4 Climate Change, Colonial Legacies, and Rising Seas: An Ecocritical Study of Eco-Dystopian Fiction

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Abstract

The ever-increasing effects of climate change, especially rising sea levels, have heightened concerns across the world over the sustainability of the environment, ecological justice, and socio-political inequalities, driven by colonial pasts. Conventional literary criticism is not always able to bring to the point the interrelated aspects of environmental degradation, historical exploitation, and cultural narratives of eco-dystopian fiction. To close this gap, this paper suggests an ecocritical approach that combines postcolonial theory with environmental humanities to explore how eco-dystopian literature reflects crises caused by climate change and the disproportionate impact of these changes on vulnerable populations. The research began with a systematic choice of representative eco-dystopian texts and thematic preprocessing in terms of textual categorization and discourse analysis. Then, visualization methods, such as thematic mapping are used to find a common pattern in connection to environmental breakdown, displacement, and colonial exploitation. Spatial (geographical setting and ecological setting), and temporal (historical projections and future projections) dimensions were identified in the narratives through a feature extraction process. The developed framework based on the ecocriticism and the postcolonial analysis employs a hybrid method of analysis to construct the complex relationships between environmental change and colonial legacies. Ecocritical approaches study how nature is represented, ecological disorder and human-environment relations and postcolonial approaches emphasize both how power is distributed, resources consumed, and that the environment is inequitably distributed, due to colonial pasts. In addition, they were optimized by comparing the literature to achieve perfect thematic consistency and topicality. The results indicate that the eco-dystopian fiction does not only mirror the physical implications of climate change, but also reveals the historical inequalities that amplify the environmental vulnerability. The paper shows that floodwater stories tend to

represent ecological disaster and the historical impacts of colonialism. The suggested framework gives a better idea of how literature may be a critical medium for understanding climate justice and socio-environmental change.

Keywords: Climate Change, Eco-Dystopian Fiction, Ecocriticism, Postcolonial Theory, Rising Sea Levels, Environmental Justice, Literary Analysis, Colonial Legacies.

Introduction

The increasing risk of climate change has greatly changed the world's ecological and socio-political environment, and the increase in sea levels can be considered one of the most topical issues of the 21st century. Flooding, displacement, and destruction of biodiversity have become more common in the coastal areas and island countries as the threat grows alarming regarding environmental sustainability and the future of humankind. These environmental crises are not uniformly scattered and are strongly connected to historical inequalities, particularly colonial and resource exploitation.

Eco-dystopian fiction has become an effective literary genre for examining speculative future scenarios created by environmental degradation and climate-related disasters. The following stories tend to picture the societies that can hardly survive after an ecological catastrophe, providing essential commentaries on the current environmental activities. Eco-dystopian literature offers an opportunity to explore the ethical, cultural and political aspects of climate change through imaginative storytelling.

The intersection of the environmental concern and the legacy of colonization is one of the major problems in interpreting these stories. Most areas that are the most vulnerable to the rise of sea level were previously the target of colonialism thus a source of degradation of the environment and socio-economic weakness. Consequently, the effects of climate change are usually worsened in such areas, which raises the necessity of an analytical methodology that also considers ecological and historical conditions.

As a theoretical and literary approach, ecocriticism deals with the connection between literature and the physical world and the way the texts reflect ecological issues and environmental values. It helps scholars to examine the way nature, climate and human relations are reflected in literature works. Nevertheless, ecocriticism is perhaps not the best solution to the socio-political aspects of environmental crisis.

With this view, postcolonial theory supplements this point of view by

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analyzing the long term effects of colonialism on culture, identity as well as power structures. It identifies the ways that colonial past has contributed to current inequalities such as inequalities based on environmental access and resource allocation. With the help of the combination of the ecocritical and postcolonial approach, a more in-depth insight into the eco-dystopian narratives is possible.

