

Proceedings of the Capacity Sharing Workshop on Integrated Water Storage Assessment in India, November 2024

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Background

The International Water Management Institute (IWMI), with the support of the CGIAR Initiative on NEXUS Gains, organized a Capacity Sharing event on **"Integrated Water Storage Assessment"** on 25 November 2024 at Marriott, Hyderabad.

This capacity-sharing aimed to inform participants on working with the novel TRACE methodology to assess surface water storage. The TRACE (Next Generation Monitoring of Surface waTer fRom spACE), a web-based application that tracks surface water storage using Earth Observation (EO) data and field information. Participants gained the knowledge key to use the TRACE for rapid assessment of water availability across different types of water bodies, from ponds to reservoirs. The capacity-sharing workshop utilised freely available Earth Observation datasets on the Google Earth Engine (GEE) platform. The event emphasised on the significance of surface water storage and its critical contribution to integrated water storage systems in conjunction with soil moisture and groundwater. The workshop used the Ramganga River Basin, part of the Ganga River Basin, as a case study to illustrate the application of the TRACE methodology. Presented here are proceedings of the workshop for Indian stakeholders which was attended by 15 participants representing the central government organisations and research institutions (10), state government departments (3), educational institution (1), as well as NGO (1).

Objective

The agenda aimed to guide participants through a comprehensive learning experience, beginning with the significance of storage mapping and integrated storage mapping. It then delved into the process of conducting storage mapping using EO data, incorporating foundational concepts from the cloud-based geospatial computing platform Google Earth Engine, and concluded with practical applications and real-world insights of storage mapping.



Workshop sessions

Inaugural session

Dr. Alok Sikka, IWMI India Country Representative and NEXUS Gains Ganga Basin Lead, welcomed the participants and provided an overview of the workshop. He briefly discussed the activities carried out under the NEXUS Gains Initiative in the Ganga basin, specifically focusing on the role of surface storage in the integrated storage assessment.

Presentation by Dr. Giriraj Amarnath, Principal Researcher, IWMI, on “Integrated Storage Mapping - Concept and its implementation for Ramganga Basin”

Dr. Giriraj Amarnath, Principal Researcher, IWMI delivered a presentation on the crucial role of water resource mapping in tackling water scarcity issues resulting from population growth, urbanisation, climate change, and over-extraction. He highlighted the use of advanced tools and techniques such as remote sensing, GIS, hydrological modelling, and ground surveys to assess surface, soil, and groundwater storage, leveraging datasets from the NASA Landsat series, ESA Sentinel-1&2, SMAP, and SWOT. Such assessment can support applications including water allocation planning, drought and flood management, irrigation, hydropower generation, and policy formulation. He briefly discussed two case studies, including the Shashe catchment conducted under NEXUS Gains and India's first water bodies census of Ministry of Jal Shakti. These case studies demonstrated the utility of integrated storage mapping techniques, revealing significant groundwater depletion and variability in soil and water storage levels. The benefits of mapping extend to inventorying water bodies, tracking availability, disaster management, optimising water usage, and supporting decision-making for activities such as agriculture, urban planning, and environmental conservation.



Presentation by Dhyey Bhatpuria, Researcher, IWMI on “Familiarizing GEE and the TRACE Concept integration”

After establishing the context and outlining the necessity for surface storage mapping, **Dhyey Bhatpuria** from IWMI gave a comprehensive summary of the TRACE methodology. He discussed the concept of this method, which included selecting the appropriate EO dataset, extracting water information from EO data, and estimating key parameters using both satellite and field data. Nitin Sharma of IWMI then introduced the participants to Google Earth Engine, initiating the hands-on activity. He explained essential and critical components of the platform with water identification and storage assessment as its key examples. Dhyey Bhatpuria and Nitin Sharma then proceeded to explain a series of Earth Engine scripts to the participants. These scripts included a comparison of SAR vs. optical satellite data, various water-land classification techniques such as static value-based thresholding, Otsu, unsupervised and supervised classification, and a comparative analysis of Digital Elevation Model datasets.



After these important preliminary steps, participants were introduced to the TRACE methodology. This included identifying bodies of water using a hybrid classification approach, creating bathymetry for elevation-masked DEMs of bodies of water, and estimating water surface area, volume, and level. Participants received all steps and their scripts to test, practice, and estimate on their computers.

During the discussions, participants shared their insights and knowledge on water storage assessments, remote sensing, and the known limitations and challenges that the TRACE methodology can address. Dr. Y.S.R. Rao from NIH gave a presentation on the tools and applications the NIH has developed to address various aspects of water resources and their assessment. He provided information on tools created using Google Earth Engine and other model products that could be advantageous for the participants and their organisations.

Dr. Giriraj Amarnath from IWMI moderated the final session, allowing participants to share their feedback on the training. Here are the key points shared by the participants:

Feedback from Participants

Dr. Y.S.R. Rao, Scientist from National Institute of Hydrology (NIH) lauded the workshop for introducing GEE as a powerful, open-source platform that simplifies water resource mapping. He recommended consolidating the data codes of the TRACE tool to facilitate easier replication and customisation at the regional level for enhanced usability.

Mr. Abhishek Sinha Director of the Central Water Commission (CWC) highlighted the holistic approach to topics like surface water extraction and reservoir management. He recommended extending the workshop duration to allow for a more in-depth exploration of the topics covered and to provide additional hands-on practice for enhanced learning.

Ms. Mohana G., Assistant Executive Engineer from the Telangana Water Resources Department emphasised the relevance of these tools for Telangana's 44,000 water bodies by proposing district-level pilot projects to provide tailored training and implementation.

Dr. Jyoti P. Patil from Scientist from National Institute of Hydrology (NIH) shared her newfound confidence in using GEE, reflecting the value of patient, hands-on training for first-time users.

Prof. Sharad Jain from Indian Institute of Technology (IIT)-Roorkee called for leveraging these tools to address challenges like storage capacity loss and identify low-impact storage sites, crucial for national-level water resource planning.

Closing remarks

Dr. Alok Sikka conveyed a vote of thanks to all participants and trainers, concluding the workshop, summarising key learnings, and outlining potential next steps.

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