. Study Area

Balad is located in Iraq, Salah Aldin Governorate, northwest of Mosul on the western shore of the Tigris River at the latitude of 34.0149- 34.0545 and longitude of 44.1458- 44.352 as in Fig. 1. It has many natural characteristics, as it is surrounded by valleys,

and has fertile agricultural lands because of its soil, which is irrigated by the flood of the Tigris River [40]. In addition to the special geological formation of this region, it is characterized by spacious plains and wide valleys, in addition to climatic factors. These factors consolidated the pillars of stability and led to the attraction and stability of the population [41].

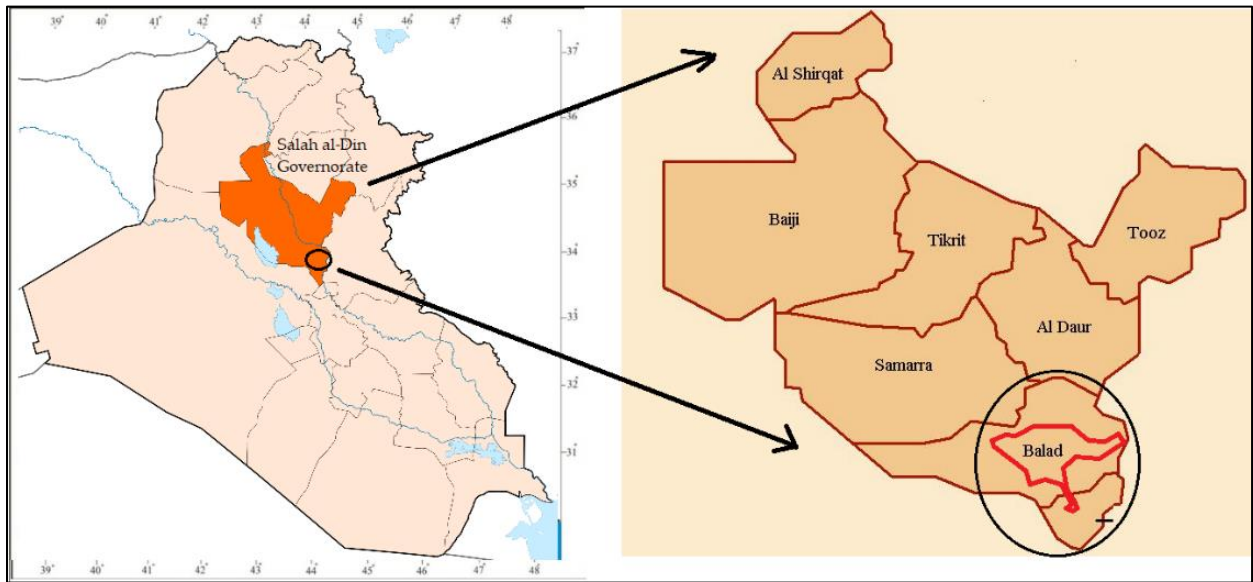


Figure 1. Location of Balad City Within Salah Al-Din Governorate [40, 45].

The last master plan was proposed for the city of Balad in 1989, by the Ministry of Municipalities and Public Works. In their design idea, the designers relied on the concepts of biological theory, as the city was likened to a living organism that needs certain organs to carry out its functions. Consider the organs of the city represented by the land uses that have special functions that serve the city. The land uses were proposed according to the concepts of variation and integration, that is, the creation of uses that differ in their functions and are integrated to serve the residents of the region. The idea was to create a city in which living concepts are in line with the context of the city and the nature of its inhabitants [42].

Residential units have been proposed, and their function is to contain all the residents and to provide all the services they need, depending on the land uses surrounding them. When dividing the land uses in the master plan, they gave each use the characteristic of exclusivity and specialization, that is, for example, that the health use specialized in treating certain cases and is exclusive to serving a certain category of patients, as well as the rest of the uses [43]. When dividing the city's neighborhoods, each neighborhood was provided with the uses it needed to help sustain and develop this neighborhood and become attractive to the population. That is, all uses were put in line with the context of the residential neighborhood and its residents [44]. Therefore, in this study,



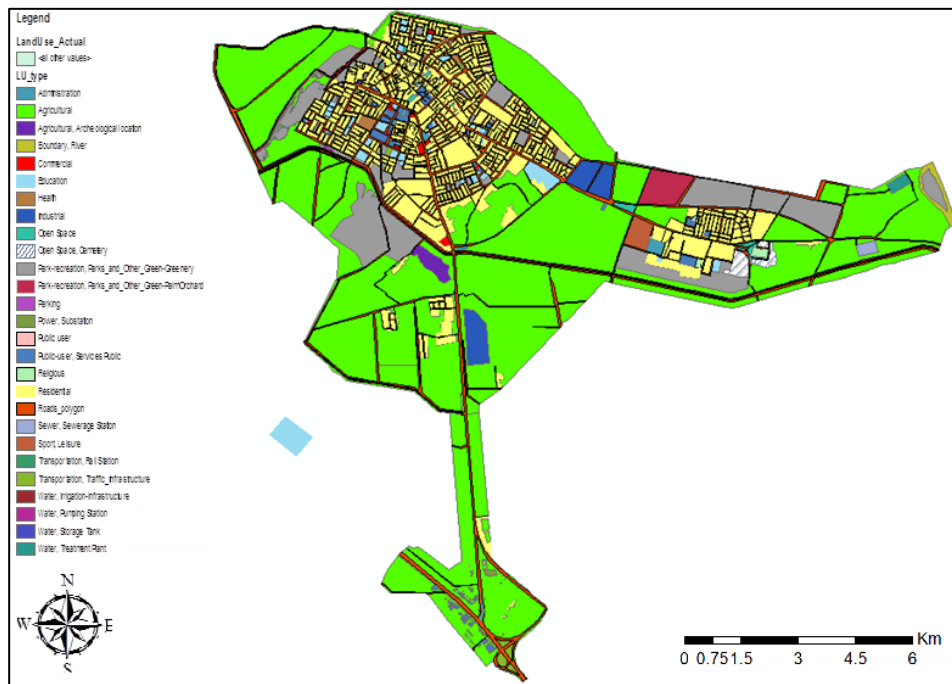
the concepts developed by the master plan will be tested, whether they are still alive in the context of the city or not, as well as the reasons for the changes that occurred in land use will be analyzed according to the concepts of the design idea of the master plan.

