

To Study The Alternations In Natural Streams Network At Aurangabad (Chhatrapati Sambhajnagar) City: State-Maharashtra, India

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Abstract

The Aurangabad is a City in Maharashtra State, India. The delineation of stream network is one of most fundamental steps on water bodies or naturally resource management. Now the urbanization development growth is very higher, its needed catchment stream network of study area Aurangabad city by using RS & GIS. This paper designed a stream network analysis platform based on Q-GIS support.

Keywords: Urban development, remote sensing, RS & GIS, Aurangabad City.

INTRODUCTION

Stream networks can be delineated from a digital elevation model (DEM) using the output from the Flow Accumulation tool. Flow accumulation in its simplest form is the number of upslope cells that flow into each cell. India is one in all the foremost flood prone countries within the world. The principal reasons for flood are prevailing natural ecological systems within the country and these are significant precipitation with temporal and spatial variation, extremely silted watercourse systems and inadequate capability to hold the high flood discharge, inadequate drain to hold away the fresh water quickly to streams/rivers. Repeatedly typhoons and cyclones conjointly cause floods. Flash floods are caused by steep and extremely erodible mountains, significantly in range ranges. The average precipitation in India is 1150 millimeter with important variation across the Country. The annual precipitation on the western coast and Western Ghats, Kasi hills and over most of the Brahmaputra River vale amounts to over 2500 millimeter. Most of the floods occur throughout the monsoon amount and are sometimes related to tropical storms, depressions and active monsoon conditions. An urban stream is a formerly natural waterway that flows through a heavily populated area. Often times, urban streams are low-lying points in the landscape that characterize catchment urbanization. Urban streams are often polluted by urban runoff and combined sewer outflows.

A stream query is part of a *stream network*. A stream network starts with one or more *stream source templates*. A stream source template collects matching events received by the monitor instance and places them as items in a stream. Stream queries take existing streams (a stream created by a stream source template or by another stream query) and generate added-value streams that contain derived items. Finally, *stream listeners* bring items out of the stream network and into procedural code. In a given stream network, upstream elements feed into downstream elements to generate derived items. When a monitor instance receives an event that matches a stream source template, the correlator activates the stream network. The passage of time can also cause the correlator to activate a stream network. If, for example, a stream query operates on the items received within the last 5.0 seconds, then 5.0 seconds after an item arrives the correlator will again activate the stream network. In a given stream network activation, not all stream queries and not all stream listeners necessarily receive items. Which queries and stream listeners receive items depends on the definitions of the stream queries and stream listeners. However, in a given stream network activation, the correlator passes items through all queries and stream listeners in the network that receive items. A query or stream listener that receives an item is considered to be activated. Only when processing of all activated queries and stream listeners is complete does the correlator process the next event on the context's input queue. In a given stream network activation, various queries can produce multiple items on their output streams. The items in a particular stream during a particular stream network activation are called a *lot*. If a stream query or stream listener receives a lot that contains multiple items, it processes all items as part of a single stream network activation. The items in a lot are always ordered, and the lots themselves are always ordered. The streamline-based methods have been recognized for their effectiveness for in an effort to improve the computational efficiencies and flow description of classical finite volume models, streamline-based simulation techniques were developed in which 3D

transport problems are cast into a set of independent 1-D problems oriented along the direction of total flux. Streamline-based methods have found applications in rapid screening and ranking 3D reservoir models and in fast flow simulations accounting for realistic including gravity, multiphase and multicomponent flow, and besides faster solutions, streamline based methods offer visual appeal and physically intuitive representation of the flow which is generally referred as flow diagnostics. A popular application of streamline-based flow diagnostics is including rate and well placement optimization.

