Environmental Digital Literature: An *Instrumentum Laboris* for Eco-social Engineering

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Abstract

Climate crisis is a global concern as manifested in unprecedented flooding, bushfires, heat waves, global warming, and desertification amongst others. There is also a growing attention in terms of scholarship and research across disciplines to address and understand the debilitating effects of environmental crises. Using Halliday's systemic meta-function of ideation and Di Rosario's entax theory, this paper examines "Climatophosis", an eco-digital poem in order to identify the eco-lexicons in the poem, and the semiotics of digitalization as tools for making environmental statements for intervention in the climate crisis. The analysis reveals the frequency of the eco-lexicon items, the affordances of environmental digital literature such as hybridity, multimodality, multilingualism, audio-visuality, ergodic features, and the human-computer interaction. Also important is the extension of Di Rosario's entax theory to include meta entax as identified in this study. The conclusion is that environmental digital literature is a veritable instrument to promote eco-advocacy and eco-social engineering through the creation of environmental consciousness and ethical considerations in the care for the environment to mitigate the climate crisis.

Keywords: Climate crisis, Digital Humanities, eco-social engineering, environmental digital literature, meta entax

Résumé

La crise climatique est un problème mondial, comme le montrent les inondations sans précédent, les feux de brousse, les vagues de chaleur, le réchauffement climatique et la désertification, entre autres. De plus, il y a de plus en plus d'attention dans les études et la recherche dans plusieurs disciplines pour comprendre et traiter les effets négatifs des crises environnementales. En utilisant la méta-fonction systémique d'idéation de Halliday et la théorie d'entax de Di Rosario, cet article analyse Climatophosis, un poème éco-numérique, afin d'identifier les éco-lexiques dans le poème et la sémiotique de la numérisation comme outils pour faire des déclarations sur l'environnement et proposer des interventions face à la crise climatique. L'analyse montre la fréquence des éléments de l'éco-lexique et les avantages de la littérature environnementale numérique, comme l'hybridité, la multimodalité, le multilinguisme, l'audio-visualité, les caractéristiques ergodiques et l'interaction humain-ordinateur. Il est également important de noter l'extension de la théorie d'entax de Di Rosario pour inclure la méta-entax, telle qu'identifiée dans cette étude. La conclusion est que la littérature environnementale numérique est un outil efficace pour promouvoir l'éco-militantisme et l'éco-ingénierie sociale en créant une conscience environnementale et en mettant en avant des considérations éthiques pour le respect de l'environnement afin de réduire la crise climatique.

1.0. INTRODUCTION

Pervasive and persistent environmental crises resulting to climate change demand persistent individual and collective attention. Global concerns and responses to mitigate the climate crises have occupied centre stage in the global environmental discourse space. Notable is the fact that attention is shifting to interdependent and multidisciplinary scholarship to address environmental and global issues. This is the impetus in the growing scholarship in digital humanities which covers digital literature. This paper is an exploration of environmental digital literature as an emerging disciplinary discourse by analyzing "Climatophosis", an environmental digital poem by Yohanna Joseph Waliya. The aim is to identify the features of digital literature in the poem and to argue that eco-digital literature is a veritable instrument for eco-social engineering. Specifically, the paper seeks to identify the features of digital environmental poems using Climatophosis to examine how the digital affordances can be deployed for advocacy to create environmental awareness for the safety and survival of the environment.

The advent of digital media as well as the general advancement in science and technology has brought many changes to human culture and society. It has changed the way people live, think, move, write, study, and even worship. It can simply be said that computers reconfigured the world or in the words of Marc Andreessen, "software is remaking the world" (cited in Gobble 1). This remaking or reconfiguring has also brought changes to the methods, themes, and tools of studies in different disciplines. One of the effected disciplines is Humanities. Stepanskaya et al., see the discipline of Humanities as a humanizing messiah in the universities of Russia and by extension the society (8718). Digital Humanities' practical and applied appeals, make it one of the ways to sustain the discipline of humanities in the face of a generation whose research is driven by applied, practical, and productive scientific orientation. It is a hybrid discipline, which combines computing/digital skills and skills and knowledge of humanities. Its goal is "to model the world around us through success and failure in order to arrive at a better understanding of what we know and don't know about humankind, their activities, artifacts, and record" (Vanhoutte 147).