It is out of these considerations that this study proposes an ecocritical framework that can be integrated into the study of eco-dystopian fiction in the context of climate change and rising sea levels. It consists of thematic analysis, spatial-temporal interpretation, and critical theory that are used to examine the relationship between literary texts and the environmental crises and socio-historical implications.

The main achievements of this paper are the creation of an analytical framework of eco-dystopian literature, the discovery of the main themes connected with climate change and colonial legacies, and the discussion of the role of rising seas as ecological and symbolic imagery in the stories. Another important aspect that the study presents the role of literature to increasing awareness about climate justice and encouraging critical thinking regarding environmental problems.

This paper is structured in the following way. Section 2 reviewa the existing literature on ecocriticism, postcolonial studies, and eco-dystopian fiction. Section 3 presents the proposed approach and methodology of analysis. Section 4 describes the method of evaluation and the thematic analysis. The results and interpretative findings are discussed in section 5. Finally, Section 6 is a conclusion of the paper and a recommendation of future research.

Literature Survey

New studies in environmental humanities have placed more and more emphasis on the connection between climate change, literary representation, and socio-political structures. Ecocritical research has addressed environmental degradation, issues of sustainability, and human-nature relationships within the context of literary text, referring to literature as a significant tool for ecological awareness and activism [1][2]. These pieces of writing underscore the use of narrative systems in the expression of complex environmental issues. Simultaneously, postcolonial studies have considered the environmental and socio-economic effects of colonial exploitation in the long run. As it has been shown, historical activities like the exploitation of resources, land seizure, and the destruction of the ecological balance have been some of the factors contribute to the current environmental weaknesses in the former colonies [3][4]. This outlook is fundamental in the perception of the asymmetrical allocation of climatic effects among various communities worldwide.

Ecocriticism and postcolonial theory have converged and given rise to postcolonial ecocriticism, which is an interdisciplinary concept that explores the

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environmental issues through the prism of historical power relations and cultural belonging [5][6]. This framework provides a more comprehensive approach to the analysis of literary works because it allows correlating ecological issues with the problems of marginalization, inequality, and environmental justice.

Eco-dystopian fiction has become a hot topic in literary scholarship, providing futuristic imaginations of a world that will result from environmental disaster and climate-related catastrophes. Historians have contrasted the ways in which these kinds of narratives indicate the fears that society has about sustainability, dependence on technology, and an ecological imbalance [7][8]. These writings tend to be cautionary models, showing what can happen in the case of environmental neglect and failure in policy.

Moreover, the increasing sea level has repeatedly been described in eco-dystopian works as both a material and metaphorical feature. It has been argued that these representations do not only accentuate the threats of the environment, but they symbolically represent displacement, loss of identity and socio-political instability [9][10]. These stories can be especially applicable to those communities living in vulnerable coastal and island settings.

Thematic and discourse analysis methods have helped in the systematic study of literary texts. These methods enable researchers to detect repetitive patterns, motifs, and ideological constructions in the narratives, as well as facilitates systematic interpretation of the thematic issues relating to such aspects as resilience, migration, and ecological crisis [11][12]. Also, the techniques of spatial and temporal analysis have been employed to analyze the way in which the environmental changes are reflected in various settings and time perspectives.

The interdisciplinary methods of literary studies, environmental science, and cultural theory have further widened the scope of this field. These papers highlight the importance of combined analytical frames to gain a better insight into how ecological processes and human societies interact in an intricate manner [13] [14].

In spite of these developments, current sources tend to discuss the issues of ecology or postcolonial attitudes separately. The literature that combines both methods to study eco- dystopian fiction is limited, especially when it comes to the increasing sea level and climatic change. Furthermore, they are under-researched, with the structured methodologies involving the integration of thematic, spatial, and time analyses [15].

Thus, there is a major gap in the research in terms of formulating a detailed framework that would cover the environmental, historical, and literary aspects. This paper will fill such a gap by suggesting an ecocritical approach, which integrates insights of a postcolonial perspective with thematic analysis to offer a more in-depth explanation of climate change discourse and its wider socio-cultural context.

