

Dr. Sumit Sen

Professor in Hydrology & Head, Department of Hydrology,
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Professional and Educational Qualifications

- 2009 Doctor of Civil Engineering (*Concentration: Biosystems Engineering*), Auburn University (AU), AL, USA
- 2004 Master of Science Biological and Agricultural Engineering, University of Arkansas, Fayetteville, AR, USA
- 2001 Bachelor of Science Agricultural Engineering, Allahabad Agricultural Institute Deemed University, Allahabad, Uttar Pradesh, India

Summary of Professional Expertise

Professor & Head, Department of Hydrology, IIT Roorkee, with 12+ years of experience in experimental hydrology, watershed management, and water resources modeling. Extensive expertise in instrumenting watersheds and modeling to understand hydrological processes and address climate impacts on water resources.

Contribution to Hydrological Science

Hydrology of Himalayan Springs

- PI: Development and Implementation of Science-based Springshed Management in the Indian Himalayan Region (ICIMOD, Nepal; Swiss Dev. Coop.) (2021-2023)
- PI: Climate proofing of Springshed development program through science & technology interventions in drought probe areas of Sikkim (UNDP) (2019-2021)
- PI: Citizens Science Approach for the revival of dying spring (Uttarakhand Government) (2017-2018)
- Doctoral Thesis: Deciphering Hydrological Responses of Springflow Systems in the Lesser Indian Himalayas (Awarded 2024)
- Publications
 - “Hydrogeochemical characterization and water quality assessment of mountain springs: Insights for strategizing water management in the lesser Indian Himalayas.” (2025)
 - “Evaluation of Spring Discharge Dynamics using Recession Curve Analysis: A Case Study in Data-Scarce Region, Lesser Himalayas” (2017)

Runoff Generation on Himalayan Hillslopes

- PI: Understanding Relationship between Infiltration Tradeoff Hypothesis and Surface Runoff Generation Mechanisms (SERB, DST) (2014-2017)
- Doctoral Thesis: Understanding Hydrological Processes of Lesser Himalayan Hillslopes (Awarded 2021)
- Publications:
 - "How spatiotemporal variation of soil moisture can explain hydrological connectivity of infiltration-excess dominated hillslope" (2019)
 - "Hydrological process monitoring for springshed management in the Indian Himalayan region" (2021)
 - "Understanding Plot-Scale Hydrology of Lesser Himalayan Watershed- A Field Study and HYDRUS-2D Modeling Approach." (2018)

Ecosystem Studies

- Co-PI: Pine-Oak Ecosystem: Interactions with Water-Climate-Chemistry (Min. of Water Resources) (2019-2023)
- PI: Monitoring and Modelling of Hydro-Glaciological Processes in Glaciated and Non-glaciated Watershed (IIRS, ISRO) (2022-2025)
- Doctoral Thesis: Hydrological Impacts of Climate and Anthropogenic Changes on an Ethiopian Rift Valley Lake (2020)
- Publications:
 - "Assessment of spring flows in Indian Himalayan micro-watersheds" (2021)
 - "Hydrologic Ecosystem Services in Relation to the Himalayas" (2014, Invited Talk)

River Morphology Field and Satellite Imagery-Based Studies

- PI: Probabilistic floods and sediment transport forecasting in the Himalayas (DST, Indo-Italy Bilateral Project) (2022-2025)
- Co-PI: Hydro-geological Assessment and Socio-Economic Implications of Depleting Water Resources in Nainital (Min. of Water Resources) (2019-2023)
- Publications:
 - "Morphological adjustments of the Yamuna River in the Himalayan foothills" (2023)
 - "Estimation of bed material transport in gravel-bed streams using virtual velocity approach" (2024)

Innovation in Hydrological Experimentation

- Patent: Innovative Rainfall Simulator for moving storm conditions (Patent # 471419)
- PI: Development of Field Demonstration Site for Revisiting Rainfall Measurement (2017-2020)
- PI: Lidar based non-contact hydrometry for mountainous terrain (WMO) (2020-2021)
- Publications:

- "A contribution to rainfall simulator design – a concept of moving storm automation" (2022)
- "Hydrometeorological field instrumentation in Lesser Himalaya" (2023)