Headwater streams have a high amount of stream edge relative to stream surface area (Richardson and Danehy 2007) and local ground water discharge is a major contributor to water flow in these streams (Leach et al., 2017). Therefore, headwater streams and their riparian zones constitute an interface between water and soil, and largely control inputs from surrounding landscapes to downstream ecosystems (Lidman et al., 2017). They also provide important ecosystem services such as cycling nutrients (Blackburn et al., 2017; Bormann and Likens, 1967) and buffering impact of pollutants (Klaminder et al., 2006). Headwater

Streams also function as important habitat for both invertebrates and plants and functions as migration corridors (Freeman et al., 2007). This strong coupling between soils and streams brings up important issues regarding management of small streams. Any perturbation in headwaters will affect downstream environments, so in order to protect large streams, it's important to protect the headwater streams (Kuglerová et al., 2017; Wipfli et al., 2007). This paper is organized as follows. First, we provide a description of the boundary layer method that has been implemented in our streamline tracing framework as a post processing tool for a commercial simulator. The implementation is validated by comparing streamline trajectories, TOF and tracer responses with a semi analytical solution based on complex variable Then we will present applications of our approach to flow visualization and flow-diagnostics-based rate allocation optimization with a series of numerical examples encompassing different levels of geologic and geometrical complexity to illustrate the robustness of the approach.

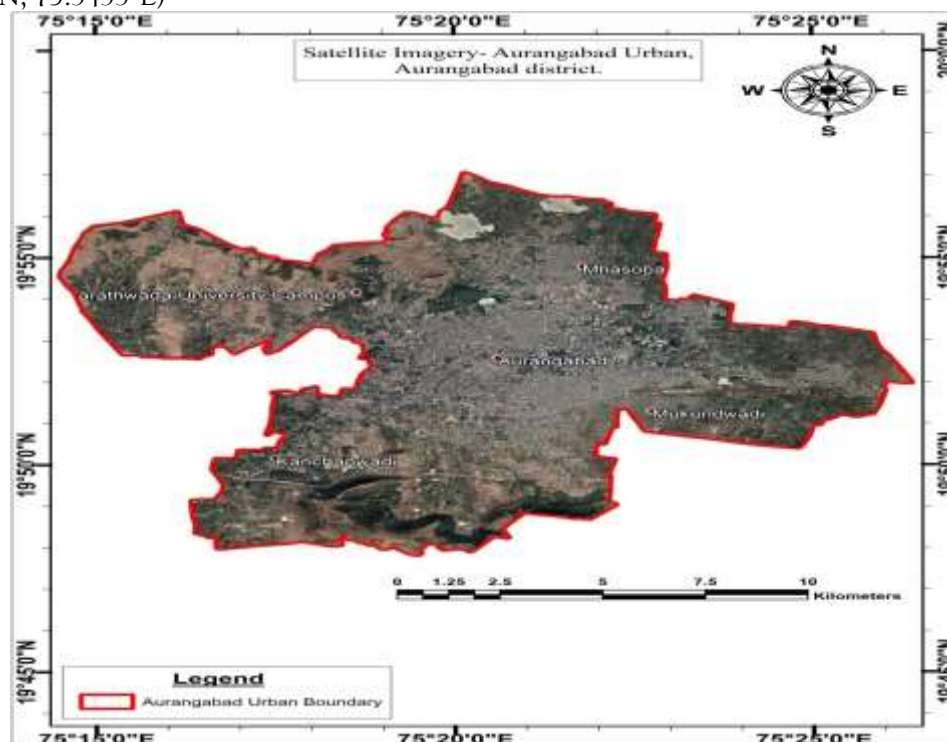
OBJECTIVE

Finding and eliminating repetitive and unnecessary processes or activities from a process in order to increase its effectiveness and efficiency is referred to as "streamlining." Process streamlining aims to increase efficiency, increase productivity, and reduce waste. Procedures must be streamlined through the use of technology, updated processes, and other practical approaches.

Study area:

The study is mainly located by Aurangabad Urbanization, mainly showing the location in satellite image are center of Aurangabad, Mukundwadi, Dr. B. A. Marathwada University, kanchanwadi & Mhasoba (old historical identification of inter area).

(19.8762°N, 75.3433°E)



Map 1.1: Study area natural streams network in Aurangabad city as Ward wise data collection.

RESEARCH METHODOLOGY

The proposed optimization method is a streamline-based gradient free method. The objective is to minimize the overall water cut within the optimization period. The allowable constraints include field injection rate target, field production rate target, maximum well injecting pressure, minimum well producing pressure, maximum and minimum production rates, maximum and minimum, and maximum well rate change ratio between two adjacent optimization intervals. The optimization is done over selected time intervals.

