

Locating of New Cities and Soil variability

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Received: 23/12/2021

Accepted: 20/1/2022

Published: 2022

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Abstract

The fertility of the land in the whole province of Babylon and its small size, and considering that its center is the city of Hilla of large cities that suffer from multiple problems on various sectors, especially the creation of residential land, made the policy of new cities one of the solutions used in dealing with these many and varied problems with the presence of the initiative by the state to establish new cities in all provinces, the **problem of research** was the existence of the challenge of determining the appropriate location of the new city in Babil province according to traditional methods and not taking into account the soil source for the future problems of these cities.

The aim is to make the appropriate planning decision for the spatial signature of the new cities in accordance with the appropriate planning methods and local standards to ensure their efficiency and ease of implementation and to ensure future axes for long-term expansion and attention to the soil standard when selecting the site. **The hypothesis of the research** is to balance the importance of soil with geographical and environmental planning standards and important elements to be taken into account when locating a new city as part of a sound urban system using modern technologies and software. The concept of a new city, which is part of the policy of urban spread and theories of urban and regional planning organized for this policy, and the types of soil supporting the urban structures and urban environment suitable for those cities, should also be identified. One of the most important **conclusions** of the research is not to view the new cities as urban expansion of large cities and to move away from the mother city appropriate planning distance. The selection of the appropriate soil for these cities in a balanced manner with other criteria as a fundamental supporter of all different uses of land, one of the most important **recommendations** was to consider the new city as a comprehensive rural and

Locating of New Cities and Soil variability

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urban development, and to take care of the soil as an important criterion because it will require treatment for each square meter of the selected area, i.e. for each housing unit, each road and various other uses, causing an increase in the cost of establishing those cities.

Keywords: New city, city size, mother city, city site, soil.

Introduction

Since antiquity, the human according to his innate behaviour, has found solutions to all his problems, starting with those which threaten his life, He lives in the highlands to prevent flooding, building castles to facilitate the process of repelling invaders, along with other problems that make his life difficult, Such as irrigation of his crops and the type of farmland, so he lived near rivers and water sources, looking for comfort and safety for himself and his family. This makes the location of urban assembly an essential part of solving the problems to which human beings are exposed and to various environmental, economic, social and even political sectors.

New cities, sprawl policy and city regulation

Countries resorted to the policy of organizing cities, starting with changes in land uses, increasing the housing area through future expansion axes, resorting to the policy of intensification through increasing the supply of vertical housing.

The policy of urban dictation and reducing the rigidity, limitations on local standards and development of degraded neighbourhoods. [Housing Policy,2010].

Therefore, countries resort to urbanization policies after exhausting their solutions in the organization of cities, which is called **peripheral development**.

which is for the development of Metropolises, it goes beyond urban planning to regional planning, because it works to achieve an urban balance between the different regions of the country , this is done by achieving "the appropriate geographical spread of housing to include the different provinces of the country, by linking housing to places of economic activity to provide jobs close to housing projects. We are working to reduce the imaginary increases in housing costs, taking into account the distribution of the population across different regions and preventing the use of agricultural land for housing purposes as part of a regional planning of cities and villages. [UNEP, 1999].

New horizons have emerged in city planning by providing new urban areas by creating new cities, that preserve the environment and reduce

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

overcrowding within the original cities as well as the preservation of agricultural land around it , process is considered one of the most important agendas of urban development beyond 2015 in the process of addressing the phenomenon of urbanization through the formation of cities and towns of the 21st century [UN HABITAT,2015], This is implied by Iraq's 2010 national housing policy in policy 2-1-9, but has remained within the concept of land adjacent to cities.

New city

The concept of the new city is an important concept, which is difficult to find a Comprehensive definition as the city definition , this is based on the different objectives for which it was created, function and size, the first definition of new cities (rather garden cities) was developed in 1910 by the English City Planning Authority that garden cities are planning a healthy life and working together, and are large enough, but not to the degree of inflation, so that they can perform their social function in stimulating relations between their inhabitants It should be surrounded by a green strip of agricultural areas and land ownership must not be in the hands of individuals, not private property of its inhabitants, but common and public property for all without specifying. [Abrams,1978].

They are defined as planned and controlled areas independent of their economy and contain a balanced diversity of housing, population groups, community facilities and land uses, with some restrictions on size and density and the maintenance of large open spaces. [Ferreira,1976].

Site for new cities

The concepts of the site are multiplied by the association with the relationships surrounding it (e.g. geography, astronomy, economic and human), where the concept of location is used by classical geographers to describe the relationship, quantity and process on the basis that it refers to the natural process only in other words "is the relationship of places through the natural process". [Hamer,1998].

It is also known as the "relationship of the subject" (state, region, city, establishment, institution..... etc. or phenomenon relative to other topics and phenomena" [Debs,2014].

The site is very important in determining the success of human activities and events because it naturally contributes to the properties it possesses, so the location of new cities is what makes the city alive and prosperous with its properties and this is what we will mention in detail, which many specialists have emphasized, as seen by Karl Marx (geographical location worker at

times "as an investment of new land and territories" more important than soil fertility). [Clark,2018].

Spatial planning principles under which selected locations for new cities are determined

The scheme must follow a methodology of lower cost when taking planning measures related to detailed surveys, applying the criteria to all the territories of a particular region, which means conducting detailed surveys of all the territories of the territory and this is contrary to the spirit of the planning process that includes within the setting of the goal, we must choose specific sites on which the survey and evaluation process is carried out among them to choose the best alternative[Macmillan,2000].

On this basis, we will use selected theories in urban and regional planning to identify those appropriate locations for surveys alone.

Urban planning theories and the location of new cities

We will mention most of the theories and models related to the subject of research and chronologically and briefly and avoid many theories that interested in architectural and formal designs and the distribution of land uses within cities, address the theories that contained the details of its location, including the spatial relationship between the new city and the mother city and the size of the population and everything related to the locations of the new cities.

The linear city of Don Arturo Soria y Mata in 1822

The Spanish-born Soria y Mata considered that the city and all its problems are a source and origin of all the disadvantages and that the city must mix with the rural. He wanted to limit the urbanization of cities on the surrounding agricultural land, he proposed the longitudinal city to surround a main axis of movement and extend its parallels focused on the whole of services and trade, and to be separate from the mother city by a distance (6-7) km, which is a layer in the projects surrounding Madrid to connect 8 existing cities to a main axis length (50) km is considered artery and spine of new urban areas for a capacity of 800 thousand people. [Allam,1995].

