

## **Geomorphological obstacles affecting the urban expansion of Madikeri City**

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### **Abstract**

The cities in which the population grows need to expand their area every year. Growth and expansion are characteristics of cities that attract people and have job opportunities for their residents, and Madikeri city in the state of Karnataka in India is one of these cities, so the planners in this city must study all Obstacles that limit the expansion of the city's area, and in this paper we will deal with the topic of geomorphological obstacles that hinder the expansion of the city Especially since Madikeri is located in a mountainous area With a statistical analysis of these obstacles In order A digital elevation model ( DEM ) will be used to obtain accurate information to be clear to the planners and to try to find appropriate solutions with the least effort and cost and to avoid obstacles that are difficult to find solutions to and to stay away from them in the construction process .

**Keywords: slopes, lowlands, floods, valleys,**

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### **I. INTRODUCTION**

When cities expand, they often encounter obstacles that hinder this expansion. These obstacles may be sea coasts, desert sand dunes, swampy lands, slippery soil, and many other natural obstacles that do not allow the city to grow and expand in certain directions. As for mountain cities, the obstacles are considered Geomorphological the most important obstacles that limit the expansion of the city, and the city of Madikeri is a mountainous city and has many geomorphological obstacles that limit the expansion of the city directly and indirectly, which will be addressed in this paper

#### **1-Landslids**

One of the factors hindering urban expansion in the city is landslides, Where landslide areas are considered dangerous areas to build on and the areas above and below areas because they are considered areas under the influence of landslides and the danger may reach, Therefore, building under landslide areas is extremely dangerous and a successful plan should stay away from these areas when expanding the city, The first zone is 1558 meters from the city limits on the eastern side, with an area of 8319 square meters. The second zone is located near the city from the southeast, with an area of 10237 square meters. The third zone is adjacent to the city limits from the western side and covers an area of 12,588 square meters. The fourth zone is located near the city from the western side, about 276 meters from the city limits, and its area is about 55,617 square meters. The fifth zone is located on the western side of the city borders, and this area is about 5066 square meters and is considered the smallest among the landslide areas near Madikeri city. The sixth zone is the largest with an area of 93,292 square meters, and it is located 171 km south of the city. The total of area of landslides about Madikeri City is 185119 square meters with percentage 4% , the map pillow shows the locations of landslids Area of landslides around Madikeri City, So, we can say landslides are the fifth geomorphological obstacle in terms of size and area.

#### **2- Water bodies**

Water bodies such as ponds, lakes and swamps are considered unfit places for construction and housing due to their negative effects on construction, This is due to the accompanying exposure of the walls to damage and moisture and the presence of reptiles and insects, Therefore, the planners to expand the city must exclude water bodies from construction areas, and on the outskirts of the city there are three bodies of water, The first zone is located on the eastern side of the city, about 898 meters away from its borders, and occupies an area of

12,844 square meters. The second water body is also located on the eastern side of the city, about 858 meters away from the city limits, and its area is about 14597 square meters, so it is considered the largest water body close to the city limits in terms of area, The third zone is located in the eastern side of the city and is about 743 meters away from its borders. The area of this area is about 2644 square meters, and it is considered the smallest in terms of area in the vicinity of Madikeri city, Through the map, we can observe the spacing and area of the water bodies near the city of Medquire, and thus the water bodies are ranked fifth in terms of area in geomorphological obstacles, with an area of about 30087 square meters with percentage 1%.

### **3- Floods**

Floods affect the urban expansion of cities because of the damage they cause to buildings, people and animals, and when planning for urban expansion of cities, especially those whose climates are very rainy, focus should be placed on the issue of floods, and the study area is located in an area with heavy rain just as mountains surround it, which leads to the flow of water falling on the mountains To the city and these waters gather to the west of the city, forming a flood inside and outside the city's borders. What concerns us here is the flood formed outside the city's borders in the area in which the city will extend in the future, as the flood forms on the western borders of the city with an area estimated at 278604 square meters with percentage 7% and the map shows the location of the flood outside the city.

### **4- Mountain peaks**

Peaks are uninhabitable as a result of the danger of living on them because of the serious accidents they cause, as well as rain and winds have a great impact on mountain tops, especially if compared to low places. The studied city is surrounded by mountains from all directions, from the northern, eastern, southern and western sides, and the mountains abound in the northern side with a greater area than other directions, and the area of these mountain peaks around the city is about 710235 square meters with percentage 17% .

