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Ecological Analysis of Public Speeches in United Nations Framework Convention on Climate Change: A Perspective of Transitivity

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***Abstract*—The objective of this study is to investigate ten speeches delivered at the 15th (COP15) and 26th (COP26) sessions of the United Nations Framework Convention on Climate Change (UNFCCC), guided by the ecosophy of "harmony, diversity, co-existence, and interaction" to extract and analyze the prevalent ecological perspectives on climate change, as well as to assess the advancements achieved since COP15. A quantitative analysis is undertaken based on the principle of transitivity, utilizing statistics pertaining to the distribution patterns of processes, participants, and the environmental elements within clauses as the fundamental data for assessment. The study revealed that the ecological perspective of the discourses is in line with the ecosophy, which advocates balanced development alongside the remediation and replenishment of nature, and the ecological perspective of COP26 significantly diverges from that of COP15, primarily due to the remarkable technological advancements achieved since then and the heightened confidence among individuals in tackling the challenges posed by climate change.**

***Index Terms*—ecological discourse analysis, transitivity, climate change**

I. Introduction

Halliday (2001) believes the language system can reflect how humans perceive the world. Language, both in its oral and written manifestations, serves as an indispensable tool for people's daily endeavors, embodying and expressing one's consciousness and thought processes. Since the 1990s, propelled by growing concerns and prescient awareness of deteriorating environmental conditions, people across the globe have embarked on concerted efforts to mitigate the dire consequences of rampant industrial development. These initiatives primarily encompass environmental advocacy campaigns orchestrated by non-governmental organizations, as well as the establishment of international platforms fostering collaboration among nations. These actions serve as a testament to the evolution of ecological ideologies, wherein people today attach far greater significance to safeguarding the earth than they did in the 1800s. They reflect a profound shift in priorities and heightened awareness towards environmental conservation. What's more, both actions and words have significant impact on the ecosystems of the planet (Huang & Chen, 2016). Language has undergone a refreshing transformation, with dictionaries embracing a plethora of novel entries that underscore environmental protection and ecological nuances. Terms like "greener", "carbon neutralization", and "sustainable" have emerged as testaments to this shift. In this regard, language becomes the vessel through which the conscious minds—the very essence that steers human actions and decisions—are articulated and disseminated, fostering a deeper understanding and appreciation for the delicate balance of the ecosystem.

The discipline that focuses on the connections between language and ecology is called ecological linguistics, put forward by Haugen in 1971. Ecolinguists scrutinize materials ranging from books to scripts even the advertisements (Alexander & Stibbe, 2014) in order to discern the implicit ecological attitudes embedded within these texts and decipher the connotative perspectives on the intricate relationship between human and nature. The analytical method, Ecological Discourse Analysis (EDA), is one of the paradigms of ecological linguistics (He, 2021), the aim of which is to reveal the ecological consciousness in discourses, to criticize destructive discourse and to champion beneficial discourse. As EDA is an endeavor inherently steeped in political and cultural values, ecological philosophy, or ecosophy, emerges as a pivotal concept that underpins and guides this analytical framework. "Ecosophy is the criterion for the judgment of the ecological property and orientation of discourse. It plays a directional guiding role in people's mind,

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discourse, and ecological behavior; in turn, they can also influence ecosophy, so together they form a cycle, as shown in Figure 1 (Cheng, 2022, p. 190)". Thus, this paper adopts the ecosophy of "harmony, diversity, co-existence and interaction", constructed by He and Wei (2018).

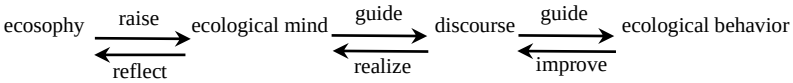

Figure 1. Cycle Between Ecosophy and Ecological Behavior (He et al., 2021, p. 54)

The topic of the discourses in the present study concentrates on climate change, a preeminent global ecological issue that stands as the most pressing environmental challenge confronting the entire world. Without interference, it poses dire threats to living conditions, undermines food security, and profoundly impacts human health. In response to this dire situation, UNFCCC serves as a pivotal forum where delegates from diverse nations convene to negotiate and collaborate on measures aimed at mitigating and adapting to the impacts of climate change.

