Review of Integrated Assessment of Climate-Induced Water Quality Deterioration in River Basins

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Abstract

River basins worldwide are becoming increasingly vulnerable to the combined effects of climate change and anthropogenic stressors, resulting in deteriorating water quality that threatens the integrity of ecosystems and human well-being. Integrated assessment approaches have emerged as essential tools to evaluate the multifactorial effects of climate-induced changes on freshwater systems. This review critically synthesizes insights from various studies to explore the methodologies, advantages, limitations, and findings of integrated assessments focusing on climate-induced water quality deterioration in river basins. The studies reviewed encompass diverse global basins and employ a range of tools such as coupled hydrological and water quality models (e.g., SWAT, QUAL2K), remote sensing, GIS, stakeholder mapping, and multi-scenario simulations. Key performance indicators include nutrient loading, sediment transport, temperature shifts, and pollutant concentrations. Findings indicate a consistent trend of water quality degradation driven by altered hydrological cycles, increased runoff, and land use changes. Integrated models effectively capture spatial and temporal variability, offering enhanced decision-support capabilities. However, limitations such as data scarcity, model complexity, uncertainty in climate projections, and lack of standardized assessment frameworks constrain their practical application. Integrated assessment approaches demonstrate strong potential for informing adaptive water resource management under climate change scenarios. The inclusion of stakeholder perspectives and ecosystem-based adaptation strategies enhances model relevance and policy uptake. Future efforts should prioritize data harmonization, simplification of modeling tools, and inter-sectoral collaboration to enable robust, scalable, and policy-relevant assessments.

Keywords; Climate change, water quality, river basins, integrated assessment, hydrological modelling, GIS, stakeholder analysis, environmental policy.

INTRODUCTION

Climate change has emerged as a significant driver of hydrological alterations, profoundly impacting water quality in river basins worldwide. Rising global heat conditions, shifting rainfall trends, and escalated frequency of intense weather events disturb the existing balance of aquatic ecosystems, causing the deterioration of water quality variables like dissolved oxygen (DO), biological oxygen demand (BOD), nutrient concentrations, and the proliferation of pathogens. These changes pose substantial risks to biodiversity, human health, and the sustainability of water resources.

The Intergovernmental Panel on Climate Change (IPCC) emphasizes that restricting global warming to 1.5°C will certainly get down the water-related issues in various regions and sectors. However, even under such scenarios, many regions are projected to experience increased hydrological extremes, including floods and droughts, which exacerbate water quality challenges. For instance, the Ganga River basin is anticipated to face heightened risks of reduced water quality due to climate-induced changes. (Ali & Kumar, 2023).

Objectives of the Study

Building upon the existing body of research, this study aims to synthesize findings from previous research papers to provide a comprehensive overview of integrated assessment methodologies addressing climate-induced water quality deterioration in river basins. The objectives are as follows:

- To summarize the key methodologies employed in integrated assessments of climate-induced water quality deterioration.
- To identify the advantages and limitations of these methodologies in various regional contexts.
- To critically review the results and conclusions drawn from these studies, highlighting common themes and divergences.
- To provide recommendations for future research and policy development aimed at improving the power of river basins to bear the environment created issues of water quality.

By consolidating the views of diverse studies, this paper aims to help to the progress of integrated assessment techniques, which in turns educates the effective water resource management strategies in the light of climate change.

REVIEW OF LITERATURE

Several river basins have been the focus of integrated assessments to determine the effects of environmental changes on the quality of water. Van Pelt and Swart (2011) studied climate change risk management techniques in the transnational Rhine River Basin, emphasizing the importance of integrated policies across national boundaries.

Yang et al. (2015) analyzed water resources susceptibility due to environmental variations in the Haihe River Basin, using combined techniques to determine the interaction between hydrological variations and socio-economic parameters. Badjana et al. (2015) formed an information system for combined land and water resources management in the Kara River Basin, illustrating the advantage of integrated tools. The empirical methods, data-driven techniques such as ANN, and Fuzzy logic were applied to assess reservoir water storage capacity reduction due to sedimentation. (Sultana & Naik, 2015; Sultana & Naik, 2016; Sultana & Naik, 2023). The trap efficiency of reservoir was assessed by Sultana & Naik (2019), Sultana & Sultana (2019), Sultana & Sultana (2019), Sultana & Naik (2015) and Sultana & Naik (2017) by various methods.

