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DEM GENERATION AND RIVER ANALYSIS USING HEC-RAS MODEL, HARIDWAR DISTRICT, UTTARAKHAND

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ABSTRACT

The Ganga River is a major river in North India known for its fertile alluvium deposits formed by floods in the Indo-Gangetic plains. Many scientists have conducted flood frequency analysis on the Ganga River using various approaches. With changes in river beds caused by anthropogenic changes, the intensity of floods has also changed in the last decade, necessitating further research.

In recent years, the US Army Corps of Engineers Hydrologic Engineering Centres River Analysis System (HEC-RAS) hydraulic model and Remote Sensing (RS) technology, in conjunction with Geographic Information System (GIS), have become critical flood monitoring tools. The primary focus in this field is the delineation of flood zones and the creation of flood hazard maps for vulnerable areas. GIS software Arc GIS and HEC-Geo RAS, as well as hydraulic software HEC-RAS, are used to analyze river flow and create flood hazard maps.

A method for delineating river system floodplains using direct processing is developed. The first goal was to build and validate a river network model of the system using existing HEC-2 model-generated data from the Hydrologic Engineering Center's River Analysis System (HEC-RAS). Haridwar is one of the first towns where the Ganga emerges from the mountains and reaches the plains. Following that, HEC-RAS simulations were run to generate water surface profiles across the system for six different design storm events. The HEC-RAS in-channel spatial data were then geo-referenced and mapped in the GIS domain before being combined with digital elevation model (DEM) over-bank data to create a triangular irregular network (TIN) model.

The goal of this research is to use the most recent version of HEC-RAS to model 1D hydrodynamic floods in the Ganga River in Haridwar District, Uttarakhand, India, with a focus on geospatial approaches.

Keywords: Triangular Irregular Network (TIN), HEC-RAS, River flow analysis

INTRODUCTION

HEC- RAS can perform alluvion mapping of water face profile results directly from HEC- RAS. Using the HEC- RAS figure and reckoned water face profile, alluvion depth and lowland boundary data sets are created through the RAS Mapper. To use RAS Mapper for analysis, you must have a terrain model in the double raster floating-point format.

