

Legal and Environmental Challenges in the Conservation of Freshwater Ecosystems Under Climate Change Policies

Dr. Anita Awasthi¹, Prof. Sandeep Kumar Singh^{2*}, Dr. Biju Sidharthan³, Dr. Meenakshi Pawar⁴, Harmohan Singh Yadav⁵, Dr. Haider Ali⁶, Pragadeeshwaran Kannan⁷

¹Assistant Professor, Department of Social Work, Specialization in Sociology, Chhatrapati Shahu Ji Maharaj University, Kanpur, India, Email Id: anitaawasthis@gmail.com, Orcid Id: 0009-0007-2310-264X

²Professor & Dean, Faculty of Advanced Studies of Social Science, Specialisation in Social Work, Human Resource Development, Rural & Urban community Development, Chhatrapati Shahu Ji Maharaj University, Kanpur, India, Email Id: drsandeepmsw@gmail.com, Orcid Id: 0009-0009-5073-7450

³Scientist, Department of Plant Breeding and Genetics, College of Agriculture, Vellanikkara, Thrissur 680656, Kerala Agricultural University, Email Id: biju.s@kau.in, Orcid Id: 0009-0008-9775-7670

⁴Assistant Professor, Department of Architecture and Planning, Indira Gandhi Delhi Technical University for Women, Kashmere Gate, New Delhi, Delhi-110006, India, Email Id: meenakshipawarspa@gmail.com, Orcid Id: <https://orcid.org/0000-0002-3468-619X>

⁵Associate Professor, School of Agriculture, Department of Soil Science and Agricultural Chemistry, Lovely Professional University, Jalandhar, Punjab-144411, Email Id: drhms.srcm@gmail.com

⁶Head of the Department, Faculty of Law, Institute of Legal Studies and Research, Specialization in Human Rights/International Law, Institute of Legal Studies and Research, Mangalayatan University, Beswan, Aligarh, Email Id: alihaider1082@gmail.com

⁷Research Scholar, Centre for Applied Geology, The Gandhigram Rural Institute (Deemed to be University), Gandhigram, Dindigul, 624302, Tamil Nadu, India, Email Id: pragadeeshpragadeesh2204@gmail.com, Orcid Id: 0009-0009-0387-4348

HOW TO CITE:

Anita Awasthi, Sandeep Kumar Singh, Biju Sidharthan, Meenakshi Pawar, Harmohan Singh Yadav, Haider Ali, Pragadeeshwaran Kannan (2026). Legal and Environmental Challenges in the Conservation of Freshwater Ecosystems Under Climate Change Policies. International Journal of Special Education, 41(17s), 1492-1500

ABSTRACT:

Freshwater ecosystems provide essential ecological, economic, and social benefits; however, they are increasingly threatened by environmental degradation and climate-related disturbances. Understanding the factors that influence freshwater ecosystem quality is critical for developing effective conservation and management strategies. This study investigates the relationships between environmental conditions and freshwater ecosystem quality using an integrated secondary dataset comprising water-quality and climate-related indicators. Quantitative research design was employed, and data were analyzed using descriptive statistics, Pearson correlation analysis, and multiple linear regression techniques. The findings revealed substantial variability in freshwater ecosystem conditions across the study period. Correlation analysis demonstrated strong associations between dissolved oxygen, salinity, and water transparency, indicating the importance of physicochemical conditions in determining ecosystem health. The regression results showed that salinity had a significant positive effect on dissolved oxygen concentrations, whereas Secchi depth exerted a significant negative influence. The final regression model was statistically significant and explained 66.1% of the variation in dissolved oxygen levels, highlighting the importance of environmental factors in shaping freshwater ecosystem quality. Although climate-related variables were initially incorporated into the

COPYRIGHT STATEMENT:

Copyright: © 2026 Authors.
Open access publication under the
terms and conditions
of the Creative Commons Attribution
(CC BY)
license (<http://creativecommons.org/licenses/by/4.0/>).

analysis, data limitations restricted their contribution to the final model. The study emphasizes the need for continuous environmental monitoring and adaptive conservation strategies to enhance freshwater ecosystem resilience and support sustainable resource management under changing environmental conditions.