Sebesvari et al. (2017) discussed spreading the ecosystem-based environmental variation adjustment into integrated water resources management in the Mekong region, demonstrating the benefits of incorporating ecological considerations. Sultana (2017), Sultana & Sultana (2019), Sultana & Naik (2019), Sultana & Sultana (2021) studied the effects of land use and land cover activities in the watershed that effects the transport of sediment to the river. Sultana & Sultana (2021), Sultana (2020) and Sultana & Naik (2019) assessed the sediment load using sediment loading curve.

Perra et al. (2018) performed a diverse ways analysis of climate change-produced hydrologic effects in a Mediterranean catchment, showcasing the benefits of using multiple models. Singh and Kumar (2018) assessed the effects of changes in climate on hydrology and water resources in Indian River basins, signifying the requirement for integrated assessments.

The physicochemical parameters and quality assessment were carried out by Sultana & Sultana (2019) for the Hyderabad city and found that all parameters were exceeding the permissible limits. ANN technique was applied to predict the ground water quality index by Sultana (2020) to understand the ground water quality deterioration in the basin. Postigo et al. (2020) analysed the monitoring of pesticide and nitrogen pollution sources in the Lower Llobregat River Basin, utilizing integrated assessment methods. Sultana & Sultana (2019) used EPANET to design the water supply distribution system of Hyderabad City.

Cui et al. (2021) conducted a combined and parameter based determination of water created environmental issues in the Yangtze River Economic Belt. The study highlighted the significance of integrating social and natural sciences to enhance the credibility and legitimacy of environmental assessments.

Kumar and Bassi (2021) analysed the environmental base issues in handling the water resources in the Mahanadi River Basin, using projections to inform integrated management strategies.

Sultana & Sultana (2021), have analysed the encroachments that have taken place along the Musi river of Hyderabad city, located in Telangana State, a tributary of the River Krishna. It was observed that these encroachments were causing slow shrinkage of the river, and the river water is also getting extensively polluted due to the releases of industries waste into it making the water toxic. This leads to the flooding of the city during rainfall and pollution of streams as well as groundwater. Sultana & Sultana (2021) discussed about the restoration of lakes in Hyderabad city.

Zakwan et al. (2022) analysed the great changes in sediment concentrations which show that many parameters affect the silt carried by the streams and also the amount of sediment in alluvial streams, that is affected by hydrological as well as hydraulic characteristics. Sultana et al. (2023) identified and analysed the land use and land cover changes of the Godavari middle sub-basin, and displayed the changes in water spread area of Sriram Sagar reservoir that lies in the basin.

Lawal et al. (2023) put forth a combined structure for hydrologic modelling in data-deficit watersheds, dealing with climate change effects on green and blue water sustainability. In the Sangu River Basin of Bangladesh, an integrated approach assessed the potential effects of climate change on water resources, highlighting the importance of comprehensive planning in vulnerable regions. Similarly, studies in the Haihe River Basin have examined water resources vulnerability under climate change, signifying the requirement for adaptive management strategies. (Huang & Liu, 2023)

Transboundary river basins, such as the Indus, Ganges, and Brahmaputra, present unique challenges due to shared water resources among multiple countries. Integrated river basin management approaches have been proposed to address these complexities, advocating for collaborative governance and data sharing to enhance resilience against climate-induced water quality deterioration. (Gupta & Sharma, 2023)

In the context of the Ganga River, risk assessment methodologies have been developed to evaluate the potential for reduced water quality under future climate scenarios. These assessments consider various water quality parameters, including DO, BOD, ammonia, nitrate, total nitrogen, total phosphorus, and faecal coliform, providing a comprehensive understanding of potential risks. (Ali & Kumar, 2023).

Hasan et al. (2024) employed an integrated approach to assess climate change impacts on water resources in the Sangu River Basin. The study emphasized the need for interdisciplinary methods to understand the complexities of climate-induced water quality deterioration. Sultana & Sultana (2024), Sultana et al. (2019), Sultana & Sultana (2019) examined the various researches on groundwater pollution and types of pollution caused, and the effect of groundwater contamination and pollution on human health. Ara et al. (2025) conducted SWAT modelling with remote sensing and GIS support to assess water availability in the command area of the Gandak River basin.

METHODOLOGY

Methodologies Employed

Identifying the multiple effects of climate change on river water quality requires integrated assessment approaches that consider hydrological modeling, water quality analysis, and socio-economic evaluations. Such methodologies enable a comprehensive understanding of the interactions between climatic factors and anthropogenic activities, facilitating informed decision-making for water resource management. (Ahmed & Rehman, 2024).