### **5- Slopes**

Slopes factor is one of the dangerous geomorphological factors that cannot be built upon, the slope factor, and given that the study city is located within a hilly region, so it abounds in it and in the areas adjacent to the slopes, which in turn lead to collapses in soil and rocks and cause human and material losses, and slopes abound around the city of Medikeri in the southern side, And to the southeast and southwest of the city, and to a lesser extent in the northern side of the city and to a lesser extent in the eastern side of the city. As for the western side of the city, it has few dangerous slopes. The slopes in this area are not dangerous and do not pose a significant impact on construction and housing. Its total area of the slopes  $>25^\circ$  around the city is about 1193185 square meters with percentage 28% , The degree of regression was divided into three degrees

1-Slope  $0^\circ-15^\circ$  is considered a light gradient and can be built upon

2-Slope  $15^\circ-25^\circ$  is considered medium and needs to study the type of soil and rocks. After the study, it was found that the soil and rocks in the area are cohesive and allow building on them.

3- Slope  $>25^\circ$  is considered a severe slope and cannot be built on because of the danger it poses.

so the dangerous slopes are the second largest geomorphological obstacle in terms of size Everything is placed on the attached map pillow .

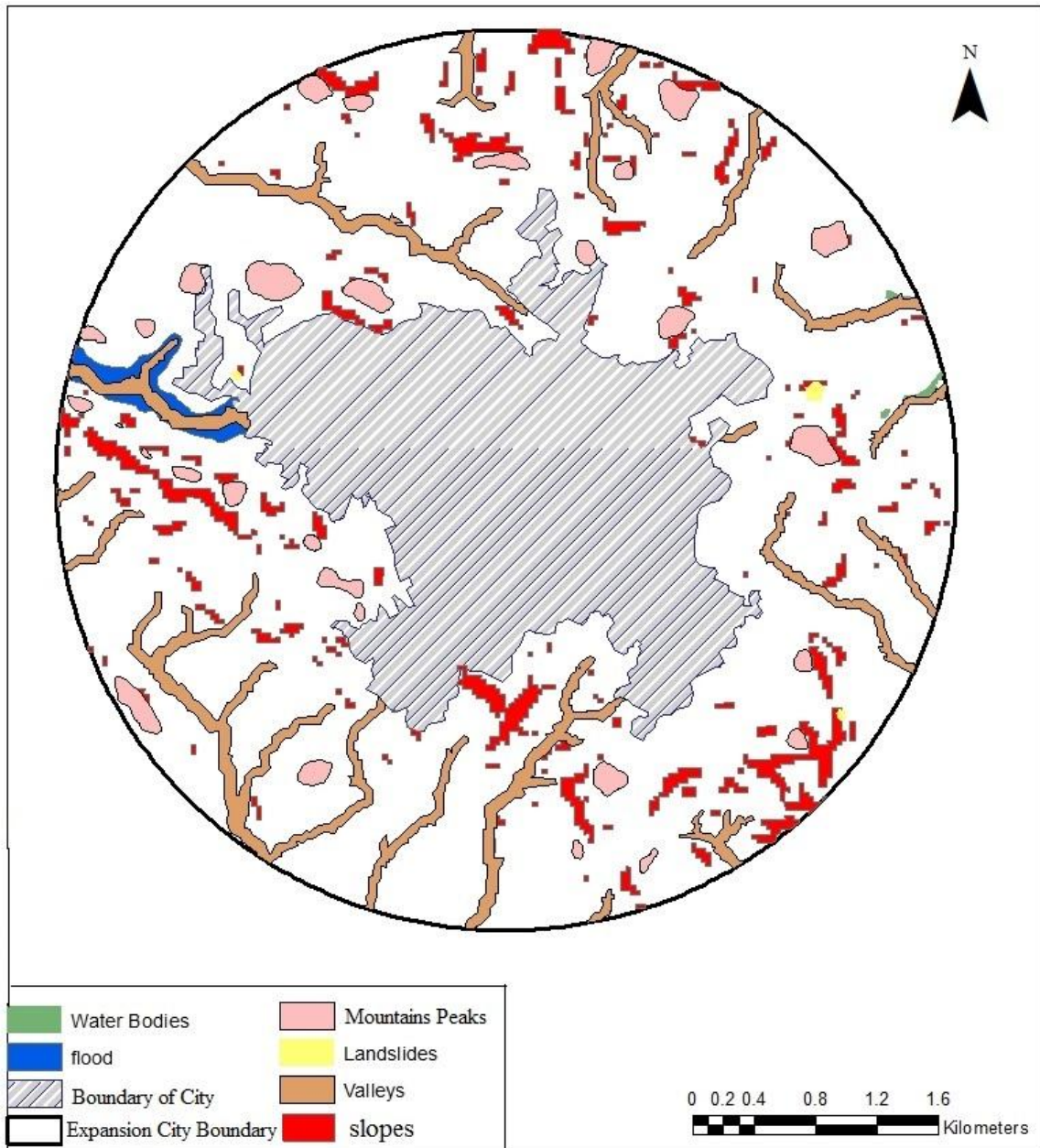
### **6- Valleys**

One of the most important geomorphological obstacles to urban expansion is valleys, because they are a place for water to gather during torrential rains and torrents are formed during the period of rain, and due to the presence of the study city in a mountainous area in which there are many and around valleys and in all directions and in the northern and southern sides are more widespread, and the area of valleys around the city is estimated at an area of 1670272 Square meters with percentage 40% , and from here we know that the area of the valleys is the largest geomorphological obstacle area In terms of area.