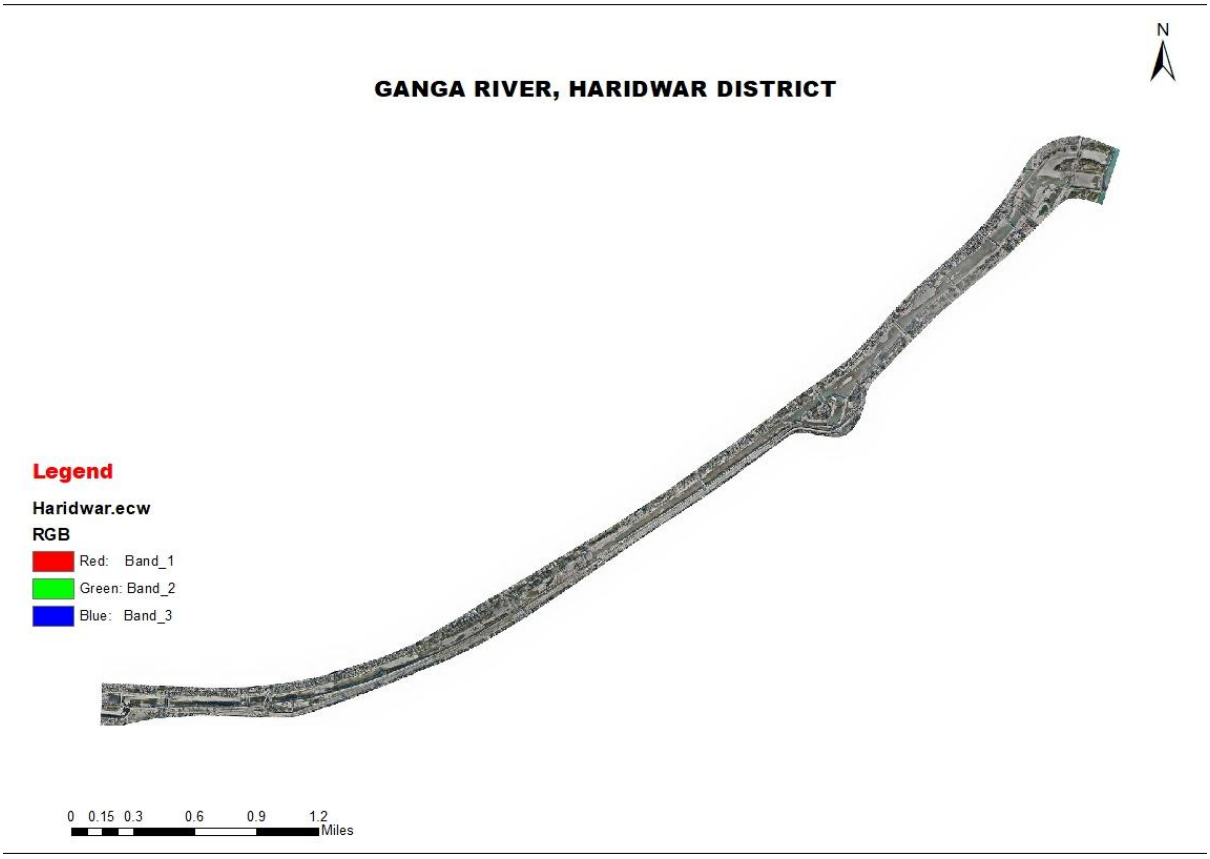
The USACE created HEC- RAS to cover and control gutters, conduits, harbors, and other public workshop systems. Simulations similar as one- dimensional steady inflow, one- and two- dimensional unsteady inflow, deposition transport, bed calculations, and water temperature/ water quality models are each available using the HEC- RAS program. This model is more generally used to examine rivulet encroachments in lowland operation and flood tide insurance exploration. Land-use change is another element that could impact the circumstance of cataracts as well as the growth of socioeconomic exertion in flood tide-prone areas. similar conduct has an impact on a swash's natural hydrology and floodplains' response to a flood tide hazard. These motorists aren't completely preventable due to their complexity. It's nevertheless effective flood tide threat operation strategies with information about the hazards are enforced, and it's possible to alleviate the associated troubles. The Hydrologic Engineering Center River Analysis System (HEC- RAS) model was used to examine the performance of the original(base DEM) and modified DEMs as crucial inputs.

River hydraulic models similar as HEC- RAS contain a wealth of detailed terrain data, generally developed from land checks. But these high-resolution data are frequently stored in the match system of the hydraulic model, a format that doesn't maintain the (X, Y) chart equals of the cross-sections. The primary difficulty with mapping hydraulic model data similar as HEC- RAS stems from the fact that Civilians and hydraulic models generally use entirely different match systems to define their data. HEC- RAS is a 1D inflow model in which the sluice morphology is represented by a series of cross-sections listed by a swash station. The swash station numbering increases from downstream to upstream.

For connecting hydraulic modeling with Civilians, numerous of these software results follow an analogous theme sampling parameters that are recaptured from a terrain model and integrated into a hydraulic model. The affair of the hydraulic model is reused for display and analysis in a Civilians once the stoner runs it. still, as the source of input sampling descriptions, this fashion requires a high-resolution DEM. Unfortunately, DEMs with suitable resolution in sluice channels for hydraulic modeling isn't constantly available and must generally be attained by remote seeing. likewise, these studies are unfit to gather precise topographical data for locales that are constantly swamped by water and must calculate on bathymetric biographies attained through land checks to condense their findings. As a result, a system for combining available DEMs with being surveyed channel elevations has been developed.

STUDY AREA

The study was carried out in Ganga River, Haridwar, Uttarakhand. This study was done to check the water flow analysis. Haridwar's location denotes the north Indian city's geographical location, and it's known for the great source of the natural resources. Haridwar situated at the latitude distance of 29°58' N to the longitudinal of 78° 10' E, surrounding a region of 2,360 sq. km.