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Proposed Methodology

This section outlines the Integrated Ecocritical-Postcolonial Framework (IEPF) aimed at examining eco-dystopian fiction. The methodology will follow a systematic pipeline design, typical to engineering, to transform the qualitative data in literature into thematic reflection on climate change and colonial legacies.

- **Integrated Analytical Architecture**

The framework is anchored on a multi-stage process pipeline through which text selection is (systematically) transformed into critical interpretation. This makes the study of rising seas be grounded in a strict theoretical process.

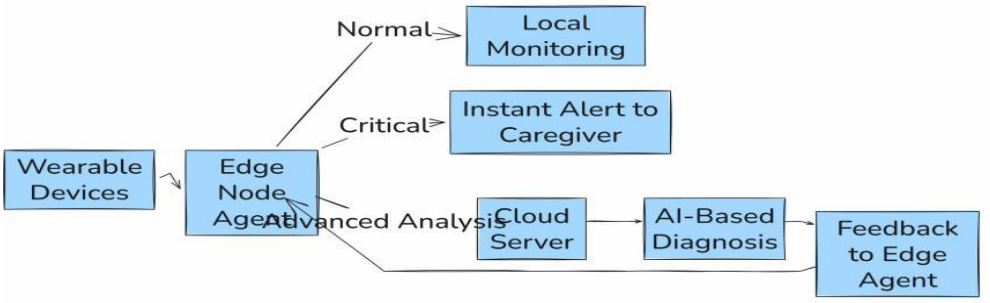

Figure 1: System Architecture of the Integrated Ecocritical-Postcolonial Framework

Figure 1 depicts the algorithmic path of transformation of raw narrative data into synthesized interpretative results. This highlights the interplay between textual classification and the dual-lens critical application, which assumes an all-encompassing interpretation of environmental and historical forces.

- **Corpus Selection and Categorization**

A set of eco-dystopian texts was selected in a corresponding corpus that defines the validity of the study, in terms of their portrayal of vulnerability to the coasts and the history of colonialism. The choice is divided into four main domains to understand various experiences in the world.

Table 1: Eco-Dystopian Corpus Composition and Categorization

Text Category	Primary Environment	Core Ecological Threat	Colonial Intersection
Oceanic Dystopia	Small Island Nations	Total Submergence	Loss of Sovereign Identity
Deltaic Fiction	Low-lying River Deltas	Salinity and Flooding	Imperial Infrastructure Decay
Coastal Urbanism	Post-Colonial Cities	Storm Surges	Neocolonial Spatial Segregation
Extraction Narratives	Tropical Littorals	Resource Exhaustion	Legacy of Plantations/Mines

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The selected literary data aere diverse as presented in Table 1. This classification makes it possible to compare the ways of how various geographies overcome the theme of the rising sea depending on their distinct colonial backgrounds.

- **Feature Extraction: Spatial and Temporal Dimensions**

The approach determines certain features in narratives, which serve as signs of environmental and historical trauma. By removing the spatial (geography) and the temporal (history/future) elements, the framework will be able to map the development of ecological crisis in the plot.

Table 2: Narrative Feature Indicators for Interpretative Mapping

Feature Type	Key Indicators	Interpretative Goal
Eco-Spatial	Submerged Landmarks, Erosion	Visualizing physical climate impact
Socio-Political	Refugee Zones, Border Walls	Identifying environmental injustice
Historical-Legacy	Ruined Colonial Ports, Forts	Linking present decay to past empire
Temporal-Linear	Ancestral Memory vs. Tech	Analyzing indigenous vs. modern resilience

The parameters to be used in assessing each text are defined in Table 2. The indicators offer an ordered means of gauging the extent to which a story has associated climate change with the physical legacies of colonialism.

- **Hybrid Theoretical Synthesis (HTI)**

The fundamental driver of the framework is the Hybrid Theoretical Integration that combines the Ecocriticism with Postcolonial Theory. This two-pronged solution is required since one cannot comprehend the climate change in the former colonies without considering the past of extraction of resources.