### **7- Lowlands**

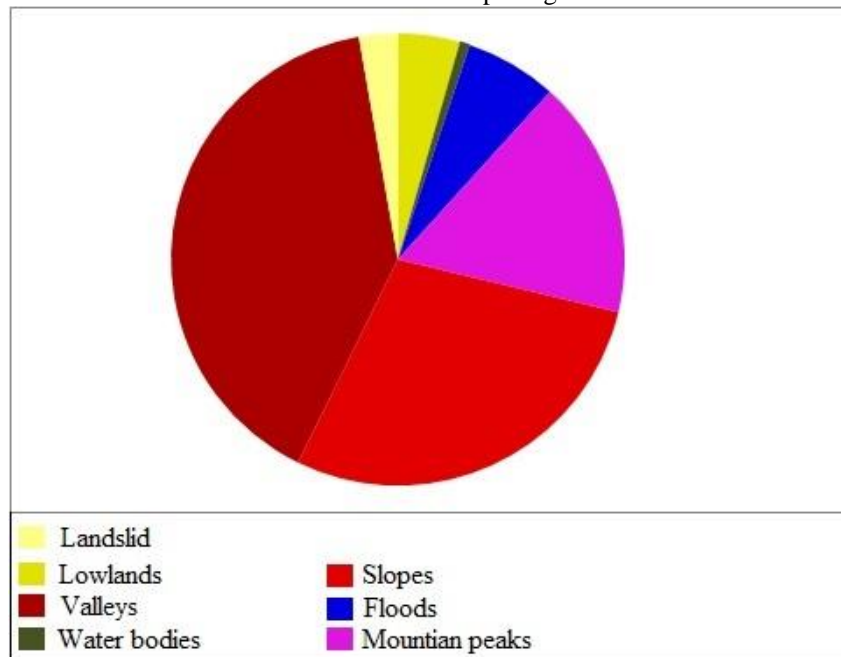
Lowlands are one of the factors that hinder the urban expansion of cities, especially in cities where the rain is heavy, where the airport water collects in the lowlands due to gravity Ponds and swamps are formed in the period of rain , and these depressions spread around the study city in all directions as shown in the map, and the area of lowlands is around The city is about 115852 square meters with percentage 3% , and it is the fifth largest area among the geomorphic obstacles around the study city.

Map of geomorphological obstacles around Madikeri



Source: the Scholar

The Relative Circle of Geomorphological Obstacles



Source: the Scholar

Tayp of obstacles	area	%
Landslids	185119	4
Water bodies	30087	1
Floods	278604	7
Mountain peaks	710235	17
Slopes	1193185	28
Valleys	1670272	40
Lowlands	115852	3
total	4183354	100

Through the previous data, we can see that the total area of geomorphological obstacles is 4180354 square meters, but this figure is incorrect because there is an overlap between the geomorphological obstacles, meaning that there are more than one geomorphological obstacle in one area, where the mountain tops and slopes are located in the same area in an area estimated at 14986 Square meters, Lowlands and valleys are located in the same area in an area estimated at 36398 square meters, Landslides and floods are found in the same area in an area of 8,980 square meters, landslides and slopes exist in the same area in an area of 23,153 square meters, and water bodies and valleys are found in the same area in an area of 11530 square meters, and there are slopes and valleys in the same The area is in an area estimated at 20,941 square meters, and the floods and valleys are located in the same area in an area of 139061 square meters, and the water bodies and valleys are located in the same area in an area of 6080 square meters, and the valleys and Lowlands are found in the same area in an area estimated at 6087 Square meters, Through this information, we can calculate the common area between two geological obstacles at once to be able to obtain the correct area of geomorphological obstacles, which is estimated at about 3913138 square meters.

## II. CONCLUSION

The city of Madikeri is a mountain city, so there are many hills and valleys around it, which leads to the presence of many geomorphological obstacles that hinder the expansion of the city, so it is necessary to study these obstacles in detail and identify dangerous places around the city in order for the future expansion of the city to take place in non-dangerous places around the city.

This paper has dealt with the geomorphological obstacles around the city of Madikeri that affect the expansion of the city in the future, and through this paper it is possible to identify the dangerous geomorphological places around the city that should be avoided in the construction process and land uses such as valleys, mountain tops, slopes, bodies of water, places of floods, landslides and low lands that Water can collect in the rainy season, and non-dangerous places can be identified and available to build on.

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