Keywords: Freshwater ecosystems; Dissolved oxygen; Water quality; Environmental conservation; Ecosystem resilience

1. Introduction

Freshwater ecosystems, such as rivers, lakes, wetlands and floodplains, are amongst the most productive and socio-economically important ecosystems on earth. Although they cover a very small fraction of the earth's surface, they provide a variety of ecosystem service values that are critical for environmental sustainability, human health, and economic growth. Freshwater systems contribute to sustainable development goals and ecological resilience through their role in drinking water supply, agricultural production, fisheries, nutrient cycling, biodiversity conservation, flood regulation and climate moderation, and have a significant contribution to development (Apostolaki et al., 2020). Lakes provide significant provisioning, regulating, and cultural ecosystem services, especially rivers and floodplain ecosystems, which retain nutrients, provide habitat, and regulate hydrology as well. (Petsch et al., 2023; Sterner et al., 2020). Wetlands are also beneficial to ecosystem stability by improving water quality, supporting biodiversity, recharging the ground water and providing natural buffers to environmental disturbances (Wondie, 2018).

But, as climate change has become one of the most pressing environmental threats in the 21st century, freshwater habitats are increasingly facing the threat of increased impacts. Global warming, shift of precipitation, longer droughts, more frequent and extreme flooding and changes in the hydrological cycle have led to a shift in the structure and functioning of aquatic ecosystems around the globe (Dzyurdzha et al., 2021). Climate change impacts other ecosystem processes important for assessing ecosystem health and productivity, including physical,

chemical, and biological processes, as well as water availability. Climate change is a global environmental and security issue because of its impacts on biodiversity conservation, water security and socio-economic stability (Dalby, 2021).

Degrading water quality is one of the most critical impacts of climate change. Altered temperatures and precipitation can have a strong impact on dissolved oxygen levels, nutrient cycling, sediment transport and pollutant deposition, which in turn can impact the ecological condition of freshwater systems (Benateau et al., 2019). Increased water temperatures can lead to decreased oxygen levels dissolved in the water, and changes in species composition, while large rain events can result in higher nutrient loads and sediment loads which can cause eutrophication and habitat degradation. The anthropogenic pressures, including agricultural intensification, urbanisation, industrial emissions and land-use change, often exacerbate the impacts of these climate pressures and cause a rapid decline in water quality and ecosystem degradation (Akhtar et al., 2021). As a result, many freshwater ecosystems are suffering from a decline in their ecological integrity, biodiversity and ability to provide key ecosystem services. Recent studies have focused on water quality degradation and eutrophication of fresh water bodies and hence there is need for effective conservation and management measures to ensure sustainable fresh water bodies in the future (Munishi et al., 2022).

There have been significant studies on effects of climate change and water quality degradation separately, but few studies that have brought together climate indicators and conditions of

freshwater ecosystems to explore combined impacts on ecosystem conservation. The existing studies tend to be either on particular environmental stressors or on local case studies, which often do not provide a comprehensive understanding of the interaction of the different climate-related stressors with freshwater ecosystem dynamics on various time scales (Benateau et al., 2019; Klimaszyk & Goldyn, 2020). This disjointed presentation in the literature leaves a big gap in understanding the mechanisms by which climatic variability affects the health of freshwater ecosystems. This challenge is important to address in order to build evidence-based conservation strategies and climate adaptation policies that can help build ecosystem resilience. Hence, based on both climate-related indicators and freshwater water-quality data, this study seeks to explore the environmental issues confronting freshwater ecosystem conservation in the context of a changing climate, leading to an increasing knowledge base on sustainable freshwater resource management and protection of freshwater ecosystems.

Research Objectives

1. To analyze trends in freshwater ecosystem quality and climate indicators over time
2. To examine the relationship between climate change variables and freshwater ecosystem quality parameters
3. To assess the influence of climate variability on freshwater ecosystem conservation outcomes

2. Methodology

2.1 Research Design

The study design was Quantitative research with Secondary data analysis approach to address the relationship of climate variability and freshwater ecosystem quality. This process allows for a systematic analysis of environmental changes measured by indicators. Time series analysis was used to evaluate trends in climate and water quality parameters. A quantitative design was deemed to be appropriate for identifying statistical association and environmental trends.