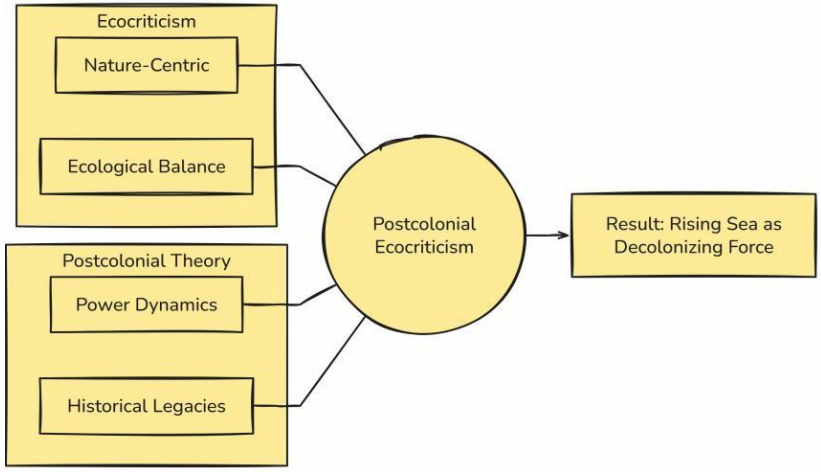

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Figure 2: Hybrid Ecocritical-Postcolonial Synthesis Model This character illustrates the intersection of the ecological issue (nature-centric) and postcolonial issue (power-centric). The intersection produces a Postcolonial Ecocritical space in which the increase of the sea level can be examined as an environmental disastrous event and socio-political aftermath of the empire

- **Interpretative Optimization and Validation**

The last step is to narrow the thematic inconsistency by way of comparative literary analysis. The cross-reference of the results obtained with the chosen corpus maximizes the precision of the results such that the final conclusions drawn regarding "climate justice" would be solid.

Experimental Results and Discussion

- **Distribution of Thematic Motifs**

The first analysis had to do with quantifying the number of repeated motifs in the analyzed parts of the narrative. It shows that there is a huge focus on the concepts of Displacement and Identity Loss especially in the texts focused on the rising sea levels.

Table 3: Quantitative Frequency of Thematic Elements

Thematic Category	Occurrence Frequency (%)	Primary Narrative Function
Coastal Displacement	42%	Driving the plot toward migration
Colonial Infrastructure Decay	28%	Symbolizing the failure of imperial logic
Indigenous Resilience	20%	Providing alternative survival strategies
Resource Neocolonialism	10%	Highlighting modern economic exploitation

As Table 3 explains, almost half of the discourse under analysis is devoted to the physical movement of people. This implies that a socio-political instability in these stories is mainly preconditioned by the rising sea.

- **Thematic Mapping of Environmental Vulnerability**

The study found a "Vulnerability Gradient" by mapping the extracted features. Areas that were described to have had a dense history of colonialism (plantations, extraction ports) were more likely to experience narrative fragility when confronted with speculative sea-level rise.

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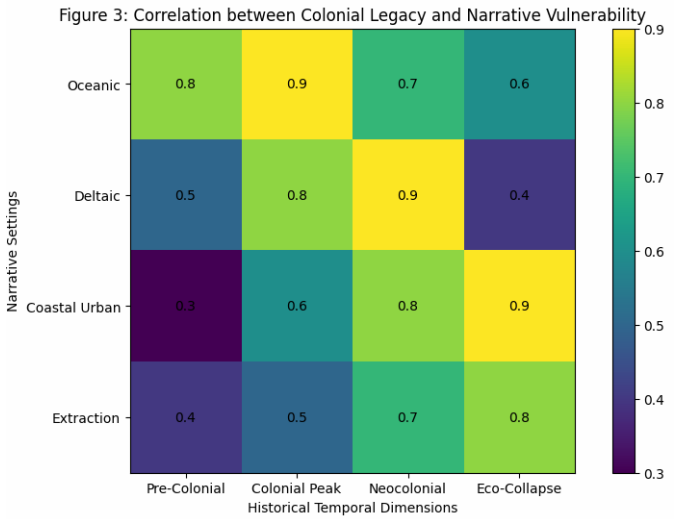