We can say here that the city of Balad has gone through many developments and births throughout history, up to the present day. The city has become an important human settlement consisting of neighborhoods and residential sectors with varying population densities and mixed and diverse land uses, in addition to infrastructure and support services. As a result, it is regarded as one of the urban cities that have

the requirements and concepts of urban life for humans, from which the general context of the city is formed.

**5.2. Data collection and analysis**

All data from the study area were collected based on recent satellite images using the GIS program. Where the satellite image was relied upon to calculate the number of housing units and neighborhoods and to determine the land uses. Balad City currently consists of sixteen residential neighborhoods with varying population densities and mixed land uses. Whereas Fig. 2 depicts the city of Balad's land use.

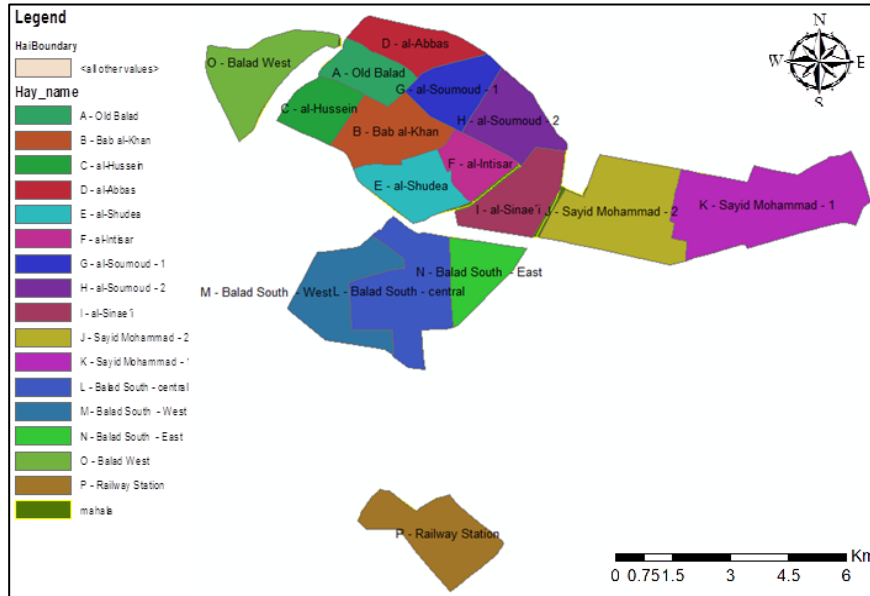


**Figure 2.** Land uses for the city of Balad .Source: The researcher used ArcMap 10.0.5 and a recent satellite image of Balad for the year 2021.

Fig. 3 depicts the city's neighborhoods and sectors. These shapes were created using the GIS program ArcMap 10.0.5 and a recent satellite image of Balad for the year 2021, and the areas and numbers of housing units for each

neighborhood were calculated [46]. Based on the most recent population statistics for the year 2021, the total population and number of families were obtained through field surveys

and a review of the city of Balad's planning departments, as shown in Table 1.



**Figure 3.** Residential neighborhoods of Balad city. Source: The researcher used ArcMap 10.0.5 and a recent satellite image of Balad for the year 2021.

**Table 1.** Residential and population statistics for the residential neighborhoods of Balad for the year 2021 [40], [42].

No.	Neighborhood	No. of families	No. of house	Population	Area
1	Sayid Mohammad - 1	799	790	4583	2701162.56
2	Sayid Mohammad - 2	623	577	3650	2094852.91
3	Balad South-East	0	0	0	779039.02
4	Balad Southcentral	964	877	4644	1900367.16
5	Balad South-West	2	2	12	1322231.74
6	al-Hussein	723	769	4741	706552.75
7	Old Balad	159	125	740	692372.53
8	Bab al-Khan	344	247	1568	1160327.3
9	al-Shudea	771	746	4924	972832.65
10	al-Intisar	476	400	2543	622239.17
11	al-Abbas	1448	1318	8089	858329.62
12	al-Soumoud - 1	890	805	4542	856072.75
13	al-Soumoud - 2	495	442	2496	1030889.48
14	al-Sinae'i	53	44	322	1078117.54
15	Balad West	689	748	4607	1334853.15
16	Railway Station	92	74	436	1419861.42
sum		8528	7964	47897	

5.2.1 Measuring the statistical factor of the population

If the values in Table 1 are interpreted using biological population theory, the community of Balad City is classified as a "compound-complex multiplied society" according to