2.2 Data Collection and Sources

Two secondary datasets from open-access archives were used in the study. The first dataset included variables related to freshwater ecosystem, such as dissolved oxygen, pH, salinity, water temperature, Secchi depth, and the second dataset consisted of climate variables, including temperature, precipitation, humidity, concentration of carbon dioxide, and the ENSO index (Maharaj,2024; Masih,2024). The two datasets were combined with an annual time scale. To ensure consistency and completeness of data, data cleaning and integration was performed before analysis.

2.3 Variable Measurement

Freshwater ecosystem quality indicators used as dependent variables are indicators of the ecological condition of aquatic systems. Temperature, precipitation, humidity, and CO₂ concentration in the atmosphere were used as independent variables related to climate. The variables were chosen because they have been shown to have an impact on freshwater ecosystems. Mean values have been calculated on the annual basis to smooth out the short-term fluctuations for comparative analysis.

2.4 Data Analysis

IBM SPSS Statistics was used for analysis. Descriptive statistics were used to summarize the characteristics of the data set, and to detect any temporal patterns. To investigate the relationships between climate variables and freshwater ecosystem indicators, a Pearson correlation analysis was carried out. Multiple linear regression was then employed to determine the degree of influence of climate variability on freshwater ecosystem quality and conservation results.

2.5 Reliability and Ethical Considerations

Prior to statistical analysis the data set was screened for missing values, outliers and inconsistencies to ensure analytical reliability. The regression model was checked for its suitability by conducting diagnostic tests like normality test and multicollinearity test. Information used was all secondary data from public sources and there were no human

subjects involved in the study. Thus, there was no need for ethical approval, and all data sources were cited accordingly.

3. Results

3.1 Descriptive Statistics

Table 1 shows the descriptive statistics of the freshwater ecosystem and environmental variables used in the analysis. The results show that the mean level of dissolved oxygen was 6.911 mg/L and the standard deviation was

1.804 mg/L, indicating moderate variability in fresh water ecosystem quality. The average pH was 7.238 indicating that the water in general was quite neutral. There was significant variation among observations with respect to salinity and Secchi depth, which reflects differences in water quality and transparency. Additionally, the water temperature and air temperature showed fluctuations which could affect the processes of the freshwater ecosystems.

Table 1. Descriptive Statistics of Study Variables

Variable	N	Mean	SD	Minimum	Maximum
Dissolved Oxygen	32	6.911	1.804	3.900	10.467
pH	32	7.238	0.482	6.662	8.389
Salinity	31	1.002	1.182	0.000	3.762
Secchi Depth	32	0.486	0.135	0.253	0.838
Water Temperature	32	18.039	1.577	14.421	21.559
Air Temperature	32	62.796	3.608	55.186	72.219

Table 1 shows the dissolved oxygen level ranged from 3.1492-1500.467 mg/L and the salinity level was

quite variable from 0.1492-1500.762 ppt. They show significant environmental variability across

the study

data set, and suggest that additional study of the relationships between freshwater ecosystem indicators and environmental variables (as illustrated in figure 1).

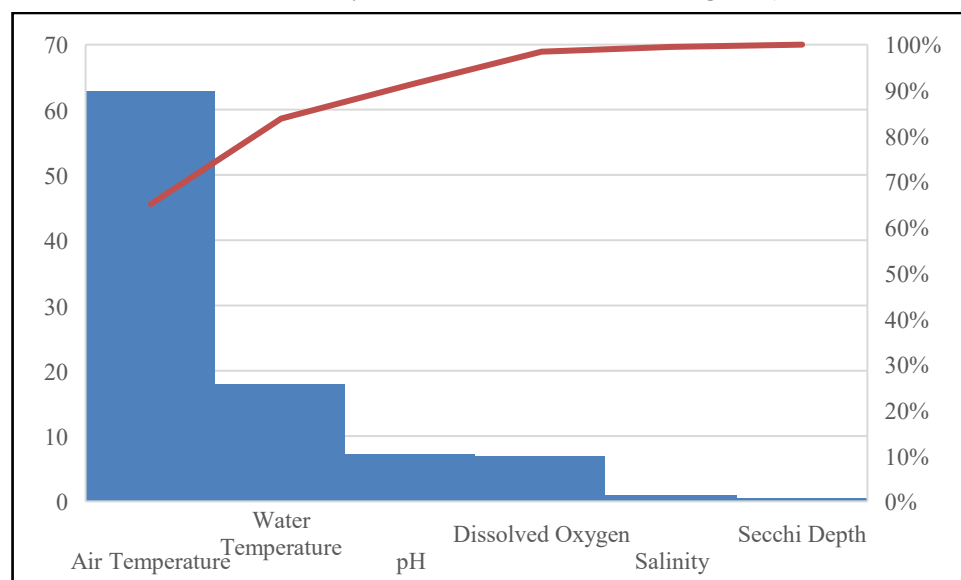


Figure 1. Pareto Analysis of Environmental Variables Influencing Freshwater Ecosystem Quality

