iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** II **Month of publication:** February 2021

DOI: https://doi.org/10.22214/ijraset.2021.33056

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue II Feb 2021- Available at www.ijraset.com

Hydrology and Hydrological Information Systems (HIS) in India

P. K. Dorle[1], S. D Ranade[2]
[1]*Scientist'C', Central Water & Power Research Station, Pune-24*
[2]*Scientist'E', Central Water & Power Research Station, Pune-24*

Abstract: Hydrology is the scientific study of the movement, distribution and management of water on Earth and other planets. Hydrology subdivides into surface water hydrology, groundwater hydrology (hydrogeology), and marine hydrology. Domains of hydrology include hydrometeorology, surface hydrology, hydrogeology, drainage-basin management and water quality, where water plays the central role. Hydrological Information Systems (HIS) in India. Need of HIS. HIS, in practice, comprises data collection and storing system, data communication/transmission system, data transformation system for producing information and information communication system, which in turn leads to inputs to informed decision making by the end-users. Applications of HIS. The Real Time Hydrological Information System (RTHIS). Hydrology Projects (HP) in India , National Hydrology Project (NHP). Mission, vision and Objectives of Hydrology Projects.
Keywords: Hydrology, Hydrological Information Systems (HIS), Real Time HIS, Hydrology Projects (HP)

I. INTRODUCTION TO HYDROLOGY

Hydrology word is derived from Greek words "hydor" meaning "water" and , "logos" meaning "study". Hydrology is the scientific study of the movement, distribution and management of water on Earth and other planets, including the water cycle, water resources and environmental watershed sustainability.

Strictly speaking , Hydrology is the science of water, although by usages the word has come to mean the study of water as it occurs on, over and under the earth's surface as stream flow, water vapour, precipitation, soil moisture and groundwater.

Hydrologists can also be scientists studying earth or environmental science and physical geography. Using various analytical methods and scientific techniques, they collect and analyse data to help solve water related problems such as environmental preservation, natural disasters, and water management.

Briefly stated, Hydrology is the science which treats of the phenomena of water in all its states; of the distribution and occurrence of water in the earth's atmosphere, on the earth's surface, and in the soil and rock strata; and of the relation of these phenomenon to the life and activities of mankind. The quantity of water with which mankind is concerned must always remain substantially the same, but its occurrence and its distribution over the surface of the earth is continuously changing.

Hydrology subdivides into surface water hydrology, groundwater hydrology (hydrogeology), and marine hydrology. Domains of hydrology include hydrometeorology, surface hydrology, hydrogeology, drainage-basin management and water quality, where water plays the central role. Hydrometeorology is a branch of meteorology and hydrology that studies the transfer of water and energy between the land surface and the lower atmosphere. Hydrologists often utilize meteorologists and data provided by meteorologists. As an example, a meteorologist might forecast 50–75 mm of rain in a specific area, and a hydrologist might then forecast what will be the specific impact of that rain on the local terrain. Surface-water hydrology is the sub-field of hydrology concerned with above-earth water, in contrast to groundwater hydrology that deals with water below the surface of the Earth. Its applications include rainfall and runoff, the routes that surface water takes (for example through rivers or reservoirs) and the occurrence of floods and droughts. Surface-water hydrology is used to predict the effects of water constructions such as dams and canals. It considers the layout of the watershed, geology, soils, vegetation, nutrients, energy and wildlife. Modelled aspects include precipitation the interception of rain water by vegetation or artificial structures, evaporation, the runoff function and the soil-surface system itself. Hydrogeology OR Groundwater Hydrology (*hydro-* meaning water, and *-geology* meaning the study of the Earth) is the area of geology that deals with the distribution and movement of groundwater in the soil and rocks of the Earth's crust (commonly in aquifers). The terms groundwater hydrology, geohydrology, and hydrogeology are often used interchangeably. A drainage basin is any area of land where precipitation collects and drains off into a common outlet, such as into a river, bay, or other body of water. The drainage basin includes all the surface water from rain runoff, snowmelt, and nearby streams that run down slope towards the shared outlet, as well as the groundwater underneath the earth's surface. Drainage basins connect into other drainage basins at lower elevations in a hierarchical pattern, with smaller sub-drainage basins, which in turn drain into another common outlet. Other terms used interchangeably with drainage basin are catchment area, catchment basin, drainage area, river basin and water basin.