Spencer's statistical factor, because the city's total population was 47,897 people. The tribal customs, traditions, and customs have a tangible character in the city, in addition to being under a central administration and following a religion represented by the Islamic religion. Furthermore, these neighborhoods are provided

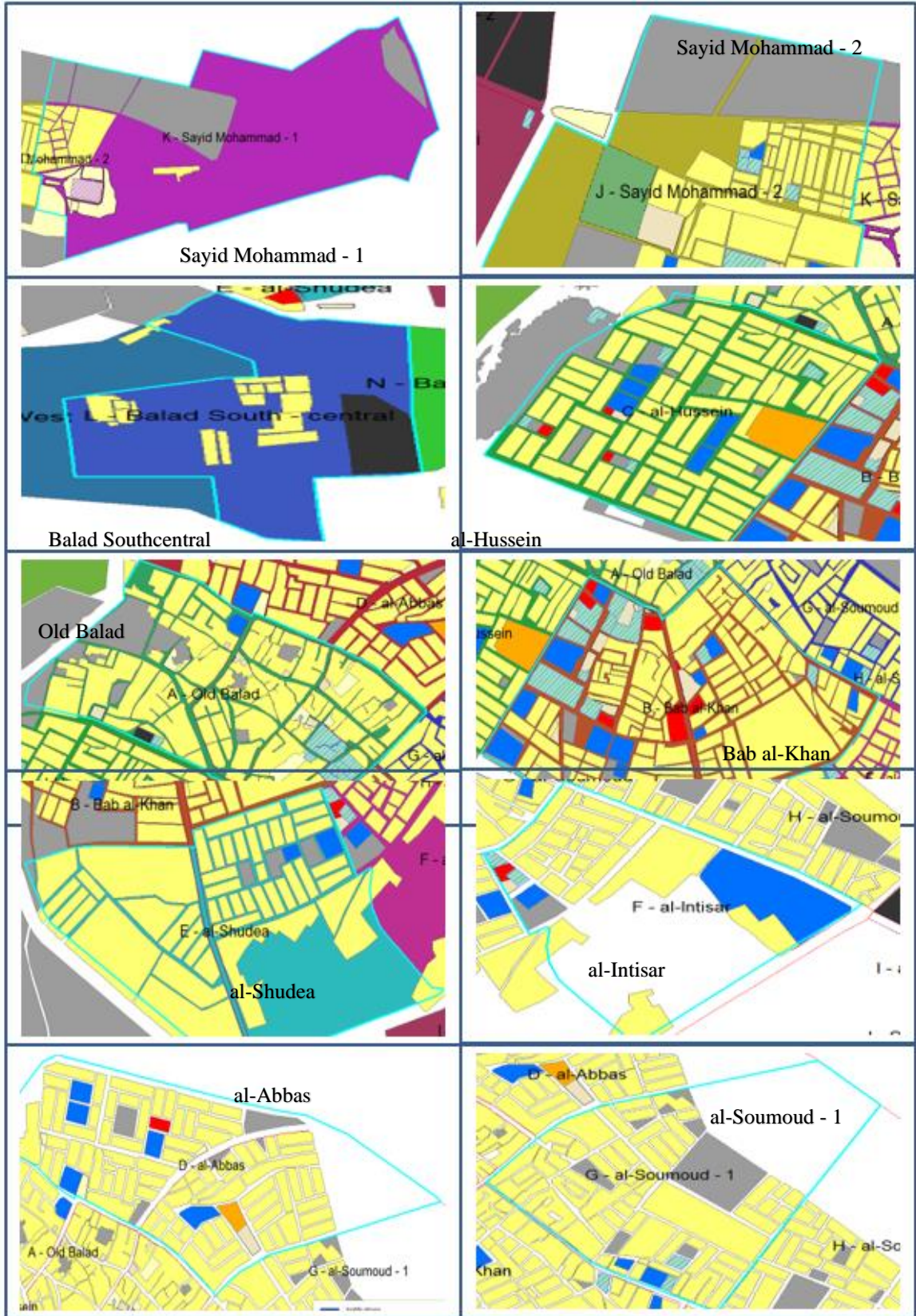
with some services required by the population, which has resulted in the growth of the city and its expansion towards the outskirts, resulting in a high population increase to the point where the population does not match the number of housing units in some neighborhoods.