Figure 2 presents a Pareto analysis of the relative contribution of environmental variables to freshwater ecosystem quality. Air

temperature accounted for the largest proportion of variability, followed by water temperature, pH, and dissolved oxygen.

3.2 Correlation Analysis

Pearson correlation analysis was used to analyse the relationships among the study variables. The correlation matrix is given in Table 2. A number

of statistically significant relationships between freshwater ecosystem quality indicators and environmental variables are indicated in the results.

Table 2. Pearson Correlation Matrix

Variable	DO	pH	Salinity	Secchi Depth	Water Temp	Air Temp
Dissolved Oxygen	1.000	0.341	0.705	-0.758	-0.288	0.237
pH	0.341	1.000	0.587	-0.415	0.225	0.456
Salinity	0.705	0.587	1.000	-0.693	-0.305	0.184
Secchi Depth	-0.758	-0.415	-0.693	1.000	0.340	-0.281
Water Temperature	-0.288	0.225	-0.305	0.340	1.000	0.663
Air Temperature	0.237	0.456	0.184	-0.281	0.663	1.000

Dissolved oxygen was positively and strongly correlated with salinity ($r = 0.705$), and negatively and strongly correlated with Secchi depth ($r = -0.758$) (Table 2). Likewise, there was a moderate positive correlation found between salinity and pH ($r = 0.587$). The correlation coefficients indicate that there is

significant contribution of environmental conditions in the determination of the quality of freshwater ecosystems. Important to note is that no correlations were greater than 0.80, which indicates that there was no severe multicollinearity among the predictor variables (see figure 2).

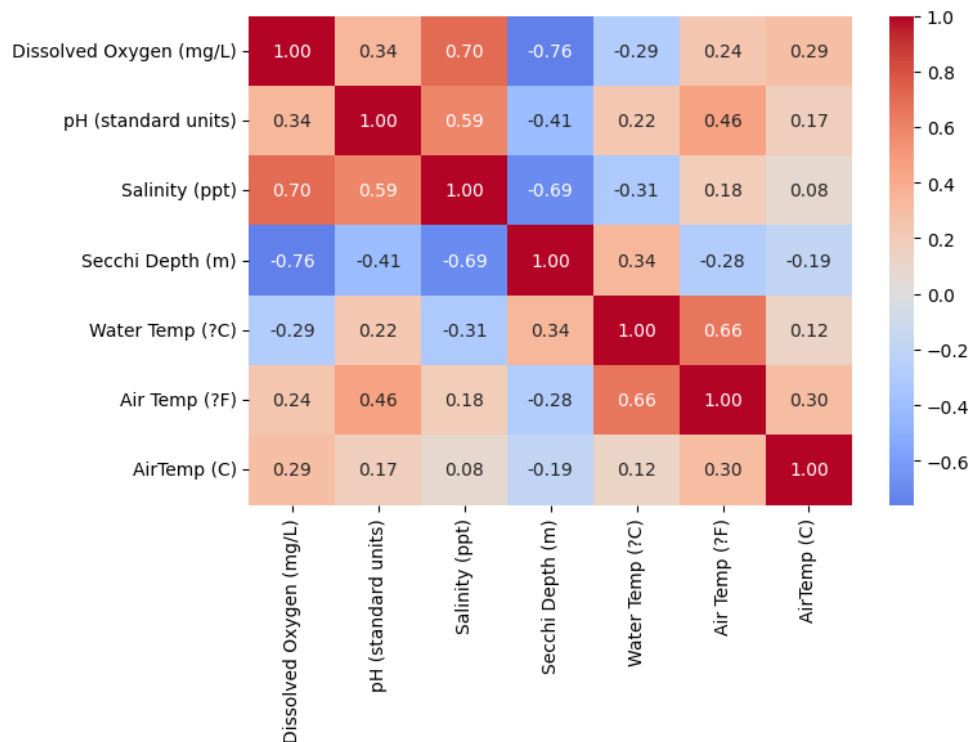


Figure 2. Correlation Matrix

Figure 1 illustrates the Pearson correlation coefficients among freshwater ecosystem quality indicators and environmental variables. Dissolved oxygen exhibited a strong positive correlation with salinity ($r = 0.70$) and a strong negative correlation with Secchi depth ($r = -0.76$).