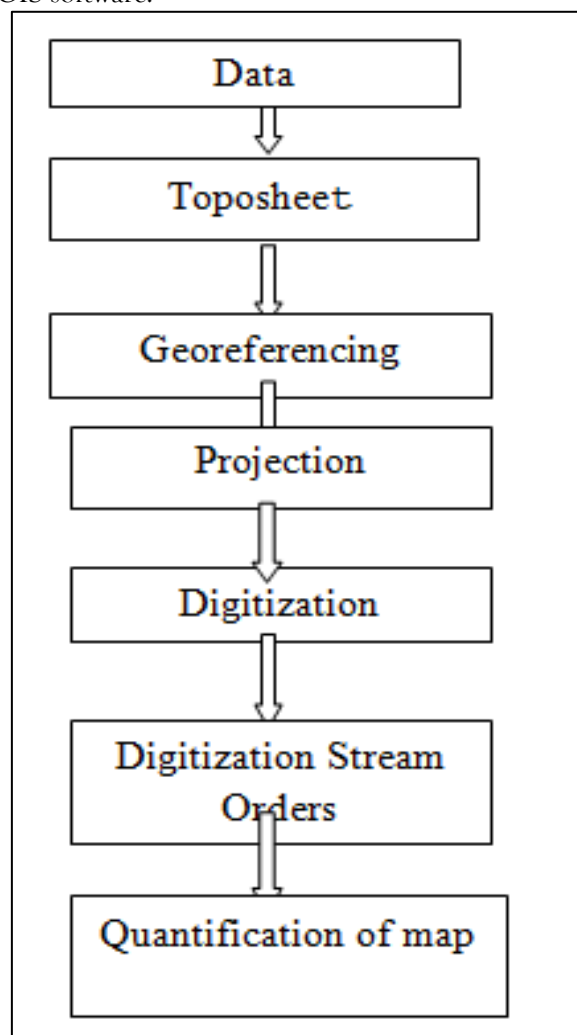
The Swedish National DEM generated by the Swedish Mapping, Cadastral and Land Registration Authority using LiDAR data was used for hydrological modelling. The resolution was 2×2 m and was generated from a point cloud with a point-density of 0.5-1 points /m² with a horizontal and vertical error of 0.1 m and 0.3 m, respectively. The mountain region in north-western Sweden was not covered by this DEM at the time of this study. The DEM was split into 2818 sub catchments where each catchment had 2 km overlap with surrounding catchments to avoid edge effects during stream extraction. The raster stream network grids were later mosaicked back together to form a cohesive stream network before analysis. Before any hydrological calculations could be conducted on the DEM it had to be pre-processed to become hydrologically correct (Marks et al., 1984). Lidberg et al. (2017) showed that breaching was the best way to pre-process high resolution DEMs in the Swedish landscape. Therefore, a three-step breaching approach was used as described below:

Stream lines from the 1:12 500 scale property maps, produced by the Swedish Mapping, Cadastral and Land Registration Authority, were burned 1 m into the DEM on agricultural land using the tool “burn streams” in Whitebox GAT 3.4 (Lindsay, 2014).

One of the historically significant locations in the Maharashtra region is the urban metropolis of Aurangabad. Modernization mapping and digital scientific work are currently being used throughout the research report.