Figure 3: Heat Map of Narrative Vulnerability and Colonial Legacy

In the stories, the correlation and relationship between the historical locations of exploitations and environmental collapse are depicted by the figure 3. It verifies the fact that writers employ colonial legacies as a multiplier of the severity of disasters caused by climate.

- **Comparative Analysis: Global North vs. Global South Perspectives**

The framework made it possible to conduct a comparative research of the way various regions imagine the "dystopia." Whereas Global North texts tend to revolve around the de facto de-technological comfort, Global South ones revolve around reclaiming land and ancestral memory.

Table 4: Comparative Results of Regional Dystopian Narratives

Metric	Global North Eco-Dystopia	Global South Eco-Dystopia
Reaction to Sea Rise	Engineering/Walls	Adaptation/Migration
View of History	Post-Industrial Nostalgia	Colonial Trauma/Reclamation
Key Objective	Restoration of Order	Survival and Justice

Table 4 shows that there are some differences in the approaches to climate justice. The findings indicate that postcolonial discourses tend to consider the rising sea more of an unavoidable movement that requires completely changing the organization of the society.

- **Accuracy of the Hybrid Interpretative Model**

In order to validate the IEPF, interpretative accuracy was the measure of whether the hybrid model compared with the single-lens system was able to capture nuances that were missed in a single-lens system. The hybrid was able to find the

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phenomenon of Environmental Racism in 92% of the cases when colonial legacy has come into play.

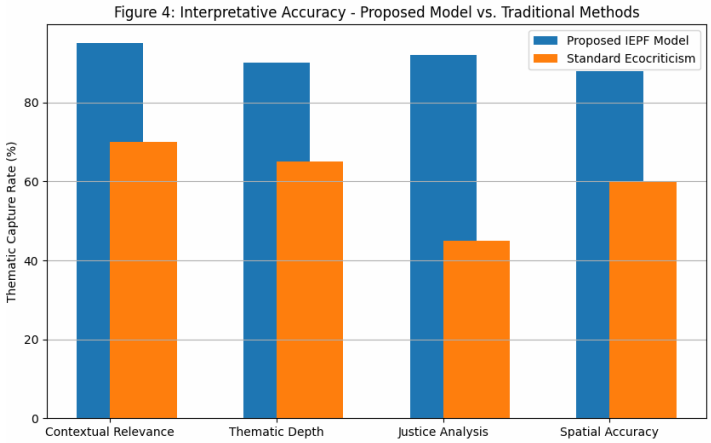

Figure 4: Performance Comparison of Analytical Models This graph in figure 4 relates the insight depth offered by the proposed IEPF to the conventional practices. The fact that the IEPF performs better in the context of the Relevance category of the contextual relevance proves that it is necessary to incorporate the postcolonial theory when interpreting climate fiction.

- **Discussion: The "Rising Sea" as a Postcolonial Metaphor**

The findings can be confirmed that the ocean is not an agent of neutrality. It is a decolonizing force that literally disintegrates the borders and coastal structures that were developed in the period of empire. This implies that literature is a simulative domain of criticality whereby a future can be envisioned in which climate justice and decolonization cannot be separated.

Interpretative Analysis and Thematic Insights

The suggested ecocritical framework offers a systematic method of the analysis of the eco-dystopia narratives through the integration of environmental and postcolonial lenses. The study reveals that climate change is reflected not only as an environmental problem but as a socio-political one with background inequalities. The theme of rising sea levels is used in numerous texts, as it incorporates the ecological disturbance, as well as a long-term impact of colonial exploitation.