Garden City - Tomorrow City (The City of Tomorrow) by Ebbzer Howard 1898

English-born scheme (Howard),his idea has a lot of planning and design details, He emphasized public ownership in garden cities, (a sign that private property will be an obstacle to public benefit, as confirmed by Muslim jurists in the necessity of public ownership of the land [Al-Sadr,1987], for easy control of land uses ,and coordination of the number (6) Satellite cities ,

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

Surrounded by green areas with a population of 32,000 and 16.1 km from neighbouring cities, it was the nucleus of many applications in the new cities of the world as a way to accommodate , guide the urban growth of bloated cities such as in London, around Cairo, around Paris ... etc. Letchworth, England, 17 km from Leyton on the River Leia, is the first practical application of the idea of garden cities, with Hampstead 7 km from London. [Hall,2003].

The city region theory of the German planner Helibrecht

This theory has a wider horizon than its predecessors, where the plan adopted the planning of an entire region surrounding the center (mother city) , dividing it into three ranges (10, 20, 40) km the areas located in the first range 10 km are It is affiliated with the mother city and begins to be autonomous as it moves away to be relatively independent on a scale of 40 km and the population in the urban areas depends on the mode of transport passing through it and its distance from the mother city, ranging from (240,000 to 1.11 million). See figure (1)

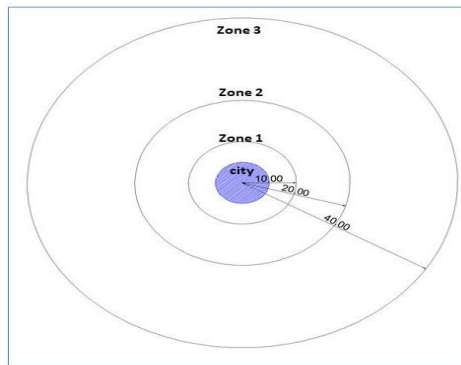


Figure (1) The three regions of the city region theory of the German planner Helibrecht

Reference/ Ahmed Kamal Afifi, Theories in City Planning, Cairo, i1, 2000, p. 113)

The distance is an important factor in the spatial organization of human stables, including cities, where they will determine the type of relations exchanged between them, which ranged from (10-40) to 40 km. In most examples up to 50 km of tape extension around a major transport hub. This is what the United States of America approached when it established many new cities where it relied 30-50 km from the home city depending on the land available free of tenure problems and relatively cheap, such as those of cities (Maryland, Columbia, Reston, Virginia). [Rabinowitz,2015].

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

What was recommended by one of the experts in the Saudi market economy, when establishing the new city's (King Abdullah Economic City) to be far at least 40 kilometers from Riyadh, the capital, as an activity of this size will provide integrated jobs and services that transfer the demand for land from Riyadh to the new city, because of its impact on competition within the market economy and create a budget in the demand for land. [Al-Shiha,2011].

the theories of regional planning give a clearer explanation of those relationships, and it should be noted that the overall development in both urban and rural areas, is one of the foundations of the principles of sustainability confirmed by the recent trends in the management of development, which necessitates the expansion of the planning horizon. [UN,2016].

Regional planning theories and new cities

The level of regional planning is more appropriate in spatial planning as it takes into account the growth of cities together as one city and one system [Tielrooij,2001].

We selected two theories of regional planning which have explained the relationship between location and population because they are the basis for determining interconnections. It also determines the class or rank that determines both the size of the city, its area and its distance from the mother city.

Rank base - size (George Zeipf) 1949

The rule developed by **Zeipf** to find the relationship between the rank of the city and its size (population) to reveal the order in which cities are organized within their territory in order to find an explanation in the growth of some cities and the decline of others through their proximity and after the theoretical values calculated for the cities' groups within their rank, and this rule includes a simple law: - the size of the designated city = the size of the first city / rank of the designated city.

The size of the city in the second rank is equal to half (1/2) the size of the first city and the size of the third city equals one third (1/3) the size of the first city and so on the rest of the ranks.

This rule is of great importance to the subject of research as it reveals what comes :- [Liang,2004].

1- The dominant mother city in the province.

2- The imbalance in the urban hierarchy, where the distance and proximity of realistic city sizes from calculated theoretical values is an important indicator

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

of the imbalance of the principle of division of labour and jobs between cities in the provision of services and the distribution of activities and events therein, so it is used as an indicator of the spatial development of regional and national plans [Spatial Development,2017].

This rule will give us an important idea of the size of the proposed new city, which will contribute to the rebalancing of the urban system, especially if it reinforces a map of the spatial dimension of this distribution of cities, see figure (2).

Central place theory Christaller 1933

The German geographer **Christaller** presented his theory at a time when the attention was focused on the analysis of relations between cities and their regions and on the other hand between the region and other regions by city planners, where his theory sees the city as a center for the provision of goods and services to neighboring cities and their backs, so that theory explained the location of cities and their distance and sizes and categories according to their functions and the identification of interlocking relations. Although this theory is commonly used to sign basic economic projects within the region.

the economic, social and political relations are all subject to the factors of size and distance between the centers of cities, where **Christaller** likened the city to the sun in the center of its satellites and wanted to increase the on-site efficiency of relations between the mother city and its aftermath, so he moved from the circular shape in distribution to the hexagonal form because the circular shape and representative of the influence of cities will leave empty areas not served by any city. [Gould,2016], see figure (3).

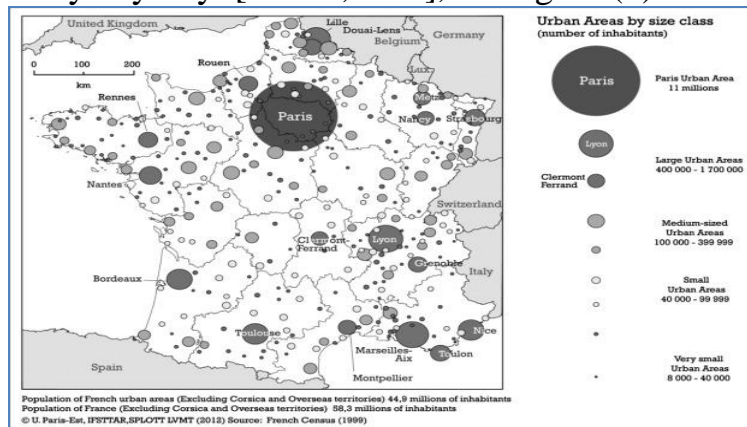


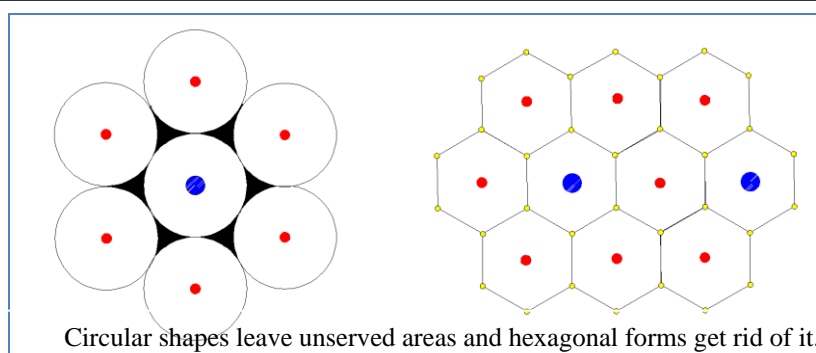
Figure (2) Urban hierarchy of cities surrounding Paris/France