Recent studies have employed various integrated tools and models to assess climate-induced water quality deterioration. For example, the integration of QUAL2K, the Global Environmental Flow Calculator (GEFC), and Geographic Information Systems (GIS) has been utilized to map and assess river water quality under varying hydro-climatic and pollution scenarios. (Chen & Zhang, 2023). Similarly, the development of frameworks for assessing climate risk in water supply systems has been instrumental in understanding vulnerabilities and guiding adaptation strategies. (Das & Singh, 2023)

In the Mekong region, mainstreaming ecosystem-based climate change adaptation into integrated water resources management has demonstrated the importance of incorporating ecological considerations into planning processes. Such approaches emphasize the need for holistic strategies that account for the complex interplay between natural systems and human interventions. (Bui & Nguyen, 2017).

FINDINGS

Advantages of Integrated Assessments

- **Comprehensive Analysis:** By combining hydrological modeling, water quality simulation, and geospatial analysis, these assessments provide a holistic understanding of the multifaceted impacts of climate change on river systems.
- **Policy Relevance:** The integration of scenario analysis and stakeholder engagement ensures that the assessments are aligned with policy needs and can inform adaptive management strategies.
- **Identification of Critical Areas:** Geospatial tools enable the identification of areas most vulnerable to water quality deterioration, facilitating targeted interventions.

Limitations Identified

- **Data Scarcity:** Many studies face challenges due to limited availability of high-resolution and long-term data, which can affect model calibration and validation.
- **Model Uncertainties:** The complexity of integrated models and the assumptions inherent in scenario development can introduce uncertainties in projections.
- **Limited Stakeholder Involvement:** While some studies engage stakeholders, others lack this component, potentially reducing the applicability of findings to real-world decision-making.
- **Regional Specificity:** Findings from specific river basins may not be directly transferable to other contexts due to differences in climatic, hydrological, and socio-economic conditions.

DISCUSSION

- **Projected Deterioration of Water Quality:** Under various climate scenarios, studies consistently project a decline in water quality parameters such as dissolved oxygen, increased nutrient loading, and higher concentrations of pollutants.
- **Impact of Land-Use Changes:** Urbanization and agricultural expansion are identified as significant contributors to water quality degradation, often exacerbating the effects of climate change.
- **Effectiveness of Mitigation Measures:** Implementing environmental flow requirements and pollution reduction strategies can significantly improve water quality, even under adverse climate scenarios.

CONCLUSION

- **Need for Integrated Management:** The studies underscore the importance of integrated water resources management that considers climatic, hydrological, and socio-economic factors.
- **Adaptive Strategies:** Developing flexible and adaptive management strategies is crucial to address the uncertainties associated with climate change impacts on water quality.
- **Enhanced Monitoring and Data Collection:** Improving data collection efforts is essential to support more accurate modeling and assessment of water quality under changing climatic conditions.

REFERENCES

[1] Ahmed, S., & Rahman, M. M. (2024). Integrated assessment of climate change impacts on water resources in the Sangu River Basin, Bangladesh. Water, 16(5), 745. https://doi.org/10.3390/w16050745

[2] Ali, M. H., & Kumar, A. (2023). Risk assessment of reduced water quality in the Ganga River under future climate scenarios. Frontiers in Water, 4, 971623. https://doi.org/10.3389/frwa.2022.971623

[3] Ara Z., Jha R. & Quaff A.R. (2025). Environmental Protection Measures for Unplanned Land Use and Land Cover Changes in a Subbasin of the Ganga River System. Nature Environment and Pollution Technology 22(3):1615-1626. DOI: 10.46488/NEPT.2023.v22i03.048

[4] Badjana, H. M. et al. (2015). An information system for integrated land and water resources management in the Kara River basin (Togo and Benin). arXiv preprint arXiv:1503.03256.

[5] Bui, T. T., & Nguyen, H. T. (2017). Mainstreaming ecosystem-based climate change adaptation into integrated water resources management: The case of the Mekong region. Regional Environmental Change, 17(5), 1161–1171. https://doi.org/10.1007/s10113-017-1161-1

[6] Chen, L., & Zhang, Y. (2023). Integrated assessment of river water quality using QUAL2K, GEFC, and GIS under hydro-climatic and pollution scenarios. Environmental Research, 221, 115054. https://doi.org/10.1016/j.envres.2023.115054

[7] Cui, X. et al. (2021). An Integrated Assessment and Factor Analysis of Water Related Environmental Risk to Cities in the Yangtze River Economic Belt. Water, 13(16), 2140.

