



EXAMINING THE REPRESENTATION OF ENVIRONMENTAL CHALLENGES: AN ECOLINGUISTIC ANALYSIS OF "IMPACT OF GLOBAL WARMING ON PAKISTAN"

Muhammad Naeem-Ur-Rahman naeemsiddiqui.saleemi@gmail.com	PhD Scholar, University of South Asia, Raiwind Road, Lahore, Pakistan.
Muhammad Hassan Lali m.hasan.lali@gmail.com	PhD Scholar, University of South Asia, Raiwind Road, Lahore, Pakistan.
Uzma Safdar uzmasafdarazeem@gmail.com	PhD Scholar, University of South Asia, Raiwind Road, Lahore, Pakistan.
Tallate Iqbal tallatiqbal.777@gmail.com	PhD Scholar, University of South Asia, Raiwind Road, Lahore, Pakistan.

Abstract

Educational texts are never linguistically neutral; they encode ideological orientations and transmit particular stories about human relationships with the natural environment. This study presents a systematic Ecolinguistic analysis of the essay "Impact of Global Warming on Pakistan" in the First-Year English Textbook prescribed by the Punjab Textbook Board (2025), investigating how environmental challenges are linguistically constructed through transitivity patterns and what ecological meanings those patterns encode. Grounded in Halliday's (1994) Systemic Functional Linguistics, specifically the transitivity system, and Stibbe's (2015) Ecolinguistic framework, the study conducts a whole-text analysis of 85 clauses. Findings reveal a striking dominance of material processes (67%), followed by relational processes (28%), with mental processes representing a mere 4%. Natural forces consistently occupy the Actor position while Pakistan and its people are relegated to passive Goals, constructing nature as adversary and the nation as ecological victim. Relational processes encode Pakistan's vulnerability as an inherent attribute rather than a historically produced condition, while the near-total absence of mental processes suppresses the emotional engagement and personal ecological agency genuine environmental education requires. Pervasive nominalization and impersonal scientific stance further erase individual human agency from the text's grammatical landscape. Three dominant stories-we-live-by emerge: nature as adversary, vulnerability as identity, and institutional redemption. Critically, the chapter's learning outcomes, oriented toward formal writing competencies, are misaligned with the spirit of SDG 13 Climate Action it explicitly invokes. The study concludes that while informationally comprehensive, the text's transitivity architecture constructs an anthropocentric, agency-erasing discourse unsuited to cultivating the ecological citizenship among students Pakistan's climate crisis urgently demands.

Keywords: *Anthropocentrism, Climate Change, Ecolinguistics, First-Year English Textbook, Global Warming, Pakistani Educational Discourse, Stories-We-Live-By, Systemic Functional Linguistics, Transitivity.*

Corresponding Author: Muhammad Naeem-Ur-Rahman (PhD Scholar, University of South Asia, Raiwind Road, Lahore, Pakistan)

Email: naeemsiddiqui.saleemi@gmail.com

1. Introduction

Climate change has been a crucial problem in the contemporary world, which has affected Pakistan in various forms. However, despite efforts by different types of public discourses, media, awareness campaigns, government discourses, and educational discourses, climate change continues to remain a challenge. Language is central to all these discourses in the sense that it helps influence people's perceptions of the climate change problem, as well as their reactions to it. Language is not only a tool for conveying knowledge about the problem but also an intricate system for constructing meaning, producing a particular manifestation of reality and an image of the world. The significance of this fact is obvious in the context of education since the language used in school textbooks not only determines the subject matter on which people get educated, but also the manner in which they think about and react to the environment.

Pakistan occupies a special place in the context of ecological problems. Pakistan was included in the list of ten most vulnerable to climate change countries despite the fact that its total share of greenhouse gas emissions is less than one percent. The country confronts problems of climate change and an atmosphere of uncertainty in the form of melting glaciers, catastrophic floods in the Indus plains, erosion on the shores of the Arabian Sea, and biodiversity loss in diverse natural habitats (Germanwatch, 2021). The aforementioned facts have very concrete implications for the living standards of the Pakistani population, who are more than 220 million people, their food security, water supply, and therefore health.

Nevertheless, very little academic research has examined how all this has been reflected in the linguistic, ideological, and pedagogical discourse of Pakistani educational texts. As Stibbe (2015) suggests, textbooks are not mere vehicles for the transmission of environmental facts; they are, in fact, sites where specific narratives about the human–environment relationship are constructed and naturalized. The grammar of the text used in textbooks has tremendous consequences for how ecological awareness is developed in students. For instance, who is represented as an actor, who is represented as a victim or sufferer, what is foregrounded and what is erased, carry profound implications for the ecological consciousness. A text that underemphasizes ecological responsibility and agency and consistently expresses nature as an enemy and communities of humans as passive victims will express a different ecological

perspective than a text that emphasizes human responsibility, ecological interdependence and the potential for individual agency.

Therefore, it is necessary to examine how language is used to convey ecological awareness in educational materials. The study has selected the essay 'Impact of Global Warming on Pakistan', which is part of the latest First-Year English Textbook prescribed by the Punjab Textbook Board (2025). For the present study, the text is examined using an integrated approach that combines Halliday's (1985; 1994) Systemic Functional Linguistics (SFL), particularly the transitivity system, and Stibbe's (2015) Ecolinguistic approach. Transitivity analysis, focusing on the distribution of experiences and ideas across process type, participant role and circumstantiality, offers a solid grammatical basis for understanding and examining how environmental reality is presented through grammatical choices. The ecological and ideological considerations surrounding those grammatical choices are further analysed through the lens of Stibbe's (2015) Ecolinguistic framework. Combined, these frameworks allow for a systematic analysis of the stories embedded in the text about the nature, vulnerability, and human agency, as well as institutional responsibilities and accountability regarding Pakistan's environmental challenges.

1.1. Statement of the Problem

The educational material is not only an informational resource but also a tool for creating certain perceptions and ideas about climate change and people's responsibility for it. One such discourse is the essay "Impact of Global Warming on Pakistan" in the newly prescribed First-Year English Textbook by the Punjab Textbook Board. The way language is used and grammatical choices are made has a significant impact on how young minds (the college students) understand and contribute to climate change in the country Qasim, 2025; Mujahid & Janjua, 2024; Nawab et al., 2025; Khan et al., 2025; Zahoor & Janjua, 2020; Riaz, 2025). The Ecolinguistic investigation reveals underlying ideological assumptions present even in what seems to be objective information and might potentially spread ecologically harmful ideas among young students at a very crucial moment of their ecological awareness development. The study is motivated by the research gap in the existing scholarship, which remains limited in how effective the latest college-level educational material is in raising climate change awareness, concerns, and responsibility among Pakistani students. Therefore, it is both timely and necessary to examine the linguistic and grammatical choices of the selected essay, particularly from an Ecolinguistic lens to understand the relationship between language, humans, and the environment.

1.2. Research Objectives

- To examine how the environmental challenges are linguistically represented through transitivity choices in the First-Year English Textbook
- To analyze how relationships between language, human agency, and climate change are constructed and represented through grammatical choices as revealed by Transitivity elements

- To explore the broader ecological meanings and environmental narratives emerging from the identified transitivity patterns as revealed by Ecolinguistic lens

1.3. Research Questions

1. How are environmental challenges represented through transitivity processes in the essay "Impact of Global Warming on Pakistan" in the First-Year English Textbook?
2. How do participant roles and process types construct relationships between human activities, climate change, and the natural environment in the essay?
3. What ecological meanings and environmental narratives emerge from the transitivity patterns identified in the text?

