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RESEARCH ARTICLE

Exploring The Impact of Urban Land Suitability on Reaching Sustainable Development Goals

Louay Taha Mohammed Rashid[1], Maha Badr Mansour[2]

[1]Al-Mamoun University College, Iraq

[2]Center for Urban and Regional Planning, University of Baghdad, Iraq

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***Corresponding Author:**

luay55taha@gmail.com

ABSTRACT

This paper explores the impact of urban land suitability on reaching sustainable development goals to provide practical insights to guide policy formulation and urban planning processes towards a more sustainable future. The main problem lies in the increasing challenges of sustainable development due to rapid urbanization. Thus, comprehending the relationship and impact between land suitability and sustainable development goals is extremely necessary for formulating policies and decision-making that are useful in preparing effective urban planning. The authors decided to evaluate the suitability of urban lands to support sustainable development, which allows for understanding the interconnections between urban land suitability and sustainability goals. A practical approach is used to examine the effect of urban land suitability on achieving sustainable development goals using statistical analysis tools represented by the simple linear regression method. It was found that there was a statistically significant effect for the axes of the independent variable, suitability of urban land, on the dependent variable, reaching sustainable development goals. In addition, the relationship between urban land suitability and sustainable development goals has been clarified and understood, which helps in making informed decisions about resource allocation, infrastructure development, and land use, which leads to promoting sustainable urban growth.

INTRODUCTION

This work highlights the impact of urban land suitability on achieving sustainable development goals and the significant role that it plays in this process. Assessing the suitability of urban land is extremely important to reaching a balance between resource conservation, environmental protection, and urbanization. Evolution in its various structures is considered a strategic choice necessary for the well-being of societies. Sustainable development and reaching its goals have become a necessity and a goal that strives for the survival and perpetuation of life and humanity on planet Earth and emphasizes the preservation of natural resources and wealth to guarantee the rights of subsequent generations [1]. Presently, the preservation and sustainability of resources are considered to be among the most common elements, as their results cannot be expected or expected

to be achieved after a certain period. It is a way of life and a developed and dynamic political approach. A study was conducted in Nablus to create a framework and general policy for fair and balanced sustainable planning for transportation and land use and to apply its concepts in the region. The study also aimed to preserve resources and the environment and reduce the resulting pollution, in addition to studying transportation, land use development, and the urban development of the city and related problems. In addition, a general framework for sustainable planning policies and strategies should be developed to distribute transportation and land uses safely, somewhat, and well [2].

This work was accomplished in order to investigate the degree of impact of land suitability for urban development on achieving sustainable development goals. The focus was also on analysis indicators such as environmental suitability, social suitability, economic suitability, structural suitability, adaptability and flexibility, and sustainable development. Moreover, a simple linear regression technique was employed to study and analyze the impact and interaction between land suitability and sustainable development. Its aim is to provide valuable insights into urban development and growth, ultimately leading to a more sustainable future.

RELATED WORKS

This section will review the most critical relevant articles that describe the importance of evaluating land suitability in achieving sustainable development goals, especially in urban planning. These articles demonstrate the need for a comprehensive approach considering multiple criteria and factors to ensure successful and harmonious land use planning.

In a study conducted by Deliry and Uyguçgil [3], the sustainable urban analysis program and geographic information systems are applied in analyzing and suiting the land for sustainable development in Eskişehir, Turkey. The results showed that there is not enough ideal space available for urban growth, but moderately suitable areas can be used for urban expansion in the future. Al-Ghorayeb et al.[4], they presented a study showing the analysis to indicate the most suitable areas for sustainable urban development in a particular area. A multi-criteria decision evaluation method based on geographic information systems was used, and it was found that regions with natural suitability could be used for urban growth in the future. In another study by Li [5], a spatial model is proposed to evaluate land suitability for urban agricultural development under different investments. TOPSIS techniques and GIS analysis are used, and urban agriculture can be considered a strategic solution to urban food demand. Another study by Fu et al. suggested highlighting the need to adapt sustainability goal strategies to unique city contexts and emphasized the role of spatial planning in sustainable development goals [6].

