Migration Letters

Volume: 20, No: S8(2023), pp. 758-776

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)
www.migrationletters.com

Building A Spatial Suitability Model for Land Use in The City of Nasiriyah

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Abstract

This research seeks to evaluate the efficiency of urban land use in the city of Nasiriyah by using some spatial and statistical tools available in the geographic information systems environment represented by the (GIS) program. The city of Nasiriyah suffers from random and irregular spatial expansion, which was not taken into account spatial suitability. For spatial expansion and urban growth in the present and future, green lands have been encroached upon within the boundaries of the basic design of the study area, as their type has been changed from green lands to residential units as a result of weak legislation and the absence of the rule of law, especially after the events of 2003. It has become clear that there is a spatial discrepancy. The distribution of urban services at the level of the city's neighborhoods is significant in terms of their spatial distribution and functional efficiency. It is difficult to work on redistributing those services in terms of the economic costs that will be spent on them as well as the reflection of their negative effects, whether psychological or historical, on the residents of the city of Nasiriyah. Therefore, spatial analyst applications were used within the Geographic Information Systems (GIS) environment for the purpose of building a spatial suitability model that contributes to selecting the best suitable locations for distributing urban services, including educational and health services in the city of Nasiriyah in the future, which can be based onto the basic design planners and decision makers when they choose the sites to distribute these services, a set of factors and conditions have been identified that have an impact in determining the most appropriate sites for distributing these services, classifying them, then giving them the appropriate weights, and then performing the weighted matching process (overlay), according to the weights that were given for the purpose of building a spatial suitability model in order to obtain the best locations located within the boundaries of the basic design to sign those urban uses in the city of Nasiriyah. The researcher worked to use the techniques available within geographic information systems and by relying on remote sensing data to build a model. Spatial suitability model for the most suitable locations that can be used in signing and building new urban services.

Keywords: *Geographic Information Systems (GIS), Spatial suitability model, urban services.*

Introduction

This research seeks to evaluate the efficiency of urban land use in the city of Nasiriyah by using some spatial and statistical tools available in the geographic information systems environment represented by the (GIS) program. The city of Nasiriyah suffers from

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random and irregular spatial expansion, which was not taken into account spatial suitability. For spatial expansion and urban growth in the present and future, green lands have been encroached upon within the boundaries of the basic design of the study area, as their type has been changed from green lands to residential units as a result of weak legislation and the absence of the rule of law, especially after the events of 2003. It has become clear that there is a spatial discrepancy. The distribution of urban services at the level of the city's neighborhoods is significant in terms of their spatial distribution and functional efficiency. It is difficult to work on redistributing those services in terms of the economic costs that will be spent on them as well as the reflection of their negative effects, whether psychological or historical, on the residents of the city of Nasiriyah. Therefore, spatial analyst applications were used within the Geographic Information Systems (GIS) environment for the purpose of building a spatial suitability model that contributes to selecting the best suitable locations for distributing urban services, including educational and health services in the city of Nasiriyah in the future, which can be based onto the basic design planners and decision makers when they choose the sites to distribute these services, a set of factors and conditions have been identified that have an impact in determining the most appropriate sites for distributing these services, classifying them, then giving them the appropriate weights, and then performing the weighted matching process (overlay), according to the weights that were given for the purpose of building a spatial suitability model in order to obtain the best locations located within the boundaries of the basic design to sign those urban uses in the city of Nasiriyah. The researcher worked to use the techniques available within geographic information systems and by relying on remote sensing data to build a model. Spatial suitability model for the most suitable locations that can be used in signing and building new urban services.

Research problem:

The problem of the research is that in many cases, sites for distributing urban land uses in the study area are chosen without taking into account a correct scientific approach that takes care of choosing the most suitable sites for spatial expansion and spatial distribution of urban services, which causes encroachment on the green spaces located Within the limits of the foundation design in the study area.

Research hypothesis:

It is possible to rely on the precise scientific spatial analysis methodology, which includes the most prominent factors affecting the spatial expansion and urban growth of the city, as well as the distribution of urban services in the city. These factors are economic, urban, environmental, as well as social, which contribute to the possibility of choosing the most appropriate and appropriate location for spatial expansion in the city.

Research objective:

The research seeks to study and build a spatial suitability model for the cadastral expansion of the city of Nasiriyah and the distribution of its urban services. This is done by using the spatial analysis methodology and using modern geographic techniques present within the Geographic Information Systems (GIS) environment through the application of the Spatial Analyst, and then applying it to The study area as a model for the purpose of determining the most suitable locations for spatial expansion, urban growth, and future distribution of urban land uses for the city of Nasiriyah.

Research methodology:

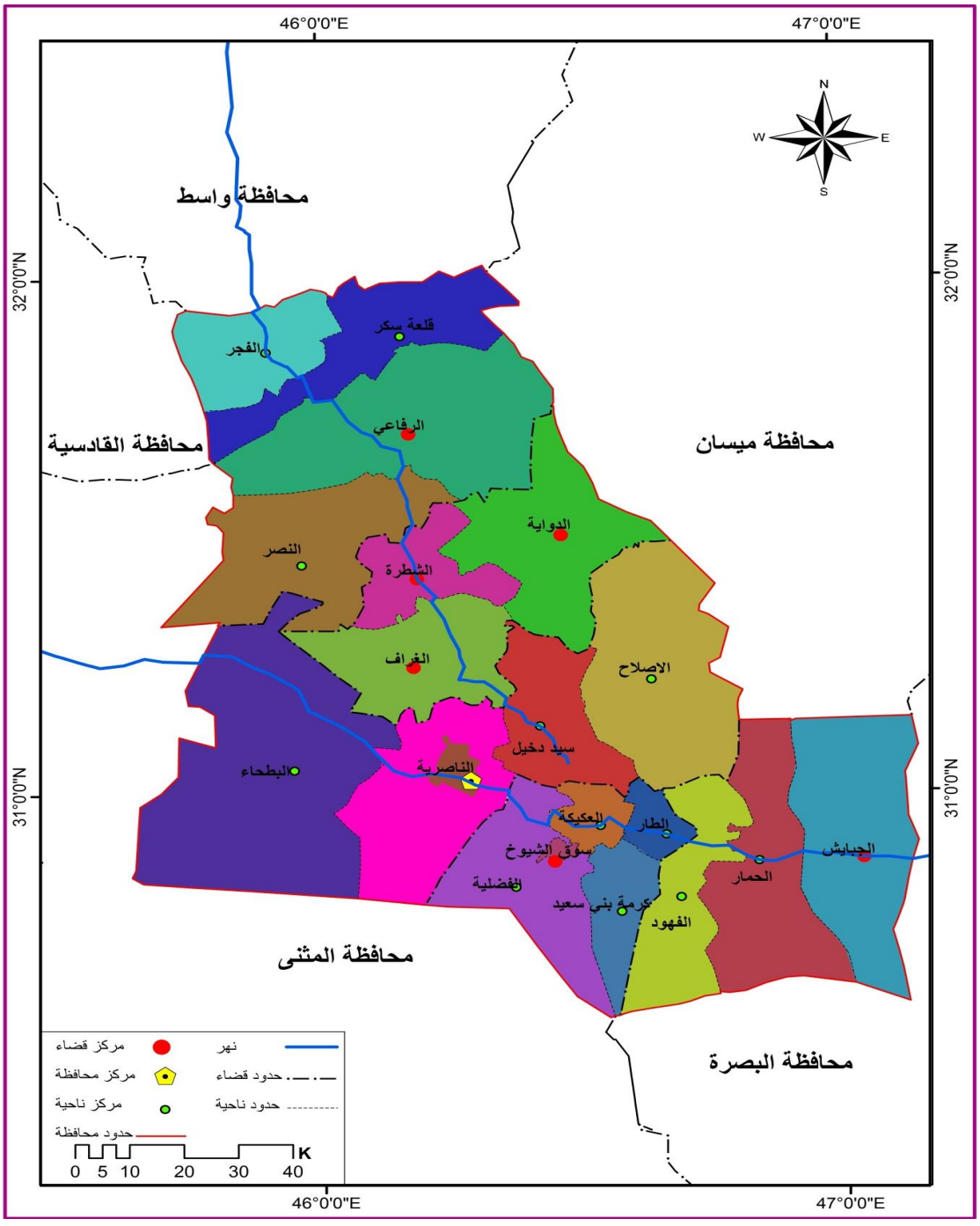
In writing her research, the researcher relied on the analytical approach that was used in analyzing data related to the research topic and dealing with it technically using the ARC GIS program to produce the maps in the final form.