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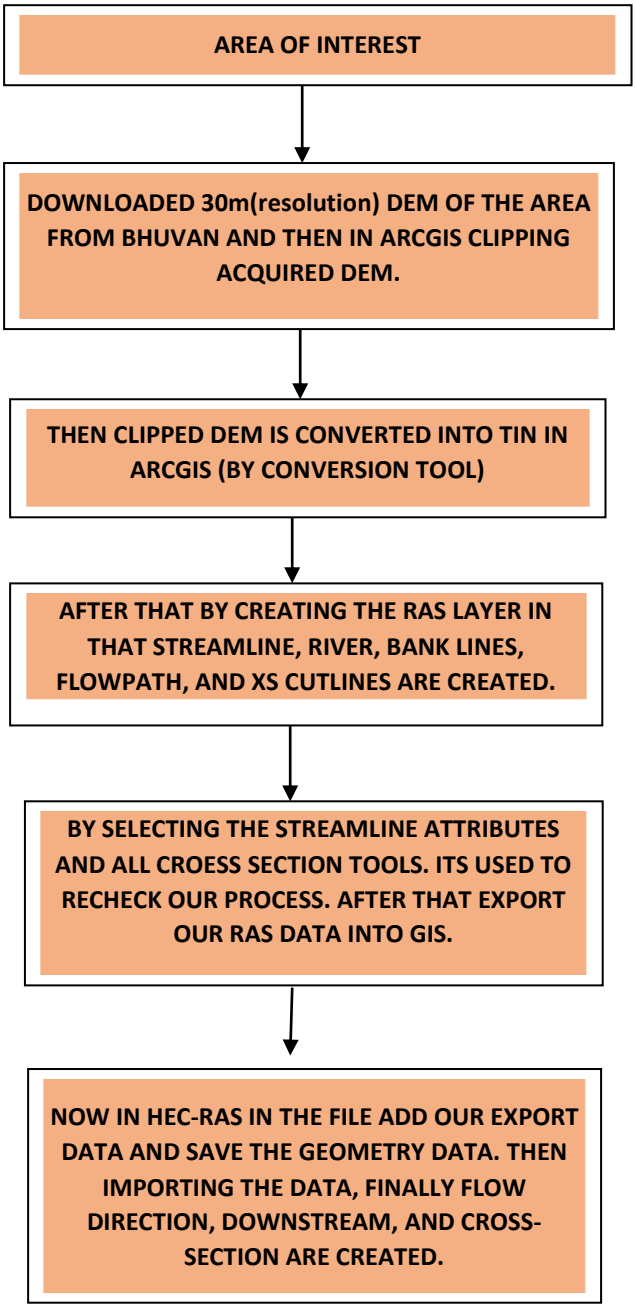

RESULTS-

TIN is used as the profile creation input data. It comes from Carto DEM (30m). The HEC-RAS model was used to create the profiles. The longitudinal profile of a Ganga River, Haridwar District, Uttarakhand. This is generated over time as a result of erosion and deposition along the river's course. A Ganga river's lengthy profile is usually a smooth curve. The profile of a river is smooth and does not show the variations in the cross-section graph.