The Concept

Urban land suitability is evaluating land for potential use in sustainable urban development. This assessment is considered extremely important to ensure urban growth. It includes analyzing a particular area's economic, social, and environmental conditions to determine its suitability for agricultural use, urban development, or other purposes. Urban land suitability includes major aspects, which are as follows [7][8]:

a) *Environmental stability*: the ability of the land to support urban development without compromising its ecological integrity.
b) *Job distribution and land distribution structure*: The existing distribution of land uses can affect the land's suitability for different purposes.
c) *Land resources and scarcity*: elements such as proximity to infrastructure, land use capacity, and accessibility.
d) *Economic and social conditions*: such as accessibility to services, economic development and population density.

e) *Technological factors*: Technological outcomes such as greenhouses, technology, and land suitability for urban agriculture.
f) *Regulations and policies*: The impact of land use decisions such as environmental protection measures and zoning laws.

Sustainable development goals

The sustainable development goals consist of seventeen goals taken from the United Nations Foundation website [9], which were adopted in 2015 to ensure a more acceptable and sustainable future for all and address global challenges. These goals are interconnected and seek to protect the planet, reduce inequality and eliminate extreme poverty by 2030. Overall, these goals are based on the 2030 Agenda for Sustainable Development, which recognizes that eliminating deprivation and poverty must go hand in hand with strategies that work to stimulate growth. Economic growth, reducing inequality, improving education and health, all while preserving the environment and tackling climate change. Figure 1 illustrates the seventeen Sustainable Development Goals.

The goals:
1. No Poverty (Goal No. 1)
2. Zero Hunger (Goal No. 2)
3. Good health and well-being (Goal No. 3)
4. Quality education (Goal No. 4)
5. Gender equality (Goal No. 5)
6. Clean water and sanitation (Goal No. 6)
7. Affordable and clean energy (Goal No. 7)
8. Decent work and economic growth (Goal No. 8)
9. Industry, Innovation, and infrastructure (Goal No. 9)
10. Reduced inequalities (Goal No. 10)
11. Sustainable cities and communities (Goal No. 11)
12. Responsible consumption and production (Goal No. 12)
13. Climate action (Goal No. 13)
14. Life below water (Goal No. 14)
15. Life on land (Goal No. 15)
16. Peace, Justice and strong institutions (Goal No. 16)
17. Partnerships for the goals (Goal No. 17)

Figure 1. The seventeen sustainable development goals [10]

The form

Any statistical and quantitative study depends primarily on collecting data about the specific environment being analyzed, and this is accomplished through one of the known data collection methods. In this work, a purposive sample, which is a sample of specialists and executive and administrative officials, was taken to answer this question [11]. In light of the above, a specialist questionnaire form was prepared, numbering 40 questionnaires, and distributed to specialists in the departments of Al Anbar Governorate. This form includes six axes, which are (environmental suitability, social suitability, economic suitability, structural suitability, adaptability and flexibility, and sustainable development). These axes represent the variable suitability of urban land and the variable reaching sustainable development goals.

Testing hypotheses

The axis of the independent variable, urban land suitability, are (environmental, social, economic, structural, adaptability and flexibility). In contrast, the axes of the dependent variable, achieving sustainable development goals, are (sustainable development). In order to test whether there is a relationship and impact of the independent variable, suitability of urban land in its five dimensions, on the dependent variable, achieving the goals of sustainable development in its dimension (sustainable development), this effect is measured through a mathematical equation called the Simple Linear Regression Equation, where it is accomplished through this the equation determines the impact and relationship between the variables of the research form, as well as predicting the values of the dependent variable, and this is named testing research hypotheses [12].