More still, Digital Humanities makes use of digital literacy and skills in solving human problems. Given that we are in the digital era, the understanding and utilization of digital literacy drives human engagement in all spheres of life (Egbe 20). It is in this light that the domain of digital literature finds relevance in the integration of digital literacy and humanities. The present research examines *Climatophosis,* a digital poem, which was inspired by the environmental crises in northern Nigeria and to demonstrate how the digital affordances can be used as instruments for eco-digital social engineering to mitigate climate crisis.

1.1. Clarification of Concepts

Certain concepts are necessary for the understanding of this investigation. These concepts are highlighted below.

i. **Electronic Literature**: This refers to "works with important literary aspects that take advantage of the capabilities and contexts provided by the stand-alone or networked computer" (Simanowski 27). Digital literature has the following features: It is digitally born with hyperlink and hypertext as well as coded. It is a literary creation within the popular culture genre that is hybrid, multimodality, multilingual, and interdisciplinary. As a digital creation, it involves human-computer interaction; it is user-friendly, aesthetic, combining audio-

visual as well as ergodic features (see Ugwumgbo, *Eco-Linguistics* 25).

ii. **Features of digital literature (Adapted from Ugwumgbo, *Eco-Linguistics* 25, Di Rosario, *Electronic poetry* 11-23, Egbe 20)** Digitally born, 2. Has hyperlink and hypertext, 3. Coded, 4. Literary creation, 5. Hybridity, 6. Multimodality, 7. Multilingual, 8. Aesthetics, 9. User-friendliness, 10. Audio-visuality, 11. Ergodic features, 12. Interdisciplinary, 13. Popular culture, 14. Involves Human-Computer interaction.

iii. **Digital eco-literature verses Eco-digital literature:** These concepts are related but not the same. Digital eco-literature is an umbrella concept, which includes eco-digital literature as well as other works of eco-concern on social media or any digital platform. It covers any literature of environmental concern that is composed on and with any digital aid. Eco-or environmental digital literature refers to graphically programmed literary works that are of eco-concern which is digitally born. This means it has features of electronic literature as outlined above. While every eco-digital literature is digital eco-literature, not every digital eco-literature is eco-digital literature, essentially because of how each is created and the medium of its creation. The present research is falls under eco-digital literature since the poem under investigation is digitally born with the identified features of digital literature which addresses environmental issues.

1.2. Digital Literature and Scholarship

A growing literacy in literature and language is digital or electronic literature and language. However, what have not been so popular among scholars are studies centered on digital texts that dwell on environmental crises. There few research studies of digital eco concern despite the promising role of the digital platform with regard to the promotion of ideology and social engineering in general. Nevertheless, African electronic literature

is gradually gathering momentum following the first African Electronic Literature Alliance International Workshop Conference (AELAIWC) was held in 2021, at the University of Lagos. While one agrees with Ajah (56) that "African electronic literature lacks critical attention, with scholars questioning the Electronic Literature Organization's limited representation of African works like Flash Fiction Ghana and Bent not Broken", the digital space will open gradually for digital literary works with focus on the environment.
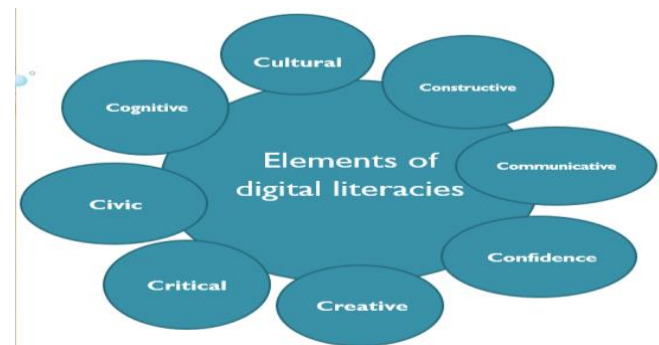
Elements of Digital Literacy:

Figure 1. Elements of digital literacies (adapted from Source: Egbe 20)

1. Cultural: Requires technology use in different contexts and awareness of the values and practices specific to varying contexts. Technology can be used in sociolinguistic studies.
2. Cognitive: Enables mastery of the use of technological tools, software, and platforms.
3. Constructive: Requires reusing and remixing existing resources depending on need, or possibly adapting them into new resources. In fact, Digital Humanities originated as a result of adapting technology to the study of humanities.
4. Communicative: Requires awareness of different communicative devices that are both digital and mobile.
5. Confidence: Places emphasis on gaining competence with digital technologies and, the ability to create an environment for practicing skills and self-learning.