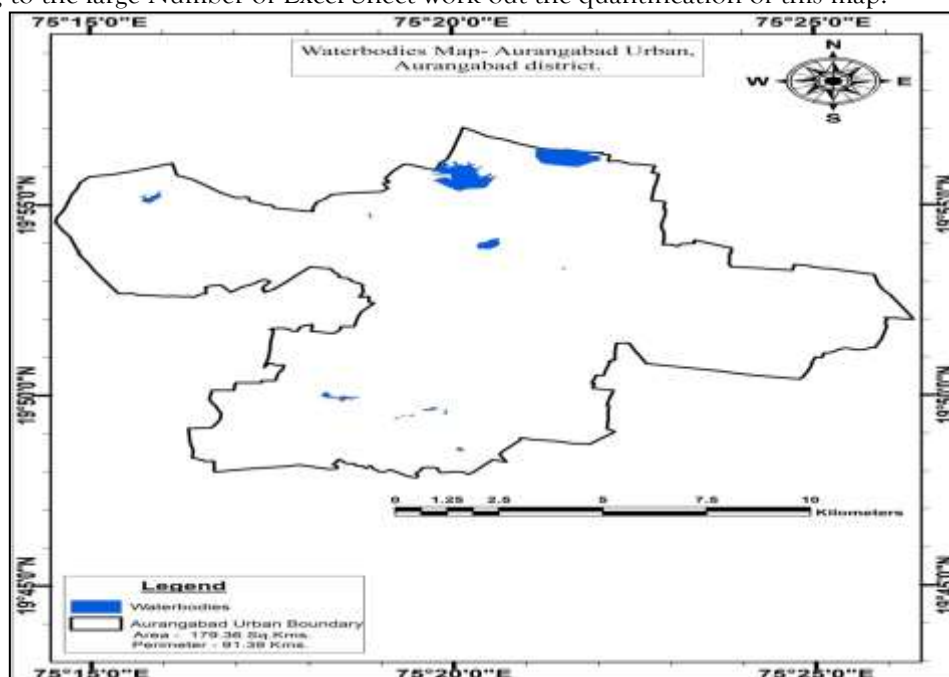
The coordinates for this location are 19.8762°N and 75.3433°E.

It functions in the free Q-GIS software.



RESULT AND DISCUSSION

According to the large Number of Excel Sheet work out the quantification of this map.



Map 1.2: Water bodies map of Aurangabad urban area.

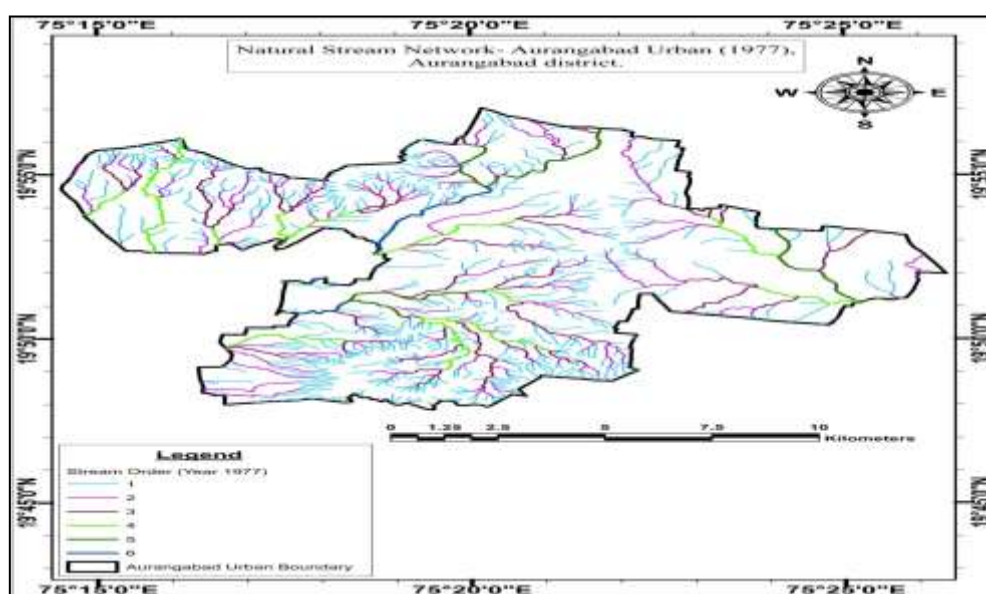
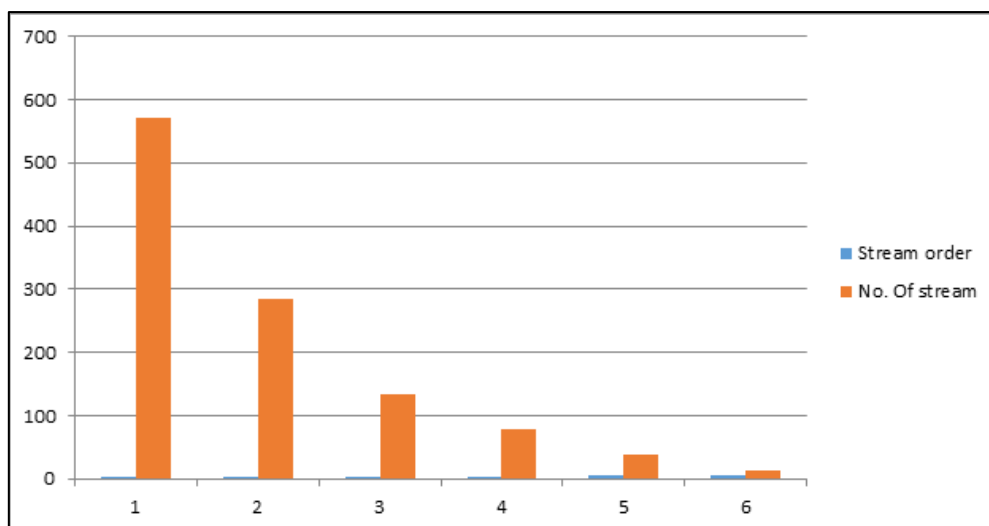
The two sizable and two tiny bodies of water on the city's geographical map, Aurangabad is one of South Asia's fastest-growing industrial hubs. Aurangabad is a rapidly expanding metropolis, but the problem of water shortage is severe and getting worse by the day, not meeting the needs of the city's water supply as of today. It is because city planners do not use GIS and remote sensing techniques, as well as the ratio of population and urbanization with environmental elements, that these factors are not greatly taken into account or followed in the city's DPR.

