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Evaluation of the Impact of Urban Green Space on the Climate in the Flood Event in Sarab Shahabad, Khorramabad

Sara Veiskarmi, Mehdi Sharifi

Abstract: ***Urban development with the current methods has had many negative effects on water resources and urban ecology and has caused urban environments to distance themselves from the goals of sustainable development. In the field of hydrology, studies show that rainwater management in cities in the traditional way has had negative effects, including an increase in the volume of runoff and an increase in peak flows. Also, the traditional methods of urban water management by removing native vegetation and increasing hard levels have greatly reduced the urban green space per capita. Considering the climate changes as well as the damage and losses caused by floods in recent years, as well as the reduction of vegetation around urban springs, and the increase in life and financial risks for citizens, in this research the risk of flooding and the zoning of flood-prone lands in The source of Sarab Shahabad, Khorramabad city It was done using satellite photos and Arc GIS software. For prioritizing the criteria, the AHP model was used. And the Expert Choice software environment was used, which ultimately resulted in the conclusion that the most important factor in the occurrence of floods is the lack of vegetation in the area and the distance from the bed of the source and construction on the way to the source, which causes irreparable damage to the area and It has also become a city.***

Keywords: Urban Green Space, Vulnerability, Flood.

I. INTRODUCTION

Flooding is becoming an increasingly frequent and serious natural hazard, which causes substantial harm to the economy, society, and human safety and property [1].

It is widely believed that the current global warming trend will lead to a continuous increase in extreme rainfall events, with major implication in terms of flood risk in many parts of the world [2].

Rapid urbanization coupled with climate change is creating a mix of increasingly inextricable challenges. If we consider the studied city of Khorramabad, the capital of Lorestan province, its population is equal to 463,599 with an average annual growth rate of 2%, the population of the city is expected to reach 5,590,190 in 1405 [3].Accommodating this growth in major cities has led to higher population density and urban sprawl [4]. Urban sprawl, in turn, has led to drastic changes in surface cover where parks, sporting fields, and farmland have been developed into impervious surfaces such as high-rise apartments, shopping centers, car parks, and vast residential developments. When one considers this change in the context of flooding, more people are now living in close quarters, leading to a higher risk of flood-related damages to both life and property [5].

Floods, particularly those in urban areas with a high percentage of impervious surfaces and high population density, can cause inundation of low-lying areas, which can result in indirect risks such as economic crises due to damage to electricity, gas, water supply, and transportation facilities [6]. In addition, projections of climate change associated with precipitation indicate the unpredictability of risks due to the low reliability of models and the spatially diverse and temporally dynamic patterns of hazards.

With the aggravation of climate change, urban flooding caused by extreme rainfall has become one of the most common meteorological disasters. Further, the control of urban surface runoff has attracted significant attention. As the main natural space of a city, urban green space is an important place for the in situ control of rainwater [7]. However, during the design of urban green spaces, designers usually focus on the rainwater discharge in the green space and ignore its function of regulating and storing runoff. Because of the entry of and trampling by tourists, soil infiltration is weakened, and the functions of the green space for rainwater retention, infiltration and storage are reduced. Most green spaces have limited abilities to regulate and store rainwater at the source [8].

Parks, street trees, urban nature preserves, and other urban green spaces are of great importance for habitability and quality of life in cities [9]. In fact, urban green spaces are increasingly considered essential “green infrastructure” because they provide numerous ecosystem services that generate diverse socioeconomic and environmental benefits, from improving health in- equalities to reducing urban heat-islands [10].

Urban green spaces are also a growing strategy for promoting climate change resilience [11], where resilience refers to a socio-ecological system’s ability to persist, transition or transform so as to maintain functioning and well-being in response to disturbance [12]. For example, several scholars have posited parks are a top option for lowering urban heat island effects [13]. As they are found to have lower air temperatures than the surrounding, built

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landscape, often times emitting a spillover cooling effect [14]. Urban forests promote water absorption and purification [15], soil stabilization [16], and pollution filtration, with effects depending on species composition. Urban green infrastructure is highly multifunctional, and aside from the foregoing services, diverse forms of green spaces including parks, urban forests, green roofs, food gardens, and pocket prairies collectively provide many other services important for maintaining quality of life in a changing climate, including food production, carbon storage, and cultural services such as aesthetics, recreational opportunities, and community cohesion.