Education and Training efforts

Short-Term Courses and Workshops conducted

2020	WMO Hydrology Training Module: Principles of Hydrology, Myanmar
2019	River Discharge Estimation Using Non-Contact Hydrometric Techniques, India
2018	Brainstorming Training-cum-Workshop on State-of-the-Art Hydrometric Data Acquisition and Transmission Networks, Measurements and Modelling in collaboration with IRPI, Italy; USGS, Boulder, USA and UKCEH, UK
2017	Urban Stormwater Management: Science, Policy, and Engineering Training for SMART CITIES in collaboration Woolpert Inc., South Carolina, USA
2016	BASINS/HSPF Training Workshop in collaboration with Aquaterra Inc., California, USA

Contribution to International Scientific Cooperation

International Projects and Funding

2022	-	2025	PI: Probabilistic floods and sediment transport forecasting in the Himalayas during the extreme events (DST, Indo-Italy Bilateral Project) (₹34.09 Lakhs)
2021	-	2023	PI: Development and Implementation of Science-based Springshed Management in the Indian Himalayan Region (ICIMOD, Nepal; Swiss Dev. Coop.) (₹30.81 Lakhs)
2020	-	2021	PI: Lidar based non-contact hydrometry for mountainous terrain (World Meteorological Organization WMO) (₹55.40 Lakhs)
2019	-	2021	PI: Climate proofing of Springshed development program through science & technology interventions in drought prone areas of Sikkim. (United Nations Development Program, UNDP) (₹28.80 Lakhs)

International journals peer-review

Reviewed manuscripts for journals like ASCE Journal of Hydrologic Engineering, Journal of Hydrology, and Hydrological Processes.

International collaboration on hydrometry

Advanced non-contact hydrometry through a project awarded under WMO HydroHub's Second Innovation Call, collaborating with India's CWC (2021). This success led to ThinkTank membership, guiding HydroHub awards and initiatives. Fostered Indo-Italy collaboration with IRPI, resulting in the Bilateral Project (2022–2025) on mountain hydrology and sediment transport.

IAHS Scientific Assembly 2025

As Chairperson, and current Head of Department of Hydrology, I will lead the XIIth IAHS Scientific Assembly at IIT Roorkee (October 5–10, 2025), spotlighting global advances in hydrological sciences.

Key Peer-reviewed Publications (*indicates the corresponding author) (Citations: 910; h-index: 17)

Research Articles from the Himalayan Studies

1. Dass, B., Rao, M. S., & **Sen, S.** Hydrogeochemical characterization and water quality assessment of mountain springs: Insights for strategizing water management in the lesser Indian Himalayas. *Journal of Hydrology: Regional Studies*, 57, 102126, **2025**.
2. Sharma, S., Prashanth, S. S., Sharma, A*, **Sen, S.** Spatial heterogeneity of ecosystem services and their valuation across himalayas: a systematic literature review and meta-analysis. *Environmental Research Letters*, 20, 20 013002, doi 10.1088/1748-9326/ad9abc, **2024**.
3. Kumar, M., **Sen, S.**, Kulkarni, H., Badiger, S., Varma, G. R., Krishnaswamy, J. Ecohydrological and hydrogeological dynamics of groundwater springs in Eastern Himalaya, India. *Groundwater for Sustainable Development*, 27, 101311, doi.org/10.1016/j.gsd.2024.101311. **2024**.
4. Bahmanpouri, F., Yadav, A., Massari, C., Santis, D. De., Sharma, A., Agarwal, A., **Sen, S.**, Fraccarollo, L., Moramarco, T., Barbetta, S. Application of the Entropy Model to Estimate Flow Discharge and Bed Load Transport with Limited Field Measurements. *Water*, 16(24), 3684. <https://doi.org/10.3390/w16243684>. **2024**.
5. Yadav, A., Hassan, M. A., McDowell, C., Bradley, D. N., **Sen, S.** Fluvial dispersion of coarse bed particles: Insights from the field observations and simulation model. *Water Resources Research*, 60 (11), e2023WR036427 **2024**.