#### *5.2.2 Measuring the Concept of function, variance, and integration*

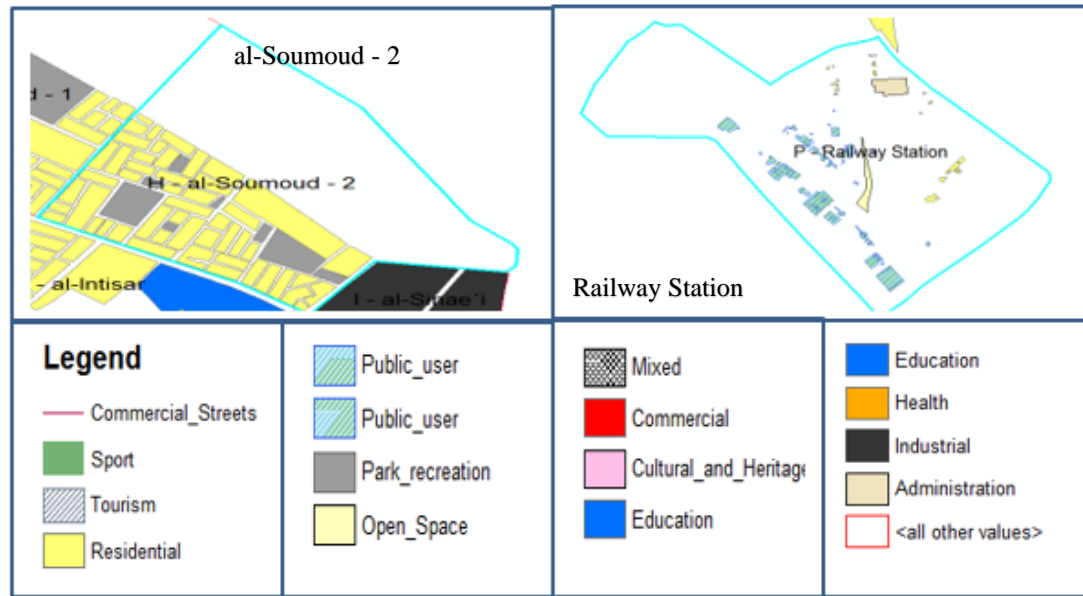
If we assume that Spencer's theory attempts to compare the concept of the city to the concepts of a living animal organism, just as a living organism consists of organs, organs, and functions, the city also consists of members represented by residential neighborhoods and devices represented by the administrative authority and functions represented by the services provided by neighborhoods to residents. According to Spencer's theory of the development of society, society consists of entities and institutions of homogeneous and differentiated functions. The city consists of residential sectors, residential sectors consist of residential neighborhoods and residential neighborhoods consist of housing units of different sizes, and housing units consist of families of different sizes and numbers. Therefore, this spatial progression from the unified and homogeneous form represented by the city to the multiple and heterogeneous forms represented by housing units and families leads to the interpretation of the biological evolution theory or the biosocial theory of Spencer. In

which the similar parts represented by housing units perform similar functions represented by housing families and providing a minimum level of services them, where Spencer called this transition "the variance". He added that the phenomenon of "integration" must be accompanied by the phenomenon of variance by relying on exclusivity and specialization, which leads to solidarity and cohesion and the dependence of parts on each other.

In order to analyze these concepts within the context of the city of Balad according to Spencer's theory, the phenomenon of "integration" will be considered represented in the urban housing services, which are supposed to be provided in every residential neighborhood in the city to be unique and specialize in serving the residents of this neighborhood. Therefore, according to the population numbers and the spaces of the residential neighborhoods shown in Table 1, it is clear that the residential neighborhood in which the largest number of residents is concentrated is (Al-Abbas neighborhood), which has a population of (8089) people. The residential neighborhood with the least population is Balad Al Janoubia neighborhood, which has a population of (12) people. To find out the reason for the population concentration in areas without others, the city was divided according to its neighborhoods, and the services in each residential neighborhood were clarified as in Fig 4.







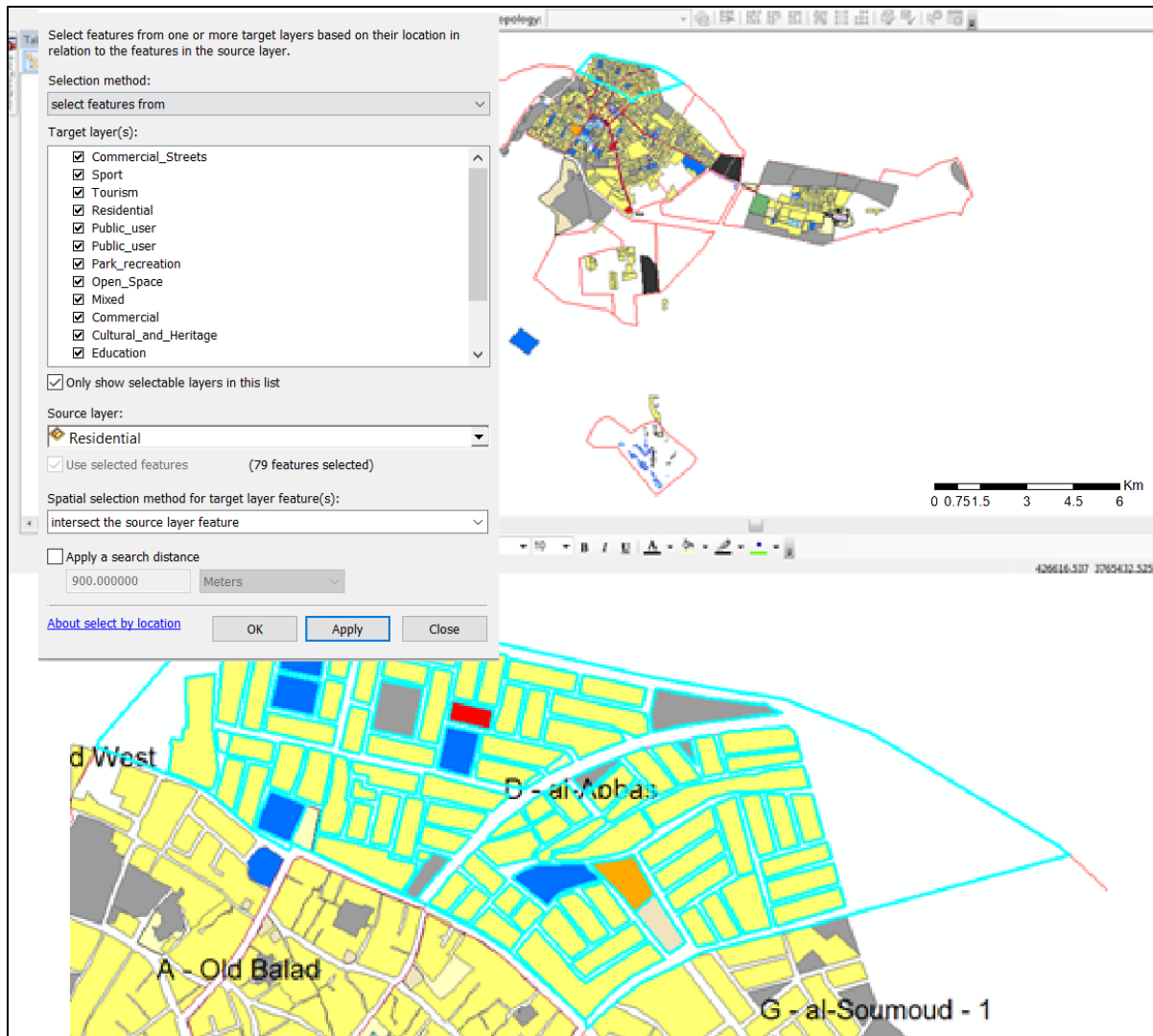
**Figure 4.** Residential neighborhoods of Balad city and land use within each neighborhood.