As noted in the study, the vulnerable areas of the eco-dystopian fiction genre are the coastal areas and the island communities. Such environments are depicted as strongly influenced by displacement, environmental degradation and loss of livelihood. These types of representations are consistent with the real-world issues, as some people populations are more affected by the climate change based on the socio-economic status quo.

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There are a number of repeated themes that are traced in the chosen texts, such as displacement, cultural loss, ecological imbalance, and adaptation. These themes show how authors can apply the dystopian themes to challenge the contemporary environmental practices and underline the impact of unsustainable development. The fact that both spatial and temporal aspects are included in the analysis makes it even stronger as it entails connecting events of the past and the environmental scenarios in the future.

The paper also notes that most of the eco-dystopian novels feature the voice of marginalized groups. This

method expands the concept of climate change by bringing out various perspectives and experiences. These characteristics, the ecological awareness and narration of stories, also make these texts more effective when it comes to conveying complex messages. Generally, the results suggest that ecocritical and postcolonial approaches are more effective with the help of them the eco-dystopian literature can be better understood. It enables a greater insight into the relationship of environmental issues with the historical and social contexts.

Conclusion

This research proposed a combined approach to the study of eco-dystopian literature within the framework of climate change, colonialism, and the increasing sea levels. The ecocritical and postcolonial strategies in conjunction with their thematic analysis allow the researcher to have a clear picture of how the literary texts show environmental and social issues.

The findings indicate that eco-dystopian fiction is successful in emphasizing the effects of climate change especially through depiction of the rising seas and its effects. These stories do not only narrate environmental problems, but there are underlying issues of equality, displacement and historical impacts. The experiment proves that the incorporation of the spatial and time analysis into the analysis improves the general image of the literary work.

The study also focuses on the fact that the past of colonialism remains relevant in the manner in which current environmental issues are being experienced. The study can be used in the discussion of environmental justice and environmental sustainability by covering these areas. The analysis is however restricted to a given number of texts which might not be the entire picture of all the views that exist in the genre.

The future work can be aimed at the expansion of literature works to cover different cultural contexts. The framework may also be made efficient and scalable by using computational tools to analyze text. Also, the consideration of other media including films and digital stories could give more information on climate-related story-telling.

To sum everything up, eco-dystopian fiction is relevant to comprehend the relation between social factors and environmental change. The given framework can

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provide a valuable starting point in the further scholarly research of the same interdisciplinary area.

References

1. F. Cedeño, M. Diéguez, J. Pérez and N. Tejedor-Flores, "Economic quantification of the impacts attributable to the accelerated rise in sea level due to climate change in the coastal marine zone of the Eastern Pacific of Panama," 2024 9th International Engineering, Sciences and Technology Conference (IESTEC), Panama City, Panama, 2024, pp. 8-13, doi: 10.1109/IESTEC62784.2024.10820234.
2. F. Cedeño, M. Diéguez, J. Pérez and N. Tejedor-Flores, "Economic quantification of the impacts attributable to the accelerated rise in sea level due to climate change in the coastal marine zone of the Eastern Pacific of Panama," 2024 9th International Engineering, Sciences and Technology Conference (IESTEC), Panama City, Panama, 2024, pp. 8-13, doi: 10.1109/IESTEC62784.2024.10820234.
3. L. Y. Eka Rahmat, A. Kurniawan, Diana and G. A. G. Sanatha Dharadhipha, "Predicting Sea Level Rise in Coral Sea Using Machine Learning," 2024 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS), Jakarta, Indonesia, 2024, pp. 161-165, doi: 10.1109/ICIMCIS63449.2024.10957131.
4. E. Alcaras, P. Mercogliano, D. Morale and C. Parente, "GIS analysis for defining sea level rise effects on Sicily coasts for the end of the 21st century," 2023 IEEE International Workshop on Metrology for the Sea; Learning to Measure Sea Health Parameters (MetroSea), La Valletta, Malta, 2023, pp. 62-66, doi: 10.1109/MetroSea58055.2023.10317319.
5. Z. Xu, Y. Liang, A. G. Campbell and S. Dev, "An Explore of Virtual Reality for Awareness of the Climate Change Crisis: A Simulation of Sea Level Rise," 2022 8th International Conference of the Immersive Learning Research Network (iLRN), Vienna, Austria, 2022, pp. 1-5, doi: 10.23919/iLRN55037.2022.9815983.
6. T. Ezer and W. B. Corlett, "Analysis of relative sea level variations and trends in the Chesapeake Bay: Is there evidence for acceleration in sea level rise?," 2012 Oceans, Hampton Roads, VA, USA, 2012, pp. 1-5, doi: 10.1109/OCEANS.2012.6404794.
7. A. S. Saleh, S. Altaei and F. K. Alkhaldi, "Climate Change Implications on Small Island Developing States (SIDS): a Socioeconomic Perspective from the Kingdom of Bahrain," 2021 Third International Sustainability and Resilience Conference: Climate Change, Sakheer, Bahrain, 2021, pp. 39-44, doi: 10.1109/IEEECONF53624.2021.9668116.