With two-thirds of the planet's population projected to be city dwellers by the year 2050 and 80% of the U.S. population being already urban, careful stewardship of green spaces is critical. In addition to population pressure, the management of urban green spaces is further compounded by continued climate change. Altered precipitation patterns, changes in the timing of seasons, and increased frequency and severity of extreme events (e.g. storms, floods, droughts) are among many climatic changes. thatmanagement planning will need to consider in order to safeguard the integrity of urban green space and associated ecosystem services [17].

Therefore, it is important to explore and optimize the method of design and evaluation of rainwater source adjustment and storage performance of green spaces to control rainwater and floods throughout a whole city [18].

Regarding the important cases of the article, he was going to attempt to explain the basic meaning of the underneath of green buildings, and to make it clear what sort of difference there is between the projects of the old bio [19]. Also, the motion of a cheap frame of motion, green designs, used by expert software It is the terrible thing that is done in this article [20] .

Research Question: How does the design of urban green space in the way of urban springs reduce the vulnerability of urban areas during floods?

Research Goal: The purpose of this article is to investigate the effect of urban green space on floods, considering the climate changes in recent years and the flood event in 2018, as well as the economic and infrastructure damage in Lorestan, as well as the lack of sufficient information to prevent In this article, we investigated the occurrence of floods and the impact of green infrastructure on the relevant climate. Another goal of this article is to add conversations in the discussion of green infrastructure [21]. This is a very important concept, but at the same time it is very new and unfamiliar to many professionals. Many of them have limited experience and information in the field of green infrastructure. Therefore, they are unaware of its importance and the capabilities it can bring to our cities. This article can also have an educational aspect to inform the public about the importance of green infrastructure design. Another goal of this article is to express a framework for evaluating the strategies of green infrastructure projects.

Research Methodology: According to the examined components, the nature of the subject and research objectives, the approach governing this research is "descriptive-survey" and "applied-developmental" type, which will be carried out in 1402 in Sarab Shah Abad watershed of Khorram Abad city. The method of collecting materials is mainly in the form of documents combined with field-observational methods. For this purpose, first through library study (books, documents, theses, etc.) to collect background, ideas and theories, and field observations are also used and finally by integrating and combining the findings Documentary and field analysis and presentation of research strategies are discussed. Then, in order to answer the questions and hypotheses, the hierarchical analysis method is used.

Based on the method of collecting information, it is both upstream and library documents as well as field documents because the nature of the topic under investigation is such that it is not possible to reach a conclusion only with document information, but it is necessary to touch the problems in the field and objectively and for The importance of the flood problem and its effect on the green space in the studied area provided some suggestions. In this research, land use layers, slope layer, and distance from the source bed of Sarab Shahabad have been used for zoning the risk of flooding and inundation of Sarab Shahabad in Khorramabad city. The steps of conducting research are providing primary data, preparing them in GIS environment, multi-criteria decision analysis and preparing flood risk mapping. The weights were calculated after standardization and the weights were done through the Expert Choice software, and after obtaining the weights, it was entered into the ARC GIS environment and the CLASSIFICATION step was implemented in this software.

Background Research: The studies and research that are similar to the topic in question are as follows:

Yuan (Daniel) Cheng et al., Urban Climate 39 (2021) 100962, Climate change impacts and urban green space adaptation efforts: Evidence from U.S. municipal parks and recreation departments.

Chaeyoung Bae, Dong Kun Lee, Journal Pre-proof (2019), Effects of low-impact development practices for flood events at the catchment scale in a highly developed urban area.