Comparison Study of 1977 & 2011 Topomap of Urbanization: The data digitize on the 1977 toposheet. On the large number excel sheet data converted into three categories wise statistical based format in the stream order, number of streams and total sum of length. In the study area totally found six streams Order on the basis of 1977 Toposheet, which is total number stream 1122 and they stream sum accretion in the formation conversation in the sum of length.

Table 1.1: On the basis of 1977 Toposheet

Stream order	No. Of stream	Sum of length
1	572	272.0138657
2	285	102.0660646
3	134	67.97863764
4	79	38.38368506
5	38	21.37580127
6	14	7.360093243
Total	1122	

Graph 1.1 showing on the basis of table 1.1



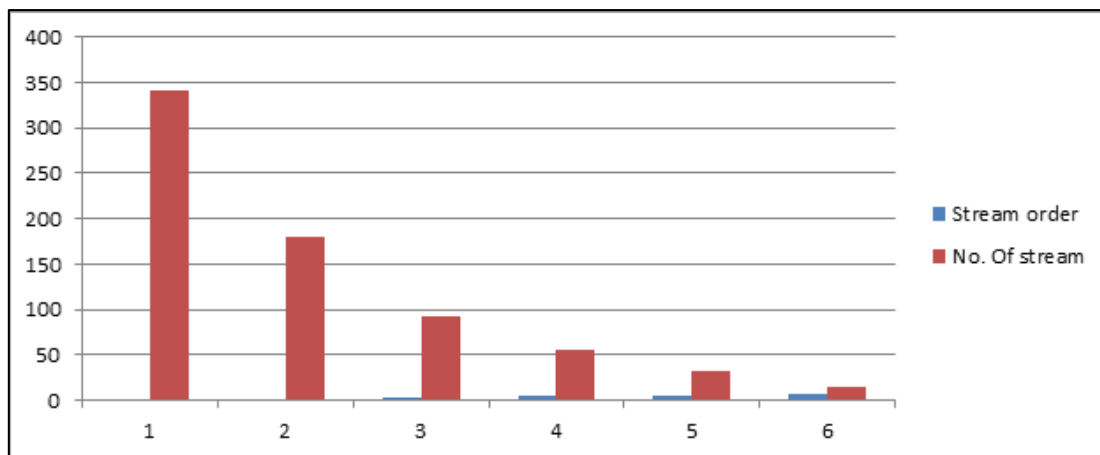
Map 1.3: Natural Stream Network of Aurangabad Urban area by 1977:

The above image of the study's natural stream network was taken in 1977, and it has since been greatly expanded. A large number of streams and drains are plainly seen on the map. Given the ratio of natural resources to population, the city is now severely under populated. Six different types of streams are compared on the maps in 2011 and are provided with a wide network.