Spatial and temporal limits of the study.

The city of Nasiriyah is defined between a circle of latitude (5°30 - 10°31) to the north and an arc of longitude (10°46) to the east. It is the center of Dhi Qar Governorate. It is clear from map (1) that its administrative borders are with the governorate, as it is bordered to the north by Al-Gharraf district and to the west. Al-Batha District, to the northeast it is bordered by Sayed Dakhil District and Al-Islah District, and to the south it is bordered by Ur and Al-Fadliya District. It occupies an area of (26,962.5) hectares, and includes (43) residential neighborhoods, as shown in Map (2).

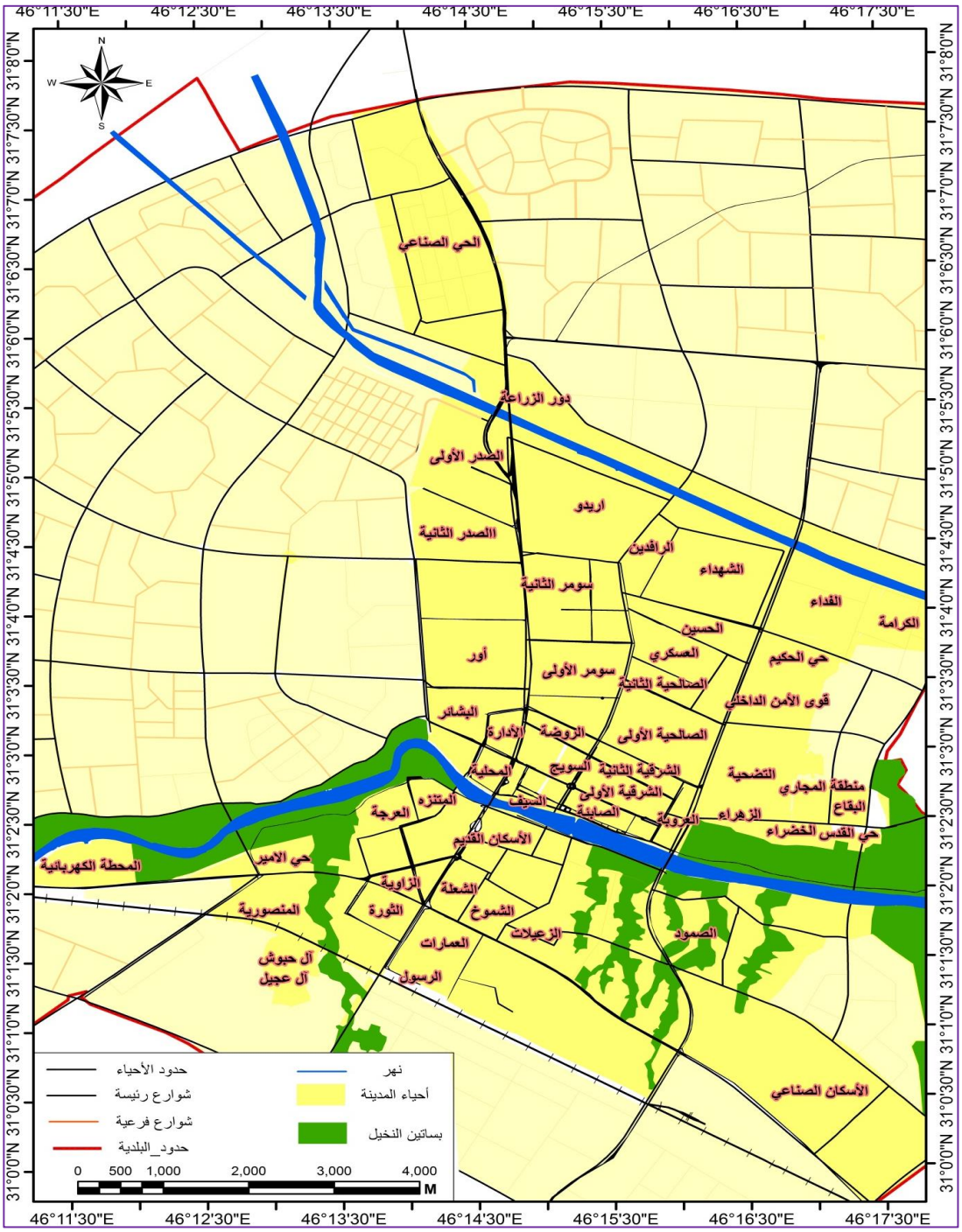
The temporal dimension: It includes knowledge of the spatial expansion and urban expansion within the updated basic design of the city of Nasiriyah for the year (2011 AD) with its future prospects until the year 2040.

Map (1) Location of the study area in Dhi Qar Governorate.



Reference: The researcher based on the program (Arc gis10.8).

Map (2) Administrative division of the city of Nasiriyah.



Reference: The researcher based on the program (Arc gis10.8).

First: The concept of evaluating the spatial suitability of educational and health land uses in the city of Nasiriyah.

Evaluating the spatial suitability of any geographic phenomenon determines its future face, through the methodology of spatial analysis found in the Geographic Information Systems (Arc GIS) environment, and given the location of the city of Nasiriyah on the bank of the Euphrates River, which helped in its spatial growth and urban development, and this in turn was reflected in the way in which uses are distributed. The urban land in it, whether for residential, commercial, industrial, or service uses, is on the one hand, and on the other hand, the city's suffering throughout the stages of cadastral growth in its

basic designs has expanded irregularly. This has contributed to the emergence and development of the phenomenon of informal housing that has recently spread in All cities of developing countries and Iraq, including them in general and the city of Nasiriyah in particular. The emergence of these slums came at the expense of empty lands planned for future spatial expansion. It also led to the conversion of these lands to residential use in light of the absence of the rule of law, especially after the year (2003) and the change in The types of land uses that were planned within the basic design prepared for the city. Spatial suitability was defined as a technical method that seeks to measure the spatial relationships between geographical phenomena, which ensures the interpretation of spatial relationships and benefiting from them in the future, including understanding the reasons for the presence of phenomena on the surface of the Earth and predicting the behavior of those phenomena. In the future, (1) as "evaluating the spatial suitability of urban land uses" means "the process of estimating the potential available on the land for various types of land uses and for all available alternatives," land use planning must be built on the basis of rationality by evaluating the available resources, and the desired goal of the process is Evaluation is determining the most appropriate area or direction to complete the process of spatial expansion of the city, whether now or in the future. (2) It can also be defined as "a means of planning the uses of the land, through which the performance provided by the land can be predicted through the capabilities and constraints expected from one of the uses." The purpose of the evaluation is to determine the best use of the land from the actual and potential aspects, taking into account the interconnection with the various areas in the city. It also provides spatial information (qualitative, quantitative) about the effects resulting from each use, the possibility of its sustainability, and the requirements for its work, (3) It is common that the principle of spatial suitability does not work on one phenomenon without another, but rather is linked to existing relationships between all geographical phenomena, whether these phenomena are adjacent or far from each other. Therefore, it can be said that the phenomena are the ones that gain the type of relationship and their future dimension and thus become the phenomena The place is constantly changing over time, which indicates a change in the value of the place. Therefore, it requires the planner and decision-makers to track and observe these variables through field study, so that they can transform the phenomenon into spatial values that can be used statistically, and the geographer has an active role in the process of signing these variables. The uses are spatially and planningly as a result of his knowledge of the spatial relationship and services in the city, and he can also identify places of dysfunction in them by reading the philosophy of place theoretically on the one hand and applying the engineering of the place on the other hand. (4) Therefore, the process of sustainable land evaluation and design of urban land uses is built on the basis of sustainable development. Through integration between suitability for spatial expansion and urban growth with development suitability