Kane Alexander et al., Journal Pre-proofs (2019), Can integrated green spaces and storage facilities absorb the increased risk of flooding due to climate change in developed urban environments?

Heesup Han et al., International Journal of Hospitality Management(2018), Water conservation and waste reduction management for increasing guest.

Changkun Xie et al, Land (2022), Design and Evaluation of Green Space In Situ Rainwater Regulation and Storage Systems for Combating Extreme Rainfall Events: Design of Shanghai Gongkang Green Space to Adapt to Climate Change.

Xiaojing Sun et al., International Journal of Disaster Risk Reduction 65 (2021) 102563, Assessment of climate change impacts and urban flood management schemes in central Shanghai.

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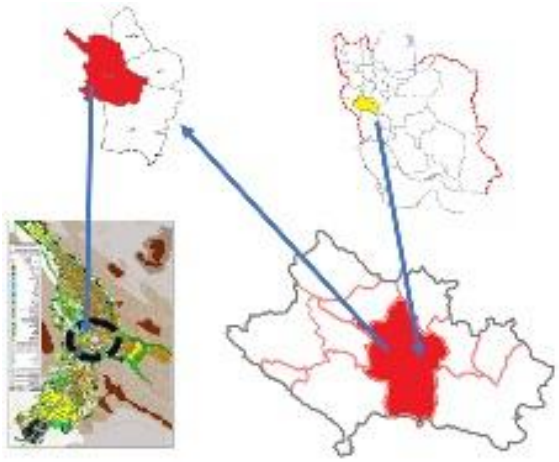
II. FINDINGS



[Fig.1: Geographical Location of Sarab Shahabad, Khorramabad (Source: Author)]

[Fig.2: Satellite Photo of Sarab Shahabad Source, Khorramabad City (Source: Author)]

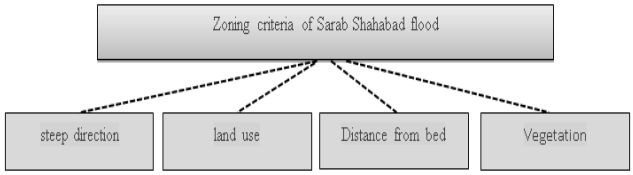
In the water balance report, it is presented in the Khorramabad study area with code 2208 located in the center of the Karkhe River catchment area. The most important cities located in this study area are Khorram Abad, Ghorab, Sarabdore and cited.

The area of Khorramabad study area is equal to 2501.4 square kilometers, of which the plain area is 199.3 square kilometers and the rest is related to the highlands of Khorramabad study area. In this study area, there are four plains named Khorramabad, Kamalvand, Qala Sangi and Deh Pir. In Qala Sangi and Deh Pir plains, no significant alluvial aquifer has formed, and Kamalvand. The rivers in this study area can be mentioned as Khorram Abad, Kakashraf and Karganeh rivers.

III. ANALYZE

A. Determining the Effective Flood Risk Zoning Criteria of Sarcheshma Sarab Shah Abad, Khorram Abad City

After determining and reviewing the criteria related to the creation of flood risk zoning and adapting them to the conditions, location and existing situation of Khorramabad city, finally, the relevant criteria were selected and compiled under a hierarchical tree at multiple levels. Considering the above-mentioned materials, as well as by studying previous sources, books and articles, as well as considering the availability of information, 4 main criteria have been considered in order to determine the effective factors of flood risk zoning in Sarab Shahabad, Khorramabad city.