The current research investigated ten discourses launched in UNFCCC, applying transitivity, one of the theories of system functional linguistics (SFL). Specifically, it scrutinizes five discourses sourced from COP15, colloquially known as the "Copenhagen Climate Change Conference" held in 2009, and another five discourses hailing from COP26, convened in Glasgow, United Kingdom, in 2021. The primary objective of this research is to uncover the linguistic features that characterize these discourses and the salient, nuanced ecological concepts they convey. By doing so, the study aims to gain insights into human attitudes towards mitigating the pace of climate change and to trace the evolution of people's ecological perspectives from 2009 to 2021, shedding light on how linguistic constructs have mirrored and influenced these transformative shifts in consciousness. The following research questions will be the primary concerns:

1. In light of transitivity system, what are the speakers' intentions about climate change? How do the speakers achieve their intentions?

2. What ecological ideas are reflected in the discourses delivered in COP15 and COP26 respectively? What are the differences between them?

II. Literature Review

A. Ecological Discourse Analysis

Chawla (2001) stated that English language habits are not beneficial to the natural environment. Halliday (2001, p. 192) reminded readers that the grammatical structure could reflect human's unconscious pursuit of growthism and hierarchism, and called for attention to "the role of language in environmental issues". Yet considering the immutability of language structure, EDA, the orientation analysis and discourse analysis to ecological meanings, has been highlighted. According to He (2021), EDA, followed by certain ecosophy, targets at judging the environment-beneficial, environment-ambivalent, and environment-destructive discourses to which linguists have applied critical discourse analysis (CDA) and harmonious discourse analysis (HDA).

The choices of discourse types and themes are not constrained. Alexander and Stibbe (2014) suggested that researchers should dig deeper into the forms of discourses. The main source of environmental discourse is media communication, and the speeches of enterprises, governments and celebrities also contain discussions of environmental issues (Zhang & Hu, 2024). Poole (2016) argued for human as a role of dominion and authority in ecological issues through a corpus-based ecological discourse analysis to texts from mining company. Sun and Yang (2020) discovered that the "Top 100 Online Positive Energy Articles of 2018" adhered closely to the underlying assumptions and guiding principles of HDA. Therefore, it is feasible for this study to choose public speeches as research materials.

Discourses themed as climate change are also a hit. According to Zhang and Hu (2024), the comparison of climate change and carbon discourse over time also reflects the perceptions and attitudes of the state, media, and leaders towards environmental issues. Napolitano and Aiezza (2019) used CDA to compare typical words, keywords, and high-frequency words and found that Obama was committed to sustainable development, but Trump-era discourse flouted and underestimated climate change issues. Currie and Clarke (2022) examined conceptual metaphors in the UK parliamentary climate change debate to reveal shifts in policymakers' perceptions of climate change. Yet till now, rather a small number of researches has been shown to choose official discourses from United Nations as well as testing the ideology advancements over a relatively long period of time.

In conclusion, EDA represents a profound self-reflection of humanity. The development of this field necessitates a continuous analysis of ever-evolving discourses. Consequently, the current research stands as a valuable contribution to the ongoing development and refinement of EDA.

B. Ecological Discourse Analysis and Transitivity

Within the SFL theory, the experiential metafunction refers to the representation of our experience of the world (Halliday & Matthiessen, 2004). According to Halliday and Matthiessen (2004), transitivity system is an important semantic system to perform the experiential functions, and it is the expression of various experiences in the real world. Transitivity analysis serves as an effective way to reveal the ecological implications embedded in the experiential meaning of discourse, raise people's ecological awareness and further improve their behavior (Zhang & He, 2020).

Gu and Guo (2023), within the framework of SFL, examined the intricate ecological relationship between human and nature as portrayed in Shen Congwen's novel, Border Town. Their analysis urged a profound reevaluation of the respective roles played by humans and nature, offering a fresh perspective and a new research direction for ecological discourse analysis.

The application of SFL to discourse analysis boasts significant practicality (Xin & Huang, 2013). In short, based on the previous analysis, it is feasible and appropriate to apply transitivity to EDA, and meanwhile, the aim to reveal the underlying ecological meanings in public speeches can be effectively accomplished through a combined approach of quantitative and qualitative analyses, leveraging both CDA and HDA methodologies.

III. Methodology

A. Research Method

Following the theoretical framework of SFL, and guided by the ecosophy "harmony, diversity, co-existence and interaction", the current research aims to adopt transitivity system to analyze 10 public speeches chosen from UNFCCC. In this study, an investigation was conducted on the process types and main participants in public speeches from UNFCCC. The beneficial, ambivalent and destructive sentences were evaluated, and the results were analyzed quantitatively by using descriptive statistics. Besides, the framework and metaphors will be taken into consideration when it comes to the discussion.