© U. Paris-Est, IFSTTAR, SPLOTT LVMT (2012) Source: French Census (1999)

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi



Figure(3) The benefit of the hexagonal distribution of Christaller 's theory

Christaller has organized the variation of distances between cities according to their volumetric variation within the layer to which they belong, the cities of the same layer are separated from each other at equal distances set by Christaller, making the distance between the centers of the first layer is 7 km, which is the distance that a man can travel by man or passenger at an appropriate period not exceeding one hour according to his opinion, and then the distance increases as the degree of class increases so that the distance of the second degree is equal $(7 \times 3 \sqrt{3})$ and hits the distance of the class by the distance of the layer Previous to be as in table (1). [Norris,1982].

Table(1) layers of service centres as reached by the theory of central places

| Class rank | number of centers | Distance in km | Center residents | regions | |
|------------|-------------------|----------------|------------------|------------------|------------|
| | | | | Region residents | Area in km |
| 1 | 486 | 7 | 1000 | 3500 | 44 |
| 2 | 162 | 12 | 2000 | 11,000 | 133 |
| 3 | 54 | 21 | 4000 | 35,000 | 400 |
| 4 | 18 | 36 | 10,000 | 100,000 | 1200 |
| 5 | 6 | 62 | 30,000 | 350,000 | 3600 |
| 6 | 2 | 108 | 100,000 | 1,000,000 | 10,800 |
| 7 | 1 | 186 | 500,000 | 3,500,000 | 32,400 |

Reference : Robert E. Norris and John D. Vitek , *Geography, An Introductory perspective* ,Charles Merrill Publishing co.ohio,1982,P327.

Christaller's theory has been criticized as much as a new opening in knowledge, as with regard to the number of seven layers (7), researchers did not support the identification of the number of these layers as stated in the theory, but ranged from three layers, as in the Study of Bree and Carson

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

when applied in Washington -Snohomish County, [Berry,1958]. As well as in the Bryce study in England and Wales. [Bracey,1956].

Soil

Recent studies have taken a great interest in urban soil, as it considers the infrastructure of ecosystems in urban areas and their various characteristics to be supportive of ecological, social and economic life within the city, as confirmed by the tasks of the Urban Soils/SUITMA group (Soils of Urban, Industrial, Traffic, Mining and Military Areas), founded in 1998 at the 16th World Conference on Soil Science in Montpellier, France[Al-Hiti,1974], an extension of the development of urban soil studies, including a soil survey to plan profitable soil use in Edmonton, Canada, where the goal was to obtain good soil sources to support grass and plant growth and avoid soil damage [Lindsay1973]. Damage was expected due to contraction due to the high soil mud content, as well as salinity and sulphate content that cause concrete erosion.

Also in Massachusetts, USA, large-scale soil surveys were conducted in several cities to assess soil capabilities to enhance municipal services such as water, sanitation and rainwater drainage [Zayach,1973].

These urban soil surveys have proven interesting because they have helped urban communities save a lot of money.

One of the most famous soil classifications, which depends on the physical properties of the soil, which depends on the soil texture and developed by (USDA) the Department of American Agriculture, where it placed it in a triangle containing the three main components of the soil, namely clay, sand and silt within the triangle of soil texture to produce (12) class as shown in the form (1-4) and table (1-2) [USDA,1975].

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

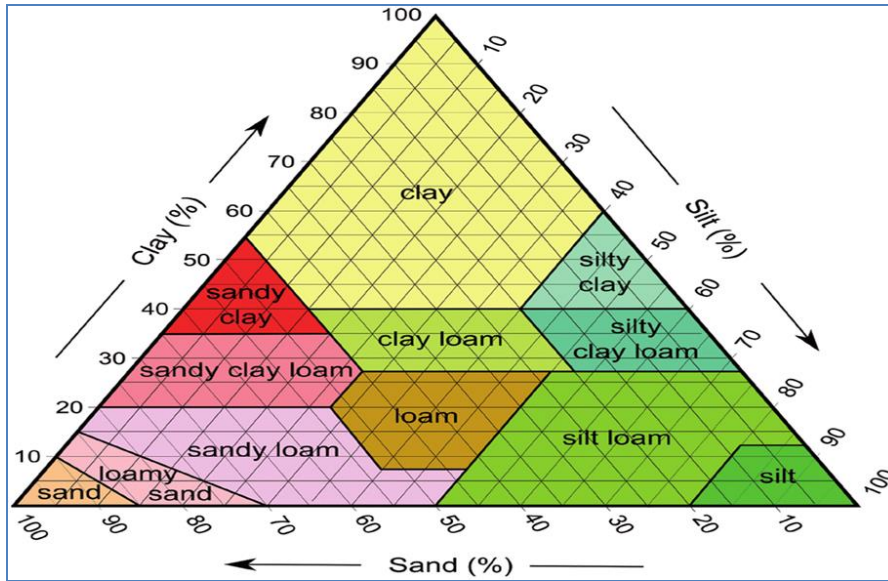


Figure (4) Triangle soil texture

Reference: *Basics of Soil Physics* / Translated by Dr. Mehdi Ibrahim Odeh, p.

69

Table (2) soil varieties by texture

| no | Texture class | Texture group |
|----|-----------------|----------------|
| 1 | sand | Coarse texture |
| 2 | Loamy sand | |
| 3 | sandyloam | Medium texture |
| 4 | loamy | |
| 5 | Silt loam | |
| 6 | Silt | |
| 7 | Sandy clay loam | |
| 8 | Clay loam | |
| 9 | Silty clay loam | Fine texture |
| 10 | Sandy clay | |
| 11 | Silty clay | |
| 12 | clay | |

Reference: *Baghdad University - Faculty of Agriculture (General Soil Principles Course 2016-2017)*

What is important in the subject of research is any type of soil preferred for urban sites according to their properties to be supportive of all uses of the land and the urban environment. This depends on the requirements of construction processes for various urban uses as well as urban agriculture and green areas, through various studies showing that the

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

second and third type in table (1-2) above are preferred because they are easy in drilling processes and respond to the reduction processes and contain water permeability to drain the rainwater falling on them as well as able to drain water leaking from water and sewage systems to prevent soil contamination. At the same time, they can be grown, in addition to being able to store pollutants such as carbon dioxide for high pores to be supportive of the urban environment. [Bullock,2009]. According to international construction standards, it gave specifications for each soil as shown in table (3)