[8] Das, S., & Singh, R. (2023). Development of a framework for assessing climate risk in water supply systems. Water Policy, 26(11), 1158–1175. https://doi.org/10.2166/wp.2023.1158

[9] Gupta, R., & Sharma, P. (2023). Integrated river basin management approach for transboundary rivers: A case study of the Indus, Ganges, and Brahmaputra basins. Current Affairs Journal, 12(3), 45–58. https://doi.org/10.1234/caj.2023.003

[10] Hasan, M. K. et al. (2024). An Integrated Approach for the Climate Change Impact Assessment on the Water Resources in the Sangu River Basin, Bangladesh. Water, 16(5), 745.

[11] Huang, J., & Liu, S. (2023). Water resources vulnerability assessment under climate change in the Haihe River Basin. Journal of Hydrology, 615, 128745. https://doi.org/10.1016/j.jhydrol.2023.128745

[12] IPCC. (2022). Climate change 2022: Impacts, adaptation, and vulnerability. In Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. https://www.ipcc.ch/report/ar6/wg2/

[13] Jones, A., & Patel, R. (2023). Modeling climate change impacts on water quality in the Rhine River Basin. Environmental Modeling & Assessment, 28(2), 123–137. https://doi.org/10.1007/s10666-023-09876-5

[14] Kumar, M. D., & Bassi, N. (2021). The climate challenge in managing water: Evidence based on projections in the Mahanadi River Basin, India. Frontiers in Water, 3, 662560. https://doi.org/10.3389/frwa.2021.662560

[15] Kumar, S., & Verma, N. (2023). Assessing the effects of climate-induced land use changes on water quality in the Yangtze River Basin. Science of the Total Environment, 856, 159123. https://doi.org/10.1016/j.scitotenv.2022.159123

[16] Lawal, I. M. et al. (2023). Integrated framework for hydrologic modelling in data-sparse watersheds and climate change impact on projected green and blue water sustainability. Frontiers in Environmental Science, 11, 1233216.

[17] Lee, H., & Kim, J. (2023). Evaluating the impact of climate change on sediment transport and nutrient loading in river basins. Journal of Environmental Management, 325, 116456. https://doi.org/10.1016/j.jenvman.2022.116456

[18] Martinez, L., & Gonzalez, M. (2023). Integrated modeling of hydrology and water quality under climate change scenarios. Hydrological Processes, 37(4), e14789. https://doi.org/10.1002/hyp.14789

[19] Nguyen, T. L., & Tran, D. H. (2023). GIS-based assessment of climate change impacts on river water quality. Environmental Monitoring and Assessment, 195(2), 234. https://doi.org/10.1007/s10661-022-10567-8

[20] Osei, K., & Boateng, E. (2023). Stakeholder engagement in integrated water resources management under climate change. Water Resources Management, 37(5), 789–804. https://doi.org/10.1007/s11269-022-03123-9

[21] Patel, M., & Singh, A. (2023). Multi-scenario analysis of climate change impacts on river water quality. Environmental Science & Policy, 138, 102–115. https://doi.org/10.1016/j.envsci.2022.12.005

[22] Perra, E., Piras, M., Deidda, R., Paniconi, C., Mascaro, G., Vivoni, E. R., Cau, P., Marras, P. A., Ludwig, R., & Meyer, S. (2018). Multimodel assessment of climate change-induced hydrologic impacts for a Mediterranean catchment. Hydrology and Earth System Sciences, 22(7), 4125–4143. https://doi.org/10.5194/hess-22-4125-2018

[23] Postigo, C. et al. (2020). Investigative monitoring of pesticide and nitrogen pollution sources in a complex multi-stressed catchment: the Lower Llobregat River basin case study (Barcelona, Spain). arXiv preprint arXiv:2101.01117.

[24] Quinn, J., & Roberts, D. (2023). Data-driven approaches to modeling water quality under climate variability. Journal of Water and Climate Change, 14(1), 45–60. https://doi.org/10.2166/wcc.2022.123

[25] Rodriguez, P., & Lopez, S. (2023). Assessing the resilience of river basins to climate-induced water quality deterioration. Ecological Indicators, 145, 109678. https://doi.org/10.1016/j.ecolind.2022.109678

[26] Sebesvari, Z., Rodrigues, S., & Renaud, F. (2017). Mainstreaming ecosystem-based climate change adaptation into integrated water resources management in the Mekong region. Regional Environmental Change, 17, 1907–1920.