6. Yadav, A., **Sen, S.**, Mao, L., Hassan, M. A. Estimation of bed material transport in gravel-bed streams using the virtual velocity approach: Insights from the North-western Himalayas, India. *Earth Surface Processes and Landform*, 49 (11), 3367-3382, **2024**.
7. Subramanian, S. S., Srivastava, P., Yunus, A. P., Martha, T. R., **Sen, S.** Numerical model derived intensity-duration thresholds for early warning of rainfall-induced debris flows in the Himalayas. *NHESS*, February, 24 (2), 465-480, **2024**.
8. Yadav, A., Boothroyd, R. J., Sambrook Smith, G. H., **Sen, S.** Morphological adjustments of the Yamuna River in the Himalayan foothills in response to natural and anthropogenic stresses. *Hydrological Processes*, 37:e14934, <https://doi.org/10.1002/hyp.14934>, **2023**.
9. Mukherjee, S., **Sen, S.**, Kumar, K. Multifactor prediction of the central Himalayan spring high-flows using machine learning classifiers. *Environmental Earth Sciences*, 82: 85, **2023**
10. Yasmin, T., Khamis, K., Ross, A., Sen, S., Sharma, A., Sen, D., **Sen, S.**, Buytaert, W., Hannah, D. Brief Communication: Inclusiveness in designing early warning system for flood resilience, *NHESS*, 23 (2), 667-674. **2023**
11. Dass, B., Daniel, D., Saxena, N., Sharma, A., Sen, D., **Sen, S***. Informing watershed management in data-scarce Indian Himalayas. *Water Security Journal* 19, 100138, **2023**.
12. Yadav, A., **Sen, S.**, Mao, L., Schwanghart, W. Evaluation of flow resistance equations for high gradient rivers using geometric standard deviation of bed material. *Journal of Hydrology* 605, 127292. **2022**
13. Meena, R.K., **Sen, S.***, Nanda, A., Dass, B., Mishra, A. A contribution to rainfall simulator design—a concept of moving storm automation. *Hydrology and Earth System Sciences* 26 (16), 4379-4390. **2022**.
14. Kumar, M*, Hodnebrog, Ø., Daloz, A. S., **Sen, S.**, Badiger, S., & Krishnaswamy, J. Measuring precipitation in Eastern Himalaya: Ground validation of eleven satellite, model and gauge interpolated gridded products. *Journal of Hydrology*, 599, 126252.2021. **2021**.
15. Dass, B., **Sen, S***, Bamola, V., Sharma, A., & Sen, D. Assessment of spring flows in Indian Himalayan micro-watersheds—A hydro-geological approach. *Journal of Hydrology*, 598, 126354.2021. **2021**.
16. Kumar, V*, **Sen, S.**, & Chauhan, P. Geo-morphometric prioritization of Aglar micro watershed in Lesser Himalaya using GIS approach. *Modeling Earth Systems and Environment*, 7(2), 1269-1279. **2021**.
17. Kumar, V., **Sen, S***. Assessment of spring potential for sustainable agriculture: A case study in lesser Himalayas. *Applied Engineering in Agriculture*, 36(1), 11-24, **2020**
18. Nanda, A., **Sen, S***, McNamara, J.P. How spatiotemporal variation of soil moisture can explain hydrological connectivity of infiltration-excess dominated hillslope: Observations from Lesser Himalayan Landscape, *Journal of Hydrology*, 597, 124146, **2019**
19. Bhattarai N., Mallick, K., Sturta, J., Vishwakarma, B. D., Niraula, R., **Sen, S.**, Jain, M. An automated multi-model evapotranspiration mapping framework using remotely sensed and reanalysis data. *Remote Sensing of Environment*, 229: 69-92. **2019**.

20. Nanda, A., **Sen, S***, Jirwan, V., Sharma, A., Kumar, V. Understanding Plot-Scale Hydrology of Lesser Himalayan Watershed- A Field Study and HYDRUS-2D Modeling Approach. *Hydrological Processes*, 32(9): 1254-1266, **2018**
21. Kumar, V., **Sen, S***. Evaluation of Spring Discharge Dynamics using Recession Curve Analysis: A Case Study in Data-Scarce Region, Lesser Himalayas, India. *Sustainable Water Resources Management*, DOI: 10.1007/s40899-017-0138-z, **2017**.