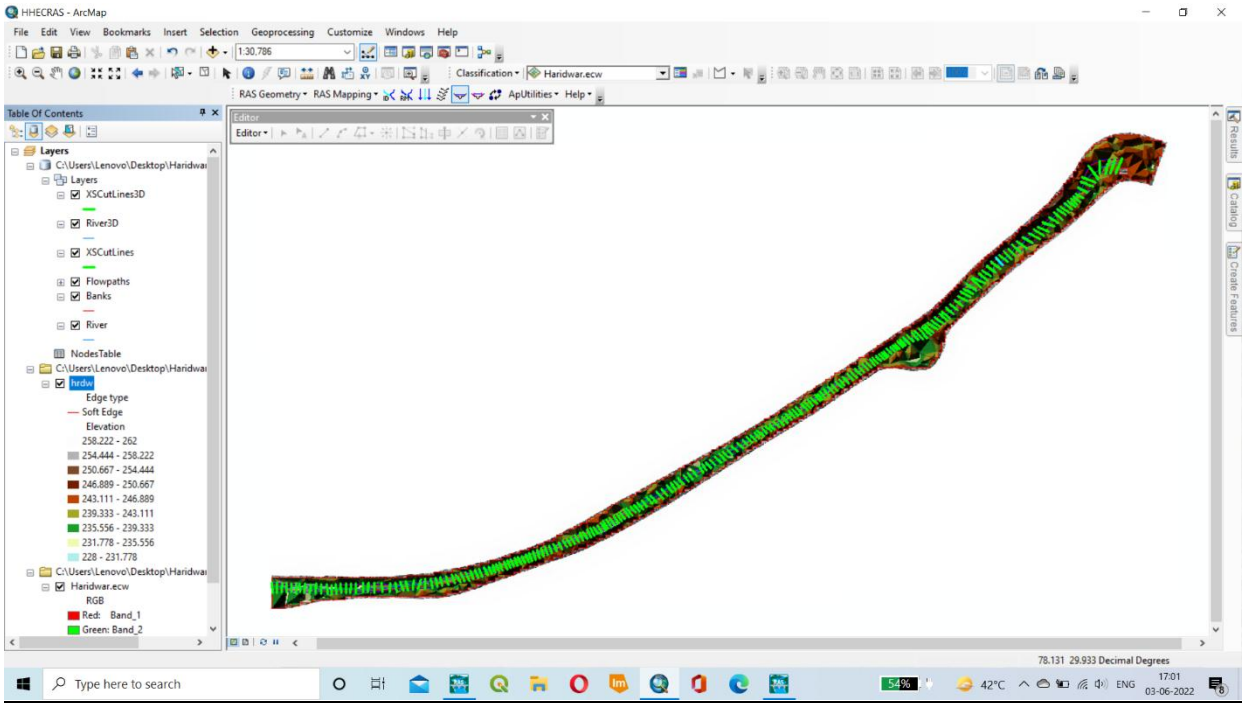
HHECRAS - ArcMap
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Table Of Contents
Layers
XSCutLines3D
River3D
XSCutLines
Flowpaths
Banks
River
NodesTable
hrdw
Edge type
Soft Edge
Elevation
Haridwar.ecw
RGB
Red: Band_1
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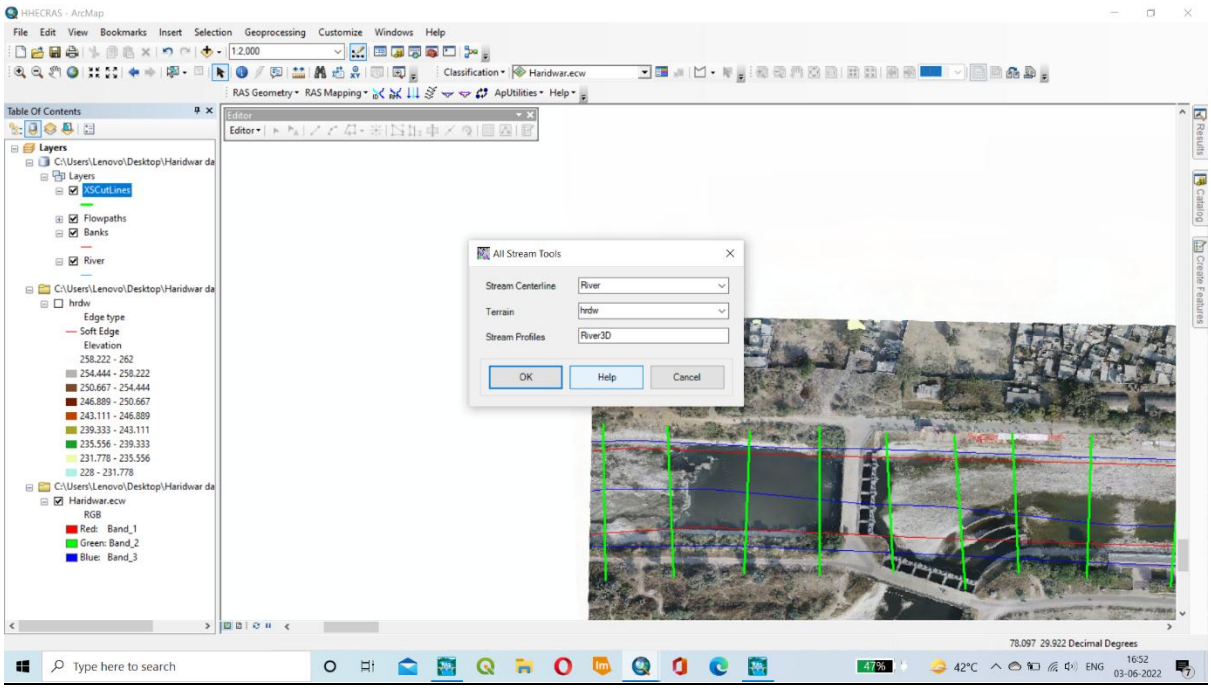
HHECRAS - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
Layers
XSCutLines
Flowpaths
Banks
River
hrdw
Edge type
Soft Edge
Elevation
Haridwar.ecw
RGB
Red: Band_1
Green: Band_2
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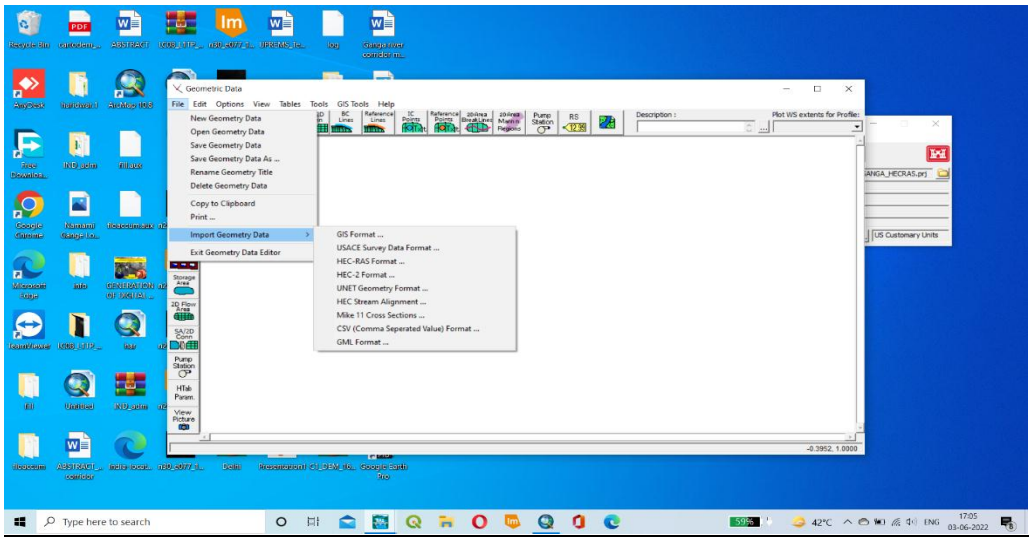