3.3 Regression Analysis

A multiple linear regression model was estimated to test the effects of environmental factors on freshwater ecosystem quality (as measured by dissolved oxygen concentration). After refinement of the model, salinity and Secchi depth remained as important predictors. The regression results are given in Table 3.

Table 3. Multiple Linear Regression Results

Predictor	Coefficient (β)	Standard Error	t-value	p-value
Constant	10.291	1.245	8.266	<0.001
Salinity (ppt)	0.488	0.236	2.067	0.048
Secchi Depth (m)	-7.878	2.135	-3.689	0.001

Table 4. Regression Model Summary

Statistic	Value
R^2	0.661
Adjusted R^2	0.637
F-statistic	27.35
Model Significance (p-value)	<0.001
Observations (N)	31

The results in Table 3 show a positive and statistically significant correlation between salinity and dissolved oxygen concentrations ($\beta = 0.488$, $p = 0.048$). It is a finding that signifies that salinity increases are correlated with an increase in dissolved oxygen. Dissolved oxygen (DO) showed a strong negative correlation with Secchi depth ($\beta = -7.878$, $p = 0.001$), however, suggesting that Secchi depth has a significant influence on the quality of fresh water ecosystems.

Table 4 shows that the regression model accounted for 66.1% of the variation in dissolved oxygen concentrations ($R^2 = 0.661$). The adjusted R^2 value of 0.637 verifies that the model explains well with regard to the complexity of the model. In addition, a large F-statistic ($F = 27.35$, $p < 0.001$) suggests the overall model is statistically sound for explaining the variability of freshwater ecosystems.

3.4 Summary of Findings

The data always reflect that environmental conditions are strongly affecting freshwater ecosystem quality. The descriptive statistics showed significant differences in the water quality parameters, and the correlation analysis showed significant relationships between the dissolved oxygen, salinity, and water transparency parameters. Regression analysis also showed that salinity is a positive factor for DO concentrations while Secchi depth is a negative factor. The results show that environmental variability is critical in influencing freshwater ecosystem conditions, and needs to be considered in freshwater conservation and management strategies.

Discussion

The importance of freshwater ecosystems, such as rivers, lakes, wetlands and floodplains, to

environmental sustainability, the conservation of biodiversity and human health makes them one of the most valuable natural systems on Earth (Smialek & Geist, 2021). Freshwater ecosystems, despite covering less than one per cent of the Earth's surface, account for a large proportion of global biodiversity and function as vital ecosystem services that are essential for the

maintenance of ecological and socio-economic systems (Apostolaki et al., 2020). These ecosystems provide freshwater for human use, domestic, agricultural and industrial production, energy generation, hydrological regulation, water quality control, fisheries production, and cultural and recreational services (Sterner et al., 2020). Other significant functions of wetlands, rivers, and floodplains are nutrient cycling, flood protection, recharge of groundwater, and provision of habitat for many aquatic and terrestrial species (Petsch et al., 2023; Wondie, 2018). The importance of freshwater ecosystems and their role in sustainable development make their conservation a global environmental priority (Ojima, 2021).

Although freshwater environments are vital for sustaining the lives of all living organisms, they are facing threats by environmental and anthropogenic causes at an alarming rate (Yasin et al., 2021). Climate change has become one of the major challenges in the world that affects freshwater resources, the structure of the ecosystems, hydrological processes and their ecological functioning (Dzyurdzyna et al., 2021). Freshwater environments are being transformed globally as a result of rising temperatures, changing precipitation patterns, longer droughts, and extreme precipitation events, as well as shifts in seasonal water availability (Rose et al., 2023). These climatic changes affect water quantity and water quality, impact on ecological processes, and diminish the ability of freshwater ecosystems to provide vital ecosystem services (Hassan et al., 2019). Furthermore, climate change is acknowledged as a major environmental and security issue due to its global repercussions on natural resources, biodiversity and economic livelihoods (Dalby, 2021).