Simple Linear Regression

It is a statistical method employed to determine the impact and relationship between the independent variables, which are the axes of the independent variable, urban land suitability, and the dependent variable. Also, it is the achievement of sustainable development goals, as this method shows the analysis of many aspects, as it shows the direction and strength of the relationship between the axes of the independent variable, suitability of urban land, and the dependent variable, achieving the goals of sustainable development. This method includes creating a quantitative predictive equation to describe the dependent variable through the axes of the independent variable and knowing the importance of each axis of the independent variable to predict the dependent variable y, finding the best linear regression is called the BEAST regression model, which can display the relationship between the axes of the independent variable. The dependent variable of this research [12]. The simple linear regression equation is written as follows:

$$y = a + bx$$

Where:

y: the dependent variable refers to achieving the sustainable development goals

a: constant value

b: The slope of the regression line, which is impact of the independent variable on the dependent variable.

x: indicates the axes of the independent variable and urban land suitability.

1st main hypothesis

MH.1: There is no significant, moral or statistical, impact of the independent variable, urban land suitability, on the dependent variable: reaching sustainable development goals in terms of the independent axis (environmental suitability)

Table 1: Simple linear regression model for the variable suitability of urban land in achieving sustainable development goals in terms of the environmental suitability axis (Source: Authors using IBM SPSS Statistic v.26)

Independent axis	**a**	**b**	***T calculated***	***T tabular***	**Sig.**
Environmental suitability	1.147	0.659	4.920	2.021	0.000
R=0.62 R^2=0.39 R^{-2}=0.37					
Independent axis	F calculated	F tabular	Sig.	Accept the hypothesis	Dependent variable
Environmental suitability	24.210	4.171	0.000	Alternative hypothesis	Achieving goals

The table above indicates the coefficients of the simple linear regression model. Through these coefficients, the impact and relationship between the independent variable and the dependent variable will be demonstrated, where the regression equation is written as follows:

Environmental suitability $* 0.659 + 1.147 =$ y (Achieving goals)

- The coefficient of determination for the R^2 model, 0.39, shows that the independent axis of environmental suitability can explain 39% of the change in the size of the variable achieving sustainable development goals, and the rest of the percentage is due to other factors. The *F calculated* value of 24.210 confirms this explanatory power, which is more significant than its tabular value of 4.171 and at an acceptable significance level of 0.000.

- The model coefficient *b* shows that the environmental suitability axis impacts the variable achieving the sustainable development goals. The value of the degree of this effect b is 0.659. This means that improving the environmental suitability axis by one unit will increase the size of achieving the sustainable development goals by 66%. This impact is confirmed by a *T calculated* value of 4.920, which is greater than a *T tabular* of 2.021 and at an acceptable significance level of 0.000. This means rejecting the first main hypothesis (null) and accepting the alternative hypothesis, which states that there is a significant or statistically significant effect of the independent variable, suitability of urban land, on the dependent variable, achieving sustainable development goals in terms of the independent axis (environmental suitability).

- The *R* model correlation coefficient exhibits a positive partial correlation between the environmental suitability axis and the variable achieving sustainable development goals. This correlation's value is 0.62, at an acceptable significance level of 0.000. This means that developing or improving the environmental suitability axis will lead to achieving sustainable development goals.

2nd main hypothesis

MH.1: There is no significant, moral or statistical, impact of the independent variable, urban land suitability, on the dependent variable: reaching sustainable development goals in terms of the independent axis (social suitability).

Table 2: A simple linear regression model for the variable suitability of urban land in achieving sustainable development goals on the social suitability axis (Source: Authors using IBM SPSS Statistic v.26).

Independent axis	***a***	***b***	***T calculated***	***T tabular***	**Sig.**
Environmental suitability	0.486	1.087	5.401	2.021	0.000
R=0.66	R^2=0.43	R^{-2}=0.42			
Independent axis	*F calculated*	*F tabular*	Sig.	Accept the hypothesis	Dependent variable
Environmental suitability	29.167	4.171	0.000	Alternative hypothesis	Achieving goals

Table 2 shows the coefficients of the simple linear regression model. These coefficients demonstrate the impact and relationship between the independent and dependent variables, and the regression equation is reported as follows:

$$\text{Environmental suitability} * 1.087 + 0.486 = \text{y (Achieving goals)}$$