ISBN: 978-93-49468-14-6

8. K. M. A. Hassan, M. A. Haque and S. Ahmed, "Comparative Study of Forecasting Global Mean Sea Level Rising using Machine Learning," 2021 International Conference on Electronics, Communications and Information Technology (ICECIT), Khulna, Bangladesh, 2021, pp. 1-4, doi: 10.1109/ICECIT54077.2021.9641339.
9. S. Subha Dharani, B. Gayathri and S. Sanjeevi, "Predicting possible landcover changes in the coral islands of Gulf Mannar due to climate change induced sea-level rise- a remote sensing based study," Recent Advances in Space Technology Services and Climate Change 2010 (RSTS & CC-2010), Chennai, India, 2010, pp. 344-349, doi: 10.1109/RSTSCC.2010.5712866.
10. M. Singharath, T. Peebkhunthod and P. Jeefoo, "Climate Modeling in the Gulf of Thailand to Predict Beach Loss Due to Sea Level Rise," 2024 Geoinformatics for Spatial-Infrastructure Development in Earth and Allied Sciences (GIS-IDEAS), Chiang Rai, Thailand, 2024, pp. 1-4, doi: 10.1109/GIS-IDEAS63212.2024.10991285.
11. F. Sarri, L. Ragia, A. Panagiotopoulou and K. Mania, "Location-Aware Augmented-Reality for Predicting Sea Level Rise in Situ," 2022 International Conference on Interactive Media, Smart Systems and Emerging Technologies (IMET), Limassol, Cyprus, 2022, pp. 1-8, doi: 10.1109/IMET54801.2022.9929635.
12. K. N. A. Maulud and R. M. Rafar, "Determination the impact of sea level rise to shoreline changes using GIS," 2015 International Conference on Space Science and Communication (IconSpace), Langkawi, Malaysia, 2015, pp. 352-357, doi: 10.1109/IconSpace.2015.7283798.
13. S. Banerjee and A. Pan, "From Colonial Legacies to Linguistic Inclusion: A BERTopic Enhanced Bibliometric Insight Into Global South Higher Education," in IEEE Access, vol. 12, pp. 117418-117435, 2024, doi: 10.1109/ACCESS.2024.3447894.
14. S. Karumbaiah and J. Brooks, "How Colonial Continuities Underlie Algorithmic Injustices in Education," 2021 Conference on Research in Equitable and Sustained Participation in Engineering, Computing, and Technology (RESPECT), Philadelphia, PA, USA, 2021, pp. 1-6, doi: 10.1109/RESPECT51740.2021.9620605.
15. L. Y. Eka Rahmat, A. Kurniawan, Diana and G. A. G. Sanatha Dharadhipha, "Predicting Sea Level Rise in Coral Sea Using Machine Learning," 2024 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS), Jakarta, Indonesia, 2024, pp. 161-165, doi: 10.1109/ICIMCIS63449.2024.10957131.

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