Table (3) Soil types, properties and suitability for the construction process

| no | Soil type | Soil type of table (2) | specifications |
|----|-----------|------------------------|--|
| 1 | Clay | 12 | Small molecules that retain water well, expand moisture and shrink significantly when dry, causing significant pressure on the foundations and causing cracks. |
| 2 | Sand | 1 | Its molecules are large. They are dry and do not retain moisture to widen the openings between its molecules. And if pressed, it's good to support the foundation because it doesn't retain water, but it's easy to drift. |
| 3 | Silt | 6 | Its molecules are very soft and retain water longer, and this leads to soil expansion, pushing and weakening the foundation, making it not ideal for support. |
| 4 | Loam | 2,3,4,7,10 | It is ideal because it carries all sizes of molecules and good properties. |

Reference: ANGLA DU PEREZ, FCS Civil & Construction Technology, Pearson South Africa, 2009, PP50-54.

It should be noted that the state and type of soil are also important for the design of the urban transport network and surrounding roads, which is one of the factors affecting the amount of longitudinal level of roads as well as important in the extension of water processing systems and sewage systems. [housing standards,2018].

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

Study area

The center of Babil province is 90 km away from the center of Baghdad province and is considered the second closest southern provincial center to Baghdad after the center of Karbala(87) km and this gives it the advantage of proximity to the administrative and geographical center of Iraq (Baghdad) at the same time. It is also the only province bordering six provinces surrounded by(baghdad , Anbar, Karbala, Najaf, Qadisiyah and Wasit), making it an important transport node in all directions. Map (1) .

Babil province is about 5,432 square kilometers and is the smallest province in Iraq after Karbala province. [RDOBP,2010].

Administrative formation

Babylon province consists of four districts and (14) Nahya as in the table (4)

Table (4) Administrative Divisions of Babylon Province

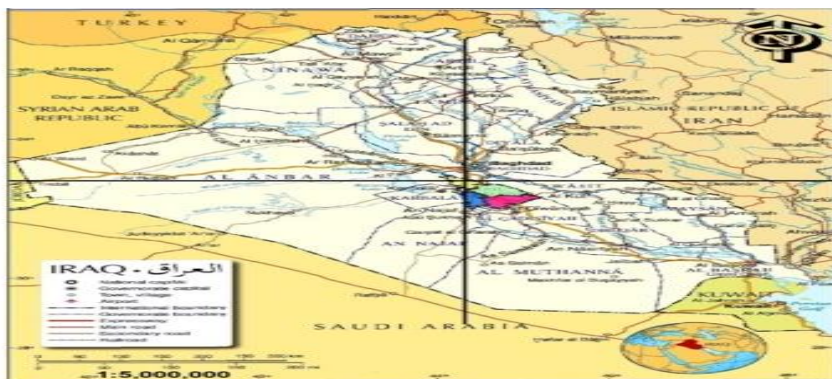
| Province | district | Nahya | Area km2 |
|----------|--------------|-----------------|----------|
| babel | halla | al hella center | 176.853 |
| | | alkfel | 535.449 |
| | | aby kraak | 185.071 |
| | mahaw eel | Mahaweel center | 191.882 |
| | | al mashroaa | 896.507 |
| | | Al amam | 229.145 |
| | hashim ya | neil | 439.852 |
| | | alkaseem | 394.711 |
| | | medhatya | 492.622 |
| | msayab | alshumally | 521.361 |
| | | altalea,a | 309.320 |
| | | sdat al handyaa | 279.198 |
| | | jerff al naser | 339.142 |
| | | alaskanderya | 438.671 |
| | Σ | 5429.784 | |

Reference: (GIS) based on the provincial index/general authority of space

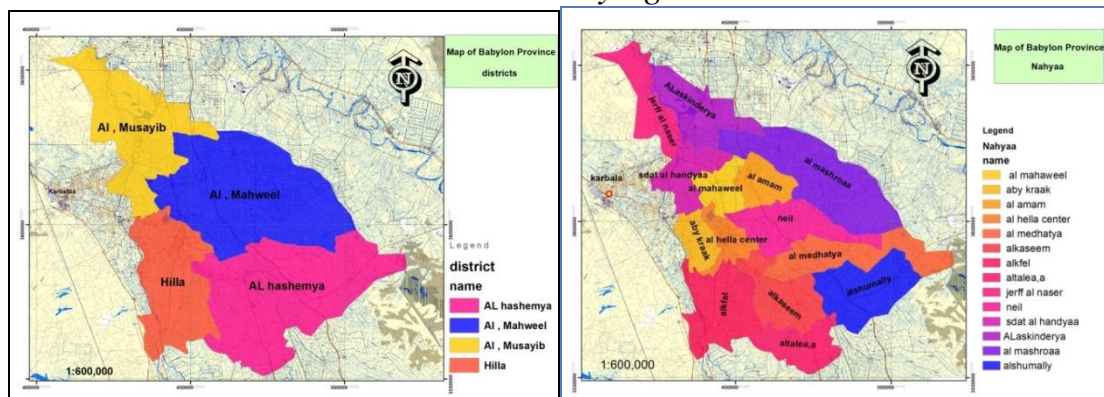
Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi



Map (1) Location of Babil province in the geographical center of Iraq
Reference : (GIS) based on iraq's administrative map - general authority of surveying



Map(2) DISTRICTS of Babylon Province

Map(3) Nahyaa of

Babylon Province

Reference: (GIS) based on the provincial index/general authority of surveying

The size of the new city in Babylon province

The size of the new city is linked to the budget of the urban system of the territory, which was found in Zeipf's base the planning interpretation available for this, and this is what we referred to it, the proposal of a new city without understanding its relationship with the urban system will lead to dysfunction that prevents the achievement of its goal, although the trends of the housing initiative have been set to reach 50% of the size of the center of the province, but we have to analyze urban areas to know the regularity or imbalance in the urban system.

The size of the new city is determined by the research approach by analysing the results of the application of the rule of rank - size to cities in Babylon province, we will deal with the urban population without the countryside to find a population size, that contributes to the organization of urban imbalance

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

in Babylon province as an administrative region with structural plans and rural development plans as one planning territory. Table 3-6 shows the administrative composition and population.