The environmental impacts of urban land uses are evaluated for the purpose of arriving at the best design for urban land uses within the scope of the city's basic design. The process of spatial expansion and selecting urban growth areas in the basic designs is carried out in an unorganized manner and without following a correct scientific approach that takes into account the spatial suitability of this expansion. This caused the depletion of large areas of agricultural land as a result of cadastral encroachment on those lands, so the researcher proceeded to use the Spatial Analyst application located in the geographic information systems environment and perform the weighted matching process (Overlay Weighted) in evaluating spatial suitability for uses of spatial suitability.

Second: Building a spatial suitability model:

The model is one of the patterns that contains a set of sequential steps that lead the researcher to the desired result. What is meant by the model is "a simple representation of the phenomenon or system that shows the various stages of the development of the

phenomenon and its relationship to the spatial and non-spatial variables that affect it and are affected by it, and the reclassification of those relationships and their results."

Geographic information systems are concerned with simulating spatial reality and representing it in various ways, means, and projections. These means and methods of representation are activated through what is called spatial models. The spatial model is a representation of spatial reality (real geographic phenomena or features), and the spatial model is considered the minimum. Of information, methods, and mathematical formulas through which the real world is represented and simulated after processing this geographic information and entering it into the computer, (5) and the signature of land uses represents one of the main goals in designing cities, because it works to provide service to the city's residents and meet their varying desires with ease and ease. The geographer helps, with a major and effective role, in the spatial and temporal distribution process within the boundaries of the basic design of the city, due to the understanding and awareness that geographical knowledge provides of the spatial relationships of the phenomena of the Earth's surface through studying the philosophy of place, whether from the theoretical or applied side, (6) and as a result of what the evaluation maps have shown. Urban land uses in the city of Nasiriyah result from a wide gap between other planning standards and the reality of actual land uses, through the use of a number of spatial and statistical tools available in the geographic information systems environment. The delegation produced several digital maps that show the extent of the difference between the two for the purpose of completing the research methodology in developing the most appropriate and realistic solutions in accordance with the research objectives. By employing the capabilities available within the (ARC GIS) program to serve and achieve the desired goals in this research and display the results and recommendations in their final form in the form of digital maps. Accordingly, reliance was placed on the Spatial Analyst applications available within the Geographic Information Systems (GIS) environment. To build a spatial suitability model that contributed to proposing the best sites for urban land uses and directing spatial expansion within the basic design of the study area that planners and decision makers look to when choosing the best sites for urban land uses. In addition to that, first submit proposals regarding the use of the lands that were designed within The updated basic design has not been implemented to this day. Despite the preparation of the basic design that was updated in the year (2011) and allocating spaces for each urban use, the concerned authorities did not work to implement those uses in a manner consistent with the design period that was specified for its implementation, except for the simple part. Which is being implemented. The researcher worked to identify those projects that were residential projects, the most important of which are (the Municipality Complex, the Follow-up Complex, the Dream of Life Complex, the Peace Complex, the Investment Authority Complex, the Imam al-Kadhim University Complex, the University Residential Complex, the Higher Health Institute Complex, The Passport Complex, the Ahrar Complex, the Municipal Inspectorate Complex, the Real Estate Registration Complex, the Judges Complex and the Treasury Complex) are located on all the borders of the basic design and as shown in map (1). The area that was implemented was estimated at (416.5) of the total area of the basic design. The updated area has an area of (8288 hectares), so the researcher worked through this research to present a proposal to implement the lands that were planned within the updated basic design, while the other proposal was to give the best places on which the city will expand spatially in the future in line with the population increase. The process of spatial suitability in geographic information systems can be divided into two parts, the first of which is defining the standards for spatial suitability for those urban uses, while the second part is applying those standards within the geographic information systems environment and applying them to urban uses in the city of Nasiriyah: .

A- Determine the criteria:([3])

The process of determining the appropriate standards for establishing any modern urban use on the ground is considered one of the difficult matters and the reason for this is due to several considerations that must be taken into account when carrying out the spatial suitability of any urban use. The results are either far from Reality, that is, in a (theoretical) way only. For example, if we wish to determine the best location for any urban use in the study area, then it is necessary to set a priority for these criteria in order to come up with the best results, and because the subject of the research is related to determining the spatial suitability of urban land uses within the basic design limits of the study area. Therefore, it is necessary to determine several criteria that must be taken into account before conducting the spatial suitability process after determining the type of use to be created. For example, when choosing the best option for establishing polluting industries, the following is required:

1 -It should be far from residential neighborhoods, and here we need a layer for residential areas.

1- It should be close to transportation roads in order to reduce the cost of the project, so we need a road layer.