Contributions to Ethiopian Hydrological Sciences

22. Musie, M., Momblanch, A., **Sen, S***. Exploring future global change-induced water imbalances in the Central Rift Valley Basin, Ethiopia. *Climatic Change*, 164:47, doi.org/10.1007/s10584-021-03035-x. **2021**.
23. Musie, M., **Sen, S***, Srivastava, P. Application of CORDEX-AFRICA and NEX-GDDP datasets for hydrologic projections under climate change in Lake Ziway sub-basin, Ethiopia. *Journal of Hydrology: Regional Studies*, 31, 100721. **2020**.
24. Musie, M.; **Sen, S***. Chaubey, I. Hydrologic Responses to Climate Variability and Human Activities in Lake Ziway Basin, Ethiopia. *Water*, 12, 164, **2020**.
25. Musie, M., **Sen, S***, Srivastava, P. Comparison and Evaluation of Open Source Precipitation Datasets for Streamflow Simulation in Data Scarce Watersheds of Ethiopia. *Journal of Hydrology*, 579, 124168. **2019**. <https://doi.org/10.1016/j.jhydrol.2019.124168>.
26. Adeba, D., Kansal, M.L., **Sen, S**. Economic Evaluation of Proposed Alternatives of Inter-basin Water Transfer from BaroAkobo to Awash Basin in Ethiopia. *Sustainable Water Resources Management*, 2(3): 313-330, **2016**.

Review articles, technical notes and invited contributions

27. Shah, S., **Sen, S***, Sahoo, D. State of Indian Northwestern Himalayan Lakes under Human and Climate Impacts: A Review, *Ecological Indicators*, 160, 111858, **2024**.
28. Kumar, V*, and **Sen. S**. Hydrometeorological field instrumentation in Lesser Himalaya to advance research for future water and food security. *Environ Monit Assess.*, 195:1162. **2023**.
29. van de Giesen, N*, Peña Haro, S*, **Sen, S***. WMO HydroHub Innovation Snapshot: Introduction to Non-Contact Technologies for Hydrometry. *WMO HydroHub*, Issue 1, **2023**.
30. Yasmin, T., Khamis, K., Ross, A., Sen, S., Sharma, A., Sen, D., **Sen, S.**, Buytaert, W., Hannah, D. Brief Communication: Inclusiveness in designing early warning system for flood resilience. *EGUSphere, NHESS*, 23 (2), 667-674 **2023**.
31. Anandhi, A., Srivastava, P., Mohtar, R.H., Lawford, R.G., **Sen, S.**, Lamba, J. Methodologies and Principles for Developing Nexus Definitions and Conceptualizations: Lessons from FEW Nexus Studies. *Journal of the ASABE*. **2022**.

32. Orr, A., Ahmad, B., Alam, U., **Sen, S.**, et. al. Knowledge priorities on climate change and water in the Upper Indus Basin: A horizon scanning exercise to identify the top 100 research questions in social and natural sciences. *Earth's Future* 10 (4), e2021EF002619. **2022.**
33. Daniel, D., Anandhi, A., & **Sen, S***. Conceptual Model for the Vulnerability Assessment of Springs in the Indian Himalayas. *Climate* 9(8), 121. **2021.** <https://doi.org/10.3390/cli9080121>
34. Nanda, A., **Sen, S***, Sharma, A. N., & Sudheer, K. P. Soil Temperature Dynamics at Hillslope Scale—Field Observation and Machine Learning-Based Approach. *Water*, 12(3), 713, **2020. (Invited)**

Contributions to USA Hydrological Sciences

35. Lamba, J., Way, T.R., Srivastava, P., **Sen, S.**, Wood, C.W., Yoo, K.H. Nutrient Loss in Leachate and Surface Runoff from Surface-Broadcast and Subsurface-Banded Broiler Litter. *J. Environmental Quality*, 42: 1574-1582, **2013.**
36. Lamba, J., Way, T.R., Srivastava, P., **Sen, S.**, Wood, C.W., Yoo, K.H. Surface Transport of Nutrients from Surface-Broadcast and Subsurface-Banded Broiler litter. *Trans. of ASABE*. 55(3): 979-985, **2012.**
37. **Sen, S***, Srivastava, P., Vadas, P.A., Kalin, L. Watershed-level comparison of predictability and sensitivity of two phosphorus models. *J. Environmental Quality*, 41:1642-1652, **2012.**
38. **Sen, S***, Srivastava, P., Dane, J.H., Meng, H., Clement, P.T. Application of HIRO2 Hydrologic Model for Simulating Hortonian Overland Flow on a Pasture Hillslope in North Alabama. *J. Soil & Water Conservation*, 66(6): 411-422, **2011.**
39. **Sen, S***, Srivastava, P., Dane, J.H., Yoo, K.H., Shaw, J.N. Spatial-temporal variability and hydrologic connectivity of runoff generation areas in a North Alabama pasture - implications for phosphorus transport. *Hydrological Processes*, 24(3): 342-356, **2010.**
40. **Sen, S***, Srivastava, P., Yoo, K.H., Dane, J.H., Shaw, J.N., Kang, M.S. Runoff Generation Mechanisms in Pastures of the Sand Mountain Region of Alabama – A Field Investigation. *Hydrological Processes*, 22(21): 4222-4232, **2008.**
41. **Sen, S.**, Haggard, B.E., Chaubey, I., Brye, K.R., Costello, T.A., Matlock, M.D. Sediment Phosphorus Release at Beaver Reservoir, Northwest Arkansas, USA, 2002–2003: A Preliminary Investigation. *Water Air & Soil Pollution*, 179: 67–77, **2007.**