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New Geometry Data
Open Geometry Data
Save Geometry Data
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Rename Geometry Title
Delete Geometry Data
Copy to Clipboard
Print ...
Import Geometry Data
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GIS Format ...
USACE Survey Data Format ...
HEC-RAS Format ...
HEC-2 Format ...
UNET Geometry Format ...
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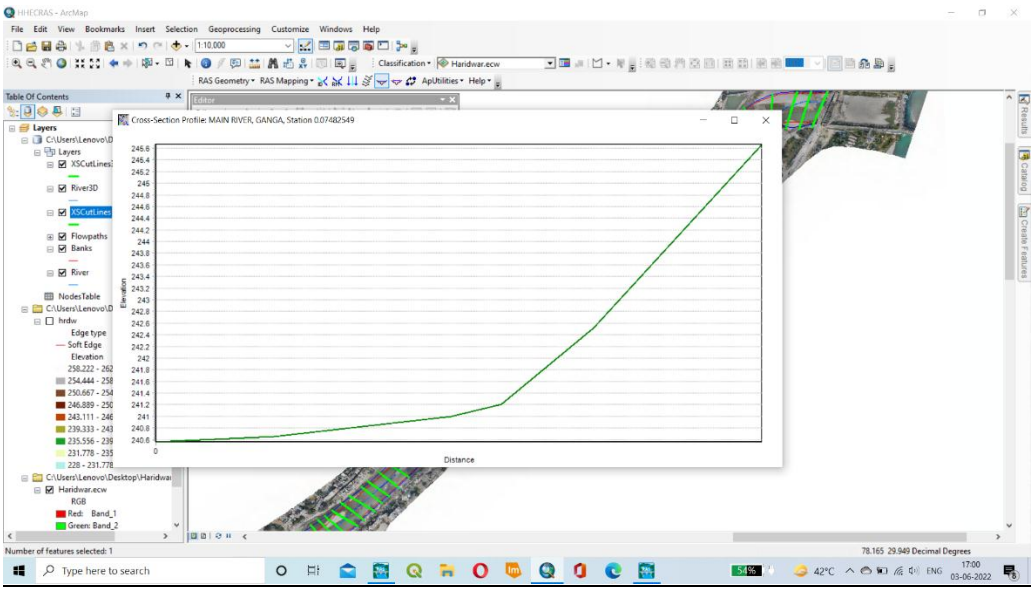
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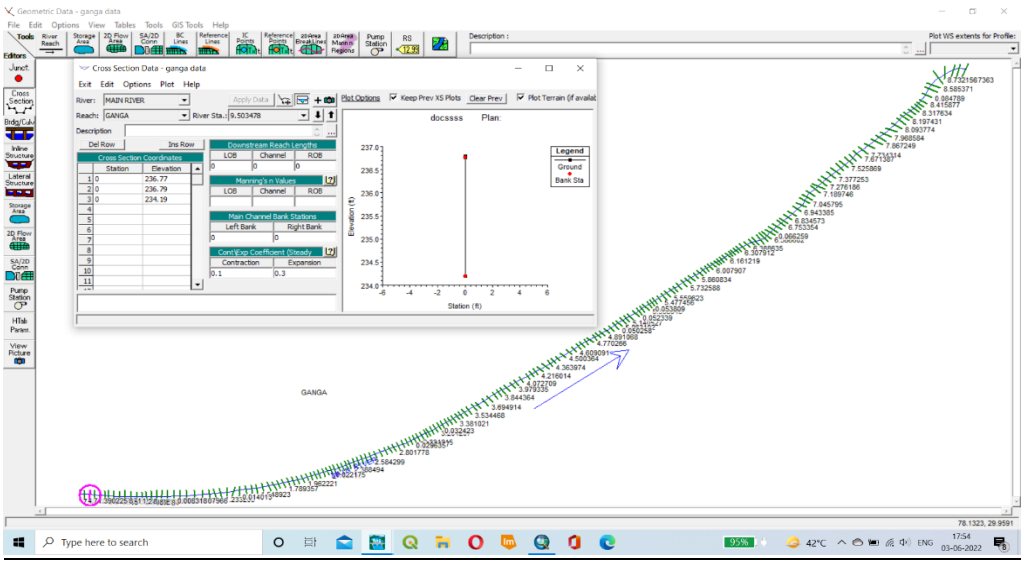
Table Of Contents
Layers
XSCutLines
River3D
Flowpaths
Banks
River
NodesTable
Haridwar.ecw
Type here to search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CONCLUSION-

This research looked DEMs (derived from Bhuvan) affect hydraulic modelling results. The study also found that the quality and accuracy of the DEM are more important than its resolution and precision in supporting flood inundation models. For example, the model is based on the 30m DEM. These outcomes are inextricably linked to the particular test. The methodology described here, on the other hand, can offer a comprehensive examination of the impact of various topography data on flood hydraulic modelling for various rivers around the world.

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