Table: 1.2 Basis on Stream Based Toposheet Data-2011

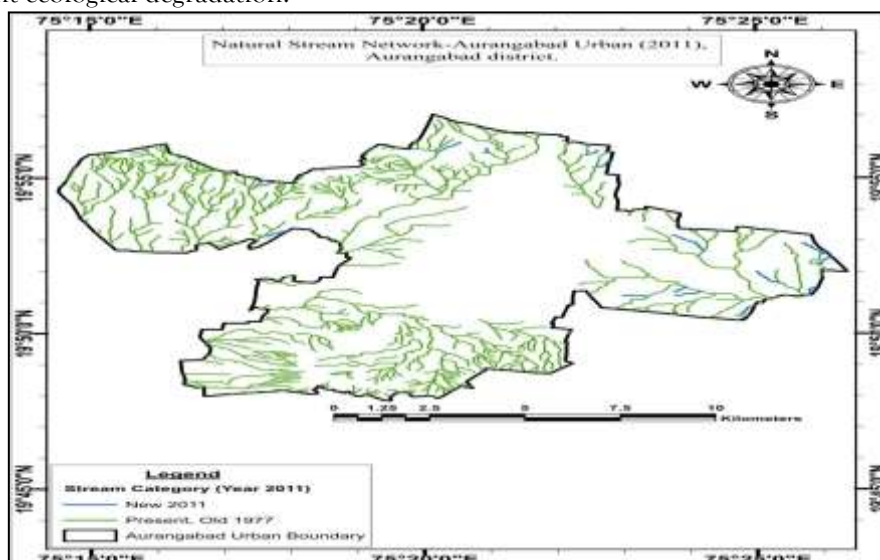
Stream order	No. Of stream	Sum of length
1	342	182.6879769
2	180	75.82149175
3	93	49.80839659
4	55	33.59081427
5	32	19.02196771
6	14	7.360093243
Total	716	

Graph: 1.2 Basis on Stream Based Toposheet Data-2011



The above graphical representation of streams in 2011 showing the decreasing number of streams as well as length of streams which concluding that the land use pattern of the study area is changes and encroached by human activities which mainly in terms of increase of population, urbanization and industrialization. In comparison of 1977 data of natural streams which had shown the above 47% loss of streams length and number. The loss of natural streams which indicating the decreasing the environmental standards as well the degradation of ecosystem and ecological component. Some of the habitat loss of the species occurred due to these disappearing streams.

Obtained data from Q-GIS and toposheet of 1977 and 2011 for Aurangabad urban streams pattern showing the variability and destruction of natural streams sources its symbolic representation of natural ecosystem loss, degradation of soil quality, land use pattern, pecculation of ground water system destroying. Main cause of the natural stream's destruction is forest of concert are increased with increase in population and its requirement of urbanization an industrialization. Climate change is also one of the major natural factors but its rate is very slow to loss the natural streams. Study area is semi-arid and the previous researcher comparison and analysis of natural stream loss rate much higher in the present study area. The assertion that natural streams in urbanized areas experienced lossless preservation from 1977 to 2011 is incorrect. A vast body of hydrological research from and concerning this period confirms that urbanization profoundly alters stream ecosystems. This process, often called the "urban stream syndrome," is caused by replacing natural surfaces with impervious ones like pavement and rooftops, leading to severe and consistent ecological degradation.



Map 1.3: Natural Stream Network of Aurangabad Urban area by 2011.