### 5.2.3 Measuring the concept of specialization and uniqueness of services in the city

According to Fig. 4, most residential neighborhoods suffer from the heterogeneity of land uses and a lack of basic services provided by the master plan when designing the city (elementary school, local market, mosque, kindergarten, administrative building, health center, green areas, etc.). Because these services specialize in specific functions and are unique to the residential neighborhood in which they are located. As a result, GIS was used to determine the neighborhood with the most services, where the analysis (Select by location) was used and the condition that determines the residential neighborhood with the most services was used, as shown in Fig. 5.

The result was that the Al-Abbas neighborhood is the neighborhood that contains the largest number of services and not others, and this explains why this neighborhood contains the largest number of residents. This result means

that the services that were allocated in other residential neighborhoods in order to be unique to serve the residents were transferred to other uses in order to be in line with the context of the residential neighborhood. That is, these services have become dead concepts and are concentrated in other places, so the exclusivity and specialization of services have not been organically integrated into these residential neighborhoods. This conflicts with the evolutionary law of Spencer (similar parts perform similar functions and dissimilar parts perform dissimilar functions). The similar parts of residential neighborhoods do not perform the same functions and services for the residents; instead, they perform dissimilar functions, which has resulted in variations in the population density of the residential neighborhoods. This analysis proves the research hypothesis that specialization and uniqueness in services are a source of weakness and disintegration in society.



**Figure 5.** Using the analysis (Select by location) to determine the best neighborhood in the services.

Some neighborhoods attracted residents to concentrate on them because the context of the neighborhood matched the residents' concepts and requirements, while others expelled residents because the context did not match the residents' concepts and requirements. This contrasts with Spencer's theory, in which the concept of variance appeared in these neighborhoods but without achieving the concept of integration and the dependence of parts and functions on one another.

#### 5.2.4 Measuring the strength of biological theory concepts in the context of the city

If we adopt the last result represented by the Al-Abbas neighborhood to determine the best locations for the services in the neighborhood and according to urban housing standards and with the help of GIS, to know the extent to which these concepts are accomplished (the extent to which the concept's strength has been achieved in the context) within the context of the residential neighborhood. Where the