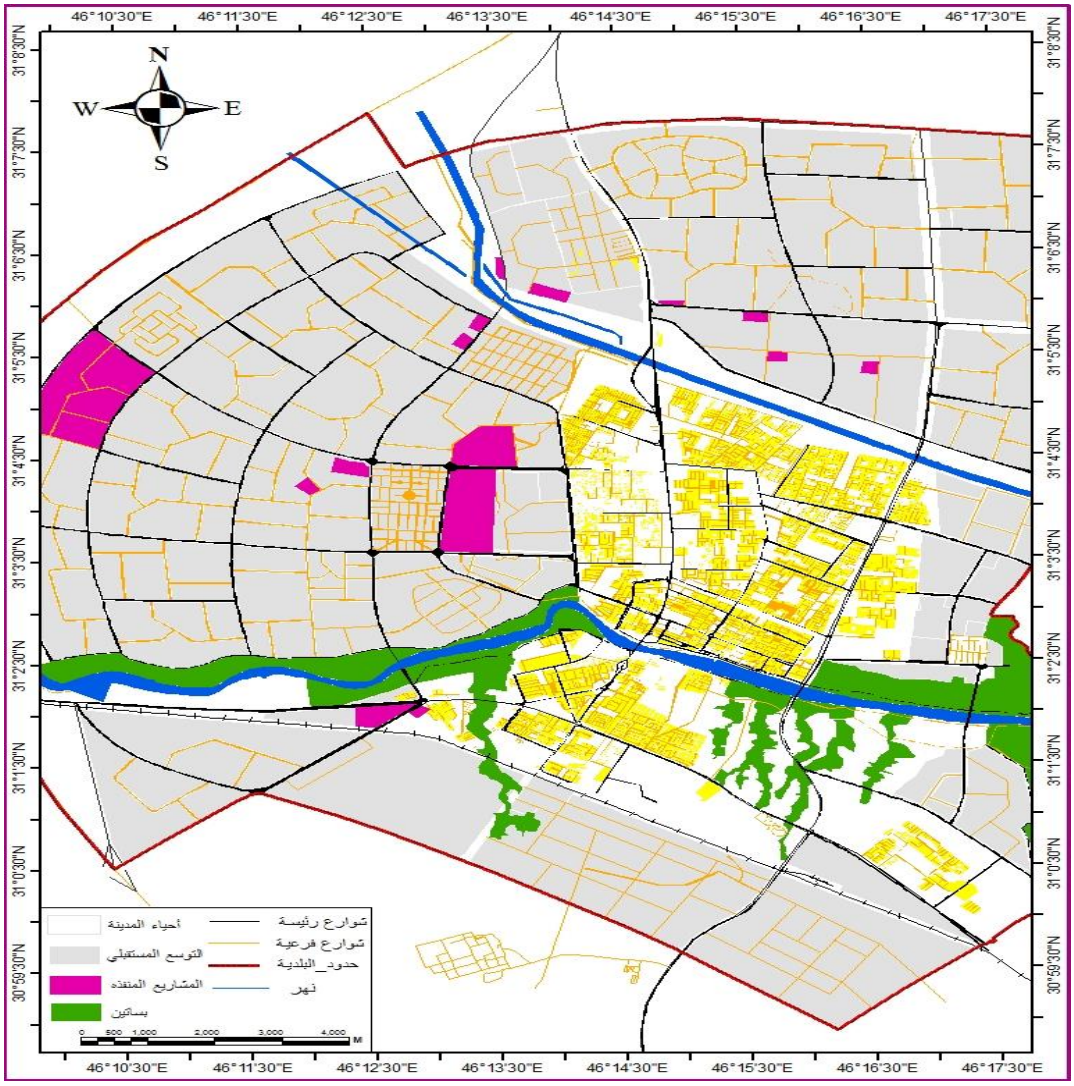
3 -Using vacant and flat lands, we need the slope of the land.

4 -It requires knowing the direction of the prevailing winds in the city, so that the wind does not transport industrial pollutants as it blows, which would have a negative impact.

On the health condition of the city's residents, as it requires that it be in the opposite direction to the prevailing winds, and here we need a layer in the direction of the prevailing winds.

[3] The researcher sought the help of some specialists (engineers and surveyors) in order to find out some of the conditions that must be met for the purpose of establishing the best sites for some uses of urban land.

Map (1) of the residential projects that were implemented within the updated basic design in the city of Nasiriyah for the year 2021.



Refence: The researcher, based on the Arc GIS 10.8 program.

5- Since it is necessary to choose sites close to water sources, i.e. near the Euphrates River, we need a water layer.

6- Also, one of the important criteria that must be taken into consideration is land ownership, as it must be confirmed that the land belongs to the state or to the company implementing that industrial project. In addition, the prices of these lands must be as low as possible. We need a class with land ownership and a class with land ownership. others in those lands.

Third: The stages of implementing spatial suitability within the geographic information systems environment.

The most important steps in the implementation stage that must be followed for the purpose of completing the spatial fit process. We take into account that there is more than one way to accomplish spatial fit in (GIS). The first method was the matching process (overlay), which indicates that it is “performing a certain match.” Between two layers in order to show another new layer that can show the extent of interconnection or other, and also one of the tools of spatial analysis is weighted overlay, which represents performing a match between several disparate layers after giving (different weights) to any of the layers so that we can obtain on a new layer called the “spatial suitability” layer, and in

this research we will rely on another method, which is considered one of the most reliable methods of work and can give flexibility to decision makers and planners, which is (Decision makers), in order to choose the most appropriate location to establish the desired use according to several options and not It is linked to a specific location, as it may be owned or from forbidden areas in which no service project can be established, for example (oil forbidden areas, industrial lands, etc.), as this road operates on other roads that do not give such access. Flexibility in work, because it works according to what is known as logic, so the choice of location must fulfill all conditions (100%), while in reality all conditions may not be met in that location in which the service is to be established, and therefore the network calculator method (Raster calculator, which we will adopt in our research, which is called Fuzzy Logic, because it is one of the best ways to achieve spatial suitability, as it works to give a degree of spatial suitability for each study area, but to varying degrees, and decision-makers must choose the most appropriate location. For example, when we want to determine A site for establishing a health center using the Raster calculator method, which gives a network image of each study area, so that it is divided into categories according to the degree of suitability. A certain piece of land may fulfill (90%) of the conditions, while we find another that fulfills (60%), and so the matter remains and the decision is taken. The final decision is in the hands of the decision makers in choosing the appropriate location to establish the project in. In this way, we have helped, through the GIS environment, find scientific and practical solutions better than editing them on paper, and condensing generalities without penetrating into the geography of the region. Through the above, we will work To clarify the most important steps that must be taken into consideration and applied for the purpose of completing the spatial suitability process according to this method, as follows:

1) Open ArcGIS 10.8, and add the Spatial Analyst toolbar to the top of the toolbar within the ArcGIS program.

2) Listing the layers that have been identified as basic criteria for choosing the most appropriate location for the service to be established within the residential neighborhood in the study area. These criteria must be converted to the grid calculator method that only deals with layers in the grid format (Raster).

3) We work to determine the extension of the new layers to be consistent with the extension of the study area, meaning that they have the same coordinates. This is done through the toolbar for spatial analysis and through (option) and choosing an extension (Extent). After that, an extension that corresponds to the study area is chosen.

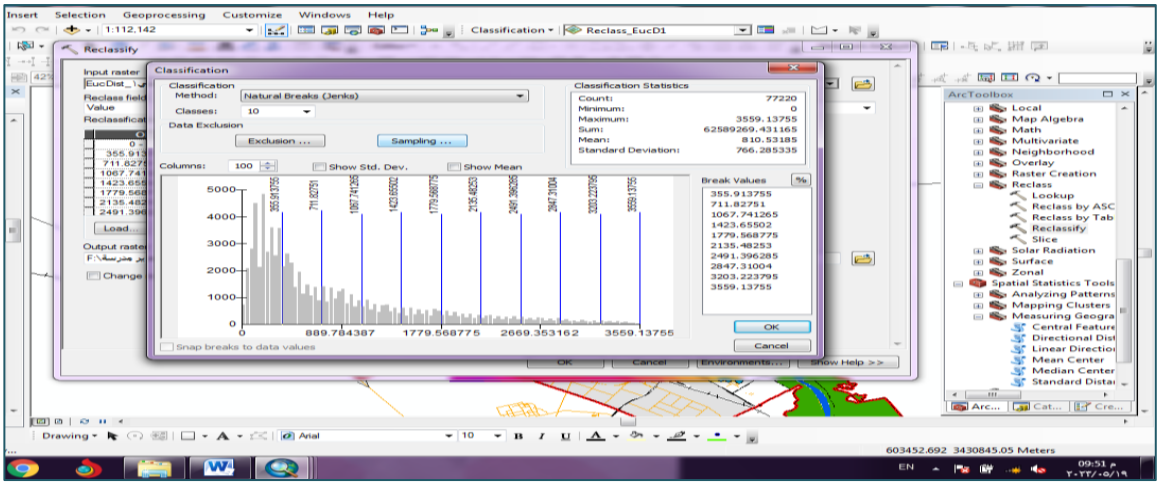
4) Work on calculating the straight distances between the layers (criteria) that have been chosen and converting them into grid layers so that they can be dealt with according to the specific tool. The importance of this step lies in finding the distances between phenomena, whether raster or linear alike, for the purpose of determining spatial suitability. Which one is the best and furthest from the phenomena, and the degree of suitability is more appropriate the farther it is from the current phenomena, and after completing the process of calculating the distances, we reclassify the network layers via the command (Reclassify) into several categories that suit the topic of the research, and we worked on choosing (10) Classes: If the appropriate distance is (100%), it takes the class (10) and returns relatively less and less. See Figure (1).