6. Creative: Creates new data in digital environments while taking risks, developing skills, and producing new things. A major creative tool of digital literacy is the multilingual and multimodal feature of the digital platform.
7. Critical: Requires the digital learner to develop various perspectives while actively taking different circumstances into account.
8. Civic: Develops and helps acquire the concepts of democracy and global citizenship as individuals become participants in society (O'Byrne, qtd. in Egbe 21-23).

Hence, digital literature as a branch of digital humanities combines studies in digital literacy and humanities. In environmental digital literature, in which digital literature becomes a medium for eco advocacy, the elements of digital literacy shines out as veritable tools for eco-social engineering.

2.0. LITERATURE REVIEW

Ugwumgbo (*Re-Greening*) *investigated* environmental literature and identified the types, causes and consequences of environmental degradation. Although the study was not on eco-digital literature per se, it suggested the use of eco-techno-criticism theory, which is a practical approach to eco-criticism by advocating technologically-driven text analysis as well as tech-solutions to environmental problems. The present study benefits from the eco perspectives of Ugwumgbo (*Re-Greening*) and extends its focus to digital eco-critical studies.

Earle is one of the few early works to review the digital affordances of *Climatophosis*, which he describes as a digital work, which neither begins nor ends. The fluidity of the poem is interpreted as a metaphor for the seemingly intractable environmental problem in the universe. This current study leans on the eco-interpretation of the digital affordance of *Climatophosis* by Earle on one hand and the textual analysis of the poem with regard to the themes of the poem and how to read the poem by Gackowski on the other. Ajah explored African electronic literature, describing its subgenre, origins, authorship, etc. noting that there is need to explore African electronic literature as an agent that can reshape global culture. In like manner, Waliya ('African Literature on MAELD' 56-57) discussed the canonicity, importance, and future of African electronic literature in terms of data documentation and the creation of database for African electronic literature, which offers hope to greater exploration and advancement of scholars of African electronic literature. From the literature review, it is obvious discourse of African electronic literature is still at its infancy and has no generated enormous critical attention and study. This is one of the impetuses for the current focus on *Climatophosis* by Waliya.

3.0. METHODOLOGY

Mixed-theoretical approach was used in this study. Halliday's systemic meta-function of ideation is used in order to identify the eco-lexical items of the poem used to depict and speak about the environment. Such an analysis shows how eco-concepts and perspectives used in the digital poem express issues relating to the environment. With reference to the digital affordances of the poem, Di Rosario's entax theory was employed to account for the semantics of semiotics within and beyond the texts. Although there are other digital theories such as Aarseth's cybertext theory, Hayles' technotext theory, amongst others, Di Rosario, (*Electronic poetry* 86-91) was found to be more appropriate for this research. This is because, Di Rosario's entax theory is suitable for the analysis of forms, structures and typography of electronic poetry, in order to build a syntax of the electronic space. Unlike syntax, which refers to grammar rules of linguistic signs, entax considers the relation between letters in the space (Giada, 149). Di Rosario (*Electronic poetry* 86-87) identifies three domains of entax, namely micro, meso and macro entax, which corresponds to the three levels of linguistic studies, morphology, semantics and pragmatics.

At the micro-entax level, which roughly corresponds to morphology, words become an entity or a whole with parts but not within a context. It concerns the internal arrangement, relationship and features of the items that make up the E-words

in E-literature; text movement, fonts, letters, color change, and the configuration of typographic signs in lines and text blocks. It deals with the morphemes of the text. It is not meaning centered, though can be metaphorically applied, with literary license. At the meso-entax domain which roughly equates semantics, a word is considered as a whole without a part, a whole within a part (the entire text), and relates to the graphic structure of the entire document. This domain deals with the lexeme by recreating an image with words as with calligrams or reproducing a movement with words such as describing pregnancy by writing the word such that it has the shape of a woman or a car written with the shape of a car. The macro-entax, which relates with pragmatics, concerns the interpretation of the graphic and visual structures of the whole document, together with the textual meaning and theme of the poem within a given context especially through the deployment of metaphors.