- The coefficient of determination for the R^2 model, 0.43, shows that the independent axis of social appropriateness can explain 43% of the change in the size of the variable reaching sustainable development goals, and the rest of the percentage is due to other factors. The F calculated value of 29.167 confirms this explanatory power, which is more significant than its tabular value of 4.171 and at an adequate significance level of 0.000.
- The b factor shows that the social suitability axis impacts the variable achieving sustainable development goals. The score of this impact is 1.087. This means that an improvement in the social suitability axis by one unit will increase the size of achieving the sustainable development goals by a value of 0.87%. Moreover, this effect was confirmed by a T calculated value of 5.401, which is greater than a T tabular of 2.021 and at an acceptable significance level of 0.000. This means rejecting the second main hypothesis (the null) and accepting the alternative hypothesis, which states that there is a significant or statistically significant effect of the independent variable, urban land suitability, on the dependent variable, achieving sustainable development goals in terms of the independent axis (social suitability).
- The R model correlation coefficient shows a positive partial correlation between the social appropriateness axis and the variable achieving sustainable development goals. This correlation's value is 0.66, at an acceptable significance level of 0.000. This indicates that developing or improving the social appropriateness axis will lead to reaching sustainable development goals.

3rd main hypothesis

MH.1: There is no significant, moral or statistical, impact of the independent variable, urban land suitability, on the dependent variable: reaching sustainable development goals in terms of the independent axis (economic suitability)

Table 3: Simple linear regression model for the variable suitability of urban land in reaching sustainable development goals in terms of economic suitability axis (Source: Authors using IBM SPSS Statistic v.26).

Independent axis	***a***	***b***	***T calculated***	***T tabular***	**Sig.**
Economic suitability	1.937	0.497	3.044	2.021	0.004
R=0.44	R^2=0.20	R^{-2}=0.18			

Independent axis	*F calculated*	*F tabular*	Sig.	Accept the hypothesis	Dependent variable
Economic suitability	9.265	4.171	0.004	Alternative hypothesis	Achieving goals

Table 3 shows the coefficients of the simple linear regression model. Through these coefficients, the impact and relationship between the independent variable and the dependent variable will be displayed, and the regression equation will be written as follows:

$$\text{Economic suitability} * 0.497 + 1.937 = \text{y (Achieving goals)}$$

- The value of the coefficient of determination R2, which is 0.20, shows that the independent axis of economic suitability can explain 20% of the change in the size of the variable achieving sustainable development goals, and the rest of the percentage is due to other factors. On the other hand, the F calculated value of 9.265 confirms this explanatory power, which is greater than its tabulated value of 4.171 and at an adequate significance level of 0.004.

- The b coefficient shows that the economic suitability axis has an impact on the variable achieving sustainable development goals. The degree value of this impact is 0.497. This means that an improvement in the economic suitability axis by one unit will increase the scope of achieving the sustainable development goals by 48%. Also, this effect was confirmed by a T calculated value of 3.044, which is greater than a T tabular of 2.021 and at an adequate significance level of 0.004. This means rejecting the third main hypothesis (null) and accepting the alternative hypothesis, which states that there is a significant or statistically significant effect of the independent variable, suitability of urban land, on the dependent variable, achieving sustainable development goals in terms of the independent axis (economic suitability).

- The correlation coefficient R also shows a partial positive correlation between the economic suitability axis and the variable achieving sustainable development goals. This correlation is 0.44 at an adequate significance level of 0.004. Therefore, developing or improving the economic suitability axis will lead to achieving sustainable development goals.

4th main hypothesis

MH.1: There is no significant, moral or statistical, effect of the independent variable, suitability of urban land, on the dependent variable: reaching sustainable development goals in terms of the independent axis (suitability of structure)

Table 4: Simple linear regression model for the variable suitability of urban land in reaching sustainable development goals in terms of the suitability of structure axis (Source: Authors using IBM SPSS Statistic v.26).