Table (5) Administrative composition and population of Babylon province
(2013-2020)

| Administrative formation | urban 2013 | urban 2014 | urban 2015 | urban 2016 | urban 2017 | urban 2018 | urban 2019 | urban 2020 |
|--------------------------|---------------|---------------|---------------|---------------|----------------|----------------|----------------|----------------|
| al hellal center | 418303 | 424065 | 435939 | 448144 | 460692 | 480300 | 500742 | 522055 |
| alkfel | 21087 | 21495 | 22097 | 22716 | 23352 | 24007 | 24679 | 25370 |
| aby kraak | 24089 | 24047 | 24720 | 25412 | 26123 | 26854 | 27605 | 28378 |
| Mahaweel center | 27270 | 27944 | 28726 | 29531 | 30358 | 31208 | 32081 | 32980 |
| al mashroaa | 35926 | 37213 | 38255 | 39326 | 40428 | 41560 | 42724 | 43920 |
| Al amam | 11765 | 12193 | 12534 | 12885 | 13246 | 13617 | 13998 | 14390 |
| neil | 6195 | 6289 | 6465 | 6645 | 6831 | 7342 | 7892 | 8482 |
| hashimya | 33007 | 26246 | 26981 | 27737 | 28514 | 29313 | 30135 | 30979 |
| alkaseem | 74079 | 81124 | 83395 | 85731 | 88131 | 90599 | 93136 | 95743 |
| medhatya | 54097 | 54784 | 56318 | 57896 | 59517 | 62663 | 65975 | 69463 |
| alshumally | 16302 | 16382 | 16841 | 17313 | 17798 | 18296 | 18809 | 19335 |
| altalea,a | 7633 | 7852 | 8072 | 8298 | 8530 | 8769 | 9014 | 9267 |
| msayab | 50800 | 53904 | 55240 | 56609 | 58012 | 59450 | 60923 | 62433 |
| sdat al handyaa | 30746 | 30762 | 33435 | 36340 | 39498 | 42930 | 46660 | 50715 |
| jerff al naser | 5484 | 5511 | 5796 | 5909 | 6065 | 6221 | 6377 | 6533 |
| alaskanderya | 90486 | 93100 | 95984 | 98957 | 102023 | 105183 | 108441 | 111801 |
| Total province | 907269 | 922911 | 947077 | 979449 | 1012928 | 1047552 | 1083359 | 1120389 |

*Reference: the Ministry of Planning and Development Cooperation, ,
Directorate of Statistics of Babylon Province, Population Estimates for
Babylon Province 2020.*

By applying the Zeipf's rule to the province's cities for 2020, it will be clear that the center of the province is dominated and that the second city of Alexandria corresponds to the size of the fourth city and the city disappears in second and third place from the table.see table(6)

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

Table (6) Base ranked size for cities in Babylon province according to population (2020)

| Administrative formation | Urban Population 2020 | Rank | The population size assumed according to the Ziv rule | Matching the realistic rank |
|--------------------------|-----------------------|------|---|-----------------------------|
| al hell center | 522055 | 1 | 522055 | 1 |
| alaskanderya | 111801 | 2 | 261027 | 4 |
| alkaseem | 95743 | 3 | 174018 | 5 |
| medhatya | 69463 | 4 | 130514 | 7 |
| msayab | 62433 | 5 | 104411 | 8 |
| sd al handyaa | 50715 | 6 | 87009 | 10 |
| al mashroaa | 43920 | 7 | 74579 | 12 |
| Mahaweel | 32980 | 8 | 65257 | 16 |
| hashimya | 30979 | 9 | 58006 | 16 |
| aby kraak | 28378 | 10 | 52205 | - |
| alkfel | 25370 | 11 | 47460 | - |
| alshumally | 19335 | 12 | 43505 | - |
| Al amam | 14390 | 13 | 40158 | - |
| altalea,a | 9267 | 14 | 37290 | - |
| neil | 8482 | 15 | 34804 | - |
| jerff al naser | 6533 | 16 | 32628 | - |

Same Reference as before. the Ministry of Planning and Development Cooperation

By looking at the urban system of Babylon province and the size of its residents, the province needs a city with a maximum size of a city in the second place alone, the smallest city in the third place, its population (from 260,000 - to 174,000) and the increase in the size of the city is calculated according to the year of the goal to complete the construction of the new city. By adopting the average family size in Iraq (6) individuals [Housing Policy,2010], the number of housing units contained in the proposed new city is (43,340-29,000) housing units, depending on the population of the city in the rank Second and third, respectively, these housing units are a modest figure relative to the housing need in the province, which amounts to (500,000) housing units for the year 2035 according to estimates of the population (277,000) urban areas units And (223,000) rural areas units [Structural Plan,2010]

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

By conducting calculations according to the ratios of the various services required, housing densities, road area and green areas (25%) The new city will need 2,162-1,452 hectares, (25 %) Residential units are vertical housing [Housing Policy,2010].

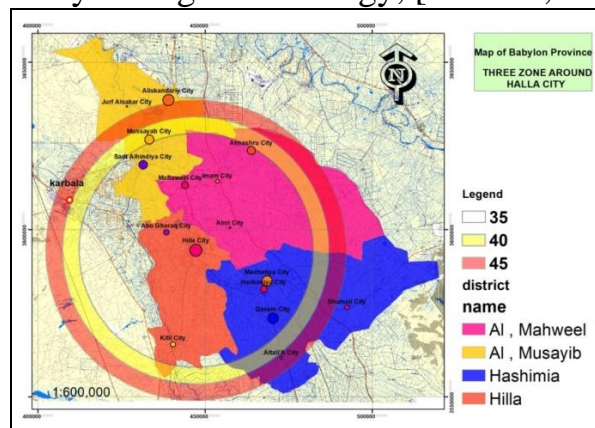
Possible location of the new city

Once the size of the new city and its area for urban policing have been determined (according to the Zeipf rule), we should use Christaller's theory to find a location that is associated with other urban centers in this urban system to maintain balanced and easy-to-access relationships as well as the dependence and interdependence of its economy.

the new cities according to other experiments are located within a distance of (30-50) [HUD,1975], Because of the small size of the province and its extensions, we will adopt three regions: (45,40.35 km), and this area has been adopted by this amount (5) km for the following reasons:

- 1- At the intersection of the two areas, it will determine the shape of a quadrant with an area close to the amount of space required for the new city (2160-1460) depending on the angle of the intersection as will be shown later.
- 2- The preference will be for the remote region as the distance will be an indicator of the decline in the value of the land as we move away from the centers of urban areas.

This will be done through the use of multiple ring buffer as one of the methods of spatial analysis in gis technology, [Demers,2009],see map (4).