1.4. Significance of the Study

The present research contributes to the field of Ecolinguistics and the study of Pakistani educational discourse by using transitivity analysis at the college level, an area that has not yet received much attention from scholars but whose significance is paramount as a stepping-stone between secondary school and university education. The selected text is a state-endorsed and compulsory one that affects the ecological consciousness of a very large number of students during a particularly crucial phase of their development. By highlighting the underlying ideological assumptions of this, the study will contribute to informed environmental pedagogy and broadly to language education.

2. Literature Review

In the present era, when ecological issues are evolving rapidly, there is a need to consider the significance of linguistic discourse in the realm of environmental awareness. Textbooks contain many facts, and they are also tools of ideology that shape the worldview regarding the connection between man and nature (Stibbe, 2015). Ecolinguistics as a branch of knowledge can be applied to critically examine the effect that language and the behavior of human beings exert upon the environment (Ali, 2019). The significance of the said discussion is particularly important in regard to the Pakistani education system, where the English language is regarded as a symbol of superiority and English textbooks form the worldviews of millions of students (Husnain et al., 2025).

2.1. Theoretical Foundations: SFL and Ecolinguistics in Environmental Discourse

Systemic Functional Linguistics (Halliday, 1985; 1994) is the analytical framework adopted in this study, particularly the ideational metafunction and the transitivity system. This metafunctional view of language allows us to understand how the speaker conveys their mental image of reality, breaking down the clauses into the processes, participants, and circumstances that identify 'how' and 'who' are being represented within a text (Sakrikar, 2019; Butt et al., 2014). The functional approach is extended here with insights from ecolinguistics, describing linguistic patterns in relation to an ecosophy, or ecological philosophy, which is based on the importance of the relationship between all life (Stibbe, 2015). According to Stibbe (2015), there are three types of discourses, beneficial, destructive, or ambivalent, which demand not only technical solutions to environmental degradation but also new stories that contest the human-

centered approaches to environmental problems. For textbook analysis, this integrated SFL-Ecolinguistics framework is not a neutral grammatical effort but a critical investigation to examine whether the pedagogical materials reinforce problematic anthropocentric discourses or foster non-anthropocentric discourses from an ecocentric perspective.

In existing scholarly literature, this integrated framework has been used productively across a variety of contexts, implying its usefulness. Mou and Wu (2023) interpret the discourse in German environmental textbooks using transitivity analysis and reveal that it emphasizes shallow environmentalism, discourse that addresses technical solutions or human health impacts while ignoring the deeper cultural and political roots of ecological destruction. Likewise, Mujahid and Janjua (2024) analyze the essay 'Smog' in the 7th-class English textbook in Pakistan, employing Stibbe's concepts of ecosophy and stories-we-live-by to identify ambivalent, constructive, and destructive discourses. In line with this scholarship, the present study adopts a combined approach to the transitivity labeling of the processes, as well as the Ecolinguistic interpretation for a comprehensive investigation.

2.2. Grammatical Patterns in Environmental Educational Texts

Throughout the literature, there is universal agreement on the degree of imbalance in transitivity processes in language textbooks. Mou and Wu (2023) studied the textbooks in the German language and found that more than half of the analyzed clauses (50%) in German textbooks represented material processes. Qasim (2025) investigated the Pakistani grade 9 books and found that the material processes factored in more than 50% of the sentences. In environmental writing, these processes at times convey an impression of man's interaction with nature, or of the physical impact of climate, by making the environment mostly a theme of action and less a living, interconnected organism. Mental and verbal processes are, for the most part, neglected. This underrepresentation speaks to a textbook model of focusing on the real, external world and not the introspection needed to meaningfully reflect on ecology (Qasim, 2025). In some cases, the relational processes (defining identities and attributes) are purely descriptive, classificatory. Relational clauses can be used to convey information about a crisis, but often they tend to describe the facts instead of assigning moral accountability (Mujahid & Janjua, 2024).

One of the fundamental aspects of Ecolinguistics, based on transitivity, is the analysis of participants' roles, namely the distinction between Actors and Goals. Common in the literature are descriptions of the linguistic strategies that remove human agency: passivation and nominalization. In their study conducted in Morocco, Mliless and Larouz (2018) found that textbooks are often used to connect with a third-party agent in the passive voice to evade the moral responsibility for emitting environmental hazards, whether from a natural or anthropogenic source, which ameliorates the grim state of ecological crises. Likewise, Nawab et al. (2025) also spot the dehumanization of nature in intermediate textbooks as in the Pakistani context, nature is portrayed as a background phenomenon of the development of humans.

Similarly, nominalization (i.e. deforestation rather than humans cutting down trees) systematically backgrounded the role or activity of humans (Aftab et al., 2025). As for the notion of erasure harming meaning-making, the research by Aftab et al. (2025) plays a counterbalancing role to Stibbe's (2015) suggestion that students can sometimes readily conclude from broader text that humans are responsible. Their findings suggest that a consistent portrayal of the human actor as a Goal is part of a construction that creates a sense of the environment being an enemy, thereby reinforcing the lack of individual responsibility. In light of these conflicting results, a whole-text analysis of the grammatical choices underlying these effects, as in the present study, is essential to investigate the ecological implications that may stem from the text's wider discursive context.

2.3. Prevailing Ecological Narratives in the Educational Context

Synthesized findings across geographical contexts point toward a hegemonic anthropocentric worldview in language textbooks, one that treats human beings as the center of the universe and nature as a passive resource. According to Khan et al (2025), textbooks in Pakistan's KPK Region have a skewed focus, treating nature as somehow serving humans and treating humans as consumers of nature. This discussion frequently takes the form of shallow environmentalism, as described by Stibbe (2015) and Mou and Wu (2023), in which technical solutions or impacts on human health are discussed but the underlying cultural and political issues that influence ecological problems are overlooked. Even when a text is meant to be environmentally beneficial, it tends to portray nature as something humans are better off without, rather than depicting the mutual dependence between humans and nature (Malik, 2025).

Research suggests that although climate change is addressed in educational materials in Pakistan, there is a lack of depth and contextualization of these terms in relation to local issues (Ali et al., 2025; Mujahid & Janjua, 2024). There is a gap between educational content and extreme climate sensitivity of the country. This is even more important because Pakistan is placed at the 8th position on the Global Climate Risk Index (Germanwatch, 2021), while 100% of the secondary school population engages in textbook discourse as their ecological literacy. Qazi et al., (2025) review the National Climate Change Policy's material processes and report that the language of the policy focuses on material processes and it is difficult to put this policy into pedagogically effective materials. Likewise, Nawab et al. (2025) specifically suggest the adoption of ecocentric metaphors in Grades 11 and 12 because they observe that the present unbalanced, neutral perspective toward environmental issues does not lead to ethical interposition on the part of the college students. At this age, the students are at a developmental stage where they will be able to emerge as proactive ecological citizens.

An overview of existing scholarship suggests that educational textbooks of primary and secondary school levels have been subjected to Ecolinguistic examination, but a more focused investigation of intermediate-level materials is needed because they lie between the primary and professional levels. Particularly, the research lacks in analyzing the newly launched First-

Year English Textbook, which is read by millions of students each year throughout the province of Punjab. Therefore, the present study has selected the essay on environmental awareness to uncover the perspective of such pedagogical texts on creating a narrative that either perpetuates the destructive story of anthropocentric dominance or provides a positive one that promotes shared ecological responsibility. The study contributes not just to Applied Linguistics but also has implications for the pressing, macro-level discussion of 'ecological literacy' in one of the climate-vulnerable countries in the world.

3. Research Methodology

The research uses a mixed-method design focusing on the frequency of transitivity elements and Ecolinguistic interpretations of these patterns.

3.1. Data Collection and Sampling

The data for this study is the essay "*Impact of Global Warming on Pakistan*", included in the First-Year English Textbook published by the Punjab Textbook Board, Pakistan. The text has been selected through purposive sampling for its relevance to the research objectives. The essay discusses environmental challenges in Pakistan and is part of a pedagogical material that shapes the ecological literacy of the students at higher-secondary level. The essay comprises 85 clauses and was analyzed as a whole to identify the transitivity patterns and their interpretations.

4. Theoretical Framework

The primary theoretical framework is Halliday's theory of Systemic Functional Linguistics (SFL), which views grammar as a meaning-making resource shaped by social context rather than a set of abstract rules. Central to SFL is the principle that language simultaneously performs three metafunctions: the **ideational**, through which language construes and represents human experience; the **interpersonal**, through which it enacts social relationships; and the **textual**, through which it organizes discourse (Halliday, 1985; Halliday & Matthiessen, 2004). This study focuses on the ideational metafunction, specifically the **transitivity system**, which Halliday (1994) describes as "a system for construing the world of experience into a manageable set of process types" (p. 106). Transitivity analysis organizes clauses into three components: **processes**, **participants**, and **circumstances**. Halliday (1994) identifies six process types, however, for the present study, only three are relevant as other three are absent in the selected text;

Material processes construe physical actions and events (e.g., *melt*, *destroy*), with participants **Actor** and **Goal**

Mental processes construe inner experience, perception, cognition, and emotion (e.g., *see*, *feel*), with participants **Senser** and **Phenomenon**

Relational processes construe states of being and identity (e.g., *is*, *represents*), with participants **Token/Value** or **Carrier/Attribute**

Circumstances provide additional contextual information about time, place, manner, or cause. The ideological significance of transitivity lies in the fact that process and participant

choices are never neutral, as Halliday and Matthiessen (2004) note, they reflect particular ways of representing the world. Assigning agency to a human Actor construes responsibility; omitting human participants obscures it, a distinction of direct relevance to environmental discourse.

The broader theoretical framework is **Ecolinguistics**, which examines how language shapes human attitudes toward and relationships with the natural world. As Stibbe (2015) defines, "Ecolinguistics explores the role of language in the interactions between humans and other species, and between humans and the physical environment" (p. 2). He proposes that texts encode **stories-we-live-by**, cognitive frames and narratives that structure ecological perception and behavior. These stories may be **beneficial**, **ambivalent**, or **destructive** in their ecological orientation. Four key concepts from Stibbe's framework inform this study:

- **Framing** refers to "how language activates cognitive structures that shape readers' understanding of ecological issues" (Stibbe, 2015, p. 103). The frames encoded through transitivity choices determine whether global warming is perceived as a natural and inevitable phenomenon or a consequence of human action.
- **Salience and Erasure** concern the differential visibility of ecological entities. Stibbe (2015) argues, "foregrounding certain participants while omitting others carries ideological weight, particularly when human agency is erased from environmental processes, naturalizing ecological destruction as inevitable" (p. 50).
- **Stories-we-live-by** are culturally embedded narratives that become "so ingrained that they are no longer recognized as stories but instead taken as descriptions of reality" (Stibbe, 2015, p. 18). Relevant narratives in this study include human mastery over nature, nature as a resource, and vulnerability and victimhood.

The integration of Halliday's theory of SFL (transitivity) and the Ecolinguistic framework by Stibbe constitutes a comprehensive analysis. Transitivity provides the lens for the structural side of analysis as it deals with process types, participants, and circumstances. The framework provided by Stibbe contributes the interpretive side of analysis, which interprets ecological meanings hidden behind structural features of language use. This analysis corresponds to the research methodology and frameworks applied in Ecolinguistics based on SFL (Goatly, 2000; Schleppegrell, 2004) that meet Stibbe's (2015) requirement to carry out studies with "rigorous linguistic description" (p. 25). Moreover, the integrated framework enables not only investigating ecological issues reflected in language but also examining ecological attitudes transmitted through language.

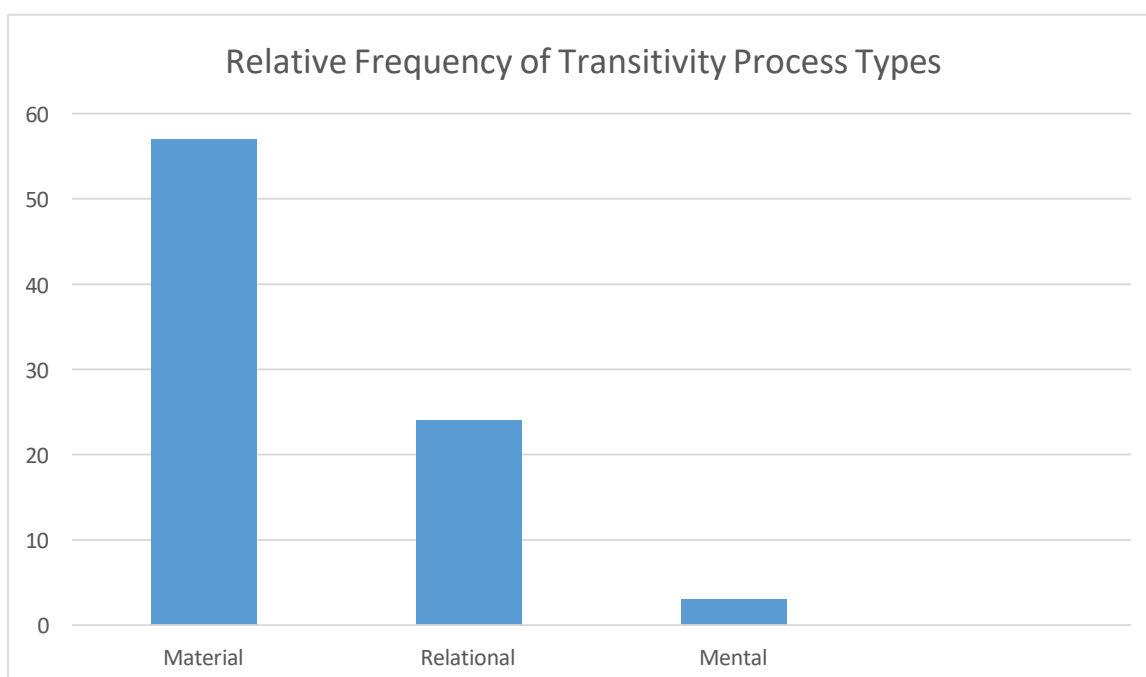
5. Results and Discussion

The transitivity analysis of the essay "*Impact of Global Warming on Pakistan*" reveals a highly structured and ideologically significant pattern of linguistic choices. The 85 clauses of the text are distributed across three process types, material, relational, and mental, with a striking absence of verbal, behavioral, and existential processes. Table 1 summarizes the overall distribution.

Table 1: Frequency and Percentage Distribution of Transitivity Process Types

Process Type	Frequency	Percentage
Material	57	67%
Relational	24	28%
Mental	3	4%
Verbal, Behavioral, Existential	0	0%
Total	85	100%

Figure 1: Relative Frequency of Transitivity Process Types



5.1. Material Processes: Dominance, Agency, and Ecological Erasure

The highest frequency number of transitivity patterns is material processes, with 57 in its 85 clauses (67%). This overwhelming dominance is connected with the study by Mou and Wu (2023), who reported that material processes were the most common type of process in German environmental textbooks and with the study by Qasim (2025), who found material processes exceeding 50% in Pakistani Grade 9 content. The present study, however, reveals a considerably higher dominance, 67%, suggesting an even more pronounced orientation toward physical action and external reality in this first-year college text.

Material processes construe the world in terms of doing and happening, actions that produce change in the physical world (Halliday & Matthiessen, 2004). The critical Ecological question, therefore, is not merely how many material processes the text contains,

but *who or what* is assigned the role of Actor, and *who or what* is relegated to the position of Goal.

Table 2: Actor Distribution in Material Clauses

Actor Type	Example Clauses	Frequency
Natural/environmental forces	glaciers, droughts, floods, sea levels, climate, global warming	28
Abstract/nominalized forces	effects of global warming, changes in temperature, the melting of glaciers	14
Institutional actors (Pakistan)	Pakistan, this framework, the GLOF project	11
Human/social actors	rapid urbanization, densely built-up areas	4

A close examination of the Actor slot in material clauses reveals that natural and environmental forces are the most frequent Actors in the text. 'Glaciers melt, floods affect, droughts exacerbate, sea levels rise, and the climate disrupts', all as grammatically agentive entities. Representative examples include:

"These glaciers, crucial for feeding the Indus River (actor), are melting (pr; mat) at an accelerating rate due to rising temperatures." (circum) (Clause 28)

"The 2010 floods (actor) affected (pr; mat) over 20 million people (goal)." (Clause 47)

"The changing climate (actor) has disrupted (pr; mat) weather patterns globally (goal)". (Clause 45)

"Which (actor) have exacerbated (pr; mat) water shortages and food insecurity (goal)". (Clause 50)

Nature is portrayed in all cases as an active agent for destruction. This result is consistent with the findings of Mujahid & Janjua (2024), who observe that when environmental forces are constantly depicted as Actors while humans are portrayed as the Goal of action, the resulting text produces an image of the environment as an antagonist; Stibbe (2015)'s Story-We-Live-By that perpetuates ecological disengagement instead of ecological engagement. Pakistan and the nation's inhabitants are invariably identified as the Goal, the passive target of nature's hostility:

Such extreme heat (actor) poses (pr; mat) severe health risks (goal). (Clause 23)

Key species such as the snow leopard and the Indus river dolphin (actor) are losing (pr; mat) their habitats (goal). (Clause 80)

Regions like Tharparker (actor) have been experiencing (pr; mat) more frequent droughts (goal). (Clause 49)

This pattern, 'nature acts, Pakistan suffers,' is sustained across all seven thematic sections of the essay without exception, constituting what Stibbe (2015) identified as a "systematic **salience** of natural agency and a corresponding **erasure** of human causal agency" (p. 50). It is important to note that while greenhouse gases, urbanization, and deforestation are

seen as root causes, they are not usually portrayed as Actors through the use of material clauses. On the contrary, they are part of the circumstantial elements or presented as abstract noun phrases, which is a grammatical technique.

Secondly, the distribution of institutional Actors is equally revealing. While Pakistan is featured as Actor in 11 material clauses, this happens solely in the context of responses to environmental catastrophes:

Pakistan (actor) has introduced (pr; mat) the Heatwave Management Plan (goal).
(Clause 26)

Pakistan (actor) has implemented (pr; mat) the Glacial Lake Outburst Flood (GLOF) project under SDG 13 (goal). (Clause 40)

Pakistan (actor) has launched (pr; mat) the Mangrove Rehabilitation Project under SDG 14 (goal). (Clause 73)

Pakistan (actor) has initiated (pr; mat) the protected areas initiative under SDG 13 (goal). (Clause 84)

This pattern creates what could be considered a redemptive narrative for the institution; Pakistan absolves itself of any causality and assumes the role of an SDG-consistent proactive reactor. Whereas this approach may serve pedagogically motivational purposes, it also fails to consider the socio-political aspects of Pakistan's environmental problems. As noted by Malik (2025), the text, even if it benefits the environment in general, still upholds the dominant anthropocentric paradigm, in which the human institution acts as a hero against the destructive force of nature. In this case, the state acts to rescue; nature is to be destroyed; people are missing. This exclusion of individual humans as agents from the Actor column proves the results obtained by Mujahid and Janjua (2024) and Aftab et al. (2025).

The Goals of material processes further consolidate this picture. The most frequent Goal entities are Pakistan, its people, its infrastructure, its ecosystems, and its agricultural lands, all constructed as passive recipients of environmental destruction:

Table 3: Categorized Distribution of Goals in Material Clauses

Goal Category	Frequency	Examples
Human communities / people	8	<i>over 20 million people (C47), up to 5 million people (C70), coastal communities (C67), vulnerable communities (C54)</i>
Natural ecosystems / biodiversity	7	<i>natural habitats (C76), decline of species and degradation of ecosystems (C77), their habitats (C80), 43,000 hectares of forest (C81)</i>
Agricultural systems / food security	7	<i>agriculture (C56), water shortages and food insecurity (C50), crop losses worth 2.2 billion dollars (C59), agriculture and drinking water supplies (C31)</i>
Institutional responses / SDG initiatives	7	<i>the Heatwave Management Plan (C26), the GLOF project (C40), the National Disaster Risk Management Framework (C52), the Mangrove Rehabilitation Project (C73)</i>

Abstract statistical / quantified entities	7	<i>a temperature of 51°C (C22), severe health risks (C23), economic losses of \$10 billion (C48), over 1300 deaths (C24)</i>
Water resources / river systems	5	<i>water flow leading to floods (C29), reduced water availability (C30), reduced river flows (C36)</i>
Infrastructure / built environment	4	<i>infrastructure development (C18), infrastructure and agricultural lands (C68), disaster preparedness mechanisms (C53)</i>
Atmospheric temperature conditions	4	<i>heat in the earth's atmosphere (C16), temperatures (C38), more heat (C21), weather patterns globally (C45)</i>
Glaciers / ice systems	3	<i>glaciers to shrink (C39), over 30% of ice (C35), water flow (C29)</i>
Pakistan / national vulnerability	3	<i>the country's vulnerability to climate change (C7), the effects of global warming on Pakistan (C12), the risks of climate-induced disasters (C8)</i>
Total	55*	

Changes in temperature, precipitation, and the increased frequency of extreme weather events (actor) have made (pr; mat) agriculture (goal) more unpredictable and less productive. (Clause 56)

The loss of biodiversity (goal) is primarily driven (pr; mat) by habitat destruction caused by climate change, deforestation, and unsustainable land use practices (actor). (Clause 83)

Clause 83 is particularly revealing: it is one of the rare instances in the text where human activities, deforestation and unsustainable land use practices are named as causal forces. Yet even here, these are embedded within a nominalized Actor phrase rather than foregrounded as agentive human choices, an ideological strategy (examined further in section 4.4).

5.2. Relational Processes: Defining Vulnerability as an Inherent Attribute

The second most common process type is relational processes, found in 24 clauses (28%). This is at par with the research of Mujahid and Janjua (2024), who reveal that relational processes are the second most common category in environmental textbooks' discourse, where the function can be described as giving factual description and classification information without giving ethical attribution. In the current text, relational processes assume an objective and a distinctly ideological function, and continuously represent Pakistan's vulnerability, susceptibility, and ecological condition as in-built elements that define Pakistan.

Table 4: Categorized Distribution of Tokens in Relational Clauses

Token Category	Frequency	Examples
Abstract nominalized processes	9	<i>Pakistan's vulnerability, the primary cause of heatwaves, the increased frequency of extreme weather events, the reason for agricultural challenges</i>
Pakistan / national entity	6	<i>Pakistan, a country, the country</i>

Environmental ecological phenomena	/5	<i>rising sea levels and coastal erosion, Pakistan's rich biodiversity and ecosystems, this geographic diversity</i>
SDG frameworks institutional concepts	/2	<i>The Sustainable Development Goals, these practices</i>
Geographical / physical entities	2	<i>which (diverse geography), this trend</i>
Total	24	

Table 5: Categorized Distribution of Values in Relational Clauses

Value Category	Frequency	Examples
Vulnerability susceptibility attributes	/8	<i>highly susceptible, particularly acute, particularly troubling, under significant threat, vulnerable to shifts</i>
Causal attribution to global warming	7	<i>primarily due to greenhouse gas emissions, direct consequences of rising global temperatures, largely due to changes in atmospheric conditions</i>
Descriptive classificatory attributes	/5	<i>17 global objectives, major threats, not limited to inland areas</i>
Dependence reliance attributes	/3	<i>heavily dependent on the Indus River, vulnerable to shifts in water availability</i>
Institutional SDG values	/1	<i>developing drought-resistant crops, optimizing water use</i>
Total	24	

Pakistan's vulnerability (token) is (pr: rel) largely due to its diverse geography (value). (Clause 4)

A country (token) that is (pr; rel) highly susceptible to the impacts of global warming (value). (Clause 3)

This problem (token) is (pr; rel) particularly acute in Pakistan (value). (Clause 32) The effects of global warming on Pakistan's agriculture sector (token) are (pr; rel) particularly troubling (value). (Clause 55)

Pakistan's rich biodiversity and ecosystems (token) are (pr; rel) under significant threat from global warming (value). (Clause 75)

The relational processes, as Stibbe (2015) proposes, give entities fixed properties that lead readers to think in certain ways. Through their repeated portrayal as susceptible, precarious, and threatened subjects, young readers are invited to understand vulnerability as Pakistan's natural condition rather than as the product of global inequities in carbon emissions, historical development patterns, or geopolitical power asymmetries. This framing is further supported by the other relational clauses, which designate the causal conditions of ecological problems, also expressed in a rather abstract, naturalized manner.

This trend (token) is (pr; rel) primarily due to increased global greenhouse gas emissions (value). (Clause 15)

The primary cause of these heatwaves (token) is (pr; rel) the enhanced greenhouse effect due to increased concentrations of greenhouse gases (value). (Clause 25)

The primary reason for this rapid melting (token) is (pr; rel) global warming (value). (Clause 37)

These clauses certainly describe causal relationships, but the causes are always general, summary, and without agents (global warming, greenhouse gas emissions, atmospheric conditions) and only vaguely refer to specific human agents. Similarly, it conforms to Nawab et al.'s findings (2025), who claim that Pakistani intermediate textbooks provide a neutral account of the environment and do not elicit ethical responses. The relational clauses found in this text are information-packed and never predicate moral or political responsibility for the environmental conditions which they describe.

5.3. Mental Processes: Marginal Consciousness, Absent Reflection

The mental process is marginally represented in the text: there are only 3 clauses in which verbs present a mental process (4%), which is the least represented process type. Ecolinguistically, this is one of the most significant findings. Grammar serves as the key to inner experience, ethical consciousness, and ecological awareness in mental processes, perception, cognition, affection, and reflection (Halliday & Matthiessen, 2004). Their near-total absence from the text points to a profound gap in the ecological discourse being transmitted to first-year students. The three mental process clauses in the text are:

The country (senser) has seen (pr; mental) a significant rise in average temperatures over the past few decades (phenomenon). (Clause 14)

Pakistan (senser) is experiencing (pr; ment) more frequent and intense heatwaves, particularly in urban areas like Karachi (phenomenon). (Clause 17)

Pakistan (senser) is also witnessing (pr; ment) an increase in the frequency and severity of extreme weather events, such as floods, droughts, and cyclones (phenomenon). (Clause 43)

Significantly, in all three instances, the Senser is not an individual human being but an abstracted national entity, the country or Pakistan. The phenomena experienced are quantitative, observable, and external: temperature rises, heatwaves, and extreme weather events. There is no clause in the text in which an individual citizen thinks, feels, worries, understands, or cares about the ecological crisis. There is no cognition, no emotional response, no ethical reflection. This finding directly confirms Qasim (2025) argument that the underrepresentation of mental processes in environmental educational texts indicates a model focused on concrete external realities while neglecting the introspective or interpersonal meanings necessary for deep ecological reflection.

From Stibbe's lens (2015), mental processes are the most important linguistic tools for foregrounding, or creating salience, de-emphasis of irrelevant ecological entities and relations and their foregrounding as emotionally and cognitively significant to readers. If a text does not appeal to the inner emotions, feelings, and sense of responsibility of the reader, it is not likely to help develop the reader's deep ecological sensibility. There is little emphasis on what

students might be feeling, thinking, or considering about climate change. Instead, students are presented with facts without emotions, data without critical thinking, and crisis without conscience. This finding also has significant pedagogical implications given the audience of the text. Nawab et al. (2025) explicitly argue that college-level students in Pakistan are at a developmental stage where they can transition from passive recipients of information to proactive ecological citizens, but only if educational discourse engages their cognitive and emotional capacities. The dominance of material and relational processes at the expense of mental ones forecloses precisely this possibility

5.4. Linguistic Form of Participants: Nominalization, Abstraction, and the Packaging of Agency

One condition that is analytically the most interesting in the transitivity patterns of this text is the typical use of complex noun phrases and nominalized groups as the realized form of participants, the Actor and the Goal, instead of simple nouns or personal pronouns. As Halliday and Matthiessen (2004) explain, nominalization (the grammatical mechanism that enables these processes and actions to be encoded in noun forms) is one of the most significant ideological tools in written discourse, in that it enables the transformation of dynamic processes involving human agents into what appear to be static forms of agents, or things. Consider the following Actor noun phrases drawn from the text:

Pakistan's heavy dependence on agriculture, a sector highly sensitive to changes in temperature and precipitation (actor) (Clause 7)

The rapid urbanization of cities like Karachi and Lahore, coupled with inadequate infrastructure (actor) (Clause 8)

The geographical diversity of Pakistan, combined with the pressures of rapid urbanization and population growth (actor) (Clause 44)

Changes in temperature, precipitation, and the increased frequency of extreme weather events (actor) (Clause 56)

The 2020 locust attack, driven by unusual weather patterns (actor) (Clause 59)

Habitat destruction caused by climate change, deforestation, and unsustainable land use practices (actor) (Clause 83)

In each of these cases, what might otherwise be expressed as a human action, humans depending heavily on agriculture, cities urbanizing rapidly, temperatures changing, humans cutting down forests, is grammatically packaged as a complex nominal group that functions as Actor. The human beings who make decisions, consume resources, clear forests, and emit greenhouse gases are entirely absent from the surface structure of these clauses. This is precisely what Stibbe (2015, p. 50) terms erasure, the systematic removal of ecologically significant entities from discourse, and what Aftab et al. (2025) describe as nominalization backgrounding human involvement in Pakistani primary textbooks. The present study confirms and extends this finding to the first-year college level.