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. It is most frequently used by reference to a set of standards against which compliance, generally achieved through treatment of the water, can be assessed. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact, and drinking water.

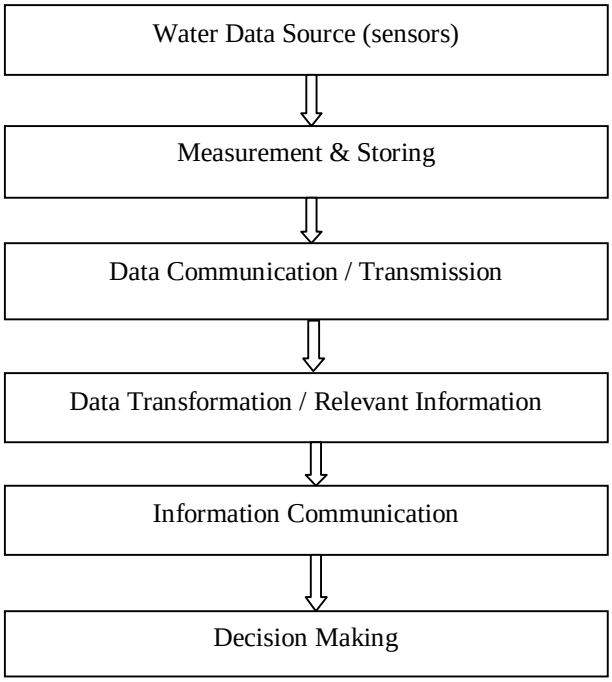
II. HYDROLOGICAL INFORMATION SYSTEMS (HIS) IN INDIA

Water plays a crucial role in the socio-economic development of India. Safe drinking water is required for the very large and growing population. Water is also a major constraining factor for the growth of agricultural and industrial sectors. In contrast, flooding frequently threatens populations and their properties. Competing demands between users and states require proper planning, design and management of water resources and water use systems. The availability of an efficient and comprehensive Hydrological Information System(HIS), comprising a reliable data base on all aspects of hydrological cycle, is a prerequisite for such planning, design and management, to get better decisions made as well as to achieve efficiency.

1) *Hydrological:* Hydrology is the science of water in the Hydrological cycle and is concerned with its states, storages and fluxes in location, time and phase. Hydrometry is the sister science, concerned with the measurement of these states, storages and fluxes
2) *Information:* Information is data which has been manipulated and processed to give them meaning and purpose (reliability, availability and presentation)
3) *System:* It is a logical and structured system to collect, convert, process, check, store and disseminate in a form suitable to users

a) Water is a Vital Natural Resource
b) Occurrence of water is not uniform in Space and Time Domain
c) Planning, Design & Operation Of Water Resource Systems requires i) Knowledge of Occurrence & Behaviour of Movement of Water ii) Not only quantity but quality is also Equally Important
d) Fast Growing Population and Rapid Urbanisation i.e. Ever Increasing Demand for Water Related Information

Hydrological information system (HIS) forms the backbone of water resources activities for a country; providing reliable data for long-term planning, design and management of resources and water use systems and for research activities in related areas. In India, primary data for HIS are collected, processed, stored and status reports brought out by agencies such as Central Water commission (CWC), India Meteorological Department (IMD),State Irrigation/ Agriculture/ Public Works/ Water Resources Departments ,etc. HIS, in practice, comprises data sensing, data measurement and storing system, data communication/ transmission system, data transformation system for producing relevant information and information communication system, which in turn provide inputs to decision making by the end users, as described below



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue II Feb 2021- Available at www.ijraset.com

Water resource challenges faced by India are considerable and can only be addressed by adopting an integrated approach that considers all uses and sources of water (surface water, groundwater, etc.) from the river basin/hydrologic perspective. This requires sound information and knowledge on the water resource base and its uses, coupled with the availability of appropriate tools for analysis and decision making. There is a need to improve hydrological forecasting, particularly in the upper reaches of rivers; provide flood alerts; and integrate stream flow predictions with weather forecasts to advance the lead time for flood management. There is also a need to facilitate and improve integrated reservoir operations. The Government of India is cognizant of the need to forge an integrated approach to developing, managing, and regulating surface water and groundwater resources, both at the basin and aquifer scales. There is also a need to strengthen its institutional capacity for Integrated Water Resources Management (IWRM).