Map (4) Of the three areas surrounding Hilla - Babil Province (45/40/35)km
Reference: (GIS) / Based on the administrative maps of The Province of
Babylon / General Authority for Survey

But it's an easy process as much as it needs to classify all the spatial elements we need, we're going to analyze the spatial structure of each district individually because it's administrative units of the center and we choose the influential urban centers (which have been characterized by their impact on

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

the urban system by applying the rule of rank - size) which is on the other hand Population needs centers in the province, as shown in table (3-12) but the distance to the important urban centers we will use the rest of the inner distance of the area surrounding the mother city (30.25.20.15.10) This corresponds to what has been mentioned above and considers the graduality of the city's areas of influence and use as a source of enhanced administrative function of the new city.

Table (7) Urban centres used in spatial analysis (spatial impact centres)

| Administrative formation | Urban Population 2020 | Rank | The population size assumed according to the Ziv rule | Matching the realistic rank |
|--------------------------|-----------------------|------|---|-----------------------------|
| al hella center | 522055 | 1 | 522055 | 1 |
| alaskanderya | 111801 | 2 | 261027 | 4 |
| alkaseem | 95743 | 3 | 174018 | 5 |
| medhatya | 69463 | 4 | 130514 | 7 |
| msayab | 62433 | 5 | 104411 | 8 |
| sdat al handyaa | 50715 | 6 | 87009 | 10 |
| al mashroaa | 43920 | 7 | 74579 | 12 |
| Mahaweel | 32980 | 8 | 65257 | 16 |
| hashimya | 30979 | 9 | 58006 | 16 |

Reference: (GIS) / Based on the administrative maps of The Province of Babylon / General Authority for Survey

Small urban centers that are not visible in the previous schedule will be neglected from the analysis process ,previous table (6).

In the analysis process, we will analyze urban centers in the same district to ensure that there is an intersection of different ranges.

New city locations in Al-Musayib district

Al-Musayib district contains three important urban centers (Alexandria, Al-Musayib and Seda al-Hindi) as shown in schedule (3-8)

Locating of New Cities and Soil variability

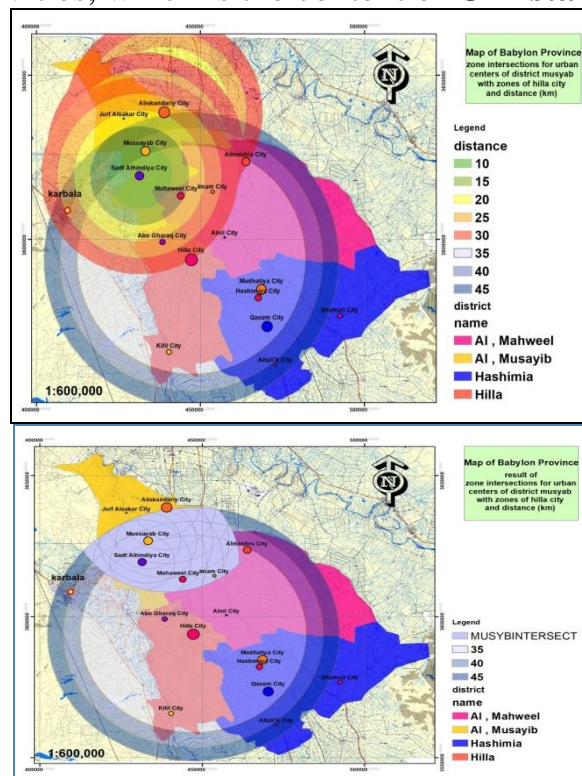
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Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

Table (8) Large urban centers to spend the space and distance from the mother city (Hilla City)

| District | Urban center | Matching the realistic rank | Distance from Hilla City (km) |
|----------|--------------|-----------------------------|-------------------------------|
| | alaskanderya | 4 | 45 |
| msayab | msayab | 8 | 36 |
| | sdat al | 10 | 30 |
| | handyaa | | |

Using multiple ring buffer for urban centers to spend the space by GIS ,see map (5) many zones will be crossed between them on the one hand and between them and the city of Hilla on the other we only have to make the intersection between these words through the feature (INTERSECT) ,map(6). And use the resulting data to choose locations that are of a relatively equal dimension for all Urban centers are located on the last scale of Hilla city ,see table (9) in which case the process of locating or multiple locations will be within the framework of a spatial engineering distribution plan for the population and activities, which is the content of **Christaller's theory**.



map(5) zone intersections for urban centers of district musyab with zones of hilla city and distance (km)

map(6) result of zone intersections for urban centers of district musyab with zones of hilla city and

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

We can organized above in a model in GIS and see Figure (5)

To produce a table (9) and contains the intersection areas of the district surrounding the mother city and the large urban centers in the district of Al-Musayib.

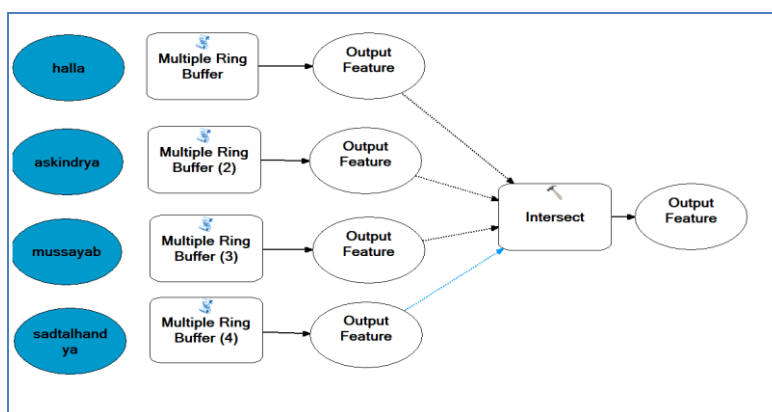


Figure (5) GIS analytical process model for the district of Al-Musayib
Table (9) the values of the first 8 out of 98 intersectional ranges between the zones of urban centres for the district of Al-Musayib

| NO | FID_askindrya_multibuffer | distance | FID_musayib_multibuffer | Distance_1 | FID_sadtalhandya_multibuffer | Distance_12 | FID_hallabuffer | Distance_12_13 | ALL DISTANCE |
|----|---------------------------|----------|-------------------------|------------|------------------------------|-------------|-----------------|----------------|--------------|
| 1 | 0 | 10 | 0 | 10 | 1 | 15 | 2 | 40 | 75 |
| 2 | 0 | 10 | 0 | 10 | 1 | 15 | 3 | 45 | 80 |
| 3 | 0 | 10 | 0 | 10 | 2 | 20 | 2 | 40 | 80 |
| 4 | 0 | 10 | 0 | 10 | 2 | 20 | 3 | 45 | 85 |
| 5 | 0 | 10 | 1 | 15 | 2 | 20 | 2 | 40 | 85 |
| 6 | 0 | 10 | 1 | 15 | 2 | 20 | 3 | 45 | 90 |
| 7 | 0 | 10 | 1 | 15 | 3 | 25 | 2 | 40 | 90 |
| 8 | 0 | 10 | 1 | 15 | 3 | 25 | 3 | 45 | 95 |

