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Condition Assessment and GIS-Based Mapping of Storm Water Drainage System in Mysore City using SWMM

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Abstract - *Stormwater drainage systems play a crucial role in preventing urban flooding and maintaining environmental sustainability. Rapid urbanization in Mysuru city has led to increased surface runoff and frequent waterlogging, especially in low-lying areas. This study presents a condition assessment and GIS-based mapping of the stormwater drainage network using field survey, QGIS, and SWMM modelling.*

A total of 96 drainage sections were surveyed and classified based on physical condition and hydraulic performance. The results indicate that approximately ***25% of drains are in good condition, 23% are moderate, and 52% are in poor condition****, highlighting significant deterioration in the drainage network.*
GIS-based thematic maps were developed to spatially represent the condition of drains and identify critical zones. Further, SWMM simulations were carried out using average rainfall data of Mysuru to evaluate hydraulic performance. The results indicate overflow and surcharging in several low-lying areas, confirming inadequate drainage capacity.
The study demonstrates that integration of GIS and SWMM provides an effective and low-cost approach for urban drainage assessment and flood mitigation planning. The findings can assist municipal authorities in prioritizing maintenance and improving stormwater management strategies.

***Key Words*: Stormwater Drainage, GIS Mapping, SWMM, Urban Flooding, Mysuru, Drainage Assessment.**

1. INTRODUCTION

Urban stormwater drainage systems are essential for managing surface runoff and preventing flooding in rapidly developing cities. With increasing urbanization, natural infiltration has significantly reduced due to the expansion of impervious surfaces such as roads, pavements, and buildings. This results in higher runoff volumes and peak flows, putting pressure on existing drainage infrastructure. Mysuru city has been experiencing frequent waterlogging and localized flooding, particularly in low-lying areas during monsoon seasons. These issues are primarily caused by inadequate drainage capacity, siltation, solid waste dumping, and lack of proper maintenance. In addition, the absence of updated spatial data and systematic documentation ofdrainage networks makes it difficult for authorities to assess and manage the system effectively.

Traditional methods of drainage assessment are time-consuming and lack spatial accuracy. The integration of Geographic Information System (GIS) provides an efficient solution by enabling the collection, analysis, and visualization of drainage data in a spatial environment. GIS helps in identifying critical areas, understanding drainage patterns, and supporting decision-making.

Further, hydraulic modelling using the Storm Water Management Model (SWMM) allows evaluation of drainage system performance under different rainfall conditions. It helps in identifying overflow points, surcharging conduits, and flood-prone zones.

In this study, a combined approach of field survey, GIS mapping, and SWMM modelling is used to assess the condition and performance of stormwater drains in selected low-lying areas of Mysuru city. A total of 96 drains were surveyed and

classified based on their physical condition and hydraulic performance. The study aims to identify critical drainage issues and provide insights for improving urban stormwater management.

2. METHODOLOGY

The methodology adopted in this study consists of field survey, GIS-based mapping, and hydraulic modelling using SWMM.

Initially, selected low-lying areas of Mysuru city were identified for detailed analysis. A field survey was conducted using GPS-enabled devices to collect data on drain dimensions, condition, and flow characteristics.

The collected data were processed using QGIS to create a spatial database and thematic maps. Drains were classified into Good, Moderate, and Poor categories based on physical condition, blockage level, and hydraulic performance.

Further, the Storm Water Management Model (SWMM) was used to simulate the hydraulic behavior of the drainage network. Average rainfall data of Mysuru was used as input for the model. Sub-catchments, nodes, and conduits were defined, and simulations were carried out to identify overflow and flooding conditions.

3. RESULTS & DISCUSSION

A total of 96 stormwater drains were surveyed and analysed for physical condition and hydraulic performance. Based on field observations, the drainage system was classified into three categories: Good, Moderate, and Poor.

The analysis shows that:

- 24 drains (25%) are in good condition
- 22 drains (23%) are in moderate condition
- 50 drains (52%) are in poor condition

The high percentage of poorly maintained drains indicates severe issues such as siltation, blockage, structural damage, and improper connectivity.

GIS-based thematic mapping using QGIS helped in visualizing the spatial distribution of drainage conditions. It was observed that most of the poorly performing drains are concentrated in low-lying areas, making them highly vulnerable to waterlogging during rainfall events.

SWMM simulation was carried out using average rainfall conditions of Mysuru. The results revealed overflow and surcharging in several sections of the drainage network, confirming that the existing system is hydraulically inadequate in handling runoff.

The combined analysis of field data, GIS mapping, and SWMM outputs clearly indicates the need for immediate maintenance and upgradation of the drainage system, particularly in critical zones.

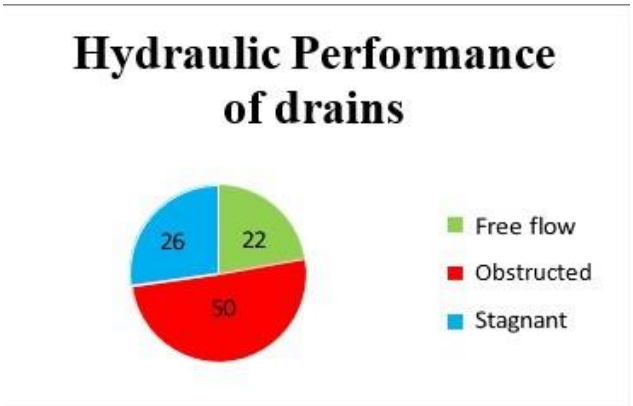

Chart -1: Hydraulic performance of the drains

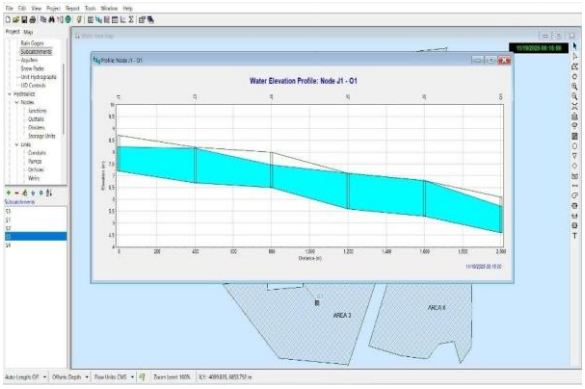

Fig -1: Profile picture of water elevation

3. CONCLUSIONS

The study highlights the critical condition of the stormwater drainage system in selected areas of Mysuru city. More than half of the surveyed drains were found to be in poor condition, indicating severe maintenance and structural issues.
GIS-based mapping proved to be an effective tool for visualizing drainage conditions and identifying critical zones. SWMM simulations further confirmed that the existing drainage system is inadequate to handle current runoff conditions, resulting in overflow in low-lying areas.
The integration of field survey, GIS, and SWMM provides a reliable framework for urban drainage assessment. The results of this study can support municipal authorities in prioritizing maintenance, improving drainage design, and reducing urban flooding risks.

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