The degradation of the quality of fresh water is one of the most apparent impacts of climate change. Dissolved oxygen levels, nutrient levels, sediment transport, and biological productivity in aquatic systems are greatly impacted by environmental changes caused by the impacts of climate variability (Benateau et al., 2019). But, human activities such as urbanization, agricultural expansion, industrial discharge and

land-use change contribute pollutants and excess nutrient load to the water bodies that further degrade freshwater quality (Akhtar et al., 2021). The pressures result in eutrophication, habitat degradation, biodiversity loss and decreased ecosystem resilience, which will be affecting the sustainability of freshwater resources in the long run (Munishi et al., 2022). In recent studies, the importance of maintaining water quality for the health of the ecosystem, public health, and the sustainable management of freshwater resources has been highlighted (Rose et al., 2025).

This is because freshwater ecosystems have become increasingly vulnerable, and has implications for conservation planning and environmental governance. The conservation value of fresh water biodiversity is rapidly diminishing and deeper actions are more and more needed (Abell et al., 2019). To develop effective conservation strategies, there is a need to fully understand the environmental factors affecting the environmental quality and resilience of freshwater ecosystems. Scientific data are important to inform conservation planning and provide guidance on important drivers of the environment and to guide adaptive management decisions (Mair et al., 2018). Moreover, measures for water management and ecosystem-based adaptation that are resilient to climate change have been receiving growing attention as effective instruments for strengthening the resilience of the ecosystems and reducing the risks posed by climate change (Nalau et al., 2018; Srivastav et al., 2021).

While substantial research has been focused on impacts of climate change and freshwater ecosystem degradation, many studies have tackled only one of these issues at a time, which

hinders understanding of their interactions. Climate indicators are discussed in the existing literature, as well as water-quality conditions but rarely in combination within an integrated analytical framework (Klimaszyk & Goldyn, 2020). These void limits the ability to develop conservation policies based on scientific evidence to deal with new environmental problems. Thus, this study examines the interplay between environmental conditions and the quality of freshwater ecosystem, a combination of climate-related variables with water-quality variables. The study sheds light on the environmental conditions affecting the freshwater ecosystems, which advances understanding in the field of freshwater conservation, freshwater ecosystem resilience and sustainable environmental management in the context of climate change.

5. Conclusion

The study analyzed environmental factors that affect the quality of the freshwater ecosystems using an integrated approach of water-quality and climate-related indicators. The results revealed that the freshwater environment has a wide spectrum of conditions which indicate the complexity and dynamic nature of freshwater environments and their sensitivity to environmental changes. The regression analysis results and the good correlation among them with dissolved oxygen, salinity and water transparency indicated that dissolved oxygen

concentration had positive correlation with water transparency and salinity and the Secchi depth had significant negative correlation. Environmental conditions play a role in determining the health of aquatic ecosystems and a large portion of the variation in the freshwater ecosystem quality measures could be explained by the final model. First, some climate change variables were entered into the analysis but not all the models had that information, so they did not have the same effect in the final model. The results provide important clues, however, to the interactions between environmental processes and freshwater ecosystem function and conservation. The results indicate that continued monitoring of the suite of water quality parameters is needed and that informed management strategies should be used to maximise ecosystem resilience. Policy-wise, the conservation of fresh water resources must go into the hands of strategies that are adaptive and resilient to climate change, which include integration of environmental monitoring, ecosystem-based adaptation and sustainable management of resources. There is a need for further research with larger and more extensive datasets that include climate, ecological and governance indicators to improve understanding of the conservation of freshwater ecosystems in the face of changing environmental conditions.