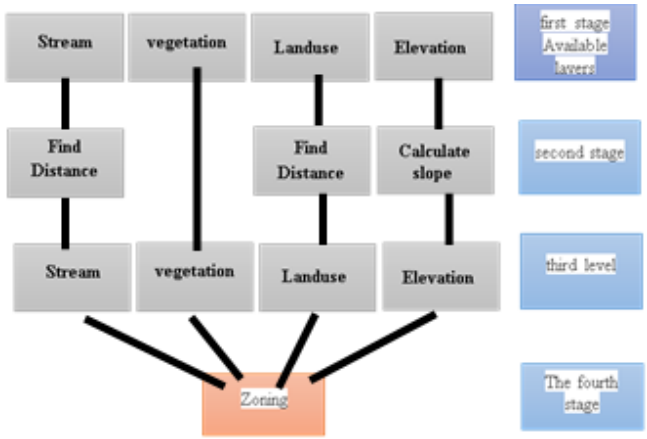


[Fig.3: Criteria (Source: Author)]

B. Flood Risk zoning in Sarab Shahabad, Khorramabad City

i. Zoning Steps

To start this work, several layers of information are needed to perform zoning according to these criteria. As mentioned before, the criteria include the distance from the bed of the source of the mirage, land use, slope direction and vegetation in the area, each of which has its own desired layer.

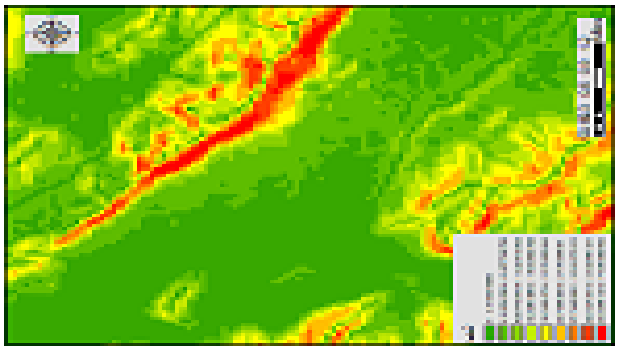


[Fig.4: Classification Steps]

The information is prepared according to the diagram above. which is discussed in detail below.

ii. Slope Layer

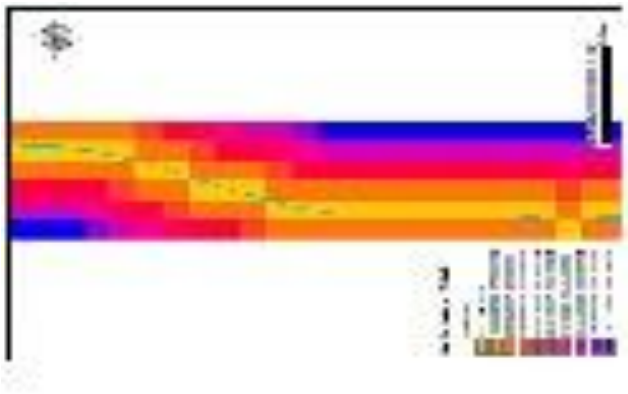
To prepare the slope layer, you must have the DEM map of the area and prepare the slope layer according to the image below. Next, the slope map was produced and classified into 10 spectrums, the more green the region is, the flatter and less the slope is, and the red the steeper the slope.



[Fig.5: Slope Map]

Distance from Shah Abad spring Bed For the map of the distance from the river bed, which is an important factor in the flooding of the studied area, the desired layer was

selected, but since the incompatible layers that were separated only include a series of parts inside the area, the analysis By default, the grid is only rectangular, which includes the maximum number of parts.



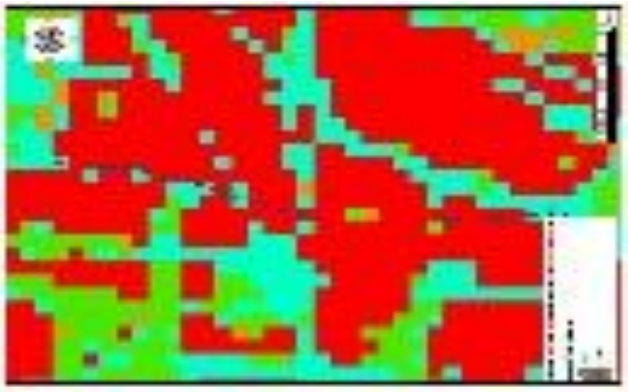
[Fig.6: The Distance of the Bed from the Source of the Mirage]

iii. Reclassify of Layers

For 3 layers, direction of slope, distance from Shadabad bed, and land use of all 3 layers were carried out according to the following Reclass steps.

iv. Land use Layer

In this part of the research, the values given to different uses should be according to their prioritization and importance in the discussion of flood risk, as vegetation is very important in this layer. Valuation is as follows. The greater the distance between the vegetation cover and the bed of the source, the less the flood effect and the buildings are given second priority.