III. THE REAL TIME HYDROLOGICAL INFORMATION SYSTEM

The Real Time Hydrological Information System (RTHIS) is an important part of all these activities. Therefore, the first component aims to support the establishment and modernisation of new and existing hydro-meteorology monitoring systems, including meteorology, stream flow, groundwater, water storage measurements, and construction of hydro-informatics centres that capture both water resources and uses. This component will be implemented by all states/union territories with the support of core central agencies under the Hydrology Projects funded by World Bank.

IV. HYDROLOGY PROJECTS IN INDIA , NATIONAL HYDROLOGY PROJECT (NHP)

A. Mission

The Hydrology Project is to improve reliability and accuracy of Hydrology and Ground Water data throughout India and to improve access to this information. The mission is to establish an effective and sound hydrologic database and Hydrological Information System (HIS), together with the development of consistent and scientifically-based tools and design aids to assist in the effective water resources planning and management within each to the implementing ageneses based on sound scientifically driven hydrogeological information and models.

B. Vision

Under the Indian Hydrology Project support program it is aimed to help India develop systems and standardized procedures to manage inter- sectoral water demands more efficiently and equitably - of major benefit to the most vulnerable strata of society - as well as to plan for and manage extreme hydrologic events such as floods and droughts.

C. Objectives

The Project Development Objective is

1) To extend and promote the sustained and effective use of the Hydrological Information System (HIS) by all potential users concerned with water resources planning and management, both public and private, thereby contributing to improved productivity and cost-effectiveness of water related investments in the States and Central agencies.
2) To extend Hydrological Information System (HIS) across whole India and to make it pan India Project.
3) Strengthening the capabilities of implementing agencies at state/central level in using HIS for efficient water resource planning and management;
4) Awareness building and outreach services about HIS use.

V. CONCLUSION

Hydrometric observations serve a very important role in the decision-making process with the application of real-time hydro-meteorological monitoring systems. Real time knowledge of water resources helps planners make informed decisions for flood forecasting, water supply management, irrigation, hydro generation, as well as environmental monitoring and planning. Hydrometric observations coupled with real-time telemetry become the basis for objective analysis of water resources. The telemetry and real-time Decision Support Systems (DSSs) brings the data to life. This allows operators to consider numerous operating criteria and the impact of any decision, rapidly, efficiently, and consistently.

A Hydrological Information System (HIS) would be designed to monitor all the processes of the hydrological cycle, which includes rainfall, evaporation, flow of rivers, groundwater recharge and extractions, etc. In a modern HIS, automatic telemetric instruments are used to measure and transmit all the hydrological parameters on a real time basis.