Reference: (GIS)

Table (9) contains the first (8) values out of (98) and represents the intersection areas between the different regions, To explain the table we take the value of the area of intersection 1 it is 10 km from Alexandria and from the Al-Musayib 10 km and from the Sadat al Handyaa 15 km and from the city of Hilla 40 km and so on the rest of the tables but the last column in the table it using the statistics within the program (ATTRIBUTE TABLE - FIELD CALCULATOR) after the development of a new column , Through this statistical process, we will get a column that includes the total distances of the intersection area from all regions, as in our example of intersection

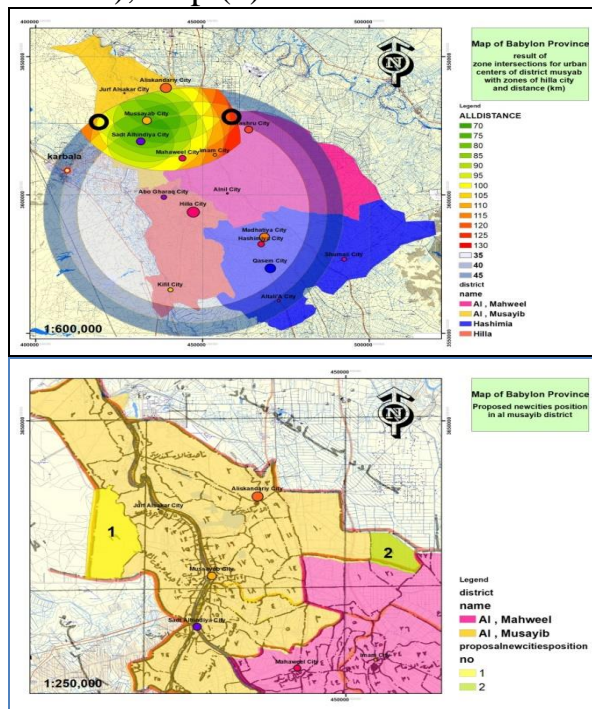
Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

area 1, the total is equal to (75) km, so all intersection zones will be sorted to see the largest total that achieves a typical divergence from all other urban centers , this is displayed through the use of the feature (SYMPOLOGY), which will display the zones of the intersection By total spacing distances in a choaked gradient that allows those looking to the map to know the range, According to the administrative boundaries of the district and this chosen location will determine the province or part of it and according to the scale of the drawing and map (7) shows this, it should be noted that we propose and determine more than one location for each district , the different qualities of each site to determine more than one alternative to be trade-off later and choose the best alternative.

When these sites are projected on the general provincial index of Babylon counties, it will be found that site 1 is located on the southern part of the county of 19 (al haswaa al janoopya) within the district of jerff al naser and with a scale of drawing (1:125,000) and location No. 2 is located in the county of (28 jazerat Alexandria) within the district of Alexandria and on a scale of drawing (1:10000), map (8).



Map (7) Analysis of intersection pronouncement of the district of Al-Musayib and selected areas

Map (8) Kadstro maps located within the selected locations for the province of Al-Musayib

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

New city sites in Al-Mahweel, Hashemite and Hilla districts

The same previous technical procedures are followed for all districts of the province to produce in total the sites of number (7) as possible sites of the new city in The Province of Babylon.

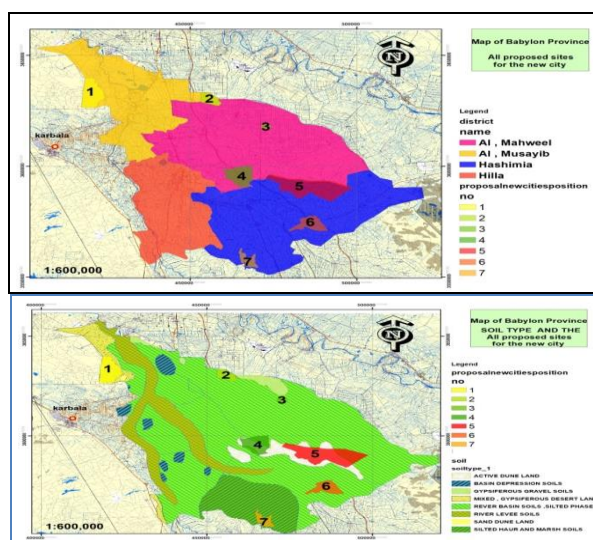
Table (10) Counties located on the selected sites of the new city - Babylon

| No | County No | County name | District | Nahyaa | Dist.from halla in km |
|----|-----------|---------------------------------------|----------|----------------|-----------------------|
| 1 | 19 | al haswaa al janoopya | msayab | jerff al naser | 45 |
| 2 | 28 | jazerat Alexandria | msayab | alaskanderya | 37 |
| 3 | 6 | Arady aljezeraa | Mahaweel | al mashroaa | 35 |
| 4 | 45 | Al jadwel | Mahaweel | neil | 18 |
| 5 | 11 | Al kamesyaa | hashimya | medhatya | 40 |
| 6 | 13 | Alshumally oa am alfilfl oa kshkshyaa | hashimya | alshumally | 43 |
| 7 | 21 | Oaoa'a | hashimya | altalea,a | 42 |

Reference: (GIS)

Soil in Babylon province

Babylon province contains eight types of soil, as shown in the map (10) [Björnck,1960].



Map (9) Counties located on the selected sites of the new city – Babylon

Reference: (GIS)

Map (10) Soil types in Babylon province and selected sites for the new city - Babil province

Reference: Dr. Bjornke, Iraq's territory and soil conditions, Ministry of Agriculture - Baghdad, 1960

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

the given digital values according to the standard preference addressed according to the physical characteristics of the theoretical part of the research as described in figure (3-10) resulting from the intersection of two layers, both soil and proposed sites.

Table (11) Counties located on selected sites of the new city - Babylon and soil type and assessment

| No | County No | County name | District | Nahyaa | Soil type | Evaluation |
|----|-----------|--|--------------|------------------|--------------------|------------|
| 1 | 19 | al haswaa al janoopya | msayab | jerff al naser | Sandy laom | 5 |
| 2 | 28 | jazerat Alexandria | msayab | alaskandery a | Silty clay laom | 2 |
| 3 | 6 | Arady aljezeraa | Mahawee l | al mashroaa | Silty clay laom | 2 |
| 4 | 45 | Al jadwel | Mahawee l | neil | sand | 1 |
| 5 | 11 | Al kamesyaa | hashimya | medhatya | sand | 1 |
| 6 | 13 | Alshumally oa am alfilfl oa kshkshyaa | hashimya | alshumally | Silty clay laom | 2 |
| 7 | 21 | Oaoa'a | hashimya | altalea,a | Silty clay laom | 2 |

Reference: (GIS)

Soil criteria weight relative to other site criterias for new cities

A survey of expert opinion was prepared for several criteria selected to evaluate the site for new cities as shown in the table (12) and the results were that the soil ranked (7) out of 10 selected criteria while the return of the land ranked first.

table (12) site criterias for new cities weights and ranks

| rank | code | Criteria | weight |
|------|------|--|---------|
| 1 | J | ownership | 1 |
| 2 | E | Natural hazards | 0.98871 |
| 3 | G | Proximity to major transport hubs | 0.98633 |
| 4 | C | Surface water | 0.96345 |
| 5 | H | Development potential | 0.95929 |
| 6 | I | Degree of reclamation and production efficiency | 0.93627 |

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

| | | | |
|----|---|---------------------------|---------|
| 7 | A | Soil | 0.92676 |
| 8 | B | Topographical | 0.85574 |
| 9 | F | Proximity to large cities | 0.74313 |
| 10 | D | Climate | 0.72812 |

Reference :Expert Questionnaire Results 2021/

https://docs.google.com/forms/d/e/1FAIpQLSeH7LLwZ76L7fUUclUtxrFHUaUPN2txX4XMPWYk7WODJoIFxw/viewform?usp=pp_url

Calculating laboratories for soil criteria

All criteria are calculated relative to (1) as the highest value in order to make all transactions of the standards equal weight when calculated despite the different ratings used but superior to another criterion will be different weights to avoid bias to one standard without another (this is the essence of using the method of multi- criteria analysis)

table (12) Calculating laboratories for soil criteria

| | no | SOIL | max | factor1 |
|----------|--------|------|-----|---------|
| | site 1 | 5 | 5 | 1 |
| | site 2 | 2 | 5 | 0.4 |
| Criteria | site 3 | 2 | 5 | 0.4 |
| A | site 4 | 1 | 5 | 0.2 |
| | site 5 | 1 | 5 | 0.2 |
| | site 6 | 2 | 5 | 0.4 |
| | site 7 | 2 | 5 | 0.4 |

Reference: (GIS)

The criteria selected for the location of new cities can be calculated with the same mechanism as the soil standard and beaten with weights obtained from the expert questionnaire for an integrated evaluation process. [Linkov,2020].

The location of the new city selected according to the soil standard

The site chosen according to the soil standard is site No. 1, as indicated in table 13 because it has a mixed sand soil, which is one of the soils supporting the urban structure as mentioned in advance, so he got the highest rating relative to the rest of the sites, which is land not preferred by farmers in terms of agriculture because of its large absorption of water and the difficulty of watering it, which reduces the problems of land tenure.

Locating of New Cities and Soil variability

abbas Alawi Mutlak Al-knany

Asist. Prof. Dr Frias Thamer Hamudy Al-rawi

Table(13)The location of the new city selected according to the soil standard

| N | Coun | County name | District | Nahyaa | Soil type | Evaluati |
|---|-------|--------------------------|----------|-------------------|------------|----------|
| o | ty No | | | | | on |
| 1 | 19 | al haswaa al janoopya | msayab | jerff al naser | Sandy laom | 5 |

Reference: (GIS)

Conclusions

- 1- The new cities are part of the urbanization policy and it are far from the mother city at a specified distance .
- 2- Get a comprehensive view and good spatial analysis when using modern technologies according to the foundations of planning theories .
- 3- The selection of the appropriate soil for these cities in a balanced manner with other criteria as a fundamental supporter of all different uses of land.

Recommendations

- 1- Adopt the method of research in the determination of the size and location of the new city, because it contributes to the preservation of urban order, and contributes to its balance.
- 2- Consider the new city as a comprehensive rural and urban development and a means of applying housing standards in the rural before urban areas.
- 3- Attention to soil as an important criterion because it will require treatment for each square meter of selected area, i.e. for each housing unit, each road and various other uses, causing an increase in the cost of establishing these cities.

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abbas Alawi Mutlak Al-knany

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المستخلص

ان خصوبة الاراضي في عموم محافظة بابل وصغر مساحتها, وباعتبار ان مركزها مدينة الحلة من المدن الكبيرة التي تعاني من المشاكل المتعددة على مختلف القطاعات خصوصا ايجاد الاراضي السكنية , جعل من سياسة المدن الجديدة من الحلول المستخدمة في معالجة تلك المشاكل المتعددة والمتنوعة مع وجود المبادرة من قبل الدولة لإنشاء مدن جديدة في جميع المحافظات, فكانت مشكلة البحث بوجود تحدي تحديد الموقع الملائم للمدينة الجديدة في محافظة بابل وفق الطرق التقليدية وعدم مراعاة التربة مصدر للمشاكل المستقبلية لتلك المدن .

والهدف اتخاذ القرار التخطيطي الملائم للتوقع المكاني للمدن الجديدة وفق الاساليب التخطيطية والمعايير المحلية الملائمة بما يضمن كفاءتها وسهولة تنفيذها وضمان محاور مستقبلية للتوسع على المدى البعيد و الاهتمام بمعيار التربة عند اختيار الموقع , وفرضية البحث هي الموازنة بين الاهمية للتربة والمعايير التخطيطية الجغرافية والبيئية والعناصر المهمة التي ينبغي مراعاتها عند تحديد الموقع لمدينة جديدة باعتبارها جزء من نظام حضري سليم باستخدام التقنيات والبرمجيات الحديثة . كما ينبغي التعرف على مفهوم المدينة الجديدة التي هي جزء من سياسة الانتشار الحضري ونظريات التخطيط الحضري والاقليمي المنظمة لهذه السياسة و انواع التربة الداعمة للهياكل العمرانية والبيئة الحضرية الملائمة لتلك المدن من اهم الاستنتاجات التي توصل اليها البحث عدم النظر الى المدن الجديدة على انها توسع عمراني للمدن الكبيرة والابتعاد بمسافة تخطيطية ملائمة عن المدينة الام , واختيار التربة الملائمة لتلك المدن بشكل متوازن مع المعايير الاخرى باعتبارها داعمًا اساسيا لجميع استعمالات الارض المختلفة, وكان من اهم التوصيات اعتبار المدينة الجديدة تنمية شاملة ريفية وحضرية, و الاهتمام بالتربة كمعيار مهم لأنه سيتطلب اجراء معالجة لكل متر مربع من المساحة المختارة , اي لكل وحدة سكنية وكل طريق ومختلف الاستعمالات الاخرى مما يسبب زيادة في تكلفة انشاء تلك المدن.

الكلمات المفتاحية: المدن الجديدة , حجم المدينة , المدينة الام, موقع المدينة, التربة