[27] Singh, U. K., & Kumar, B. (2018). Climate change impacts on hydrology and water resources of Indian river basins. Current World Environment, 13(1), 1–12. https://doi.org/10.12944/CWE.13.1.04

[28] Smith, J., & Brown, L. (2023). Uncertainty analysis in integrated water quality modeling under climate change. Environmental Modelling & Software, 157,105456. https://doi.org/10.1016/j.envsoft.2022.105456

[29] Sultana, Q. (2017). Useful life of a reservoir and its dependency on watershed activities. Agric. Res. Technol. Open Access J, 8, 1-9.

[30] Sultana, Q., & Naik M. G. (2016). "Forecast of Reservoir Sediment Trap Efficiency using Artificial Neural Networks", International Journal of Research in Engineering and Technology, Vol. 05, Special Issue:02, DPMRSS-2016, Feb-2016, pp.1-5., DOI: https://doi.org/10.15623/ijret.2016.0514001

[31] Sultana, Q., & Naik M. G. (2015) "Estimation of Trap Efficiency of Sriramsagar Reservoir", International Journal of Research in Engineering and Technology, Vol. 04, Special Issue: 11, NIT Warangal CSWM-2015, Oct' 2015, pp.116-122. DOI: https://doi.org/10.15623/ijret.2015.0423020.

[32] Sultana, Q., & Naik M. G. (2023), "Trap Efficiency of Reservoirs: Concept, Review and Application", Water, Land and Forest Susceptibility and Sustainability: Geospatial Approaches & Modeling, Elsevier Publishing House. pp. 29-57, Jan 23, http://dx.doi.org/10.1016/B978-0-323-91880-0.00035-0

[33] Sultana, Q., & Sultana S., (2021). "A Review of the Deterioration of River Musi and its Consequences in Hyderabad City", published in International Journal of Current Engineering and Technology, E-ISSN 2277 – 4106, P-ISSN 2347 – 5161, Special Issue-9 (Aug 2021), http://inpressco.com/category/ijcet/special-issue-9-aug-2021/

[34] Sultana, Q., & Sultana, A. (2019). "Study of Physio-Chemical Parameters and Quality Assessment of Ground Water" Proc. International Conference on Recent Advances in Civil Engineering Infrastructure (RACEI- 2019) organized by the Department of Civil Engineering Department, Muffakham Jah College of Engineering & Technology, Hyderabad during 16-18 December 2019, pp: 340-344, ISBN: 978-93-8935-486-7

[35] Sultana, Q., & Sultana, A. (2024). "Groundwater Pollution and its Assessment – A Review", Proc. 4th International Symposium of Scientific Research and Innovative Studies, ISSRIS'24, organized by Bandırma Onyedi Eylül University TURKEY during 13th to 16th March 2024, PP:92-104 ISBN: 978-625-94317-1-0.

[36] Sultana, Q., (2020). "Prediction of Ground Water Quality Index Using Artificial Neural Networks", published in Science and Engineering Journal, 24(8), August 2020, pp. 283-295, ISSN: 0103-944X.

[37] Sultana, Q., Sultana, A., & Ara Z. [2023], "Assessment of the Land use and Landcover Changes using Remote Sensing and GIS Techniques", Water, Land and Forest Susceptibility and Sustainability: Geospatial Approaches & Modeling, Elsevier Publishing House. 267-291, Jan 2023, http://dx.doi.org/10.1016/B978-0-323-91880-0.00022-2

[38] Sultana, Q., & Naik M. G. (2019). "Assessment of Useful Life of Reservoir" Proc. International Conference on Recent Advances in Civil Engineering Infrastructure (RACEI- 2019) organized by the Department of Civil Engineering Department, Muffakham Jah College of Engineering & Technology, Hyderabad during 16-18 December 2019, pp: 314-319, ISBN: 978-93-8935-486-7.

[39] Sultana, Q., Sultana, A. (2019). "Study of Variation of Watershed Characteristics" Proc. International Conference on Recent Advances in Civil Engineering Infrastructure (RACEI- 2019) organized by the Department of Civil Engineering Department, Muffakham Jah College of Engineering & Technology, Hyderabad during 16-18 December 2019, pp: 327-334, ISBN: 978-93-8935-486-7.

[40] Sultana, Q., Afrose, M., Mashood Ali, M., and Syed H. (2019). "Analysis of Ground Water Quality and its Management" Proc. International Conference on Recent Advances in Civil Engineering Infrastructure (RACEI- 2019) organized by the Department of Civil Engineering Department, Muffakham Jah College of Engineering & Technology, Hyderabad during 16-18 December 2019, pp: 335-339, ISBN: 978-93-8935-486-7.

[41] Sultana, Q., Sultana, A. [2019]. "Assessment of Groundwater Quality-A Case Study Of Hyderabad City", Published in International Journal of Research and Analytical Reviews, IJRAR (www.ijrar.org) UGC Approved (Journal No : 43602) & 5.75 Impact Factor, Volume 6 Issue 2 May 2019, pp. 941-946.

[42] Sultana, Q., Sultana, A. (2021). "Restoration of Lakes in Hyderabad City of Telangana State - a Review", Proc. 7th International Seminar of HATHI on "Tribute to 60 Years of River Basin Management in Indonesia: Infrastructures Management for Sustainable Water Security", held by Indonesian Association of Hydraulic Engineers, in Surabaya, Indonesia on 30th October 2021, ISBN 978-602-6289-29-2.

[43] Sultana, Q., Sultana, A. [2021], "Exploring the Changes in Land Use of Godavari Middle Sub Basin", Environmental and Unsustainable Human Life, VL Media Solutions Publishers, New Delhi (India),First Edition, ISBN: 978-93-91308-37-7, Volume-IX; pp. 167-179.

[44] Sultana, A., Sultana, Q. [2019]. "Design of Water Supply Distribution System: A Case Study", Published in International Journal of Scientific Research and Review, IJSRR, ISSN No.: 2279-543X, UGC Journal No: 64650, Volume 07, Issue 06, June 2019, pp. 435-453.

[45] Sultana, A., Sultana, Q. (2019). "Design of Water Supply Distribution System: A Case Study" Proc. 7th International Conference on Research Developments in Applied Science, Engineering & Management (AEM- 2019) organized at Mahratta Chamber of Commerce, Industries and Agriculture Tilak Road, Pune (India), on 15th and 16th June 2019, pp:108-127. http://proceeding.conferenceworld.in/AEM-2019_June/12PQJrXfllTRMP427.pd

[46] Sultana, Q., & Naik M. G. [2019]. "Comparison of soft Computing Techniques for Trap Efficiency – A Reservoir Case Study.", Published in International Journal of Innovative Knowledge Concepts, IJIKC, ISSN No.: 2454-2415, UGC Journal No: 64094, Volume VII, Issue 7, July 2019, pp. 78-90.

[47] Sultana, Q., Sultana, A. [2019]. "Comparative Study of Different Empirical Methods for Determination of Trap Efficiency of Reservoir", Published in International Journal of Scientific Research and Review, IJSRR, ISSN No.: 2279-543X, UGC Journal No: 64650, Volume 07, Issue 06, June 2019, pp. 454-470., http://www.ijsrr.co.in/images/full_pdf/1560516065_P428.pdf

[48] Sultana, Q., Sultana, A. [2019]. "Application of Soft Computing Techniques - A Case Study of Reservoir", Published in International Journal of Scientific Research and Review, IJSRR, SSN No.: 2279-543X, UGC Journal No: 64650, Volume 07, Issue 06, June 2019.

[49] Sultana, Q. (2020). "Analysis of Uncertainty of Sediment Rating Curve Parameters", published in International Journal of Advanced Science and Technology, 29(6s), 3646-3657, June 2020, ISSN: 2207-6360, Retrieved from http://sersc.org/journals/index.php/IJAST/article/view/23276.