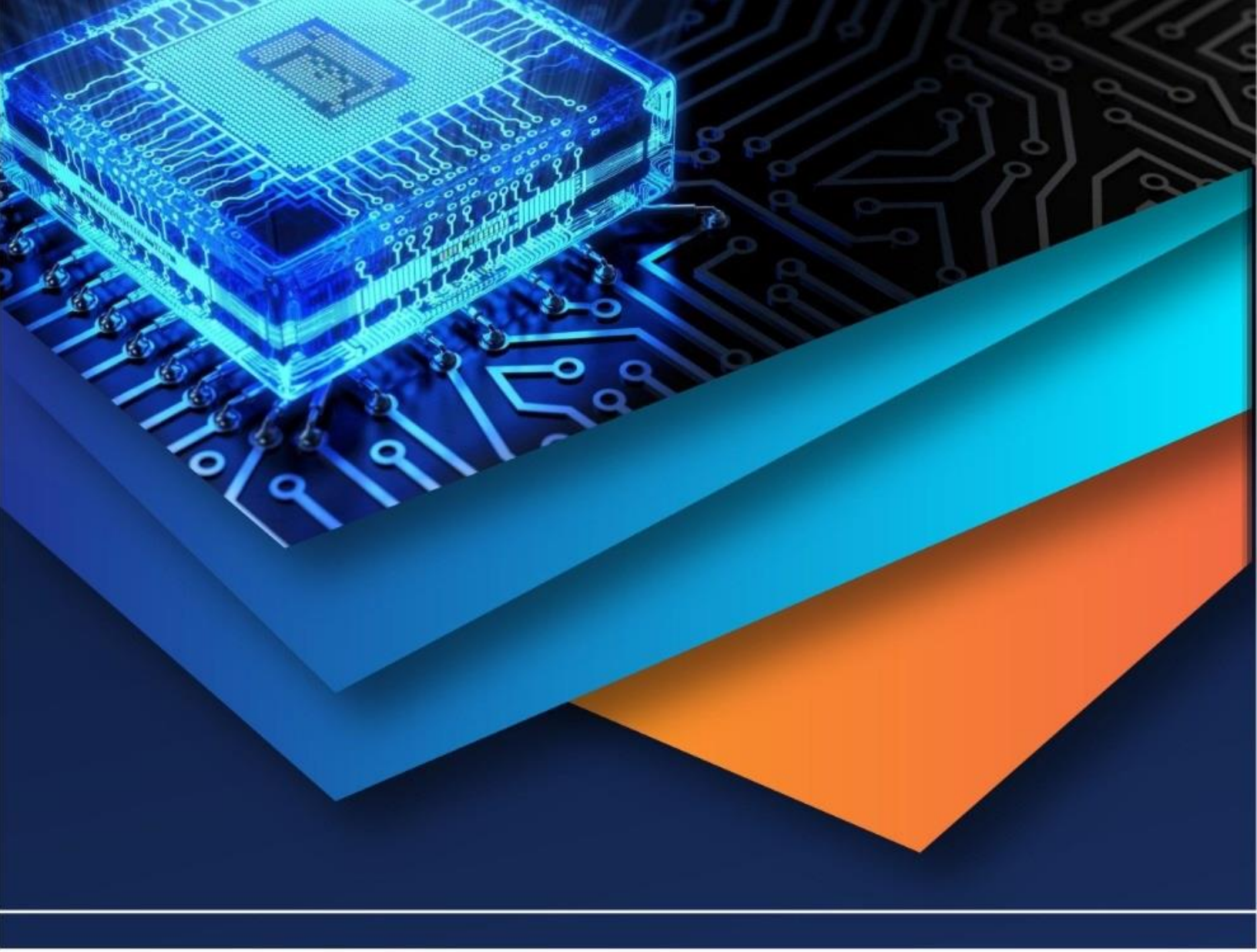
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue II Feb 2021- Available at www.ijraset.com

VI. ACKNOWLEDGEMENT

It gives us great pleasure in presenting the paper on "Hydrology and Hydrological Information Systems (HIS) in India". We would like to take this opportunity to thank our Director, CWPRS, Pune for giving us all the help and guidance we needed for publishing this paper. We are also grateful to entire NHP team at CWPRS and at Ministry.

REFERENCES

[1] http://hydrology-project.gov.in/index.html
[2] Department of Water Resources, River Development and Ganga Rejuvenation, 'An Introduction to Real-time Hydrological Information System' January 201
[3] https://en.wikipedia.org/wiki/Hydrology
[4] Adolph F Mayer, C.E. John, 'The Elements of Hydrology' Wiley & Sons, Inc.
[5] R C Ward, 'Principles of Hydrology' McGraw-Hill Publishing Company Limited.
[6] http://nhp.mowr.gov.in
[7] Dr. Eram Artinyan, Dr. Dobri Dimitrov.'Hydrological Information System, Basic Tool in Water Management and Decision Making
[8] Md.Shahadat Hossain, Musfiqur Rahman, Mir.Md.Tamim, 'Coping with new challenges in Water Resources Management in Bangladesh'



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY