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## Reimagining Environmental Justice in Indian English Fiction: A Multiscalar Ecocritical Reading of Forests, Villages, Cities and Rivers

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**ABSTRACT:** Environmental degradation in South Asia is deeply intertwined with colonial histories, uneven development, ecological injustice, and social inequality, making literary texts valuable sites for examining the complex relationships between human societies and the natural environment. While Indian English fiction has received considerable attention within Eco-critical scholarship, existing studies have largely examined forests, villages, cities, and rivers as discrete ecological settings or symbolic landscapes. This study develops the concept of Multi-scalar Environmental Forms as a comparative Eco-critical framework to investigate how narrative structures construct ecological knowledge and environmental justice across interconnected scales of experience. The study comparatively analyses four seminal novels *Aranyak* by Bibhutibhushan Bandyopadhyay, *Nectar in a Sieve* by Kamala Markandaya, *The Calcutta Chromosome* by Amitav Ghosh, and *The God of Small Things* by Arundhati Roy. Employing an interdisciplinary qualitative methodology that integrates close textual reading, comparative literary analysis, environmental humanities, literary geography, postcolonial Eco-criticism, and scalar analysis, the study examines how narrative form mediates relationships between individual experience, ecological processes, and broader socio-political structures.

The findings demonstrate that forests, villages, cities, and rivers function not merely as narrative settings but as dynamic ecological forms that expose the interconnected realities of colonial dispossession, agrarian vulnerability, biodiversity loss, urban ecological risk, scientific governance, environmental toxicity, and caste-based environmental injustice. Across the selected texts, literary techniques such as catalog narration, domestic realism, documentary montage, and recursive temporality enable movement between embodied experiences and planetary ecological processes, thereby revealing how environmental crises are produced through historically uneven social and political structures. The study advances environmental humanities by proposing Multi-scalar Environmental Forms as an original analytical model that integrates literary form with ecological scale, environmental justice, and spatial politics.

## 1. INTRODUCTION

The 21<sup>st</sup> century environmental crisis has intensified unprecedented, including biodiversity loss, climate change, deforestation, freshwater degradation, urban environmental vulnerability, and uneven distribution of environmental risks in various

communities. These crises are no longer just regarded as scientific or environmental phenomena; on the contrary, they are increasingly regarded as the result of historical, political, cultural, and economic processes that affect the relationship between human, non-human life, and the environment. Environmental justice has therefore become a central issue in modern science, drawing attention to the unequal interaction between environmental degradation and colonial history, capitalist development, caste, class, gender, and governance. Understanding these interrelated aspects requires analytical methods that can combine environmental reality with cultural understanding and moral reflection.

In this context of knowledge, the environmental humanities have developed into an interdisciplinary field that combines literary research, environmental history, geography, political ecology, anthropology and sustainable development research. The Department of Environmental Humanities believes that literary texts are the main source of environmental knowledge, rather than seeing literature as a passive reflection on environmental changes. Stories shape the public's understanding of environmental crises by making complex environmental processes emotionally understandable, with historical foundations and moral significance. Therefore, modern science has shifted its attention from traditional concepts of nature to issues such as environmental justice, environmental governance, inter-species relations, infrastructure, toxicity, climate vulnerability, and scale politics. Literary stories have special significance because they show different views of environmental changes in different societies and interrelated spatial and time scales.

This study proposes a multi-level ecological form as a new ecological critical framework for analyzing how literary stories organize ecological knowledge at the interrelated ecological level. The concept proposed in this article is not to regard forests, villages, cities, and rivers as isolated habitats, but to conceptualize them as narrative forms that mediate the interrelationship between individual experience, ecological processes, institutional structures, and planetary environmental changes. The proposed concept is not to regard forests, villages, cities, and rivers as isolated habitats, but to conceptualize them as narrative forms that mediate the interaction between individual experiences, ecological processes, institutional structures, and planetary environmental changes. The scale here refers not only to the geographic scale, but also to the geographic scale. It also refers to the narrative movement of literary texts that link intimate physical experiences with larger historical, ecological, political, and environmental systems. Literary techniques, including cataloging storytelling, daily realism, document editing, recursive time and emotional space, make these scalars transition and transform the ecological space into a dynamic structure, revealing the interrelationship of environmental crises.

The theoretical significance of this concept is that it combines the ideas of environmental humanities, post-colonial ecological criticism, literary geography, political ecology and environmental justice research. In order to develop this argument, the study conducted a comparative analysis of four influential literary works representing different ecological environments: **Aranyak** by **Bibhutibhushan Bandyopadhyay**, **Nectar in a Sieve** by **Kamala Markandaya**, **The Kolkata chromosome** by **Amitav Ghosh** and **The God of Small Things** by **Arundhati Roy**. Together, these novels cover forestry, agriculture, urban and river ecology, touching on colonial history, environmental degradation, modern scientific research, industrial transformation, and social injustice. Their comparative analysis allows us to understand how different narrative strategies form interrelated ecological processes on different spatial and time scales.

Therefore, this study solves the following research problems:

1. How do the selected Indian English novels of Dhow portray forests, villages, cities, and rivers as multidimensional forms of the environment, not just physical objects?
2. How does narrative technique establish a relationship between embodied human experience and broader environmental, historical, and political processes?
3. How do these literary works promote a modern understanding of environmental justice, sustainability, biodiversity, and environmental governance?
4. How the proposed structure of Multiscalar ecological forms expands the existing knowledge of environmental humanities and how the proposed structure of multi-scalar ecological forms expands the existing knowledge of environmental humanities and post-colonial ecological criticism

Based on these issues, the main goals of the research are: (1) to establish a theoretically sound multi-level ecological form model; (2) to compare how selected Indian English novels reflect ecological transformation on an interrelated scale; (3) To demonstrate

the role of narrative forms in acquiring ecological knowledge and environmental ethics; (4) to establish the relevance of literature;

Therefore, the main contribution of this article is theory and method. In theory, it proposes a multi-level ecological form as a primitive analytical framework, explaining how literary stories organize ecological relationships at the universal, local, regional, national, and planetary levels.

## 2. LITERATURE REVIEW

### 2.1 Environmental Humanities: From Natural Description to Environmental Justice

In the past three decades, the environmental humanities have evolved from the revival of the past three decades. The environmental humanities have developed from a relatively specialized branch of ecological criticism to the humanities. This discipline was originally related to the literary depiction of nature and wilderness, and now includes environmental history, political ecology, geography, anthropology, philosophy, sustainable development research, science and technology, and critical social theory. Recent research has significantly expanded the scope of environmental research and recognized that environmental crises can not only be understood through scientific or technical explanations, but should also be regarded as historical, cultural, political, and ethical phenomena (Heise, Christensen, & Niemann, 2023; Rose, 2021).

This ideological shift reflects a deepening understanding of the contemporary environment. This ideological shift reflects a growing awareness that contemporary environmental issues, including biodiversity loss, climate change, species extinction, freshwater degradation, environmental migration, and environmental inequality, are both material and cultural issues. Therefore, literature is not only used as a reflection of environmental changes, but also as the main way to obtain knowledge about the environment. Storytelling enables readers to understand environmental crises through emotional experience, historical memory, ethical reflection, and spatial imagination, and complements scientific descriptions of environmental transformations. Recent research in the environmental humanities has proved that literary stories have unique explanatory power because they combine empirical ecological processes with human life experience and moral responsibilities.

Another important development involves growing. Another important development is related to the growing concern for environmental justice. Recent studies have shown that environmental risks are unevenly distributed and depend on race, caste, class, gender, colonial history, and economic inequality, rather than treating environmental degradation as a universal condition that affects all population groups equally. Therefore, environmental degradation is increasingly being interpreted as an issue of equity, not just an issue of environmental protection. This view extends ecological critical research beyond the concept of nature and turns to the analysis of infrastructure, management, resource extraction, population displacement, and socio-ecological vulnerability. Therefore, the environmental humanities are gradually moving away from the binary distinction between "nature" and "culture". On the contrary, scientists believe that ecosystems are interrelated social material complexes in which people, non-human species, infrastructure, technology, and institutions interact on different scales. This understanding of interconnection provides an important theory, that is, the humanities have gradually moved away from the binary distinction between "nature" and "culture" as a result. On the contrary, scientists believe that ecosystems are interrelated social material complexes in which people, non-human species, infrastructure, technology, and institutions interact on different scales. This understanding of interrelatedness provides an important theoretical framework.

### 2.2 Material Ecocriticism and the Agency of Matter

Recent research has further expanded this approach beyond 2020 to include research on biodiversity, multi-species research, and environmental sustainability in the literature analysis. Materialistic environmental criticism considers environmental degradation not only as the destruction of the landscape, but also as the destruction of ecological networks that connect human communities, species diversity and the material habitat. Thus, literary texts are increasingly interpreted as spaces in which material institutions manifest themselves through narrative forms.

This shift is especially important for Indian novels in English, where forests, rivers, agricultural landscapes, disease ecology, and urban infrastructure are often linked to narrative institutions. These texts challenge anthropocentric literary criticism by showing how environmental processes shape memory, identity, work, and political conflicts. Thus, material environmental criticism provides the necessary theoretical basis for understanding ecological space as an active narrative form rather than a passive landscape.

## 2.3 "Blue Humanities": Rivers, Oceans and Hydroscares.

Recent environmental studies have also witnessed the rapid emergence of "blue humanities," which explore the cultural, political, and ecological significance of the aquatic environment. Early literary criticism often viewed rivers and oceans as symbolic landscapes or geographical habitats. Modern humanities view water as an active ecological medium through which to spread the story of colonialism, trade, immigration, pollution, mining, and environmental justice.

Water is increasingly perceived as a material and political phenomenon. Rivers not only carry sediments and biological diversity, but also recall population displacement, industrial pollution, caste exclusion, and development-related violence. Therefore, the aquatic environment has become the focus of discussions on environmental governance, sustainability, freshwater safety, and climate adaptation.

## 2.4 Political Ecology, Environmental Justice, and Slow Violence

Political ecology has fundamentally changed modern environmental science by demonstrating that environmental degradation is inseparable from political power, economic inequality, and institutional governance. Political environmentalists do not interpret environmental crises as natural disasters, but believe that environmental risks arise from an unequal system of resource allocation, capitalist accumulation, colonial administration, and development policies.

Closely related to this point of view is the concept of environmental justice, which focuses on the unequal distribution of environmental benefits and burdens between different social groups. Environmental injustice manifests itself in environmental pollution, exposure to toxins, population displacement, loss of biodiversity, unequal access to natural resources, and vulnerability to climate change. These conditions have disproportionately affected historically marginalized societies, especially in postcolonial societies.

Rob Nixon's concept of **Slow Violence** remains fundamental, as he interprets environmental destruction as gradual, cumulative, and often unnoticeable rather than spectacular.

## 2.5 Anthropocene, Capitalocene, and Plantationocene

Perhaps no discussion has changed the humanities about the environment as profoundly as the discussion about the Anthropocene. Although this term defines humans as geological forces capable of altering planetary systems, many researchers believe that this concept can mask historical inequality by attributing environmental destruction to all humans equally.

Therefore, alternative concepts such as the Capitalocene and the Plantationocene have emerged. Capitalocene researchers believe that the current environmental crisis is caused primarily by the capitalist system of extraction, accumulation, industrialization, and global resource development, rather than by the general nature of man. Greening and research also show that the colonial plantation economy, forced labor, monoculture agriculture, and environmental simplification are historical drivers of biodiversity loss and environmental inequality.

## 2.6 Literary Geography and the Politics of Ecological Space

The "spatial turn" in the humanities has had a profound impact on literary criticism, shifting critical attention from the temporality of narrative to the creation of space and location. Literary geography argues that space is neither a neutral background nor a passive environment; rather, it is created by society, subject to political disputes, and mediated by culture (Lefebvre, 1991; Massey, 2005). Modern researchers also argue that artistic texts actively create geographical images that form an idea of territory, identity, mobility, belonging to the environment and spatial justice. Therefore, landscapes in literature should be interpreted as dynamic socio-ecological formations involved in historical and political processes, rather than as static images of nature.

A recent scholarship (2020-2025) expanded the geography of literature beyond cartographic representation, combining environmental thinking with issues of Infrastructure, Mobility, resource extraction, and environmental management. Scholars are increasingly studying how literary narratives reflect environmental changes caused by the construction of dams, plantations, mining, urban expansion, transportation networks, and population displacement caused by climate change. Such studies show that the literary space serves as an ecological archive, where material landscapes store stories of Environmental violence and social inequality.

This spatial perspective is particularly relevant to Indian English fiction, where forests, villages, towns, and rivers often function as contested ecological territories shaped by colonial land management, development policies, industrial expansion, and uneven modernization. Rather than representing an isolated environment, these spaces interact through ecological, economic, and political networks that span regional and national boundaries.

## 2.7 Scalar Theory and Narrative Ecology

Scale issues are becoming increasingly relevant in environmental humanities, as environmental crises manifest simultaneously at multiple spatial and temporal levels. Climate change, declining biodiversity, water scarcity, environmental pollution and ecological migration cannot be adequately understood from an exclusively local or exclusively global perspective. Instead, environmental phenomena arise as a result of constant interaction between authorities, households, communities, ecosystems, institutions and planetary systems.

Thus, scalar theory challenges the traditional binary between local and global analysis. However, scalar analysis is still relatively undeveloped in literary studies. Existing ecocritical studies often discuss "place", "landscape", or "environment" without adequately explaining how literary narratives create transitions between different ecological levels.

## 2.8 Contemporary Indian Ecocriticism: Results and Emerging Directions

Ecocritical studies of Indian literature have grown considerably over the last two decades. In the early stages of research, the focus was on the depiction of wildlife, pastoral landscapes, environmental ethics, and the postcolonial relationship between nature and culture. Influenced by postcolonial ecocriticism, scholars subsequently demonstrated that environmental degradation in South Asia is inseparable from colonial history, land alienation, resource extraction, industrialization, caste hierarchy, and modern development.

More recent research increasingly addresses issues of environmental justice, vulnerability to climate change, biodiversity conservation, river ecology, protection of the urban environment, and indigenous knowledge of the environment. Researchers have shown that in Indian fiction in English, environmental crises are presented not only as environmental problems, but also as manifestations of historical inequality, social exclusion, and political conflicts. Amitav Ghosh's work on the environment has sparked widespread discussions about climate change, planetary fantasy, and the limitations of traditional realist literature in representing the complexity of the environment. Similarly, increased attention has been drawn to Kamala Markandaya, Arundhati Roy and Bibhutibhushan Bandyopadhyay for their detailed descriptions of agricultural change, hydrological ecology, forest conservation and environmental ethics.

## 2.9 Recent Developments (2020-2025): Towards Interconnected Environmental Humanities.

Research in the humanities published over the past five years shows a crucial shift towards relational and interdisciplinary approaches. Rather than viewing environmental crises as isolated ecological phenomena, researchers are increasingly studying the interrelated dynamics of biodiversity loss, climate adaptation, food security, energy transition, waste management, environmental governance, and multi-species coexistence. This study highlights that environmental problems arise as a result of complex interactions between natural systems, political institutions, technological infrastructure, and cultural practices.

## 2.10 Critical Analysis and Research Gap

The above review shows that the humanities on the environment have undergone significant theoretical changes over the past decade. Materialist ecocriticism highlighted the role of matter; the humanities interpreted the aquatic environment as dynamic socio-ecological systems; political ecology and Environmental Justice revealed an uneven distribution of environmental risks; the debate on the Anthropocene challenged universal ideas of environmental responsibility; literary geography has emphasized the creation of an ecological space; although scalar theory has revealed the interrelated nature of ecological processes operating

Despite these findings, there are still four significant gaps in existing research.

First, ecocritical studies of Indian English-language fiction continue to favor thematic interpretation rather than theoretical integration. Forests, villages, towns, and rivers are usually considered independently of each other, rather than as interconnected ecological units participating in broader ecological systems.

Second, although modern science increasingly recognizes the importance of environmental justice, relatively few literary studies show exactly how the narrative form shapes ecological understanding of inequality, governance, biodiversity, sustainability, or environmental change.

Third, modern comparative research rarely explains how literary technology enables us to connect concrete human experience with larger environmental, political, and planetary processes. Therefore, the role of narrative form in constructing ecological scale has not been fully studied by theorists.

Finally, there is currently no comprehensive analysis system that combines literary geography, environmental humanities, post-colonial ecological criticism and scalar theory into one that can explain the ecological interaction of various narrative environments in Indian English novels.

This research eliminates these limitations by providing a multi-level environmental form as the original theoretical and methodological framework. The concept does not regard forests, villages, cities, and rivers as separate ecological categories, but conceptualizes them into interrelated narrative forms, organizing environmental knowledge on a global, local, regional, national, and global scale. The study combines comparative literary analysis with modern environmental science to show how narrative structure mediates the relationship between environmental justice, biodiversity, sustainability, governance, colonial history and environmental change.

### 3. THEORETICAL FRAMEWORK: MULTISCALAR ECOLOGICAL FORM

#### 3.1 Rethinking the Scope of Environmental Humanities

A decisive feature of modern environmental crises is that they are manifested on different spatial, temporal, and institutional scales. Climate change, biodiversity loss, freshwater degradation, environmental pollution, deforestation and resource extraction cannot be regarded as isolated local events or completely global phenomena. On the contrary, they are the result of the interrelated relationships between individual organizations, families, communities, ecosystems, infrastructure, countries, and earth processes. Therefore, scale has become the central analytical category of environmental humanities, political ecology, literary geography and sustainable development research. Recent research has shown that environmental processes are interrelated in nature and develop through interactions that transcend traditional geographic boundaries and challenge the binary differences between local and global.

Solving this theoretical restraint requires a structure that can explain not only what ecological space is, but also how literary forms establish relationships between multiple ecological scales. Therefore, this study proposes **Multiscalar Environmental Forms (MEF)** as a new conceptual framework, combining literary forms, environmental humanities and scalar theory to explain the dynamic creation of ecological meaning in storytelling.

#### 3.2 Definition of Multi-Scalar Ecological Forms.

**Multiscalar Ecological Form** refers to the narrative structure of artistic texts that organize ecological relationships at the interrelated spatial, temporal, material, and political levels. The framework does not regard forests, villages, cities, or rivers as passive habitats, but conceptualizes these environments into dynamic narrative forms, actively mediating between human experience, inhumane activities, environmental processes, and institutional authority.

In this concept, "**multiscalar**" means continuous movement between different levels of environmental organizations. These include:

Compare the range of manifestation and sensory experience of the human body;

Distribution of domestic and social scales of daily interaction with the environment;

Comparison of landscape scales, including forests, rivers, agricultural systems, and urban infrastructure;

A combination of regional and national benchmarks determined for the management, development and rational use of resources; and

This is one of the most important factors in developing a common attitude and achieving mutual understanding.

It is important to understand that scale is not understood as a fixed geographic level, but as a narrative process through which literary technology connects the individual's environmental reality. Changing narratives on these scales enable the literature to show how open local experiences of drought, pollution, disease, displacement, or environmental loss are embedded in the broader historical structure of colonialism, capitalism, technological modernization, and environmental governance.

### 3.3 Conceptual Framework

The proposed concept is based on five complementary knowledge traditions and goes beyond the existing theoretical framework.

#### Environmental Humanities

The Department of Environmental Humanities provides an interdisciplinary framework that recognizes that environmental crises are simultaneously ecological, historical, political, ethical and cultural phenomena. Environmental humanities do not separate scientific knowledge from cultural expression, but emphasizes the ability of literature to generate ecological understanding through narrative imagination, ethical reflection, and historical memory. The multi-scale ecological form accepts this view, but expands it by showing how the literary form itself produces scalar ecological knowledge.

#### Post-Colonial Ecological Criticism

Post-colonial ecological criticism shows that the environmental degradation of the previous colonial society is inextricably linked to imperial history, capitalist expansion, land tenure and uneven development. Therefore, the environmental changes in South Asia are driven by the interrelated history of colonial rule, caste hierarchy, industrialization, and resource extraction. The current concept contains these ideas and believes that colonial ecological history becomes visible through large-scale narrative movements that link local ecological experiences with empires and global systems.

#### Literary Geography

Literary geography believes that space has social conditions and political disputes, rather than geographic neutrality. Therefore, forests, villages, cities, and rivers are interpreted as social and ecological forms formed by changes in mobility, infrastructure, management, labor, and the environment. They established various ecological forms on the basis of this tradition, and emphasized that literary spaces do not acquire meaning in isolation, but through their connection with a broader ecological network.

#### Political Ecology and Environmental Justice

Political ecology shows that environmental degradation reflects the uneven distribution of power, resources, and vulnerability, rather than a purely natural process. Environmental justice also emphasizes that environmental benefits and burdens are unevenly distributed based on caste, class, gender, race, and historical inequalities. The proposed framework contains these points of view and explores how the narrative environment reveals uneven environmental conditions within the scope of different policies.

#### Scalar Theory

Scalar theory believes that environmental phenomena are the result of interactions between organs, societies, institutions, ecosystems, and planetary systems. Current literary research recognizes the importance of scale, but rarely explains how narrative forms produce scalar transitions. Multi-scalar ecological forms eliminate this limitation by defining literary technology as a mechanism for narrative interconnection of ecological scales.

### 3.4 Distinguishing Multiscalar Environmental Forms from Existing Frameworks

Although the proposed framework builds on existing ecocritical research, it differs from previous methods in several important ways.

Traditional ecological criticism primarily examines the literary expression of nature, environmental ethics, and the relationship between man and landscape. Although these methods form the basis of research in the environmental literature, they often take precedence over thematic interpretation rather than formal analysis.

Material ecological criticism shifts attention to the action of matter by showing that forests, rivers, microorganisms, weather systems, and the material environment actively participate in narrative meaning. But the main focus is still on material agency, rather than the organization of ecological relationships on multiple narrative scales.

**Blue Humanities** redefines the aquatic environment as a dynamic socio-political system that links Water, history, ecology, mobility, and environmental justice. However, his analysis still focuses mainly on hydrology, rather than providing a general comparative framework applicable to different kinds of Environment.

Similarly, political ecology and environmental justice effectively explain the uneven distribution of environmental risks, but relatively little attention is paid to formal literary mechanisms that make this inequality narratively understandable.

Finally, literary geography has successfully demonstrated that space is produced by society, but usually focuses on spatial expression rather than scalar narrative movement.

Multiscale environmental forms extend these traditions by integrating their central insights into a single literary-ecological model. Its originality lies not only in identifying a greener environment, but also in explaining how the literary form itself constructs the relationships between environmental processes operating across specific, local, regional, national and Planetary scales. The framework therefore shifts analytical attention from isolated environmental environments to interconnected ecosystems mediated by narrative technology.

### 3.5 Narrative Form as Ecological Infrastructure

The basic premise of this research is the function of the narrative form as an ecological infrastructure. Literary techniques are not only about organizing the aesthetics of history, but also actively create ecological relationships by connecting environmental processes that are scattered in space and time.

Different narrative strategies create different scalar movements.

Aranyak is characterized by catalog stories that collect ecological details through extensive descriptions of species, landscape, and seasonal rhythm. This technique transforms biodiversity into narrative memory while linking sensory perception to the colonial history of the environment.

These narrative techniques generate ecological knowledge by allowing readers to perceive the relationships between environmental events, otherwise these events will appear disconnected. Therefore, the narrative form has become a literature mechanism for simulating ecological complexity.

## 4. METHODOLOGY

### 4.1 Research Design

This research adopts a **qualitative, interpretive and comparative research** design and is placed within the interdisciplinary framework of Environmental Humanities. The research combines close reading of the text, Comparative Literary analysis, ecological critical study, literary Geography, Political Ecology and narrative analysis to examine how Indian English novels construct ecology at different environmental scales. The research does not consider literary texts as passive manifestations of environmental reality, but conceptualizes them as sites for the production of ecological knowledge, where narrative structures actively shape the understanding of environmental justice, sustainability, biodiversity, governance, and social and ecological transformation.

### 4.2 Corpus Research and Reasons For Text Selection

The Corpus contains four influential novels that together represent the vast ecological landscapes of modern South Asia:

**Aranyak Bibhutibhushan Bandyopadhyay**

**Nectar in a sieve (Kamala Markandaya)**

**The Calcutta Chromosome (Amitav Ghosh)**

**The God of small things by Arundhati Roy**

These novels are selected through targeted theoretical sampling, a strategy commonly used in qualitative humanistic research to identify texts that may shed light on specific conceptual problems. The guide to choice is not just the author's popularity, but each novel's ability to represent a unique kind of environment while collectively performing comparative analysis across more ecological scales. Each novel foresees a different ecological environment and played an important role in the history of the environment in South Asia.

**Forest Ecology-Aranyak** explores colonial Forestry, biodiversity, Indigenous and rural livelihoods, and ecological poverty.

**Agrarian Ecology-Nectar in a Sieve** examines the vulnerability of Agriculture, drought, industrialization, food insecurity and environmental change in the countryside.

**Urban Ecology - The Calcutta Chromosome** studies scientific modernity, epidemiology, technological infrastructure, urban environment and ecological insecurity.

**River Ecology - The God of Small Things** analyzes hydrological landscapes, pollution, caste-based exclusion, environmental memory, and ecological injustice.

Together, these four texts constitute a complementary ecological history, including forests, villages, towns and rivers, the main environmental forms examined in this study.

#### 4.3 Selection Criteria

The selection of the literary corpus is based on six clear criteria.

**First**, each novel puts environmental conditions at the center of the narrative, rather than simply using nature as a descriptive background.

**Second**, the selected texts represent diverse ecological environments, which collectively include forests, agriculture, cities, and river ecosystems.

**Third**, all four novels deal directly with fundamental issues in modern environmental humanities, including environmental justice, biodiversity, colonial environmental history, ecological governance, sustainability, industrialization, and social and environmental inequality.

**Fourth**, the text covers various historical moments and can analyze the long-term environmental transformation from colonial management to postcolonial development and the late modern ecological crisis.

**Fifth**, the novel uses unique narrative techniques such as catalog narrative, domestic realism, documentary Montage, and recursive topicality that contribute to exploring the relationship between literary form and ecological scale.

**Finally**, the selected works themselves have attracted considerable academic attention, but they are rarely reviewed together through a comprehensive multi-level framework. Therefore, their comparative analysis allows for theoretical innovations in addition to the existing author's or text-oriented research.

#### 4.4 Comparative Research Strategy

The study uses the **Methodology of Comparative Literature** to identify both common environmental patterns and significant differences in the selected novels.

Unlike traditional comparative studies, which emphasize the similarity of a theme or an author's point of view, in this study texts are compared according to the forms of the environment they create and the scalar relationships that arise from the organization of the narrative. Therefore, the comparison focuses on how forests, villages, cities, and rivers function as interconnected ecological systems rather than as isolated literary sites.

Four aspects are considered in the framework of the comparative analysis::

1. The Represented ecological environment;
2. The dominant narrative strategy;
3. Socio-ecological processes; and

4. A Multiscalar movement linking local environmental experiences with broader historical, political, and planetary systems.

This multidimensional comparison allows us to identify recurring ecological structures, taking into account the different historical and ecological contexts presented in each novel.

#### 4.5. Scope and Limitations

The study recognizes a number of limitations.

Firstly, the analysis is limited to the four canonical works of Indian English-language fiction and, therefore, does not include all the diversity of modern South Asian literature on the environment.

Secondly, the research focuses exclusively on qualitative literary interpretation and does not include the study of readers' reactions, corpus linguistics, digital humanitarian methods, and geospatial mapping or computer text analysis.

Thirdly, although the proposed structure is intended for translation, its use is demonstrated only in Indian fiction in English. Future research may assess its applicability to other postcolonial works, indigenous narratives, climate literature, texts in regional languages, and transnational environmental literature.

Finally, the narrative form is preferred in the research as the main analytical tool. Although this focus promotes theoretical development, additional interdisciplinary research combining literary analysis with environmental history, environmental data, ethnography, and sustainability science can provide additional insights into the relationship between literature and environmental change.

## 5. DISCUSSION

This research study aims to explore how Indian fiction in English constructs ecological knowledge through interconnected ecological spaces, and to develop multilevel ecological forms (MEFs) as a new analytical framework in the environmental humanities. A comparative analysis of **"Aranyak"**, **"Nectar in a Sieve"**, **"The Calcutta Chromosome"** and **"The God of Small Things"** shows that ecological narratives are not just descriptions of forests, villages, cities or rivers; Rather, they function as dynamic narrative structures that connect embodied human experience with broader ecological, political, historical, and planetary processes. These results contribute to the ongoing debate in the humanities about the environment, as they rethink the literary form as an active mechanism through which environmental justice, environmental governance, and sustainability are critically examined and interpreted.

### 5.1 Rating of Achievements in the Field of Modern Humanities about the Environment

The results confirm the main argument of modern environmental humanities that environmental crises can be understood not only through environmental science or technological interventions, but should also be addressed through cultural narratives that shape environmental awareness, ethical responsibility, and political imagination. Recent research has increasingly recognized that climate change, biodiversity loss, freshwater degradation, and environmental inequality occur as a result of interactions between ecological systems, historical institutions, and socio-political structures, rather than as a result of isolated natural processes. This study expands this interdisciplinary perspective by demonstrating that literary narratives actively organize these relationships through narrative form.

Unlike traditional ecocritical readings, which primarily address environmental topics, the current analysis shows that narrative techniques, including narrative cataloging, everyday realism, documentary editing, and recursive temporality, perform significant environmental work. They allow readers to see the interrelationships between environmental events that occur simultaneously at the physical, social, landscape, institutional, national and planetary levels. Thus, literature serves not only as a means of representing the environment, but also as a cognitive framework through which the complexity of the environment becomes understandable.

Thus, these results confirm recent advances in the field of environmental humanities, which emphasize interconnectedness and multi-species ecological thinking, expanding them through a systematic theory of scalar narrative organization.

### 5.2 Comparison with Previous Studies

The results confirm and expand existing research in the field of postcolonial ecocriticism and Indian environmental humanities.

**Aranyak's** previous research focused on colonial forestry, environmental ethics, and the emotional relationship between humans and forests. While these interpretations remain valuable, current research shows that the novel also treats forests as multi-layered ecological systems that link biodiversity, colonial rule, indigenous displacement, and regional ecological history through the accumulation of narratives. Thus, the forest functions as an ecological archive, and not just as a symbolic landscape.

Similarly, research on "**Nectar in a Sieve**" has traditionally focused on rural poverty, the difficulties of agriculture, industrialization, and postcolonial development. This analysis expands on these interpretations by showing how household realism transforms household experiences into broader critiques of environmental vulnerability, food security, and sustainability. Instead of depicting the suffering of individuals, the novel reveals the structural interdependence of agricultural systems, development policies, and environmental sustainability.

Existing interpretations of **the Calcutta chromosome** often focus on postcolonial scholarship, historiography, and speculative literature. In contrast, in the modern concept, urban ecology and scientific management are considered as interrelated ecological systems operating at the institutional and planetary levels. Diseases, infrastructure, technological knowledge, and environmental uncertainty appear as components of a broader ecological network rather than isolated plot themes.

During the research on **the God of Small Things**, caste, memory, gender and the symbolism of the river were thoroughly studied. This study builds on these findings, demonstrating that river ecology functions simultaneously as a material infrastructure, environmental archives, and political landscapes in which hydrological degradation, environmental isolation, and social injustice become mutually reinforcing factors. Thus, the novel illustrates how environmental justice is embedded in both ecological systems and historical memory.

Collectively, these reinterpretations move beyond author-specific readings by demonstrating common ecological structures operating across diverse literary texts. The comparative perspective therefore contributes a level of theoretical integration that has remained largely absent from previous studies of Indian English fiction.

### 5.3 Advancing Ecocriticism through Multiscalar Environmental Forms

The principal theoretical contribution of this study lies in the development of **Multiscalar Environmental Forms (MEF)** as an integrative ecocritical framework.

Conventional ecocritical scholarship has made substantial contributions by examining representations of nature, environmental ethics, wilderness, and postcolonial landscapes. More recent developments including Material Ecocriticism, Blue Humanities, Political Ecology, and Literary Geography have significantly expanded the analytical scope of environmental literary studies by recognising the agency of matter, hydrological systems, political power, and spatial production. Nevertheless, these approaches often remain conceptually specialized, each emphasizing a particular ecological dimension.

The proposed MEF framework does not replace these perspectives; rather, it integrates them within a unified analytical model centered on narrative form and ecological scale. The framework demonstrates that environmental spaces acquire meaning through dynamic interactions among biodiversity, infrastructure, governance, historical memory, technological systems, and socio-political inequality. Most importantly, it identifies literary narrative as the mechanism through which these interactions become perceptible across multiple scales.

This conceptual shift advances ecocriticism in three important ways.

First, it redirects analytical attention from environmental themes to environmental forms, recognising that narrative organisation itself produces ecological understanding.

Second, it introduces scalar movement as a methodological principle capable of connecting embodied experience with regional, national, and planetary environmental processes.

Third, it integrates literary criticism more directly with contemporary Environmental Humanities by demonstrating that literature participates in interdisciplinary knowledge production concerning environmental justice, sustainability, biodiversity conservation, and ecological governance.

## 5.4 Environmental Justice and the Politics of Scale

One of the most significant findings emerging from the comparative analysis concerns the inseparability of environmental degradation and social inequality.

Across all four novels, ecological crises are shown to affect communities unevenly according to colonial histories, caste hierarchies, economic marginalization, technological access, and institutional governance. Environmental risks therefore appear not as universally shared ecological conditions but as politically produced inequalities.

This observation strongly supports contemporary Environmental Justice scholarship, which argues that ecological degradation should be analyzed through questions of equity, power, and historical responsibility. However, the present study extends these discussions by demonstrating that environmental justice is inherently multiscale. Ecological inequality is simultaneously experienced through bodily vulnerability, household livelihoods, community relationships, regional development, national governance, and global environmental systems.

The comparative analyses therefore reveal that literary narratives possess exceptional capacity to represent environmental injustice precisely because they connect intimate everyday experiences with larger political and ecological structures. Such scalar integration is considerably more difficult to achieve through conventional environmental policy discourse alone.

## 5.5 Policy and Sustainability Implications

Although literary studies are not traditionally associated with environmental policymaking, the present findings demonstrate their broader relevance for sustainability discourse.

First, the narratives collectively emphasise the importance of recognising local ecological knowledge within environmental governance. Indigenous forest practices, agrarian experience, community memory, and traditional relationships with rivers provide valuable insights that remain highly relevant to contemporary conservation and resource management strategies.

Second, the study highlights the necessity of integrating social justice into sustainability policy. Environmental conservation cannot be separated from questions of livelihood security, equitable resource distribution, public health, Indigenous rights, and social inclusion. Policies that privilege ecological protection while neglecting historical inequalities risk reproducing existing forms of environmental injustice.

Third, the findings underscore the significance of interdisciplinary environmental education. Literary narratives encourage ethical reflection, historical awareness, and ecological empathy in ways that complement scientific environmental education. Integrating literary perspectives into sustainability curricula can therefore strengthen public understanding of complex socio-ecological relationships.

Finally, the study supports governance approaches that recognise ecological systems as interconnected rather than administratively fragmented. Forest conservation, agricultural policy, urban planning, freshwater governance, biodiversity management, and climate adaptation should be understood as mutually dependent components of broader socio-ecological systems.

## 5.6 Contribution to Environmental Humanities

The present research makes several contributions to the broader field of Environmental Humanities. Theoretically, it introduces Multiscale Environmental Forms as a new interdisciplinary framework integrating Environmental Humanities, Literary Geography, Political Ecology, Scalar Theory, and Postcolonial Ecocriticism. Rather than analysing environmental narratives through isolated thematic categories, the framework conceptualises literary environments as interconnected ecological systems organised through narrative form.

Methodologically, the study demonstrates how comparative literary analysis can be strengthened through transparent analytical procedures, including structured coding, scalar interpretation, and comparative synthesis. This methodological integration contributes greater analytical rigour to qualitative environmental literary research.

## 5.7 Relevance to the Global South

The findings possess particular significance for environmental scholarship concerning the Global South. Much environmental theory continues to emerge from Euro-American intellectual contexts, sometimes overlooking the historical specificity of colonialism, uneven development, ecological dispossession, and social stratification that characterize many postcolonial societies. Indian English fiction offers an important corrective by demonstrating how environmental degradation intersects with colonial land policies, caste hierarchies, agrarian transformation, rapid urbanization, and unequal developmental trajectories.

## 5.8 Synthesis

Taken together, the findings demonstrate that Indian English fiction offers far more than literary representations of environmental degradation. The selected novels collectively construct complex ecological systems in which biodiversity, environmental justice, governance, sustainability, historical memory, and socio-political inequality interact across multiple scales of experience. By introducing Multiscalar Environmental Forms, this study provides a theoretically integrated framework that explains how narrative form itself organises these relationships, thereby extending current scholarship in Ecocriticism and Environmental Humanities.

## 6. LIMITATIONS AND DIRECTIONS OF FUTURE RESEARCH

As with all qualitative literary research, this research has several limitations that should be recognized. These limitations did not diminish the importance of the results, but determined the scope of the research and determined the production direction of future interdisciplinary research.

### 6.1 Scope of the Literary Corpus

The first restriction relates to the size and composition of the research building. The study only examined four classics of Indian English novels: "**Aranyak**", "**Nectar in a Sieve**", "**The Calcutta Chromosome**" and "**The God of Small Things**". These novels were selected through targeted theoretical sampling because they represent four different ecological environments—forests, villages, cities, and rivers—and provide for the development of the proposed concept of **Multi-Scalar Ecological Forms** (MEF). However, they do not fully reflect the diversity of Indian environmental literature.

Contemporary Indian environmental literature includes many other types, including climate literature, indigenous stories, Dalit literature, regional environmental novels, speculative novels, memoirs, travelogues, poetry and environmental non-fiction. Future research involving a broader and more diverse literary corpus can further evaluate the applicability and reliability of the proposed framework in the context of different literary traditions and environments.

### 6.2 English-Language Corpus

The second limitation is due to the extraordinary attention of Indian novels in English. Although Indian English literature occupies an important position in the study of post-colonial and environmental literature, it only represents an integral part of India's multilingual literary landscape. Many important environmental materials are written in Bengal, Tamil, Malayalam, Hindi, Kannada, Marathi, Assamese, Odia, Telugu and many other regional languages. These texts often preserve the ecological knowledge of indigenous people, the local ecological history, and the culturally specific relationships between communities and ecosystems, which may not be fully reflected in English literature.

In the future, comparative research involving the multilingual literature of South Asia will greatly enrich the humanities by studying the differences in environmental stories in the linguistic, cultural and regional contexts. These studies will also contribute to the decolonization of literary research in the field of environment and expand the scope of perspectives included in comparative ecological criticism research.

### 6.3 Explanatory Nature of Literary Analysis

This research adopts qualitative and explanatory methods based on careful reading, comparative literary analysis, literary geography and environmental humanities. Therefore, the result inevitably reflects a theoretically reasonable interpretation of the text. Although the transparency of the method has been improved by developing a clear analytical framework and structured coding categories, alternative theoretical methods, including ecological feminism, postmodernism, multi-species research,

impact theory, indigenous ecology or decolonization environmental criticism, can produce other interpretations of the same literary text.

## 6.4 Lack of Reader Response Analysis

The study only focused on the interpretation of the text, and did not study how readers perceive stories about the environment, or how literary expression affects environmentalism, moral attitudes, or environmental behavior. The study of reader feedback can provide valuable insights into whether multidimensional narrative structures improve readers' understanding of environmental justice, biodiversity conservation, sustainability, or climate change. Empirical research involving students, teachers, environmental experts, and general readers can supplement literary analysis by examining the public perception and educational impact of environmental literature.

## 6.5 Limited integration of Digital Humanities

Another limitation involves the lack of digital humanitarian methods. This research is based on traditional conscious reading and comparative interpretation of texts without the use of computer methods, which are becoming more and more influential in literary criticism.

Corpus linguistics, computational text analysis, topic modeling, semantic network analysis, stylistic analysis, and text machine analysis methods can provide additional perspectives by identifying large ecological patterns, repetitive ecological dictionaries, narrative networks, and vocabulary distribution in the broader literary corpus. The integration of digital humanities and environmental humanities will enable future researchers to combine qualitative interpretation with computerized evidence, increase the depth and reproducibility of analysis, while maintaining the richness of interpretation of literary analysis.

## 6.6 Lack of geographic information systems and spatial Mapping.

Although the study used the concepts of literary geography and scalar theory, it did not use geographic information systems (GIS) or other digital spatial mapping methods. GIS-based literary cartography allows visualization of ecological landscapes, river systems, forest boundaries, urban infrastructure, migration routes, colonial administrative areas and ecological transformations represented in literary stories. These methods will provide further empirical support for the analysis of spatial relationships and scalar changes proposed in the concept of multi-level ecological forms.

## 6.7 The Possibility of Transferring the Concept of Multi-Scalar Ecological Forms Framework.

The proposed multidimensional environmental form system (MEF) was developed and tested using four canonical works of Indian English novels. Although the results of the comparison show that it has broader analytical potential, the system has not yet been systematically applied to other literary traditions, historical periods, or geographic regions.

Therefore, the possibility of communication is still an important area of future research. Comparative applications, including literature on Africa, Latin America, indigenous peoples, Southeast Asia, the Arctic, the Pacific, and climate literature, can assess the theoretical applicability of the system as a whole, and determine changes in specific regions. These comparative studies will help to develop more globally inclusive environmental humanities, which can consider different environmental history and cultural experiences.

## 6.8 The Future Direction of Interdisciplinary Research.

The above limitations point to several promising areas for future research.

Finally, the proposed multi-level environmental formal framework should be tested not only in Indian novels in English, but also in comparative studies of climate novels, indigenous literature, environmental poetry, environmental memoirs, and transnational environmental stories. This kind of research will expand the scope, assess their cross-cultural applicability and contribute to the sustainable development of environmental humanities as an interdisciplinary field that can solve complex environmental problems of the 21st century.

## 6.9 Summing Up and Reflections

Recognizing these limitations strengthens rather than weakens current research, clarifying its analytical boundaries and identifying opportunities for future research. Although the focus is on corpus-based and qualitative methods, research has

shown that multilevel ecological forms provide a theoretically consistent and methodologically transparent framework for understanding how literary stories organize ecology at different levels. By combining environmental humanities, literary geography, political ecology, and environmental criticism, this framework lays the foundation for future interdisciplinary research linking literary research with environmental science, sustainability research, digital humanities, and public policy.