The ideological consequence of this pervasive nominalization is substantial. Where there is no deforestation but fires, and where rapid urbanization raises the risks of ecological trouble rather than urban planners/decision-makers making specific choices that could be made differently, the text creates a world where ecological crises seem to 'happen' due to forces larger than humans. This confirms what Mliless and Larouz (2018) found in Moroccan textbooks: that nominalization, like passivization, functions to conceal human culpability and mitigate the hazardous reality of ecological crises.

Participant noun phrases are also complex enough to affect the informational density of the text. Calling this 'grammatical metaphor', Halliday (1994) writes that nominal groups are used with a high nominal density in academic writing to encapsulate a lot of information in a concise part. This effect is good for the informational goals and scientific texts, but it makes the reader and the reality described by the text cognitively distant in some places. A first-year student reading that "the geographical diversity of Pakistan, combined with the pressures of rapid urbanization and population growth, makes the country particularly susceptible to climate-induced disasters" receives a densely packaged causal explanation that obscures both the human choices embedded in urbanization and the specific communities most vulnerable to disaster. The complexity of the nominal group serves accuracy at the expense of ecological proximity and personal relevance.

5.5. Circumstantial Elements: Framing Crisis through Time and Scale

Circumstantial elements in the text are predominantly of two types: temporal circumstances, anchoring ecological crises in specific historical moments or future projections, and causal circumstances, explaining why processes occur. Representative examples include:

In 2022 (circum), Jacobabad (actor) recorded (pr; mat) a temperature of 51°C (goal). (Clause22)

By 2100 (circum), sea levels along Pakistan's coast (actor) could rise (pr; mat) by 0.6 meters (circum). (Clause 69)

Over 30% of the ice in Pakistan's glaciers (actor) has already melted (pr; mat). (Clause 35)

In fact, there is a double effect of the temporal circumstances: firstly, it gives empirical support to the environmental claims in the text through grounding them in certain figures, and secondly, it helps shape an ecological problem not only in terms of historical facts but also as something inevitable in the future. The inclusion of statistics in circumstantial context, 51 degrees Celsius, 0.6 metres, 43,000 hectares, five million people, serves the purpose of constructing the discourse of urgent action needed for addressing the environmental situation in the country. Nonetheless, the discourse itself does not assign any human actors' responsibility in terms of causing the problem. Likewise, causal context does not point to the concrete actions of some human agents and industry but describes the ecological process in abstract terms of global nature: 'due to rising temperatures, caused by global warming, due to changing climate conditions'. Global warming becomes the dominant causal force here,

although, on one hand, it is scientifically correct, on the other hand, it ignores the specific position of Pakistan in global ecological systems, a country that contributes minimally to global greenhouse gas emissions yet bears disproportionate consequences (Chandio et al., 2025).

5.6. Ecolinguistic Interpretation: Stories-We-Live-By

Drawing together the findings from the transitivity analysis reveals three dominant **stories-we-live-by** (Stibbe, 2015) embedded in the text's grammatical choices:

Story 1: Nature as Adversary

The use of natural forces, such as glaciers, droughts, flooding, sea levels, heat waves, as Actors in the material sentences, where the Goals are Pakistan and the people living in it, creates a story where nature emerges as the chief destructive force and the people as its helpless victims. As noted by Mujahid and Janjua (2024), this story views the environment as an antagonist against which humans need to be protected instead of being viewed as an interconnected system within which humans form an integral component. This is a highly anthropocentric view that, strangely enough, robs individuals of their environmental agency because once humans become mere helpless victims to natural forces and events, then there is very little that they can do ecologically speaking.

Story 2: Vulnerability as Identity

Encoding the processes of relationships in seeing Pakistan's vulnerability and dependence as attributes of permanence and stability tells another very powerful story, namely that Pakistan has been rendered as a vulnerable state. Encoding vulnerability as such, instead of a historically contingent construction that is politically produced in Pakistan, turns vulnerability into something natural and normalized. Such a narrative, according to Khan et al. (2025), as revealed in their examination of KPK textbooks, is based on a hegemonic anthropocentric perspective that assumes ecological vulnerability to be something naturally given instead of a politically transformative project.

Story 3: Institutional Redemption

The third story arises out of the collection of material clauses, where the nation-state of Pakistan, functioning as an institutional actor, engages in actions related to launching, executing, developing, and implementing environmental projects consistent with the objectives outlined in the SDGs. The significance of such a narrative lies in its ability to resolve the narrative of conflict presented in the former two: by introducing Pakistan and nature as opponent and victim, respectively, the narrative creates a resolution in the form of a well-equipped state to deal with the challenge. Although there may be some motivational value in such a framework, it denies the development of two other narratives that are vital in ecological discourse: the narrative of individual responsibility, which emphasizes citizens as ecological actors, and the narrative of global responsibility, in which the role of wealthier nations, which emit more, is acknowledged.

As can be seen from the above examples, taken together, the three stories create an information-rich but environmentally ambivalent pedagogical discourse, as Stibbe (2015) calls

it, which neither explicitly destroys the environment nor creates deep ecocentric environmental awareness as needed in any educational program regarding nature. While the textbook is informative on ecological problems, it achieves so by using the transitivity framework, which denies human agency and nature, thus creating an image of nature as a menace and a problem to humanity. These results are generally consistent with Zahoor and Janjua's (2020) assertion regarding the creation of anthropocentric human-nature relations through Pakistani English-language textbooks and apply the same concept to the higher education level for the first time.

6. Conclusion

In conclusion, the present study examined how environmental challenges are linguistically represented in the essay *"Impact of Global Warming on Pakistan"* in the First-Year English Textbook, drawing on Halliday's (1994) transitivity system and Stibbe's (2015) Ecolinguistic framework. The analysis of 85 clauses has revealed a linguistically consistent and ideologically coherent picture, one that is both informationally rich and ecologically ambivalent. Three dominant stories-we-live-by emerge from these patterns: nature as adversary, vulnerability as identity, and institutional redemption. Collectively, these narratives construct a pedagogical discourse that constructs Pakistan as a passive victim of ecology, naturalizes the vulnerability of the country, and confines any sort of agency to the state alone, leaving individuals out of any possible ecological discourse. The findings of the current study are consistent with the existing research (Mujahid & Janjua, 2024; Zahoor & Janjua, 2020; Nawab et al., 2025; Aftab et al., 2025; Riaz, 2025), which reported that the environmental textbooks for students use anthropocentric patterns, resulting in the absence of any agency within their discourse. The findings have implications for the construction of environmental textbooks and curricula. Textbooks designed for college students should go beyond mere information about ecology and work towards instilling ecological identity in the young minds of students. Future research studies can be conducted on the Ecolinguistic analysis of environmental discourses in other higher and higher-secondary school textbooks and pedagogical materials.