Data Presentation and Analysis

What follows is a presentation of the data of this investigation. The textual version of the poem is presented in both the English and French versions. The text and some parts of the graphics are presented through a screenshot of the poem. A pie chart containing the percentage of the different types of words as well as a word cloud representing the word frequency of the text are presented.
 Text of *Climatophosis* in English and French

Climatophosis by Yohanna Joseph Waliya, Nigeria

English Version

The earth shrugs,
Says,
Humanity is a problem to itself
and other living things:
they have learned to take but,
not to give to their environment.

The sea overflows,
Says,
People fill me with plastic,
change my temperature and currents,
and kill my living things.

The glaciers melt,
Say,
I am thousands of years old
but now am disappearing
and will raise the ocean levels to flood the cities.

The sun scorches,
Says,
People are to blame because they cut down the trees
and burn so much carbon, they warm the earth itself.

French version

La terre hausse les épaules,
dit-elle,
l'humanité est un problème pour elle-même
et pour les autres êtres vivants:
ils ont appris à s'en bénéficier,
sans donner à leur environnement.
La mer déborde,
dit-elle,
Les gens me remplissent de plastique,
modifiant ma température et mes courants,
et tuent les êtres vivants.

Le glacier fonde,
dit-il
J'ai des milliers d'années,
mais maintenant je disparais
et je vais élever le courant de l'océan,
pour inonder les villes.
Le soleil brûle,
dit-il
Les gens sont à blâmer parce qu'ils coupent les arbres
et brûlent tellement de charbon qui réchauffent la terre-même.

4. ANALYSIS

Climatophosis is a coinage from two words: 'climate', and 'metamorphosis'. It refers to the changes in the environment occasioned by climate change which is the focus of the poem. This eco-

digital poem makes the environment speak for herself through digital affordances by which the environment blames climate change on the activities of humans. The poem was electronically composed, written in simple English and French in which the texts crisscross each other, highlighting multimodality as a feature of eco-digital literature. The texts combine graphical features along with literary narrative. The entire texts, not just a word or an alphabet, have the movement feature technically known as ergodic feature, which exemplifies the meta entax dimension of the poem. Waliya's environmental poem is a poem of lamentation, in which the environmental bodies: *sea, glacier, sun and earth*, are personified to create awareness about climate change. The poem written in a reported speech, blames the whole issue of climate change on humanity. No wonder there is high frequency of words related to human agents in the poem. There is also the presence of flora lexicon because the trees (*People are to blame because they cut down the trees (*Waliya, *Climatophosis*) are one of the recipients of the activities of humanity, which cause harm on the environment. This point is also supported by the high frequency of abiotic eco-lexicon such as: *things, people, says, living, earth* in the poem.

Personification is a major literary tool used in the poem to create concreteness. The environmental bodies mentioned in the eco-digital poem took up human qualities as illustrated in these extracts from the poem:

 The <u>earth shrugs…says</u>…. The <u>sea overflows, says</u>…. The <u>glacier …says</u>…. The <u>sun… says</u>….

 Through the use of first-person personal pronoun, "I' the environment is personalized as a living being which narrates its story of lament of what it was and is but no longer that which it was and it is. These are conveyed in the following:

I am thousands of years old
but now am disappearing
and will raise the ocean levels to flood the cities

People fill me with plastic,
change my temperature and currents,
and kill my living things

The diction of the poem is in simple English and French. The texts of both languages crisscross each other thus accentuating the digital affordance of the poem as digitally created. The use of these two languages is symbolic. Earle provides a metaphorical nuance to the multilingual feature which gives the feeling of many different conversations going on at once, all on the same topic but unrelated directly. These features are mostly within the domain of micro-entax, which include, "fonts, letters, and the configuration of typographic signs in lines and text blocks. It deals with the morpheme – like for instance words' forms, colors changing" (Di Rosario, *Digital poetry,* 115). The texts' ergodic or non-ergodic behaviors and the background colors and designs which add to the multimodality of the poetic digital features are included as seen in Figure 2 below.

Figure 2: Digital Face View of "Climatophosis" before it is launched.

Before the launching, everything is static (Figure 2 above). There is no movement. The texts, the background, the sun, are all serene. The background has ergodic features of a moving cloud when launched. The background of the poem is made up of multiple colors and features. There is neither color change nor changes in font size. Nevertheless, three major features appear static throughout the dynamic movement of the poem*:* the name of the author/ the place / year of publication, the title of the poem and the sun.