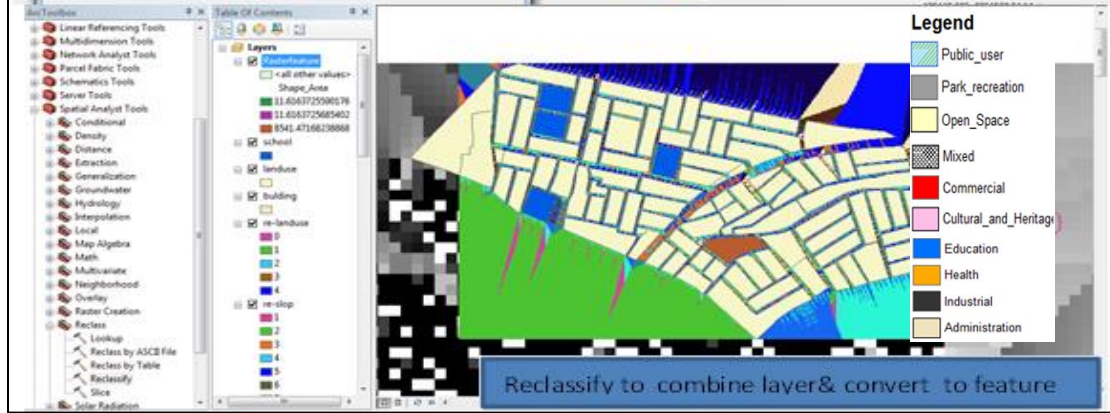
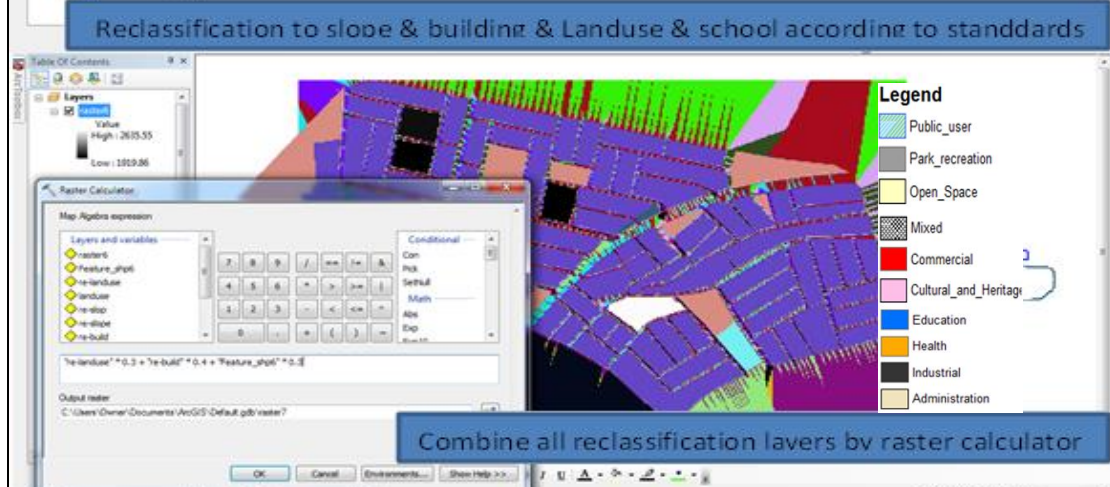
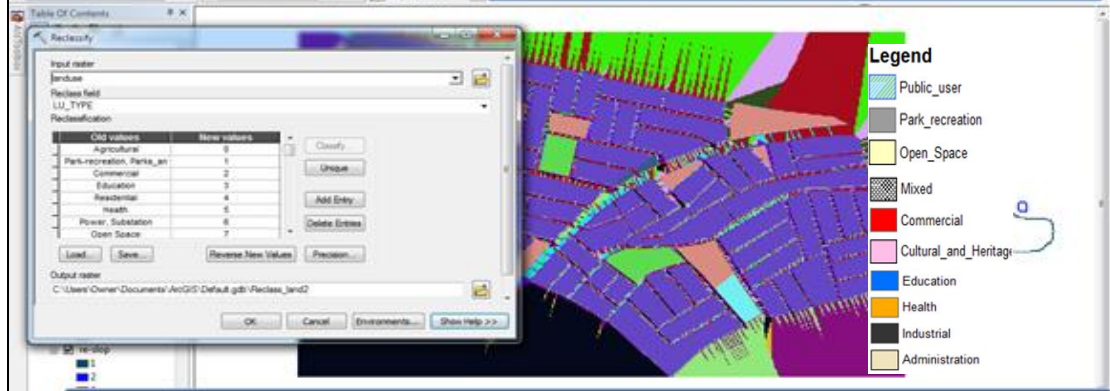
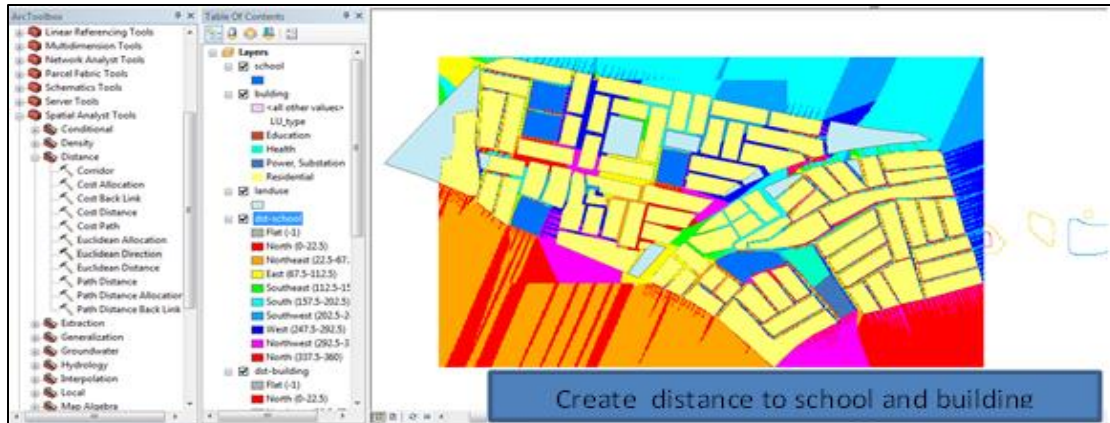
program analysis will be based on the criteria and conditions of urban housing to determine the optimal location for services (for example, the optimal location of a school will be determined according to the standards), and if the actual location of the service agrees with the proposed location of the program, this means that this concept will remain in the context and if it does not comply with this. It means that this concept will die and turn into another use because there is a plan to develop the city's services to suit urban housing standards. If the result is a "living concept", it means that the concepts of Spencer's evolutionary theory will apply to the context of this residential neighborhood, and if a dead concept, their theoretical concepts do not apply in the context of the neighborhood and the city. Fig. 6. Based on the results of the program analysis, we see that the optimal location of the primary school does not apply to the locations of schools in the neighborhood, so this concept will be considered a dead concept. This result is in contrast to Spencer's first and second evolutionary laws, which indicates that the strong concept in society continues to evolve without dying, as he likened it to a kind of cause that does not perish nor destroy but remains in society in a way that separates knowledge.

#### *5.2.5 Measuring the concept of the strength of interconnection and interaction between parts in the context of the city*

The next step involved analyzing the main roads that connect the residential neighborhoods to see the suitability and serviceability of these roads for the city context. Where a "Network

Analysis" was used to find out the strength of neighborhood interdependence with each other and the extent of service provided by the road to users in terms of time and cost, as shown in Fig. 7.