References

- Aftab, S., Sharif, M., Hameed, M., & Nadeem, M. (2025). Role of human agency in ecological text: An ecolinguistic analysis of primary English textbooks of Pakistan. *Journal of Applied Linguistics and TESOL*, 8(2), 2687–2701. <https://jalt.com.pk/index.php/jalt/article/download/1060/841>
- Qazi, A. A., Iqbal, M. J., & Qasim, H. M. (2025). Investigating the ecolinguistics dimensions of Pakistan's climate change policy (2021): A transitivity analysis. *Journal of Applied Linguistics and TESOL (JALT)*, 8(4), 654-664. <http://doi.org/10.63878/jalt1381>
- Afzal, F., e Nayab, D., & Noor, Z. (2024). Exploring Eco-Pedagogical Discourse at Secondary Level: A Comparative Analysis of PTB Vs. Oxford English Text Books. *Annals of Human and Social Sciences*, 5(3), 193-204. [http://doi.org/10.35484/ahss.2024\(5-III\)18](http://doi.org/10.35484/ahss.2024(5-III)18)

- Khan, I. U., Salman, S., & Naz, R. (2025). Constructing Nature in the Classroom: An Eco linguistic Analysis of Depiction of Human-Nature Relationship in English Textbooks. *NUST Journal of Social Sciences and Humanities*, 11(1), 19-29. <https://doi.org/10.51732/njssh.v11i1.242>
- Malik, S. (2025). Linguistic analysis of green content in Italian high school English textbooks: An ecolinguistic perspective. [Dissertation Thesis]. <https://doi.org/10.48676/unibo/amsdottorato/11799>
- Mliless, M., & Larouz, M. (2018). An ecolinguistic analysis of environment texts in Moroccan English language teaching textbooks. *International Journal of Research in Environmental Studies*, 5, 103-116. https://www.academia.edu/37996106/An_ecolinguistic_analysis_of_environment_texts_in_Moroccan_English_language_teaching_textbooks
- Mou, Y., & Wu, Y. (2023). An ecolinguistic analysis of German textbooks used in Chinese universities: Environmental content and ecological view. *Porta Linguarum An International Journal of Foreign Language Teaching and Learning*, (VIII), 27-43. <https://doi.org/10.30827/portalin.viVIII.29203>
- Mujahid, M., & Janjua, F. (2024). Smog and individual responsibility: A transitivity analysis of 'Environmental Education' in PCTB English 7. *Pakistan Languages and Humanities Review*, 8(3), 233–246. [https://doi.org/10.47205/plhr.2024\(8-III\)22](https://doi.org/10.47205/plhr.2024(8-III)22)
- Nawab, S., Wasti, A. T., & Hassan, S. S. U. (2025). Ecological Discourse Analysis of the Textbook of English Language. *Liberal Journal of Language & Literature Review*, 3(3), 199-223. <https://llrjournal.com/index.php/11>
- Riaz, A. (2025). Ecological Concepts in Pakistani ESL Textbooks: An Analysis of Content, Visuals, and Exercises. *Social Science Review Archives*, 3(3), 669-689. <https://doi.org/10.70670/sra.v3i3.903>
- Sakrikar, S. S. (2019). MAK Halliday's Transitivity-An Overview. *International Journal of English Language, Literature in Humanities*, 7(1), 59-80. <https://ijellh.com/index.php/OJS/article/view/6277>
- Qasim, H. M. (2025). Ideational Metafunction in a Pakistani English Textbook: A Transitivity Study of the Punjab Textbook Board's Grade 9 Content. *Pakistan Social Sciences Review*, 9(2), 575-589. [https://doi.org/10.35484/pssr.2025\(9-II\)44](https://doi.org/10.35484/pssr.2025(9-II)44)
- Stibbe, A. (2015). *Ecolinguistics: Language, ecology and the stories we live by*. Routledge.
- Trčková, D. (2016). Representations of nature in ecotourism advertisements. *Discourse and Interaction*, 9(1), 79–94. <https://doi.org/10.5817/DI2016-1-79>
- Zahoor, M., & Janjua, F. (2020). Green contents in English language textbooks in Pakistan: An ecolinguistic and ecopedagogical appraisal. *British Educational Research Journal*, 46(2), 321–338. <https://doi.org/10.1002/berj.3579>

Appendix

The Transitivity Analysis of the Essay: "Impact of Global Warming on Pakistan"

1. The Sustainable Development Goals (SDGs), established by the United Nations in 2015, (token) include (pr: relational) 17 Global objectives aimed at fostering a better and more sustainable future (value).
2. Among these, SDG 13: Climate action (token) is (Pr: rel.) particularly relevant (value) for Pakistan,
3. a country (token) that is (pr; rel.) highly susceptible to the impacts of global warming (value).
4. Pakistan's vulnerability (token) is (pr: rel) largely (circumstance) due to its diverse geography (value),
5. which (token) includes (pr; rel) high mountain ranges, vast plains, and an extensive coastline (value).
6. This geographic diversity (token) makes (pr; relational) the country particularly prone to a wide range of climate-related risks, including glacial melt, extreme heat, and sea level rise (value).
7. Moreover, Pakistan's heavy dependence on agriculture, a sector highly sensitive to changes in temperature and precipitation (actor), exacerbates (pr; mat) the country's vulnerability to climate change (goal).
8. The rapid urbanization of cities like Karachi and Lahore, coupled with inadequate infrastructure, further (actor) increases (pr; mat) the risks of climate-induced disasters such as heat waves and flooding (goal).
9. Compounding (pr;_) these challenges (goal) is (_mat) the country's limited financial and technical resources (actor),
10. which (actor) hinder (pr; mat) its ability to effectively mitigate and adapt to climate change (goal).
11. Finally, with a population exceeding 220 million, Pakistan (token) faces (pr; rel) immense pressure on its resources and infrastructure, particularly in the face of ongoing climate change (value).
12. These factors (actor) collectively (circum) intensify (pr; mat) the effects of global warming on Pakistan (goal),
13. which (goal) are explored (pr; mat) in detail below.

Rising temperatures and heatwaves

14. Given Pakistan's geographical diversity and rapid urbanization (circum), the country (senser) has seen (pr; mental) a significant rise in average temperatures over the past few decades (phenomenon).
15. This trend (token) is (pr; rel) primarily (circum) due to increased global greenhouse gas emissions (value),
16. which (actor) trap (pr; mat) heat (goal) in the earth's atmosphere (circum).
17. As a result, Pakistan (senser) is experiencing (pr; ment) more frequent and intense heatwaves, particularly in urban areas like Karachi (phenomenon),

18. where (circum) rapid growth (actor) has outpaced (pr; mat) infrastructure development (goal).
19. These Rising temperatures (token) are (pr; rel) not just a product of global patterns (value)
20. but are exacerbated (pr; mat) by local factors such as urban heat islands (actor),
21. where (circum) densely built-up areas (actor) retain (pr; mat) more heat (goal).
22. In 2022 (circum), Jacobabad (actor) recorded (pr; mat) a temperature of 51 °C (124 F), among the highest in the world (Dawn, 2022)-(goal).
23. Such extreme heat (actor) poses (pr; mat) severe health risks (goal),
24. as evidenced by the heatwave in Karachi in 2015, which (actor) resulted (pr; mat) in over 1300 deaths (BBC News, 2015)-(goal).
25. The primary cause of these heatwaves (token) is (pr; rel) the enhanced greenhouse effect due to increased concentrations of greenhouse gases (value).
26. To combat these challenges (circum), Pakistan (actor) has introduced (pr; mat) the Heatwave Management Plan, including early warning systems and public awareness campaigns, as part of its efforts to align with SDG 13 (goal).