The texts have many features, which include animation features, font size, type, color, and movement. Some palpable animation features are span, transition, move-left infinite, move-right, row-reverse, rotate. Text colors are floral-white, #f0e129", light-sky-blue, hsl (22, 94%, 50%). Text alignment features are left, center, justify.

Figure 4. Pie chart of the biotic eco-lexicon of "Climatophosis".

Figure 3: Screenshot of the first verse of the poem

In addition, a digital affordance added to the digital text which is so important is how to read the text of the poem. The poem is read by launching the poem and hovering the mouse on the texts. The texts on which the mouse is hovered stops moving. This allows the reader to read the particular block of texts. When the mouse is released, the texts continue to move. The data presented below are a summary of the abiotic eco-lexicons of the poem presented in a pie-chart and word cloud as shown in Figures 3 and 4 respectively.
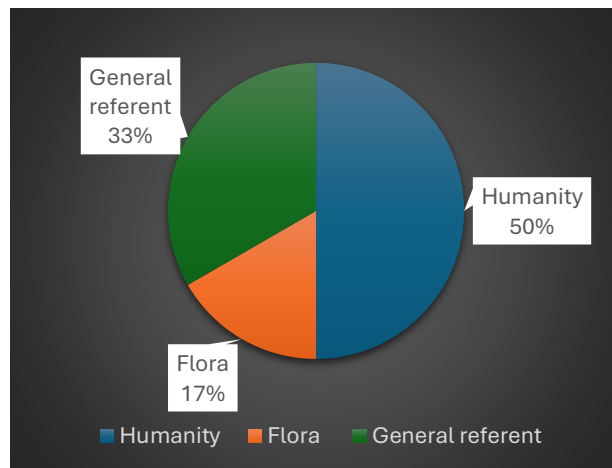
Figure 4 contains the percentage representation of the biotic referents in "Climatophosis". There are three referents, *humanity, flora,* and *general referents*. While *humanity* has 50 percent, which is the highest percent, *flora* and *General* have 17 and 32 percent respectively. Recall that the lexicons under *humanity* are *humanity and people.* Consequently, *humanity* having the highest frequency rhymes with the concern of the poem, which laments the effect of human activities on the environment.

The biotic *flora* has only one referent (*trees*) in the poem. It shows that, the eco-digital poem did not go into looking at the effect of climate change on the many types of *flora* that are in existent. However, he used the word '*trees'* as a synecdoche and metonymy for *flora*. *Tree* is a type and part of *flora* (plants), which is used for the entire class of *flora* in the universe. It is the word that is mostly associated with the word *flora*. This helps the poet to achieve economy of words. And that is one of the functions of language- one can say less or more with language as a system.
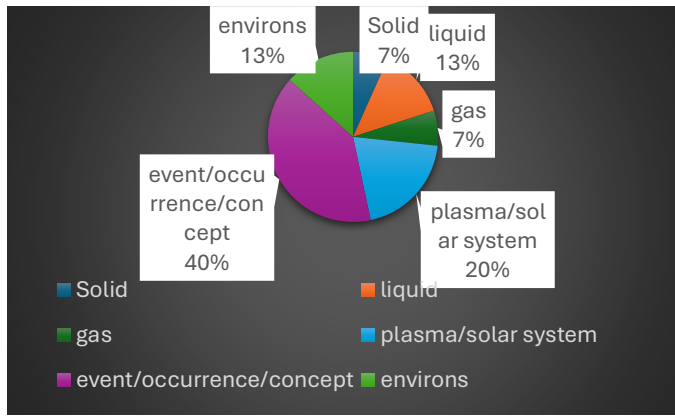
Figure 5. A pie chart showing the Abiotic eco-lexicons of "Climatophosis"

In Figure 5, among the abiotic (non-living things) eco-lexicon referents, *events/occurrence/concepts* rank highest with 40 percent. This shows how the poet describes environmental concepts and situations. He simply retells the environmental crises with the tool of language. Next in rank are *liquid* and *plasma/solar system*, having 20 percent occurrence each. This shows that the water bodies and the solar systems are well considered in the poem. And they are concrete places often affected by environmental crises. In fact, in the poem, they are personified as lamenting and blaming *humanity* as the architect of climate change. The *environs*, which refers to the terms used for places or locations in the poem has 13 percent. This is indicative of the settings in the poem. *Solid* and *Gas* have the lowest and the same percent.