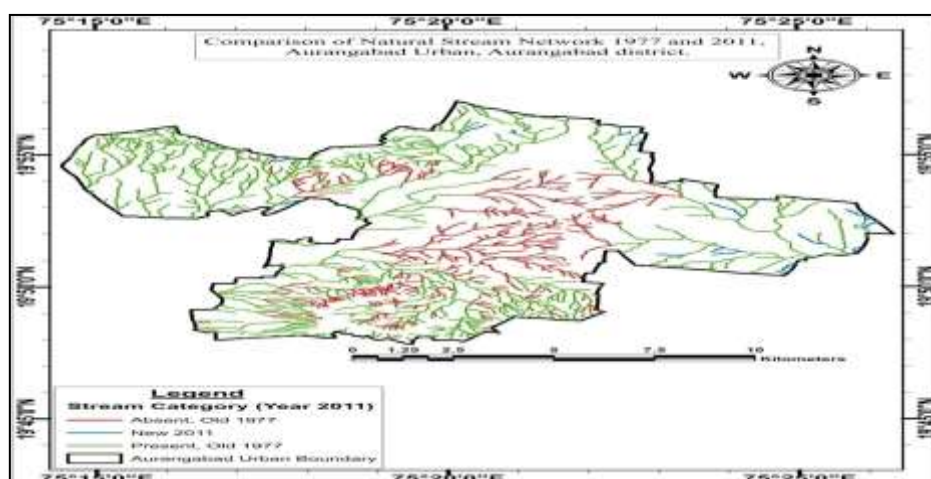
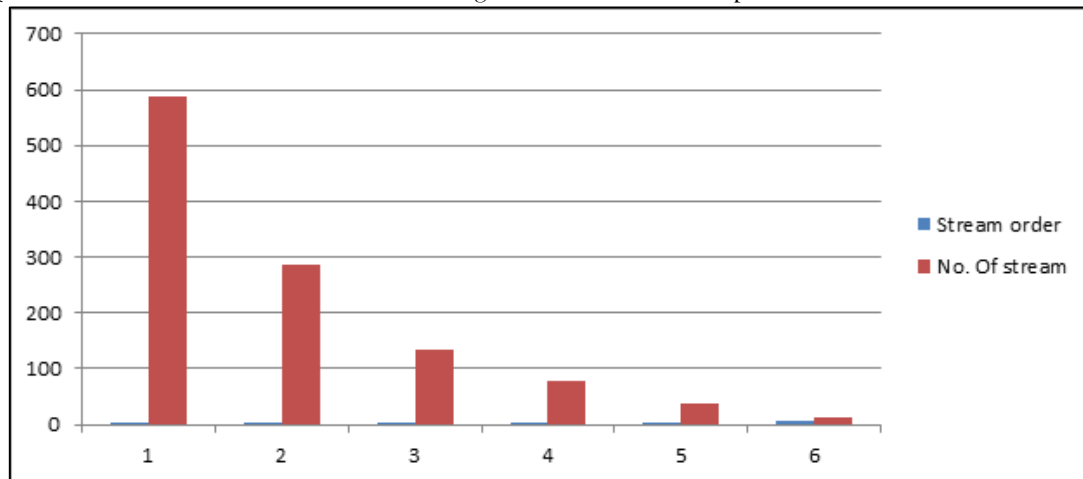
Map of the natural stream network from 2011 illustrating the phenomena of natural streams disappearing as a result of accelerated urbanization and rising urban population. Additionally, the area's industrialization advanced quickly, and engineering and technology features are now accessible to commerce transformation on a global scale. The quantity of natural streams was coordinated by this entire process.