Independent axis	***a***	***b***	***T calculated***	***T tabular***	**Sig.**
Structure suitability	2.265	0.407	2.586	2.021	0.014
R=0.39	R^2=0.15	R^{-2}=0.13			
Independent axis	*F calculated*	*F tabular*	Sig.	Accept the hypothesis	Dependent variable
Structure suitability	6.686	4.171	0.014	Alternative hypothesis	Achieving goals

The table above displays the coefficients of the simple linear regression model. Through these coefficients, the effect and relationship between the independent variable and the dependent variable will be demonstrated, and the regression equation will be written as follows:

Structure suitability $* 0.407 + 2.265 =$ y (Achieving goals)

- The value of the coefficient of determination R2 is 0.15, indicating that the independent axis of structural suitability can explain 15% of the change occurring in the size of the variable achieving sustainable development goals, and the rest of the percentage is due to other factors. The F calculated value of 6.686 confirms this explanatory power, which is greater than its tabular value of 4.171 and, at the significance level—accepted with a value of 0.014.
- The b factor shows that the structure suitability axis affects the variable reaching the sustainable development goals, with an impact of 0.401. This means that improving the structure suitability axis by one unit will increase the size of achieving the sustainable development goals by a value of 40%. This impact was confirmed by a T-calculated value of 2.586, which is greater than a tabular T of 2.021 and at an acceptable significance level of 0.014. This means rejecting the fourth main hypothesis (null) and accepting the alternative hypothesis, which states that there is a significant or statistically significant effect of the independent variable, suitability of urban land, on the dependent variable, achieving sustainable development goals in terms of the independent axis (suitability of structure).
- The R correlation coefficient shows that there is a positive partial direct correlation between the structure suitability axis and the variable reaching sustainable development goals. The value of this correlation is 0.39 at an adequate significance level of 0.014. This means that development or improvement in the axis of infrastructure suitability will lead to reaching goals.

5th main hypothesis

MH.1: There is no significant or statistically significant impact of the independent variable, urban land suitability, on the dependent variable, reaching sustainable development goals in terms of the independent axis (ability to adapt and flexibility)

Table 5: Simple linear regression model for the variable suitability of urban land in reaching sustainable development goals in terms of the axis of adaptability and flexibility (Source: Authors using IBM SPSS Statistic v.26).

Independent axis	***a***	***b***	***T calculated***	***T tabular***	**Sig.**
Adaptability and flexibility	1.005	0.749	5.266	2.021	0.000
R=0.65	R^2=0.42	R^{-2}=0.41			
Independent axis	*F calculated*	*F tabular*	Sig.	Accept the hypothesis	Dependent variable
Adaptability and flexibility	27.726	4.171	0.000	Alternative hypothesis	Achieving goals

The table above indicates the coefficients of the simple linear regression model. Through these coefficients, the impact and relationship between the independent variable and the dependent variable will be demonstrated, and the regression equation will be written as follows:

Adaptability and flexibility $* 0.749 + 1.005 =$ y (Achieving goals)

- The R2 value of 0.42 displays that the independent axis of adaptability and flexibility can explain 42% of the change in the size of the variable reaching goals, and the rest of the percentage is due to other factors. The F calculated value of 27.726 confirms this explanatory

power, which is greater than its tabular value of 4.171 and at a significance level—accepted with a value of 0.000.

- The b factor shows that the axis has an impact: the ability to adapt and be flexible on the variable reaching the sustainable development goals. The value of the degree of this effect, b, is 0.749. This means that an improvement in the axis: the ability to adapt and be flexible by one unit. This will improve the extent of reaching goals by a value of 75. %. This impact was confirmed by a T calculated value of 5.266, which is greater than a T tabular of 2.021 and at an adequate significance level of 0.000. This means rejecting the fifth main hypothesis (the null) and accepting the alternative hypothesis, which states that there is a significant or statistically significant effect of the independent variable, suitability of urban land, on the dependent variable, achieving sustainable development goals in terms of the independent axis (Adaptability and flexibility).

- The R model's correlation coefficient clearly shows a positive partial direct correlation between the axis of adaptability and flexibility and the variable achieving sustainable development goals. This correlation's value is 0.65, at an adequate significance level of 0.000. This means that developing or improving the axis of adaptability and flexibility will lead to reaching goals.