References

- Abell, R., Vigerstol, K., Higgins, J., Kang, S., Karres, N., Lehner, B., ... & Chapin, E. (2019). Freshwater biodiversity conservation through source water protection: Quantifying the potential and addressing the challenges. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 29(7), 1492-1500.
- Akhtar, N., Syakir Ishak, M. I., Bhawani, S. A., & Umar, K. (2021). Various natural and anthropogenic factors responsible for water quality degradation: A review. *Water*, 13(19), 2660.
- Apostolaki, S., Akinsete, E., Koundouri, P., & Samartzis, P. (2020). Freshwater: The importance of freshwater for providing ecosystem services. *Encyclopedia of the World's biomes*, 1492-1500.
- Benateau, S., Gaudard, A., Stamm, C., & Altermatt, F. (2019). Climate change and freshwater ecosystems: Impacts on water quality and ecological status. *Hydro-CH2018 Project*. Federal Office for the Environment (FOEN), Bern, Switzerland, 110.
- Dalby, S. (2021). Global climate change and security threats. *Handbook of Security and the Environment*, 1492-1500.
- Dzyurdzha, O. A., Burlakov, V. V., Fedotova, G. V., Skubriy, E. V., & Orlova, L. N. (2021). Climate change as a global threat to the world economy. In *Industry 4.0: Exploring the Consequences of Climate Change* (pp. 1492-1500). Cham: Springer International Publishing.
- Hassan, B., Qadri, H., Ali, M. N., Khan, N. A., & Yattoo, A. M. (2019). Impact of climate change on freshwater ecosystem and its sustainable management. In *Fresh water pollution dynamics and remediation* (pp. 1492-1500). Singapore: Springer Singapore.

- Klimaszyk, P., & Goldyn, R. (2020). Water quality of freshwater ecosystems in a temperate climate. *Water*, 12(9), 2643.
- Maharaj, S. (2022). Water quality data [Data set]. Kaggle. <https://www.kaggle.com/datasets/sahirmaharaj/water-quality-data>
- Mair, L., Mill, A. C., Robertson, P. A., Rushton, S. P., Shirley, M. D., Rodriguez, J. P., & McGowan, P. J. (2018). The contribution of scientific research to conservation planning. *Biological Conservation*, 223, 1492-1500.
- Masih, A. (2024). Climate change dataset (2020–2024) [Data set]. Kaggle. <https://www.kaggle.com/datasets/atifmasih/climate-change-dataset1492-1500>
- Munishi, L. K., Blake, W., Comber, S., Hutchinson, T. H., & Ndakidemi, P. A. (2022). Towards sustainability: Threat of water quality degradation and eutrophication in Usangu agro-ecosystem Tanzania. *Marine pollution bulletin*, 181, 113909.
- Nalau, J., Becken, S., & Mackey, B. (2018). Ecosystem-based Adaptation: A review of the constraints. *Environmental science & policy*, 89, 1492-1500.
- Ojima, D. S. (2021). Climate resilient management in response to flash droughts in the US Northern Great Plains. *Current Opinion in Environmental Sustainability*, 48, 1492-1500.
- Petsch, D. K., Cioneck, V. D. M., Thomaz, S. M., & Dos Santos, N. C. L. (2023). Ecosystem services provided by river-floodplain ecosystems. *Hydrobiologia*, 850(12), 1492-1500.
- Rose, J. B., Örmeci, B., & Aw, T. G. (2025). Water quality and health: An ecological perspective. *Water & Ecology*, 1(2), 100007.
- Rose, K. C., Bierwagen, B., Bridgham, S. D., Carlisle, D. M., Hawkins, C. P., Poff, N. L., ... & Williamson, C. E. (2023). Indicators of the effects of climate change on freshwater ecosystems. *Climatic Change*, 176(3), 23.
- Smialek, N., Pander, J., & Geist, J. (2021). Environmental threats and conservation implications for Atlantic salmon and brown trout during their critical freshwater phases of spawning, egg development and juvenile emergence. *Fisheries Management and Ecology*, 28(5), 1492-1500.
- Srivastav, A. L., Dhyani, R., Ranjan, M., Madhav, S., & Sillanpää, M. (2021). Climate-resilient strategies for sustainable management of water resources and agriculture. *Environmental Science and Pollution Research*, 28(31), 41492-15005.
- Sterner, R. W., Keeler, B., Polasky, S., Poudel, R., Rhude, K., & Rogers, M. (2020). Ecosystem services of Earth's largest freshwater lakes. *Ecosystem Services*, 41, 101046.
- Wondie, A. (2018). Ecological conditions and ecosystem services of wetlands in the Lake Tana Area, Ethiopia. *Ecohydrology & Hydrobiology*, 18(2), 1492-1500.
- Yasin, H. Q., Breadsell, J., & Tahir, M. N. (2021). Climate-water governance: a systematic analysis of the water sector resilience and adaptation to combat climate change in Pakistan. *Water Policy*, 23(1), 1492-1500.