Figure 6: Word cloud of "Climatophosis"

From the word cloud above, the most conspicuous words are: *people, earth, says, living, things*. This shows the interaction between the things within the environment. It is important to point out the process verb, *says/say* which occurs four times in the poem. The verb is used in the context of a participant, in this case, the earth/environment reporting the process of destruction and harm done to it. It is an important epistemic choice because the environment speaks for itself and tells of its debilitating narrative of what it has suffered through human hands and actions.

The multimodal and multilingual affordances and features are highlighted by the visual platform with text features in two different languages all helping in meaning-creation. The background's multiple colors with its ergodic features is taken to be at micro entax, as the environment where the text stays, just like in any writing platform-writing page background. The multiple colour effects highlight types of environmental crises, highlighting the environmental theme and feature of the work. The poem is static before launching. It becomes ergodic after, with the texts stopping only when the mouse is hovered over them. Prior to moving the mouse, the scene depicts pristine nature, which degrades with the action of humans. The digital reading skill highlights the human-computer interaction affordance of the text.

The suggestive meaning of the title and behavior: *Climatophosis* symbolizes how Nigeria or the world is plunging the environment and creating climate change. This is the domain of linguistic semantics – where words suggest behavior and coinage suggests meaning. The text features which include animation, font size, type, color, and movement are under the domain of micro entax-morphological features. They can be interpreted as the small human actions that lead to big environmental issues, since the texts builds up from alphabet, morpheme to sentence. The interpretation of the texts and graphics of the poem within ecosophy is under the domain of macro entax-pragmatics while the reading style and skill are under meta-entax. Akin to the above, the ergodic features, and the multiple color features are metaphors for the multiple areas experiencing climate change. They connote the different aspects and types of environmental crises.

They also resonate with the multiple activities that cause environmental crises. The background is in constant flux. Even hovering the mouse does not stop it. It stops only the texts. This is typical of the moving sky, and a metaphor for the continuous changes in the environment as time passes by. It also shows the helplessness of man in the face of natural disaster.

Furthermore, "The text keeps moving around the world symbolizing all the discussion that goes on surrounding climate change whilst the temperatures of the earth remain the same" (Earle). The moving texts are stopped by hovering the mouse on them. This reminds humanity that just as they caused the change, they can also stop the crises through their actions. Besides, the static features show that even in the changing climate, there are unchanging things, like the earth itself, which has continued to exist despite the changes within it. They are also pointers to human problems, which are constant, but in different forms.

The constant moving of the text and the temperature map (Earle) cloud-background of the digital text is a creative way of showing the universality of environmental crises, which has engulfed the universe. Consequently, the hovering of the mouse, which stops the movement of the portion under the mouse, is indicative of human-computer interaction. In the context of text. This signifies the fact that humanity must act fast to stop the environmental crises.

The research has shown that in the theory of entax as outlined by Di Rosario (*Electronic poetry* 117), there are digital affordances that are beyond the three domains of entax (micro, meso, and macro). These affordances are beyond the entax because they have nothing to do with the texts of the poem, yet they contribute to the meaning and understanding of the poem. This fourth domain identified as meta entax (beyond entax) (Ugwumgbo, *Eco-Linguistics,* 89*)*, reveals how the poems are read, the human-computer interaction, the sounds if any, technical features, which contribute to meaning creation and interpretation of the poem. An instance is the reading of *Climatophosis* in which the texts stop when the mouse is hovered on them. This affordance is interpreted as humanity's control as well as impact on nature (see Ugwumgbo, *Eco-Linguistics,* 87). These features when interrogated further are seen as veritable tools for promotion of ideologies. These features enable digital poems to create images that speak to multiple and wide audiences and invoke the need to act.

5.0. CONCLUSION

The paper examined the place of digital literature through an analysis of Climatophosis by Waliya. In doing that we identified the biotic and abiotic eco-lexicons found in the poem using Haliiday's meta-function of ideation within Systemic Functional Grammar as well as Di Rosario's digital theory to interrogate the digital affordances of the poem. This is done in the context of a growing digital culture and global digital citizenship through the genre of environmental digital literature, which opens a fresh and refreshing window within the domain of digital literature and digital humanities. This paper contextualizes the global environmental crises on one hand, and advocates the use of eco-digital literature as an instrument to create a new sense of being to protect, care and safeguard the environment for the flourishing of humanity and the ecosystem in general.

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