5) Upon completion of all these steps, we perform the matching using the tool (Raster calculator) and we collect the layers after giving the layers specific weights to each of the layers according to the importance of the layer. At the conclusion of these steps, we determine the best locations to establish any of the projects for which the appropriate location is to be chosen. It is within the design limits of the study area, see Figure (2).

6) The Model system was also used and applied to the land uses that were identified, and they were reclassified and weights were given to each layer for the purpose of selecting

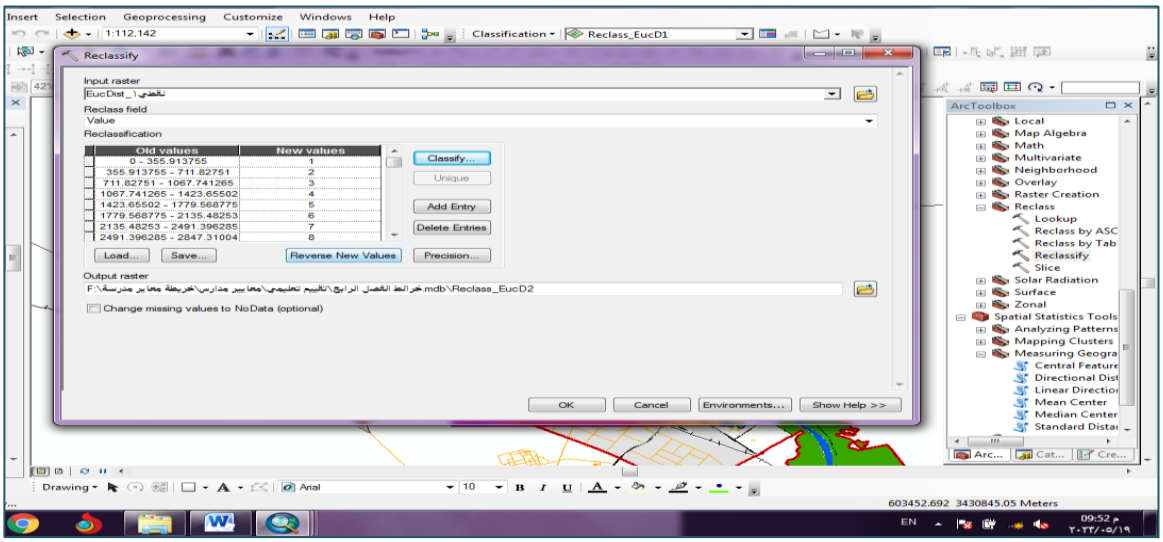
the most appropriate sites for constructing future projects within the boundaries of the basic design of the city. See Figure (3) and Figure (4).

Figure (1) shows the classification process for selecting the best places to provide services in the city of Nasiriyah.



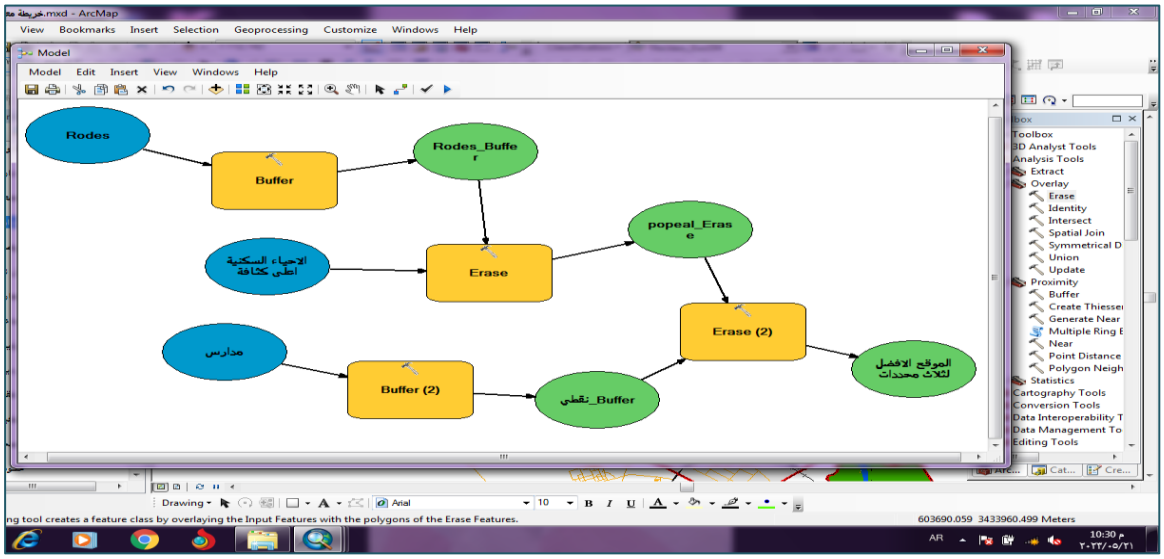
Refence: The researcher, based on the Arc Gis 10.8 program.

Figure (2) shows the process of giving weights for the purpose of choosing the best places to provide services in the city of Nasiriyah.



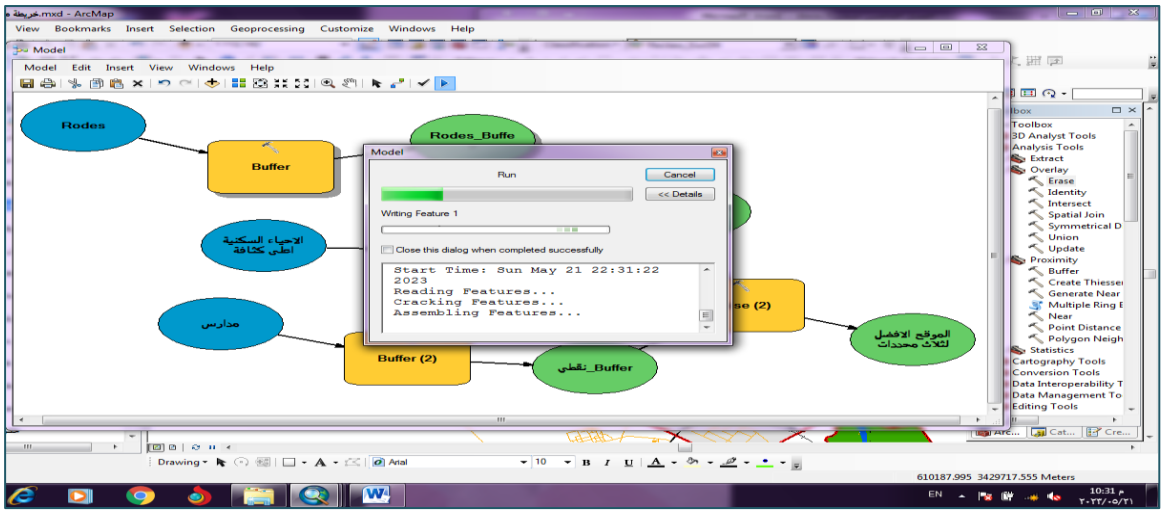
Reference: The researcher, based on the Arc Gis 10.8 program.

Figure (3) Building a model through the (Model) system on service uses in the city of Nasiriyah.