Melting Glaciers and Water Scarcity

27. The effects of global warming (actor) extend (pr; mat) beyond urban heatwaves to the Melting of Glaciers in Pakistan, particularly those in the Himalayas and Karakoram ranges (goal).
28. These Glaciers, crucial for feeding the Indus River (actor), are melting (pr; mat) at an accelerating rate due to rising temperatures (circum).
29. The melting of these Glaciers (actor) initially increases (pr; mat) water flow, leading to floods (goal)
30. but over time (circum) it (actor) results (pr; mat) in reduced water availability (goal),
31. threatening (pr; mat) agriculture and drinking water supplies (goal).
32. This problem (token) is (pr; rel) particularly acute in Pakistan (value),
33. where agriculture (token) is (pr; rel) heavily dependent on the Indus River (value),
34. making (pr; rel) the country (token) vulnerable to shifts in water availability (value).
35. Over 30% of the ice in Pakistan's Glaciers (actor) has already melted (pr; mat),
36. leading (pr; mat) to reduced river flows (goal) (The Express Tribune, 2020).
37. The primary reason for this rapid melting (token) is (pr; rel) global warming (value),
38. which (actor) increases (pr; mat) temperatures (goal),
39. causing (pr; mat) Glaciers (goal) to shrink faster than they can regenerate (circum).
40. To address these challenges (circum), Pakistan (actor) has implemented (pr; mat) the Glacial Lake Outburst Flood (GLOF) project under SDG 13 (goal),
41. focusing (pr; mat) on building early warning systems and constructing protective infrastructure (goal) to mitigate the risks associated with Glacial melt (circum).

Increased Frequency of Extreme Weather Events

42. As the effects of global warming (actor) intensify (pr; mat),

43. Pakistan (senser) is also witnessing (pr; ment) an increase in the frequency and severity of extreme weather events, such as floods, droughts, and cyclones (phenomenon).
44. The geographical diversity of Pakistan, combined with the pressures of rapid urbanization and population growth (actor), makes (pr; mat) the country (goal) particularly susceptible to these climate-induced disasters (circum).
45. The changing climate (actor) has disrupted (pr; mat) weather patterns globally (goal),
46. leading (pr; mat) to more intense rainfall and prolonged dry periods in Pakistan (circum).
47. For instance, the 2010 floods (actor) affected (pr; mat) over 20 million people (goal)
48. and caused (pr; mat) economic losses estimated at 10 \$ billion (World Bank 2010) (goal).
49. Resultantly, regions like Tharparker (actor) have been experiencing (pr; mat) more frequent droughts (goal),
50. which (actor) have exacerbated (pr; mat) water shortages and food insecurity (goal).
51. The increased frequency of these extreme weather events (token) is (pr; rel) largely due to changes in atmospheric conditions caused by global warming (value).
52. In response, Pakistan (actor) has developed (pr; mat) the National Disaster Risk Management Framework as part of its commitment to SDG 13 (goal).
53. This framework (actor) enhances (pr; mat) disaster preparedness and response mechanisms (goal),
54. aiming (pr; mat) to build resilience in vulnerable communities (goal).

Impact on agriculture and food security

55. The effects of global warming on Pakistan's agriculture sector (token) are (pr; rel) particularly troubling (value) because of the country's heavy reliance on this sector for both food security and employment (circum).
56. Changes in temperature, precipitation, and the increased Frequency of Extreme Weather Events (actor) have made (pr; mat) agriculture (goal) more unpredictable and less productive.
57. With agriculture being highly sensitive to these climate variations (circum), the sector (actor) is facing (pr; mat) significant challenges (goal).
58. Wheat yields, (goal) for example, are estimated (pr; mat) to decline by 6 to 8 % by 2050 due to changing climate conditions (IFPRI, 2021)-(circum).
59. Furthermore, the 2020 locust attack, driven by unusual weather patterns (actor), caused (pr; mat) crop losses worth 2.2 billion dollars (goal),
60. highlighting (pr; mat) the vulnerability of Pakistan's food security to climate change (FAO, 2020)-(goal).
61. The reason for these agricultural challenges (token) lies (pr; rel) in the direct impact of higher temperatures and unpredictable rainfall on crop growth and productivity (value).
62. To mitigate these risks (circum), Pakistan (actor) is promoting (pr; mat) Climate-Smart Agriculture practices as part of its SDG 13 initiatives (goal).

63. These practices (token) include (pr; rel) developing drought-resistant crops, optimizing water use, and improving soil management techniques (value).

Coastal Erosion and Sea Level Rise

64. Global warming's impact on Pakistan (token) is (pr; rel) not limited to inland areas (value);
65. it (actor) also significantly (circum) affects (pr; mat) the country's Coastal regions (goal).
66. Rising sea levels and coastal Erosion, driven by global temperature increases, (token) are (pr; rel) major threats to the coastline of Sindh and Balochistan (value).
67. These changes (actor) threaten (pr; mat) to displace coastal communities (goal),
68. damage (pr; mat) infrastructure and inundate agricultural lands (goal).
69. By 2100 (circum), sea levels along Pakistan's coast (actor) could rise (pr; mat) by 0.6 metres (circum),
70. potentially displacing (pr; mat) upto 5 million people (IUCN, 2022)-(goal).
71. The primary reason for the sea level rise (token) is (pr; rel) the thermal expansion of seawater and the melting of polar ice caps (value),
72. both of which (token) are (pr; rel) direct consequences of rising global temperatures (value).
73. In response, Pakistan (actor) has launched (pr; mat) the Mangrove Rehabilitation Project under SDG 14 (goal),
74. which (actor) aims (pr; mat) to restore Mangrove forests that act as natural barriers against coastal Erosion and sea-level rise (goal).

Threats to Biodiversity and Ecosystems

75. Pakistan's rich Biodiversity and ecosystems (token) are (pr; rel) under significant threat from global warming (value).
76. Changes in temperature and precipitation patterns (actor) are disrupting (pr; mat) natural habitats (goal),
77. leading (pr; mat) to the decline of species and the degradation of ecosystems (circum).
78. This (token) is (pr; rel) particularly concerning for a country like Pakistan (value),
79. which (actor) relies (pr; mat) heavily on its natural resources for livelihood and economic activities (goal).
80. For example, key species such as the snow leopard and the Indus river dolphin (actor) are losing (pr; mat) their habitats (goal) due to changing climate conditions (WWF Pakistan, 2021)-(circum).
81. Furthermore, Pakistan (actor) is losing (pr; mat) approximately 43000 hectares of forest annually (goal),
82. which (actor) contributes (pr; mat) to the decline in biodiversity (Global Forest Watch, 2022)-(goal).
83. The loss of biodiversity (goal) is primarily driven (pr; mat) by habitat destruction caused by climate change, deforestation, and unsustainable land use practices (actor).

84. To counter these trends (circum) Pakistan (actor) has initiated (pr; mat) the protected areas initiative under SDG 13 (goal),
85. which (actor) aims (pr; mat) to conserve critical habitats and endangered species (goal) by expanding protected areas and restoring degraded ecosystems (circum).