Table 1.3 Streams Data Difference between 1977 & 2011

No. of stream Order	No. Of stream	Sum of length
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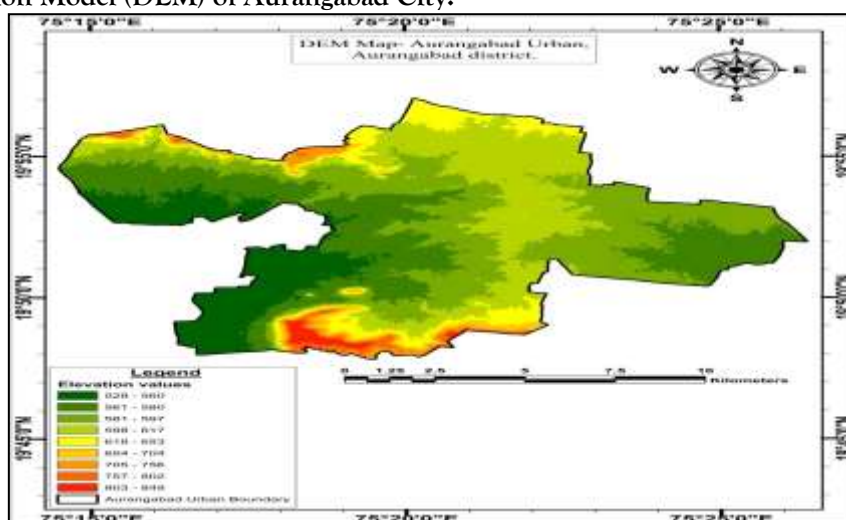
1	588	283.102687
2	287	104.2516274
3	134	67.69625566
4	79	38.38368506
5	38	21.37580127
6	14	7.360093243
Total:	1140	

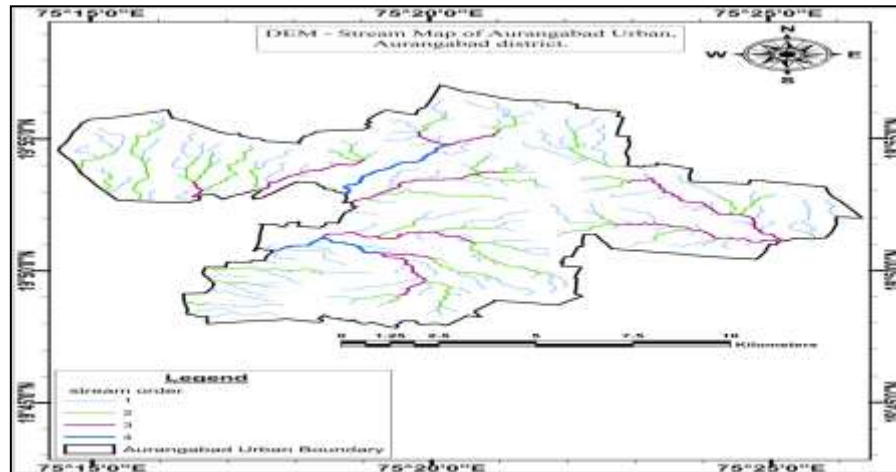
Graph: 1.3 Natural Stream Network of Aurangabad Urban area comparisons between 1977 & 2011 data:



Comparative investigation of the natural stream network in the research area demonstrates the wide and dynamic change in the number of streams as well as the network's rapid decline. All of this demonstrates the city's unsustainable growth and the uncontrolled human activity that has an adverse effect on the city's environment and natural resources.

Digital Elevation Model (DEM) of Aurangabad City:



Streams Network of DEM:**CONCLUSION**

Since human life and health have improved thanks to the highly developed science and technology of the 20th century, more people are being born and dying, which has an impact on population growth. Population unrest is adversely correlated with rapid industrialization and urbanization. The area under inquiry is a heavily populated, urbanize, and industrialization region of the state of Maharashtra. Due to this cause, the city's urban area is becoming more and more synchronicity and encroached upon by people for their way of life. The present study's data, which were derived from toposheet, RS, and GIS, demonstrate how human activity is encroaching on the forest cover and natural streams, and how these streams will eventually be destroyed. This study comes to the conclusion that rising unsustainable urbanization activity is to blame for the decline in Aurangabad Municipal's natural streams and watershed area.

Population growth and urbanization have a negative impact on the city's environment, causing problems with water supply, air quality, citizen health, and many forms of pollution. The digitalization data between two different toposheets are 1977 and 2011. On the 2011 toposheet digitize map, the stream network that was digitized in 1977 is primarily missing, and various naturally occurring streams, ponds, and water bodies have had their areas decreased. Flooding is primarily occurring in stream-reducing areas because to the significant rainfall in the urban region. Urban areas are severely affected.

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