ANALYSIS OF RAINFALL AND GROUNDWATER TABLE FLUCTUATION IN MYSORE CITY USING ERDAS AND ARCGIS

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Introduction:

Mysore district, located in the Indian state of Karnataka, experiences a typical tropical climate with distinct wet and dry seasons. Rainfall plays a vital role in shaping the region's environment and economy. The district receives its primary rainfall during the Southwest Monsoon, which typically occurs from June to September. During this period, the region witnesses heavy precipitation, contributing to agricultural growth and the replenishment of groundwater resources. The groundwater table in Mysore district is closely linked to the monsoon rainfall. Adequate rainfall is essential for recharging underground aquifers, which serve as a critical source of freshwater for the region. However, the balance between rainfall and groundwater levels is delicate, and fluctuations can impact both agricultural practices and the availability of potable water. Variability in the monsoon patterns, climate change, and anthropogenic factors can influence the groundwater table in Mysore district. Proper management of this precious resource is crucial for the sustainable development of the district, ensuring reliable water sources for agriculture, industries, and daily life. Analysing rainfall and groundwater table data in Mysore district is essential for understanding the region's water resource dynamics. This study aims to examine the relationship between rainfall patterns and groundwater levels, which are critical for sustainable water management and agricultural practices in the region. By studying historical data, we can assess trends, seasonal variations, and potential impacts of climate change on groundwater resources. Such analysis will provide valuable insights for informed decision-making and the development of effective water resource management strategies in Mysore district.

Objectives:

The main Objective of this project is to depict the annual and monthly rainfall and GWT patterns over Hebbal and Siddalingapura situated in Mysuru district from the year 2019 upto 2023 and comparing it with current year.

1. ***Well Inventory:*** Identifying places with Borewells are and mapping them in shape file along with the depth at which water is found in that exact region.
2. ***Correlation Analysis:*** Investigate the relationship between rainfall and groundwater fluctuations to understand how precipitation influences groundwater recharge and depletion.
3. ***Spatial Distribution Mapping:*** Map the spatial distribution of rainfall and groundwater table levels to identify areas with high or low water availability.
4. ***Analysis of long-term rainfall trends:*** Will be conducted to identify patterns, anomalies, and potential shifts in precipitation over different seasons or years.
5. ***To compare the targeted regions of the District of its Rainfall and GWT pattern:*** Two villages are taken into consideration in this project namely Hebbal and Siddalingapura and from the obtained results for both the regions, comparison is made between them of water availability and trends in rainfall.

Methodology:

1. Studying and analysing the Plot area i.e., a portion of Mysore district area of its locality in, land type and water availability were done using Geological maps collected from the survey of India.
2. Previous year Rainfall and GWT data of two targeted regions namely Hebbal and Siddalingapura were collected from District groundwater officer Mysore.
3. From the collected rainfall data the number of Heavy Rainfall Event is calculated for each year for both Hebbal and Siddalingapura regions of Mysuru, from which the year is either considered as a flood ear or a drought year.
4. Percentage appreciation or depreciation is calculated between the year 2023 and the average of the years 2019 to 2022.
5. Site visits were conducted near certain points of Hebbal and Siddalingapura and depth at which underground water would be found was noted along with the latitude and longitude of the exact point of that region.
6. The collected depths along with the latitudes and longitudes of that specific point were imparted into the software and from the help of the shape file of the two regions a dedicated map is made.
7. With the help of geological map the two regions the soil type is understood and percolation factor distributed throught the map is taken into consideration to understand the runoff characteristics of water after rainfall for Ground water detection.
8. Results obtained from site visits tabulated are compared with the previous year data and percentage appreciation or depreciation is calculated.

Conclusion:

In Siddalingapura we have observed a depletion in rainfall in the year 2023 when compared with 2022, 2021, 2020, 2019 by around 47.2% Similar is the case with the GWT of that particular region with a percentage increase in depth at which groundwater was found of around 65.22%. Main reason for such an increase in depth is not just rainfall but also borewell pumps which pumps out water for commercial usage etc which is necessary. From the results obtained from site visits conducted between October 2023 and March 2024, we got an average depth of water found as 5.95m in Siddalingapura overall which when compared with the years 2019 to 2023 is an increase in depth of 49.04%. Drought year is seen in these two regions frequently over the past 5 years as per calculations done regarding Heavy Rainfall Event. We got HRE's ranging between 2 and 4 in numbers per year which is decent but not as great as what we see in northern side of India.

In Hebbal region, rainfall is seen more in this region of about 28.5% more when compared with Siddalingapura in the year 2023. But when compared with previous years Hebbal has experienced deficiency in rainfall of about 31.1% when compared with the years 2019, 2022, 2021 and 2022. Talking about GWT, the observation was taken from October 2023 to march 2024 through site visits, and it was found out that in Hebbal overall, groundwater was found at an average depth of 2.01m which is shallower when compared with the year 2023 which was 3.06m with a decrease in depth of about 34.4% but next when we compare it with the average value of the years 2019 to 2023 which is 6.73m, we get a percent improvement in GWT by 70.1% upto march 2024 since march comes between pre monsoon and monsoon season this year. Drought year is still seen in this region till the year 2023 as we saw in Hebbal, Heavy rainfall Event occoured ranging between 3 and 6 in numbers from the year 2019 to 2023, HRE experienced here is better when compared with Siddalingapura but still not as good as what we see in north India.

It has been experienced that rainfall varies from season to season and from place to place. This has major implications on agriculture. Therefore, greater emphasis has been laid on the pattern of seasonal distribution of rainfall. Rainfall varies from month to month because of the different climatic conditions over the area. Where rainfall is governed by the South West Monsoon, the months of June-September account for about 60% of the total annual rainfall. On the other hand, January and December are the months of the lowest rainfall. The main causes for the temporal and spatial variations of rainfall are the atmospheric disturbances such as thunderstorms. Duration of rain at any region depends on the number, size and rate of thunderstorm cells. In winter season thunderstorm rain is the least. In summer season, thunder activity increases gradually. In the post- monsoon season, heavy rainfall roughly occurs in the areas of thunderstorm cell.

Talking about Groundwater table, The overall Mysuru region comprises mainly of Migmatites and Granodiorite which occupy about 90% of Mysuru area making the region well predictable in determining the location and depth of Groundwater. Also

since the geological aspect always remains constant in a region, The value of GWT would mainly rely upon the amount of rainfall received in that region.

Scope for future work:

High-resolution Spatial Analysis: Enhance the spatial resolution of rainfall data and groundwater monitoring networks to capture localized variations within Mysore city. Utilize ArcGIS tools to interpolate and analyse high-resolution data, providing insights into micro-scale variations in rainfall intensity and groundwater levels.

Temporal Analysis: Expand the temporal scope of analysis to assess long-term trends and seasonal variations in rainfall patterns and groundwater levels. ArcGIS software can be used to visualize temporal trends, detect anomalies, on water resources in Mysore city.

By pursuing these future work scopes, the analysis of rainfall data and groundwater fluctuation using ArcGIS software in Mysore city can contribute to more effective water resource management, resilience to climate change, and sustainable development outcomes.