

**WEB BASED GEOSPATIAL FRAMEWORK FOR WATER
RESOURCES INFORMATION SYSTEM**

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**WEB BASED GEOSPATIAL FRAMEWORK FOR WATER
RESOURCES INFORMATION SYSTEM**

by

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Submitted

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Doctor of Philosophy

to the



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*To my parents,
to Niharika,
and mostly to my wife Megha*

CERTIFICATE

This is to certify that the thesis entitled “**WEB BASED GEOSPATIAL FRAMEWORK FOR WATER RESOURCES INFORMATION SYSTEM**” being submitted by **Mr. Nagraj S. Patil** to the **Indian Institute of Technology Delhi** for the award of the degree of **Doctor of Philosophy** is a bonafide record of research work carried out by him under my guidance and supervision. The thesis work in my opinion, has reached the requisite standard, fulfilling the requirements for the said degree. The results contained in this thesis have not been submitted, in part or full, to any other University or Institute for the award of any degree or diploma.



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(Nagraj S. Patil)

Abstract

Water resource management is of primary importance to the society, economy and the environment. Climate change is expected to have significant effects on the hydrological cycle. Formulation of adaption strategy for these changes requires an understanding of the complex consequences of climate change on the hydrology, human and environmental uses of water so that a sustainable option is selected.

The study presents web based water resources information system framework that has been formulated and consists of a hydrologic information system intended to meet the specific information needs connected with water related aspects of the various line departments of a typical state (Himachal Pradesh). The framework consists of a hydrologic information database coupled with the tools for collating primary and secondary data for analyzing and visualizing the data and information. The framework is maintained and updated to reflect fully the most accurate ground truth data and the infrastructure requirements for planning and management. This framework provides a common information base to all the line departments and other users.

The framework also incorporates hydrological model output for indirect assessment of various entities of water balance in space and time. The Soil and Water Assessment Tool (SWAT) hydrological model with ArcGIS interface has been used to simulate various water balance components, flow and water quality for the present and future climate change Greenhouse Gas (GHG) scenarios.

Water resources are sensitive to climate change, which will have major effects on precipitation, evapotranspiration, and runoff. But estimating the nature, timing, and even the impacts at the regional and local scales, involving many uncertainties is of primary interest to water planners. User friendly web interface has been developed to view the model results for analysis. Furthermore, the interface can address the specific information needs to assess the impact of climate change on water resources. The framework provides a common information base for the entire stakeholders for selecting the appropriate adaptation strategies.

Web-based Geographic Information System (GIS) (GIS Server) has been implemented to cope with all the above concerns and to provide aggregation of information. The geodatabase is designed taking into consideration the requirement of typical line departments related with water resources. This information includes spatial datasets, which include hydrography, administrative area, drainage area, landuse and soil, and the related object classes (non spatial data). Implementation has been designed to host GIS computing and dissemination facility by GIS based Server. The users can get connected to the central GIS servers using desktop GIS software, web browsers and custom applications. This framework would provide a robust platform for assessing the status of water resources that is most up-to-date and can help in the planning process through integration of scales and sectors. The framework further provides the predicted scenarios for the future that can serve as good information base for addressing viable strategies for adaptation to climate change.

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