



## Application of HEC-HMS Model for Runoff Dynamics

Vidya, K.N.<sup>1</sup> and Vanitha, S<sup>2\*</sup>

<sup>1</sup>Ph.D. Scholar, Department of Soil and Water Conservation Engineering and Agricultural Structures, Agricultural Engineering College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, India

<sup>2</sup>Associate professor, Department of Agriculture Engineering, Nandha Engineering College, Erode, India

\*Corresponding author. E-mail: vanitha.subramani636@gmail.com

*Land Use and Land Cover Changes (LULC), as well as sustainable protection of the earth's surface, remain important environmental challenges that society must solve. Increases in impervious surfaces have resulted from industrial growth and urbanisation, altering the hydrological processes in a watershed. Researchers use hydrologic models to simulate the physical behaviour of the watershed from rainfall to runoff to better understand how LULC changes in the watershed affect hydrological processes. Hydrologic engineers in Corps of Engineers- Hydrologic Modelling System(HEC-HMS), a rainfall-runoff simulation model, was used to simulate peak river discharge values for current and future conditions.*

### Introduction

Hydrological patterns are drastically altered as a result of human modifications such as land cover alteration, irrigation, and so on. The hydrological cycle combines the earth system's water and energy fluxes, and this, in essence, influences the fluxes of the system. As a result, LULC variations have a major impact on the hydrological cycle. Remote sensing data has played an important role in mapping LULC shifts in different parts of the world over the last few years. HEC-HMS is a computer programme developed by the USACE's Research and Development Program and first published in 1992 by the Hydrologic Engineering Centre (HEC). Both in popular and restrained conditions, the HEC-HMS can simulate the rainfall-runoff-routing process. "The Flood Hydrograph Package HEC-1 and various basic variants of HEC-1 are replaced and substituted by the HEC-HMS" (USACE-HEC 2000). The initial release of HEC-HMS was known as version 1.0, and it included all of the features of HEC-1 with some improvements. The program's second release, version 2.0, included the SMA method, which extended the program's capabilities from event-based simulation to continuous simulation and event-based simulation. The program's third major update, version 3.0, introduced a new graphical interface along with the expansion of potential and snowmelt evapotranspiration methods in the meteorological model, as well as several new infiltration representation methods in the basin model. Version 4.0, which adds sediment transport and surface erosion functionality to the computation, is the program's fourth major release. The most recent version of the HEC-HMS software is 4.2.1. The HEC-HMS adds some unique features to precipitation-runoff-routing simulation, such as precipitation-specification options, and more. Loss models for estimating runoff volume, transform models for converting excess rainfall, hydraulic routing models for accounting storage and energy flux, the Baseflow model, and models for water management measures are all available (including divergence and storage).



### **Applications HEC-HMS RainfallRunoff modelling**

- Support leaders in the planning and control of water supplies.
- Analytical and statistical methods make real-world system characterizations simpler.
- Create a visual representation of how water supplies react to changes in land use and weather events.
- Physical processes that convert rainfall to runoff are conceptualised using a series of equations based on various catchment parameters.
- Surface runoff modelling is difficult due to the complexity of the equation and the many interconnected variables.

### **Conclusion**

The HEC-HMS has the capability to accurately model runoff using rainfall and basin characteristics. The HEC-HMS has enough potential to simulate runoff with accuracy using rainfall and basin characteristics. The HEC-GeoHMS programme (Plugin tool in Arc GIS) can be used for river basin model construction and finding basin characteristics, the autocalibration and manual calibration both work better in HEC-HMS, and the soil moisture accounting loss process works more reliably for continuous modelling, and it gives better results in a semi-distributed and distributed approach.

### **References**

1. Ammar RafieiEmam., Binaya Kumar Mishra., Pankaj Kumar., Yoshifumi Masago and Kensuke Fukushi., 2016. Impact Assessment of Climate and Land-Use Changes on Flooding Behaviour in the Upper Ciliwung River, Jakarta, Indonesia. *Water* 2016, 8, 559; doi:10.3390. [www.mdpi.com/journal/water](http://www.mdpi.com/journal/water)
2. Kishor Choudhari., Balram Panigrahi and Jagadish Chandra Paul., 2014. Simulation of rainfall-runoff process using HEC-HMS model for Balijore Nala watershed, Odisha, India. *International Journal of Geomatics and Geosciences* Volume 5, No 2.
3. Salil Sahu., S.K. Pyasi and R.V. Galkate., 2020. A Review on the HEC-HMS Rainfall-Runoff Simulation Model. *International Journal of Agricultural Science and Research (IJASR)*. ISSN(P): 2250–0057; ISSN(E): 2321–0087. Vol. 10, Issue 4, Aug 2020, 183–190