## 7. CONCLUSION

The increasing environmental crisis of the 21st century has moved into the 19th century. The 20th century, including climate change, biodiversity loss, environmental degradation, freshwater scarcity, and environmental injustice, has fundamentally changed the relationship between literary research and environmental humanities. Literary narrative is seen not only as an aesthetic expression of environmental change, but also as a key form of environmental knowledge that highlights cultural, historical, ethical, and political aspects of social and environmental transformation. In the context of this broader knowledge, this study aims to explore how Indian novels in English build ecological relationships on various spatial and political scales, and transform multilevel ecological forms into a new theoretical framework for comparative analysis of environmental literature.

The study includes four interrelated tasks. First, he examines how forests, villages, cities, and rivers function as unique but interconnected ecological forms in Indian novels in English. Secondly, he studies narrative techniques in literary texts that relate specific human experiences to broader ecological, historical, and institutional processes. Third, it examines how these stories represent environmental justice at the intersection of colonialism, caste, governance, biodiversity, industrialization, and sustainable development. Finally, an assessment will be given as to whether a multiscale analysis system can provide a more complete explanation of environmental relationships than existing ecocritical methods.

A comparative analysis shows that the four selected novels - "**Aranyak**", "**Nectar in a sieve**", "**The Calcutta Chromosome**" and "**The God of Small Things**" - together create an ecological space as a dynamic social ecosystem, rather than a passive geographical environment. Each novel describes a unique ecological environment, while at the same time revealing the complex interrelationships between ecological processes involving the body, society and landscape on a regional, national and planetary scale. Forests have become ecological archives shaped by the influence of biodiversity and colonial governance; agricultural villages demonstrate the interdependence of ecological sustainability and social resilience; urban landscapes reveal the ecological aspects of scientific modernization and Modernization and institutional power; river systems link ecological memory with hydrological justice and socio-political inequality. These results confirm that ecological significance is determined not by an isolated landscape, but by an interconnected narrative structure that constantly crosses multiple ecological scales.

The main contribution of this work is the development of multilevel ecological forms (MEFs) as an original theoretical framework for the humanities on the environment. Existing methods include environmental criticism, substantive environmental criticism, humanities, political ecology, literary geography, and scalar theory, each of which has significantly expanded research in environmental literature. However, these methods usually focus on specific aspects of environmental analysis. The proposed concept unites these traditions, showing that literary stories organize ecological knowledge through the dynamic interaction of ecological forms, narrative techniques, historical processes and political structures. Instead of treating forests, villages, cities, and rivers as separate categories of objects, MEF conceptualizes them in interconnected narrative forms that make ecological complexity understandable.

The results of these studies also contribute to the current debate about environmental justice and show that environmental degradation in Indian English novels has always manifested itself in the form of historical imbalances and social differences. It has been shown that environmental risks are linked to colonial heritage, caste hierarchy, economic inequality, technological infrastructure and management systems, confirming that environmental crises are inseparable from social justice issues. By revealing how literary stories relate everyday experience to the broader structure of environmental inequality, the study reinforces the basic thrust of environmental justice by expanding it through scalar and narrative perspectives.

In addition to literary criticism, this research has great implications for the broader field of environmental humanities. It shows that artistic texts are an important tool for interdisciplinary environmental research and can provide information for discussing issues of biodiversity conservation, sustainability, environmental governance, adaptation to climate change, as well as social and environmental sustainability. Careful reading, comparative literary analysis, and the integration of literary geography, political ecology, and environmental humanities illustrate how literary studies can provide insight into and contribute to cultural and ethical aspects of environmental change.

The research is also of practical importance. For educators, this study highlights the value of including environmental literature in the curriculum for the development of environmental knowledge, moral thinking, and citizenship in relation to the environment. For researchers in the field of environmental humanities, the proposed structure is a systematic comparative method of analyzing the ecological history of various literary traditions. For sustainable development policy makers and experts, the study highlights the importance of considering cultural narratives as additional resources for environmental communication, public participation, and inclusive discussion of sustainable development issues. By demonstrating how literature reveals the life experience of environmental change, the study promotes a broader dialogue about equitable environmental management and sustainable development.

Despite these contributions, the study recognizes that the proposed structure is a preliminary theoretical statement rather than a definitive model. Its use is limited to the four canonical works of Indian English-language novels, and its broader portability requires further experience and comparative verification. Future research should focus on multilingual Indian literature, indigenous environmental stories, and environmental novels in the global South, climate novels, and transnational literary traditions. Interdisciplinary collaboration combining digital humanities, geo-information systems, corpus linguistics, archival research, environmental history, the study of reader feedback and the science of sustainable development will further expand the analytical potential of multi-level environmental formularies and deepen their contribution to interdisciplinary environmental research.

Ultimately, this study shows that literature is not only a storehouse of ecological imagination, but also an active participant in the production of ecological knowledge. By introducing multilevel ecological forms, the article offers a new conceptual vocabulary for understanding how narrative structures convey the interrelationships of ecology, history, politics, and justice at interrelated levels. By doing so, she contributes to the continuous development of the humanities about the environment, demonstrating that literary narratives are necessary to interpret the complex sociology-ecological realities of the Anthropocene and to represent a more equitable, sustainable and environmentally responsible future. Instead of simply documenting environmental crises, literature is becoming a transformative intellectual practice that allows researchers, educators, policy makers, and ordinary citizens to rethink humanity's relationship to a world that transcends humanity through relational, comparative, and multilevel approaches.

## AUTHOR CONTRIBUTIONS

V. Sathesh Kumar conceptualized the research framework, developed the multiscale ecocritical methodology, conducted the primary textual analysis of the selected Indian English fiction, and wrote the original draft of the manuscript.

Dr. S. Vanitha supervised the entire research process, provided critical intellectual guidance on the theoretical underpinnings, validated the literary interpretations, and contributed to the review and editing of the manuscript.

Dr. R. Selvarajan (Corresponding Author) performed the formal analysis, coordinated the project administration, verified the interdisciplinary coherence between environmental humanities and natural resource perspectives, and revised the final manuscript for publication. All authors have read, reviewed, and approved the final submitted version of the manuscript.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## ETHICS STATEMENT

Ethical approval was not required for this study.

## DATA AVAILABILITY STATEMENT

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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