Refence: The researcher, based on the Arc Gis 10.8 program.

Figure (4) shows the completion of the (Model) process for service uses in the city of Nasiriyah.



Reference: The researcher, based on the Arc Gis 10.8 program.

Fourth: Building the model and choosing the best location for land use in the city of Nasiriyah: ([4])(Suitability Model).

Based on what was presented previously about what spatial suitability is and how to implement it within the GIS environment, at this stage we will work to evaluate spatial suitability according to the degree of relative importance, according to the justifications given to each factor in terms of its importance mentioned in the classification process, and we will give weights to these uses. And then after that, we work on conducting the weighted matching process (Weighted Overlay) that exists within the GIS environment and within the Spatial Analyst applications, and these weights will be given to the layers,

[4] The researcher limited the application of spatial suitability to service uses because they suffer from a clear deficiency, in addition to the researcher being able to obtain standards that are appropriate for those services. We will exclude the rest of the urban uses because the researcher was unable to obtain standards that are appropriate for them.

each according to their relative importance, and this process will be worked on within the application Model Builder system, and therefore we will work to apply this suitability to the service uses of the city of Nasiriyah, as follows:

1- Spatial suitability for educational use.

Through the spatial analysis of educational use, we found that about (29.9%) of the city's area is served, and the percentage of the population (2.9%) is out of the total population to whom educational services are provided and they fall within the standard. Therefore, it is necessary to find school buildings. Additional services can be provided and meet the needs of the growing population, as new school buildings can be constructed in the locations shown in Map (2) that require the evacuation of classes (the following criteria). See Table (1).

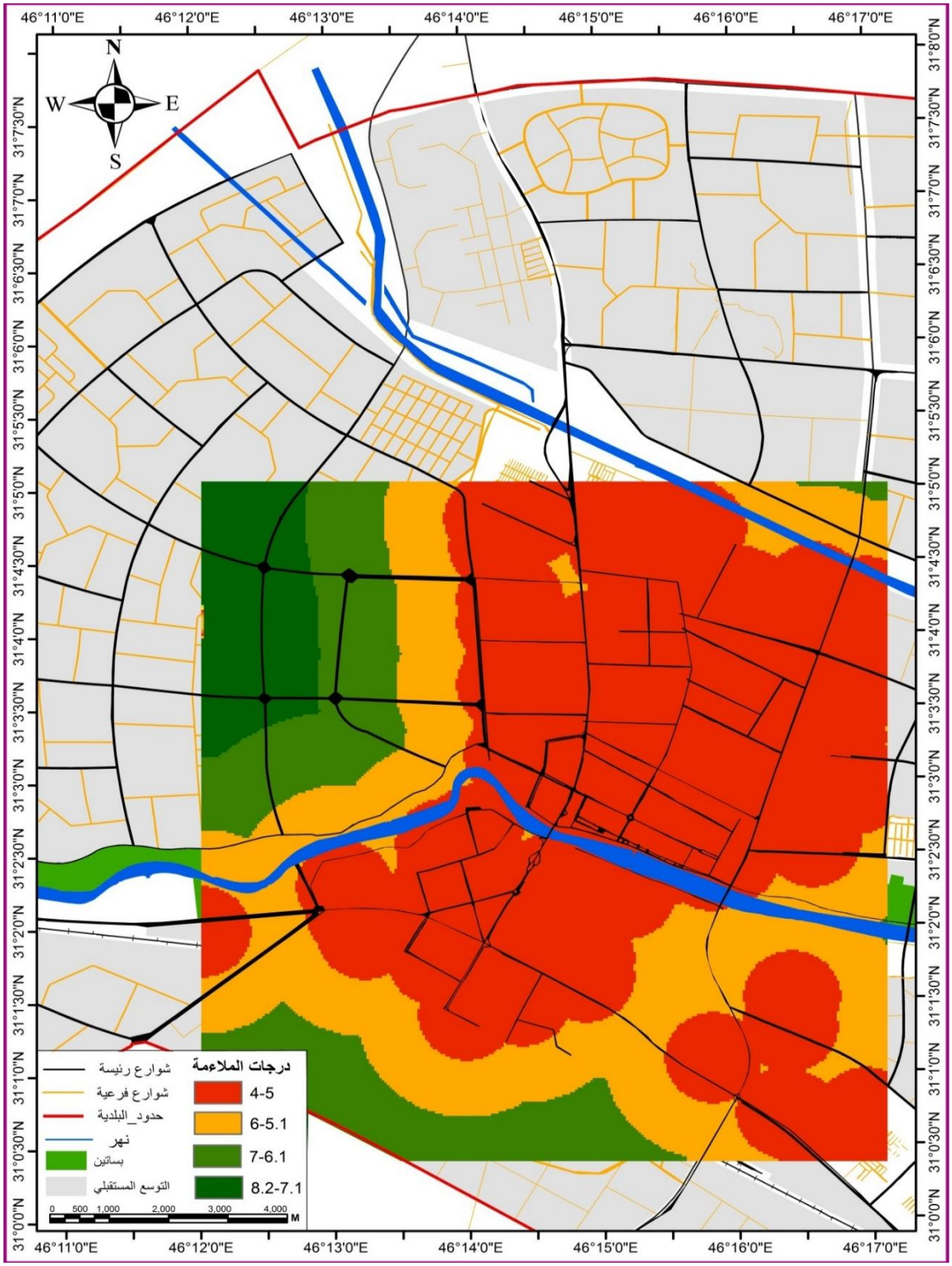
Table (1) Criteria used to calculate the degree of spatial suitability for educational use.

No.	Layer name	Fitting Score - Closest Distance	Layer Weight %
1	Educational use layer	1	30
2	Layer for water	(Delete Entries)	10
3	Green areas	3	10
4	For vacant lands	7	10
5	Residential area class	6	10
6	Layer for main roads	4	5
7	Layer for secondary (sub)roads	8	5
8	Layer for service areas (spaces)	10	20
The total			100

The researcher relied on the Arc Map 10.8 program.

It is clear from Table (1) that we have several classes that the researcher can reclassify those classes using the (Reclassify) command into several classes in accordance with the subject of the study. We worked to classify them into (10) classes, so the distance is (100%), taking the class (10) We follow a relative progression of less and less, in giving the types, and this was the reason for giving

Map (2) spatial suitability model for choosing the best places to provide educational services in the city of Nasiriyah for the year 2021.



Reference: The researcher, based on the Arc GIS 10.8 program.

Spaces close to educational use are as appropriate as possible (1) because we do not want to establish new educational use near old educational buildings, so it is preferable to establish them in vacant lands if possible, as they are better than green lands that are of

great importance to the city, or are On a side road or on a layer of water, so the researcher believes that the two most important things that must be present in choosing the appropriate and most suitable location for establishing new educational institutions is their distance from the current institutions. The other matter is that they be established on lands that belong to the state's ownership, as they are (with Less cost), so the distance from educational services layer was given importance (weight) (30%), uses (20%), and the remainder for other conditions, and the following results were revealed:

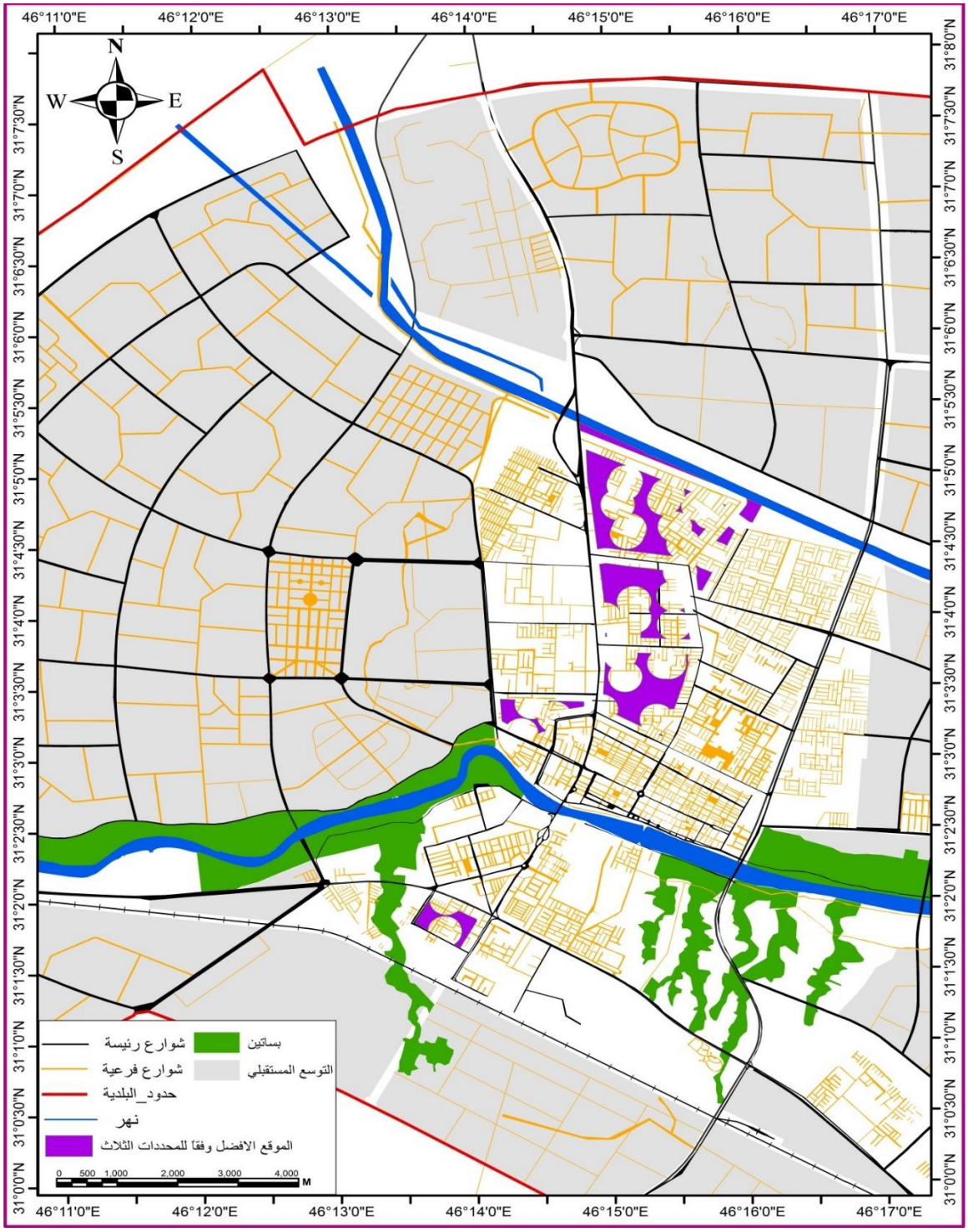
A - It became clear to us from the above that there is no site available that achieves complete spatial suitability (100%), and the reason for this is the crowding of urban uses in the study area. In other words, this indicates that the decision maker must bear some additional burdens or make some concessions. From some of the conditions presented, for example, there is barren, uncultivated land, and the land belongs to the state, far from government institutions, as well as a good distance from residential neighborhoods, and it was not within the water layer, meaning that it fulfills all five conditions, but despite the fulfillment of all appropriate conditions for its establishment, the There is no road to reach it, and this is what was indicated by fuzzy logic, meaning that the picture is not completely visible to us, as it is not possible to fulfill all the conditions in choosing the best location for spatial expansion in any of the urban uses in the city.

B - It was shown through map (2) that the best suitable areas for building a school lie in the following locations (Al-Muhyah District 1, 2, and 3, as well as in the locations behind the university, Al-Ajeel, and Al-Habush) because these neighborhoods are located far from the neighborhoods of the city center in which urban services are concentrated. It is also "outside the standard distance for the purpose of reaching what is dearest."

C - It became clear that there was no need to establish many educational institutions in the old city center, as it showed the least degree of suitability for establishing schools there, as shown in map (2).

In addition, the model was applied in order to know the best location for the purpose of establishing a new school within the city of Nasiriyah. Therefore, we must have several criteria for establishing that school. The first criterion is that it must be in the highest population density neighborhood in the city, while the first criterion is that it must be in the highest population density neighborhood in the city. The second criterion for the new location is that it be far from the locations of the old and already existing schools, even if it is at least 500 meters away from them. Therefore, the model was implemented using (Tool box) and selecting (Model). After that, we work to determine The three determinants for the purpose of extracting the best areas for the location of any school within the neighborhoods of the study area. The neighborhoods of (Sumer, Al-Rafidain, Al-Bashaer, and Al-Thawra) were identified, and then transportation routes were determined, provided that the selected school was far from highways in order to preserve the safety of students from road accidents. Likewise, this school must be far from the old schools, as is clear in map (3).

Map (3) Applying the model to choose the best places to establish schools in the city of Nasiriyah for the year 2021.



Source: The researcher, based on the Arc Gis 10.8 program.

2- Spatial suitability for sanitary use.

From the process of spatial analysis of health use, it became clear to us that (13.9%) of the total area of the city is served, while the number of residents within the scope of service was (67%) who obtain health services. Therefore, it was necessary to provide health centers and hospitals for the purpose of To meet the needs of the growing

population, modern health centers can be established in the locations shown to us in Map (4), which require the following layers (i.e. criteria) to be extracted from in Table (2).

Table (2) Criteria used to calculate the degree of spatial suitability for health use.

No.	Layer name	Fitting Score - Closest Distance	Layer Weight %
1	Educational use layer	1	30
2	Layer for water	(Delete Entries)	10
3	Green areas	3	10
4	For vacant lands	7	10
5	Residential area class	6	10
6	Layer for main roads	4	5
7	Layer for secondary (sub)roads	8	5
8	Layer for service areas (spaces)	10	20
The total			100

The researcher relied on the Arc Map 10.8 program.

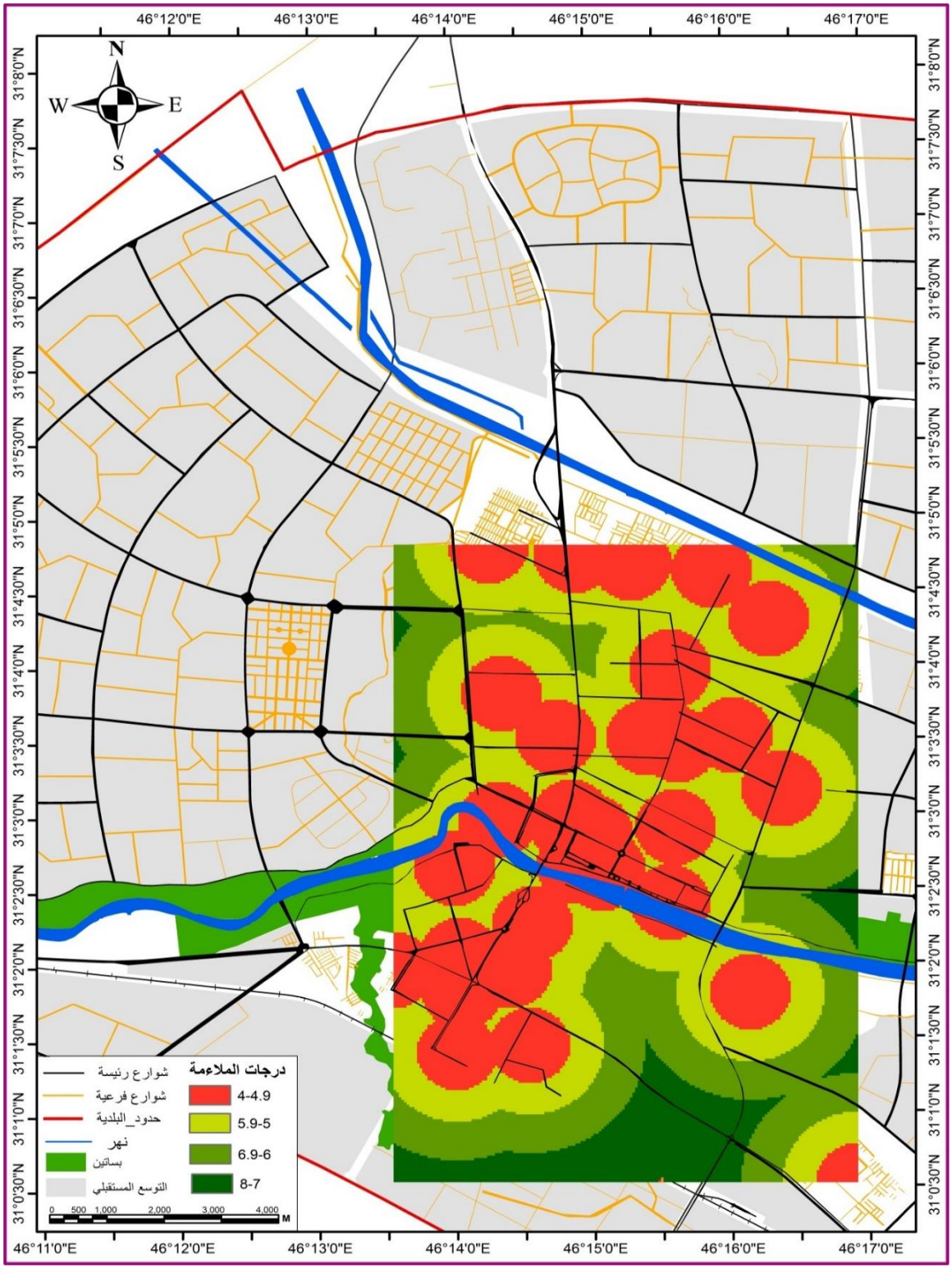
From the table above, the same classes were dealt with with the process of replacing the educational use layer with health use, as well as a change in the suitability degrees for some classes. It appears to us that in map (4) there are suitability degrees that ranged between (4-8), which is a degree that may be expressive of on the ground in the city, we can clarify the following points:

A- The following residential neighborhoods (Industrial Housing, Al Haboush, Al Ajeel, Al Zahraa District, Al Sadr District) represent the best locations for establishing these centers, and these neighborhoods are indeed in dire need of these health centers, and the reason for this is due to the remoteness of the centers. current conditions for those neighborhoods despite their population density.

B- The residential neighborhoods (Al-Hussein District, Al-Shumoukh District, Al-Sikka and Buildings, Al-Karama) ranked second in terms of suitability and the need of their residential neighborhoods for the establishment of health centers and with preparation that can achieve sufficiency and be appropriate.

C - While there are some residential neighborhoods in which health services are somewhat sufficient (Sumar, Salihiya, Al-Bashair, Ur, Arida and Al-Rafidain), with few degrees of blame, as it was necessary to establish new health centers in those residential neighborhoods.

Map (4) Spatial suitability model for selecting the best places to provide health services in the city of Nasiriyah for the year 2021.



Reference: The researcher, based on the Arc GIS 10.8 program.

Conclusions:

1- In the study area, there is a clear deficiency in the distribution of urban services and in most residential neighborhoods, according to the standards that were set by the Iraqi

planner and were not taken into consideration by the executive authorities. There is a large gap between those services and the area that was planned for them within the limits of the design. The basis is that the health use area is (--m) per capita, and the reality of the situation is (----). As a result of the large discrepancy between the areas, these services were low in providing their services to meet the desires of the population in the study area.

2- The availability of tools within the geographic information systems environment has a significant impact in clarifying the true picture of the nature of urban services in the city through statistical and spatial tools that can be employed and produced in the form of maps that can be analyzed and interpreted and the differences between what is currently the case for those services and the standard set for them can be monitored. The design provided the basis for the study area.

3- Adopting the method of building databases and processing them in various ways, leading to the stage of building a data model and choosing the best locations, will be easy to apply on the ground, and building the model for spatial suitability is one of the models that can find wide applications in the field of geography.

4- In the spatial analysis of the sites chosen to provide urban services and cadastral expansion in the city, it must be based on modern and accurate methods. The reason for this is the intertwining and complexity of the factors affecting the cadastral expansion and urban growth of the city. The GIS environment provides a good analytical environment when it is provided with the correct information and carefully weighing the impact of these factors.

Suggestions:

1--The necessity of benefiting from geographic information systems techniques, especially the ARC GIS program, and the tools it contains that decision makers and planners can employ to formulate urban controls for spatial suitability areas and build a spatial suitability model, as well as giving weights to each urban use, which helps in Determining the directions of the cadastral expansion and future urban growth of the city by the competent authorities represented by the Municipality of Nasiriyah and the Department of Urban Planning, because these modern geographical techniques have proven their efficiency in determining the best and most appropriate direction for the cadastral expansion of the city.

2- The necessity of following up and implementing laws and legislation to protect the uses of urban land that were planned within the limits of the city's basic design and not to encroach on them, especially the use and preservation of agricultural lands as they are considered the city's breathing space.

4- The necessity of joint work between the geographer and the staff responsible for planning the basic design of the city, because of its major role in adding scientific knowledge that many workers within this field lack, as well as the scientific and applied ideas that geography carries that are compatible with the world's experiences and with previous scientific experiments that confirm the fact Participation in various types of planning processes.

References

1- Muhammad Ibrahim Muhammad Sharaf, Spatial Analysis Using Geographic Information Systems, Dar Al-Ma'rifah University for Printing, Publishing and Distribution, 2008, p. 51.

2- Sami Sheikh Deeb, Marah Mugharouna, Evaluating the spatial suitability of the urban expansion of the city of Latakia using spatial analysis methodology, Tishreen University Journal of Engineering Sciences, Volume 41, Issue 6, 2019, p. 282.

3- Wahida Daoud Mahmoud Al-Daini, Spatial Suitability of Transport Garages in the City of Basra ((A Study in the Geography of Urban Transport)), Master's Thesis, College of Education for Human Sciences, University of Basra, 2017, p. 117.

4- Raed Al-Halabi, Spatial Analysis of Areas Threatened by Torrents and Floods in Jericho Governorate Using Geographic Information Systems (GIS) and Remote Sensing, undated, p. 125.

5- Rafid Musa Abd Hassoun Al-Amiri, Spatial Suitability for Community Services in the City of Diwaniyah and Its Future Signatures, doctoral thesis, College of Education for Girls, University of Kufa, 2014, p. 277.

6- Alkinany, K., Algabery, A. The Use of Spatial Analysis Methodology in Assessing the Spatial Suitability of Urban Expansion of Kut City, journal of the faculty of education, number 12, Waset, Iraq, 2010, p19.