[Fig.7: Valuation of Land Use Layer According to Zoning Conditions]

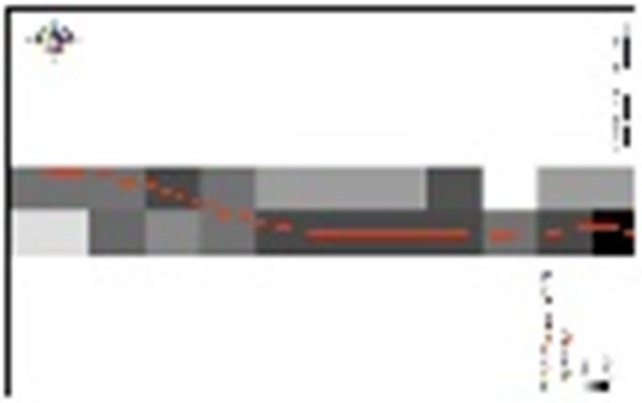
v. Combination of Layers

Here we have 3 maps classified according to what has been done. Next, we have to weight these layers according to the weights we obtained from the AHP model and Expert choice software, and categorize the areas at risk of flooding according to priority.

Table 1: Weight of Layers

Layer	Weight
land use	0.667
Distance from the	0.186
Source bed	0.9
Steep direction	0.57
Vegetation	

At this stage, the weights obtained from AHP were entered into the software, and at the end, weight was given to the data and the final map was produced.



[Fig.8: The Final Flood Risk Zoning Map of Sarab Shahabad Source, Khorramabad City]

In the photo above, the white areas have a lower risk of flood crisis. The darker the color spectrum in the photo, the higher the danger in the photo above, the white areas have a lower risk of flood crisis. The darker the color spectrum in the photo, the higher the risk in these areas.

IV. CONCLUSION

In this study, the risk of flooding and the zoning of flood-prone areas in the source of Sarab Shahabad in Khorramabad city were carried out using satellite images and Arc Gis software, and for prioritizing the criteria, AHP model and Expert choice software environment were used. The flood-prone areas were determined according to the four factors of slope of the region, distance from the main floodplain, vegetation cover, and land use, respectively, land use with a relative weight of 0.667, distance from the source bed with a weight of 0.186, slope with a weight of 0.90, and vegetation with a weight of 0.90. 0.57 weight were prioritized. In the zoning done in this study, it was concluded that the smaller the distance from the riverbed, the lower the slope of the area, the less vegetation and the lands with residential uses. The higher the risk of flooding in this area, the more these items are opposite, the lower the risk. With a brief look at the history of the flood and the research conducted in this field, the conclusion is that the most important factor in the occurrence of floods is the lack of vegetation in the area and the distance from the bed of the source and the construction on the way to the source, which causes irreparable blows to the It includes the region as well as the city.

DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

- **Conflicts of Interest/ Competing Interests:** Based on my understanding, this article has no conflicts of interest.
- **Funding Support:** This article has not been sponsored or funded by any organization or agency. The independence of this research is a crucial factor in affirming its impartiality, as it has been conducted without any external sway.

- **Ethical Approval and Consent to Participate:** The data provided in this article is exempt from the requirement for ethical approval or participant consent.
- **Data Access Statement and Material Availability:** The adequate resources of this article are publicly accessible.
- **Authors Contributions:** The authorship of this article is contributed equally to all participating individuals.

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