Where Fig. 7 shows the interconnection between neighborhoods depending on the shaded areas that represent the main roads connected. It is clear that these roads are cut off in most areas, which indicates the lack of connection and interconnection between these neighborhoods, which leads us to the fact that the road network that connects the city is not considered a strong concept, but rather it needs to be developed to link all areas. If the roads are analyzed based on Spencer's evolutionary theory, and by comparing the city to a living organism, the road network represents the main arteries and veins of the organism, and any defect in this network will be reflected in the functions performed by the city. The strength of interaction between neighborhoods and residents and the shift from homogeneous concepts and activities to heterogeneous concepts and activities and the extent of their continuity depends on the network of roads linking them and the extent of their strength and meeting the concepts of the context. This is contrary to what Spencer's theory came with, especially the third evolutionary law, which explains the continuity of movement of things and the transformation of energy from one form to another depending on the strength of communication and interdependence between the parts.





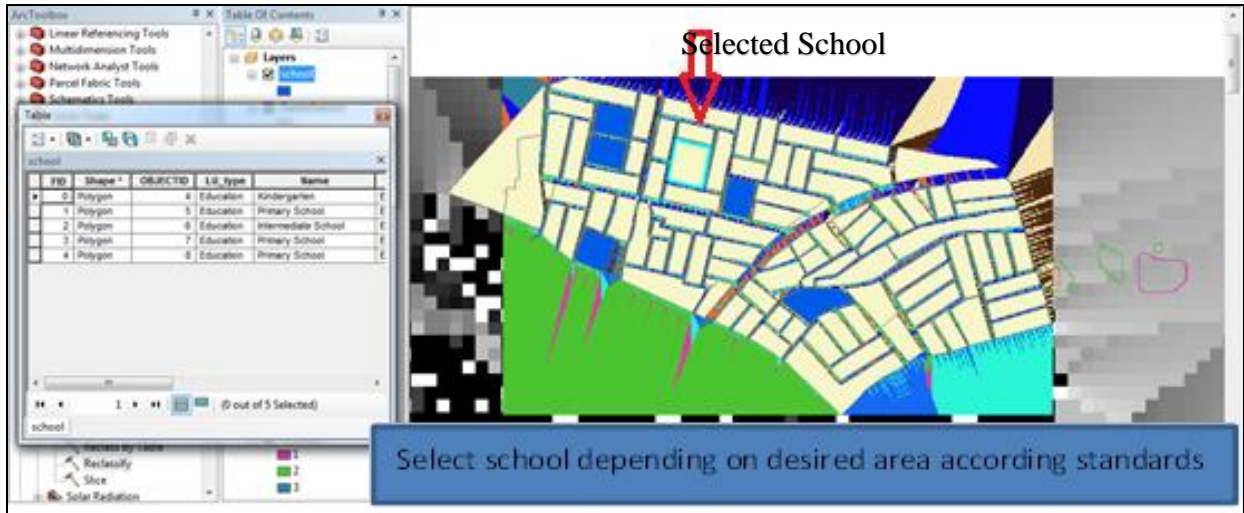


Figure 6. The sequential steps for choosing the best school location within the Al-Abbas residential neighborhood using ArcGIS.