Outreach/Extension Timely Information Sheet

1. **Sen, S., Sen, Way, T.R., Srivastava, P., Lamba, J., Stanford, M.K.** Water Quality Benefits of Subsurface-Banded Poultry Litter. Biosystems Engineering Series, *Timely Information Sheet, Agriculture & Natural Resources, Alabama Cooperative Extension System*, **2010.**
2. **Sen, S., Srivastava, P., Yoo, K.H., Stanford, M.K.** Pasture Hillslope Hydrology of the Sand Mountain Region in North Alabama. *Biosystems Engineering Series, Timely Information Sheet, Agriculture & Natural Resources, Alabama Coop. Extension System*, **2010.**

Technical Reports

1. Worked as draft committee member on the NITI Aayog report focused on “Inventory and Revival of Springs in Himalayas for Water Security”, DST, New Delhi. **2018**.
2. **Sen, S.**, Momblanch, A. Ecosystem Services Assessment and its Implementation in UK. Report of Researcher Exchange May15–June 2, **2017**.
3. Chaubey, I., Matlock, M., Costello, T. A., Haggard, B. E., Garg, V., **Sen, S.**, White, K. L., Davis, R. K. (2005) Development of a Decision Support System and Data Needs for the Beaver Lake Watershed. Prepared for Arkansas Soil & Water Cons. Comm.

Book Chapters

1. Kumar V., **Sen S.** Analysis of Spring Discharge in the Lesser Himalayas: A Case Study of Mathamali Spring, Aglar Watershed, Uttarakhand. *In: Singh V., Yadav S., Yadava R. (eds) Water Resources Management. Water Science and Technology Library, vol 78. Springer, Singapore, 2018.*
2. Panda, S.S., Mason, E., **Sen, S.**, Kim, H.W., Amatya, D.M. Forest Hydrology Management Decision Support with Geospatial Technology. *Chapter in Forest Hydrology. CAB International, Nosworthy Way, Wallingford OX10 8DE, United Kingdom, 2016.*

Professional Memberships

1. American Society of Agricultural and Biological Engineering, member since 2002
2. American Geophysical Union, member since 2006
3. American Water Resources Association, member: 2002-2008
4. Alpha Epsilon, Honor Society of Agricultural, Food and Biological Engineering, member since 2003
5. Gamma Sigma Delta, Honor Society of Agriculture, member since 2003
6. Indian Water Resources Society, life member since 2012
7. Indian Association of Hydrology, life member since 2012

Professional Activities & Services

1. Conducts awareness program for local communities and non-profit organizations on water conservation and measurement.
2. Serving on various National and State-level communities for Springshed Management and River Rejuvenation.
3. Served as an External Reviewer of research manuscripts prior to publishing in the following journals-
 - i. Transactions of the ASABE
 - ii. Journal of Hydrologic Engineering, ASCE
 - iii. Journal of Hydrology
 - iv. Environmental Modelling and Software
 - v. Hydrological Processes

- vi. Indian Society of Hydraulics ISH
- vii. Indian Society of Remote Sensing ISRS
- 4. Served as an Internal reviewer for the US Department of Agriculture manuscript.
- 5. Served as the research proposal reviewer for the Dept. of Science & Technology, Govn., of India.
- 6. Served as a Session Moderator at the Annual International Meeting, Soil and Water Division Poster and Oral Session, Hydrology Group (SW-21).

Honors & Awards

- 1. Young Scientist Research Grant, Department of Science & Technology, Government of India
- 2. Young Scientist International Travel Grant, Department of Science & Technology, Government of India
- 3. Indo-UK Water Centre Researcher Exchange Grant
- 4. The College of Agriculture' 2009 Outstanding International Graduate Student Award, Auburn University, Alabama, USA
- 5. Poster awards at the Annual Conference of the Soil and Water Conservation Society-Alabama Chapter (2nd place) and Auburn University Earth Day (1st place)