CONCLUSION

1. Evaluating key aspects of urban land suitability provides sound insights for city planners to make informed decisions about land use and development, as this contributes to building more resilient and sustainable cities.
2. The sustainable development goals constitute a complete framework for reaching sustainable development and are essential in addressing the world's most pressing challenges.

3- It must be considered that growing and improving the suitability of urban land in terms of the environmental suitability axis will lead to an impact on reaching sustainable development goals in terms of:

- Maintaining and improving environmental quality in urban areas
- Mitigating environmental impacts,
- Protecting ecosystems,
- Preserving natural resources, effective use of resources,
- Green infrastructure, recycling, reducing waste,
- Generating renewable energy.

Environmental suitability also creates flexible, environmentally friendly cities that reduce their environmental footprint.

4- It must be considered that growing and improving the suitability of urban land in terms of the social suitability axis will lead to an impact on achieving sustainable development goals in terms of:

- The social dimensions of urban land include the provision of social infrastructure and amenities.
- Providing basic services and equitable access to them for all segments of the population impacts the quality and well-being of the population’s lives.
- Evaluating urban lands in terms of their capacity for cultural diversity, inclusion, social cohesion, and enhancing community participation,
- Creating entire cities whose residents have access to entertainment, opportunities for social interaction, public spaces, and education.

5- It must be considered that developing and improving the suitability of urban land in terms of the economic suitability axis will lead to an impact on achieving sustainable development goals in terms of:

- Studying and evaluating the economic potential of urban lands in terms of the land's ability to support diverse economic activities.
- Creating job opportunities through investment and income generation will contribute to sustainable economic growth.
- It assesses urban land in terms of its capacity for sustainable business practices, entrepreneurship, and innovation promotion.
- Create economically flexible and vibrant cities that improve residents' living standards and provide livelihood opportunities.

6- It must be considered to develop and improve the suitability of urban land. Also, it will lead to an impact on reaching sustainable development goals on the one hand:

- The availability and adequacy of infrastructure in urban areas, including needs for future development.
- Identifying gaps and evaluating current infrastructure networks, evaluating urban land in terms of its ability to support communications networks, waste management, water and sanitation services, energy supplies, and effective transportation systems.
- Adequate infrastructure creates cities.
- Effective and well-connected, it reduces environmental impacts and resource consumption and provides essential services to the population.

7- It must be considered that developing and improving the suitability of urban land in terms of the axis of adaptability and flexibility will lead to an impact on achieving sustainable development goals in terms of:

- Urban lands are able to adapt and withstand economic and social disruptions, natural disasters, and climate change.
- It can adopt approaches to adaptive planning, disaster risk reduction, green infrastructure, and incorporating climate-responsive design.
- Adapting and being resilient creates cities that can respond to and recover from stresses and shocks effectively and are prepared to confront them. Uncertainty in the future.

Recommendations

1- Encouraging comprehensive urban planning that considers land suitability assessment is vital to reaching sustainable development goals. This includes considering factors such as social amenities, green spaces, housing, transportation, and infrastructure to create liveable and sustainable urban environments.

2- Strengthen collaboration between stakeholders, community organizations, researchers, city planners, and government entities to ensure that sustainable development goals are aligned with land suitability assessments. This will enable a set of policies, their implementation, and effective decision-making.

3- Highlighting the essentials of sustainable land use practices to support sustainable development goals. This includes preserving environmentally sensitive areas, effective land use patterns, compact city design, and promoting mixed-use development.

4- Improvement in data collection and analysis is needed in order to assess the suitability of urban lands accurately. This is accomplished by utilizing a data-based approach to improving urban land use for sustainable development and decision-making processes and utilizing remote sensing and geospatial technologies.

5- Considering the social justice dimension in urban land suitability assessments. This is accomplished by ensuring that land use decisions take into account the requirements of different communities, including equitable distribution of resources and access to services and housing at affordable prices.

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