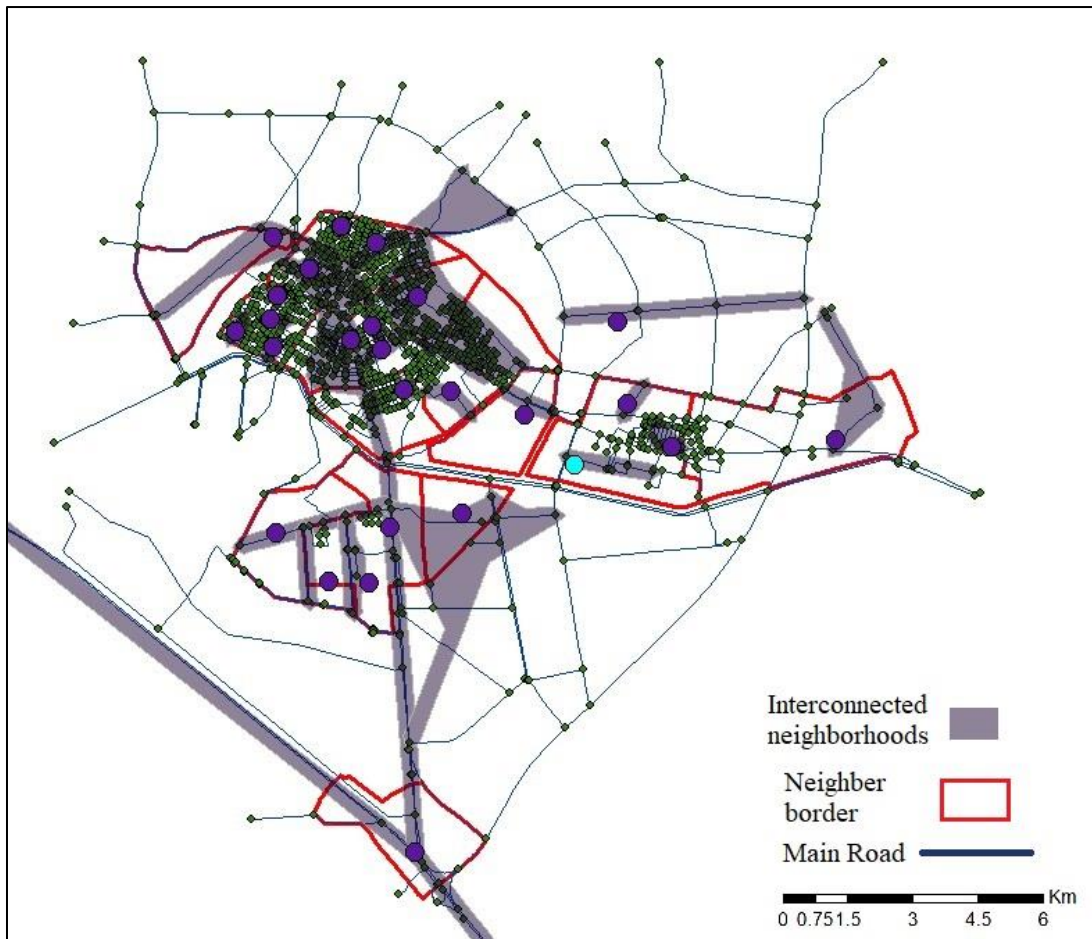


Figure 7. Neighborhoods are served by main roads.

Through the previous steps, the goal of the research was achieved, as Spencer's biological evolution theory was explained according to the statistical concept, the concept of function, variance, integration, and specialization. The concepts of the theory were applied to the land uses, and the strength of the concept was measured as its response to the city context. It has been proven that the strong concept will continue to develop without dying, and the extent to which the concepts of the theory are achieved in the context of the urban city has been explained, as well as the reason for the strength or weakness of the concept, and whether the concept will remain in the context or will it die if it does not conform to the context. The reason for the concentration of population and services in some neighborhoods and not others, and the transformation of land use from one use to another in line with the context of the city, was also explained. This aspect is represented by the research gap that was not addressed by the previous studies.

The analysis showed a lack of organic integration between the biological parts of the city. Institutional integration between the structures of society represented by the integration of services does not appear except in specific neighborhoods. This is contrary to the principles of evolution and change in biological theory, which stresses the necessity of the interconnection of parts with each other for the continuation of society. Corresponding with this conclusion is the study of Jonathan H. 2017, which confirmed that the absence of social structure variables in society leads to the disruption of society due to the pressure that will be generated on its members.

Most of the services in residential neighborhoods specialize in certain jobs, but they are not unique to serving the neighborhood

itself, but rather serve the neighboring neighborhoods. That is, the survival of this neighborhood depended on the functions of the neighboring neighborhoods and did not depend on itself as an independent organic organism. This is confirmed by the theory in another concept, which is the concept of natural selection, according to the study by Jonathan H. 2017, meaning that society is developing by acquiring new services and cultures from other societies.

The modern urban society in the city of Balad cannot be compared to a living organism that goes through gradual stages of growth, leading to aging and death, because modern society is based on the individual's format to provide him with an appropriate environment ready for living, and this environment does not need a long period to grow and pass through the stages of growth to become Ready to live, it can be provided with all the necessities of life in a very short period. The study by Sandra J., 2005 supported this conclusion when it reached that maximizing the happiness of people in society is through social equality that provides people with the necessities of life, which accelerates the growth and development of society.

The analysis of the concepts of the theory has political implications represented in the need to change some of the city's policies depending on the results of the analysis. In particular, the results revealed that the services in the neighborhoods are not in line with the requirements of the residents, and this requires the enactment of new laws and standards that are compatible with the context of the city. The lack of services is due to religious and political reasons, which was confirmed by researcher Paul Elliott, in 2003 when he proved that the evolutionary stimulus for Spencer was through his religious association with Derby Abbey,

which made the monastery a dominant authority over others.

The research recommends measuring the concepts of Spencer's biological theory on other cities in the Middle East and testing the strength of the concepts in them and the extent of their realization within their context. This is what Spencer also recommended, according to the study of Betz, 2010 and the study of Jonathan H. 2017, who emphasized testing his concepts under certain conditions in society and making sure of their ability to solve a problem and develop community functions.

## **6. Conclusions**

Based on the findings of an analysis conducted by GIS for the city of Balad by evolutionary theory concepts, it was concluded that despite its ability to statistically classify them, evolutionary theory, particularly the biological aspect of it, is unable to explain population concentration in residential neighborhoods. This is due to the theory's reliance on population growth to determine the nature of society and the state of its transition and transformation from one type to another, without taking into account other factors that contributed to its growth and development. This conclusion is confirmed by a study by Heather Winlow, 2020, which focused on the aspect of social solidarity and neglected the causes of population growth and its concentration in some areas and not others. Also, the inability of theory to predict the reasons for the city's growth and expansion based on variation and integration concepts, because these concepts confirmed that life tends to exclusivity and specialization, as well as the dependence of parts on each other. While the city's neighborhoods differed in the services, they provided without demonstrating integration and exclusivity in these services, this resulted in

a difference in growth and development between one neighborhood and another, without dying or fading out this neighborhood despite the difference. If each neighborhood relied on the concept of exclusivity and specialization in services, the neighboring neighborhoods would suffer from functional and social dysfunction. The study of Andrew M. McKinnon, 2010 confirmed this conclusion when it proved that the theory will be stronger if the growth of society is explained according to new concepts of variance and integration.

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## **Conflict of interest**

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

## **Author Contribution Statement**

The author, Ali Dhafer Abed, presented the research problem and analyzed the theory according to analytical methods.

The author, Nuridah Binti Sabtu, supervised and verified the final analysis results of the research.

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