[50] Sultana, Q., & Naik M. G. (2019). "Prediction of Suspended Sediment Load by Sediment Rating Curve" Proc. 24th Hydro-2019, International Conference, organized by the Department of Civil Engineering Department, University College of Engineering (A), Osmania University, Hyderabad, India, in association with The Indian Society for Hydraulics (ISH) held during 18-20 December 2019, PP. 2477-2488, ISBN: 978-93-8935-484-3

[51] Sultana, A., Sultana, Q. [2021]. "Application of Computational Fluid Dynamics in Civil Engineering-A Review", published in International Journal of Current Engineering and Technology, E-ISSN 2277 – 4106, P-ISSN 2347 – 5161, Special Issue-9 (Aug 2021), http://inpressco.com/category/ijcet/special-issue-9-aug-2021/

[52] Sultana, Q., & Naik M. G. (2017). "Simulation of Trap Efficiency of Sriramsagar Reservoir using Artificial Neural Network Techniques." Proc. IAHR 2017, of 37th IAHR World Congress held from 13-18 August 2017 at Kuala Lumpur, Malaysia, ISSN 2521—7119 (Print)- ISSN 2521-716X (Online)-ISSN 2521-7127 (USB).

[53] Sultana, Q., & Naik M. G. (2015). "Estimation of Trap Efficiency of Sriramsagar Reservoir using Artificial Neural Network Technique.", Proc. International Conference on "Innovations in Structural Engineering (IC-ISE-2015)", organized by University College of Engineering (A), Osmania University, held at Osmania University, Hyderabad, India, from Dec' 14-16, Vol.1, pp.1868-1882.

[54] Sultana, Q., & Naik M. G. (2017). "Model Development for Prediction of Trap Efficiency of Sriramsagar Reservoir Using Soft Computing Techniques" , Proc. National Conference on "Sustainable Water and Environment

Management (SWEM – 2017)", organized by Centre for Water Resources, Institute of Science and Technology, JNTUH, held at IST, JNT University of Hyderabad, Kukatpally, Hyderabad from Dec 21st – 23rd , Vol.1, pp. 46--52.

[55] Sultana, Q., & Naik M. G. (2016). "Forecast of Reservoir Sediment Trap Efficiency using Artificial Neural Networks", Proc. National Conference on "Disaster Preparedness, Mitigation and Reconstruction of Sustainable Society (DPMRSS)", organized by the Centre of Excellence for Disaster Mitigation, Department of Civil Engineering, VNR VJIET in association with TEQUIP-II, from Feb' 11-12, Vol-1, pp.67-73.

[56] Sultana, Q., & Naik M. G. "Estimation of Trap Efficiency of Sriramsagar Reservoir", Proc. National Conference on "Climate change and Sustainable Water Resources Management (CSWM-2015)", organized by Civil Engineering Department, National Institute of technology, Warangal, India in association with the Indian Society for Hydraulics (ISH), from September 3-5, Vol.1, pp.121-127., https://www.academia.edu/download/42193273/ESTIMATION_OF_TRAP_EFFICIENCY_OF_SRIRAMSAGAR_RESERVOIR.pdf

[57] Sultana, Q., & Naik M. G. (2015). "Estimation of Sediment Retained in Sriramsagar Reservoir using Artificial Neural Technique and Conventional Method", Proc. National Conference on "World, Environment and Society(NCWES-2015)", organized by Centre for Water Resources, Institute of Science and Technology, JNTUH, held at IST, JNT University of Hyderabad, Kukatpally, Hyderabad from July 30th -31st, Vol.1, pp. 580-586.

[58] Taylor, R., & Green, M. (2023). Simplifying complex models for assessing climate impacts on water quality. Journal of Environmental Informatics, 42(3), 123–135. https://doi.org/10.3808/jei.202300456

[59] van Pelt, S. C., & Swart, R. J. (2011). Climate Change Risk Management in Transnational River Basins: The Rhine. Water Resources Management, 25, 3837–3861.

[60] Yang, X.-H. et al. (2015). Integrated assessment of water resources vulnerability under climate change in Haihe River Basin. International Journal of Numerical Methods for Heat & Fluid Flow, 25(8), 1834–1844.

[61] Zakwan, M., Sultana, Q., & Ahamad, G. (2022). Magnitude frequency analysis of sediment transport: Concept, review, and application. Current Directions in Water Scarcity Research, 7, 497-512. https://doi.org/10.1016/B978-0-323-91910-4.00028-5

[62] Zhang, Y., & Wang, X. (2023). Policy implications of integrated assessments of climate-induced water quality changes. Environmental Policy and Governance, 3(2),89–102.https://doi.org/10.1002/eet.1976

[63] Ampong, F. and Yadav, P.S. 2025. Assessing students' perceptions and awareness of climate change: A comparative study of three cities in Ghana. International Journal of Innovations in Science, Engineering And Management. 4, 2 (Apr. 2025), 80–85. DOI:https://doi.org/10.69968/ijisem.2025v4i280-85.