B. Source of Discourses

In this paper, in total ten discourses are chosen for transitivity analysis. Five discourses are chosen from COP15 and the other five discourses are from COP26 in UNFCCC.

The selection of discourses from COP15 and COP26 in this study is grounded on two main reasons. Firstly, the years in which these conferences were held—2009 for COP15 and 2021 for COP26—mark crucial junctures in the global narrative on national-level strategies to address climate change. COP15, the Copenhagen Conference, coincided with the impending expiration of the Kyoto Protocol, ushering in the need for a fresh cooperative framework. COP26 arrived on the heels of the adoption of the Paris Agreement, signifying a new era in international climate action. Secondly, the intervening decade between 2009 and 2021 provides ample time for the evolution and transformation of ecological ideologies. This temporal span enables a discerning analysis of discourse, shedding light on how ecological perceptions towards environmental protection have shifted and matured over time.

To ensure the authenticity and reliability of the data, all discourses utilized in this study have been downloaded from the official website of the United Nations. This step guarantees that the source material is of the highest quality, free from any bias or misinterpretation, and directly reflects the official proceedings and discussions held during COP15 and COP26.

C. Data Collection and Analysis

Adhering to the principles of SFL, a meticulous manual analysis was conducted to quantify the six discourse processes and the distribution of participants within these discourses. This approach ensures that each occurrence of the discourse processes and the roles played by the participants are accurately identified and recorded.

In conducting this research, a series of principles grounded in SFL have been followed to ensure the accuracy and precision of the clause selection. Specifically, the following rules have been applied. As for dependent clauses, only the finite clauses are considered for analysis, which include object clauses, adverbial clauses, non-defining relative clauses. The paralleled clauses and para-tactic verb phrases are treated separately and counted individually.

The sentences in this study have been classified into six types based on their verb usage, aligning with the fundamental processes outlined in SFL. The six processes are material process, mental process, relational process, verbal process, behavior process and existential process. (1) Material Process: This process captures actions and occurrences, emphasizing the "doing" or "happening" aspects of events and their resulting changes. (2) Mental Process: This process delves into the realm of human consciousness, encompassing two primary subtypes: emotions (e.g., "I'm pleased to do...") and perceptions (e.g., "see", "understand", "think"). (3) Relational Process: This process describes states of "being" rather than actions or sensations. It encompasses three types: location (indicating where something is), possession (indicating ownership), and static quality (indicating the inherent attributes of something). (4) Verbal Process: As the name suggests, this process revolves around "saying" and the communication of information. It includes not only speech acts but also any actions that convey the transfer of information, such as writing or signaling. (5) Existential Process: This process highlights the existence or occurrence of something, typically marked by the characteristic "there be" sentence structure. (6) Behavior Process: This process focuses on physiological or instinctive human actions that do not require conscious decision-making, such as breathing, smiling, or crying.

The abbreviation of ingredients of each process is presented as follows:

Ma: Material process; Me: Mental process; Re: Relational process; Ve: Verbal process; Ex: Existential process; Be: Behavior process

A: Agent; G: Goal; B: Behaver; Sy: Sayer; Rv: Receiver; S: Senser; Ph: Phenomenon; Ca: Carrier; At: Attribute; Id: Identified; Ir: Identifier; Ex: Existent

Below are samples of transitivity analysis in this study.

Surely now [Id], then, is [Re] the time [Ir] to recognize that we [Ca] cannot have [Re] capitalism [At] without Natural capital—we [A] cannot sustain [Ma] our human economy [G] without sustaining Natural economy? I [S] know [Me] that so very many [A] of you here today have been negotiating [Ma] the unbelievably complex details [G] of a potential agreement for a very, very long time, and you [Ca] must be [Re] profoundly weary [At].

IV. Result

A. *Distribution of Process Types*

Five discourses in COP15 held in Copenhagen in 2009 are chosen for the analysis in the current study. There are 4,357 words and 255 processes in total.

Material process accounts for the most, comprising nearly half of the total number of processes. Relational process follows closely, accounting for 25.88%. Mental process occupies a notable proportion of 12.94%. Lastly, verbal process and existential process contribute 8.24% and 1.96% respectively.

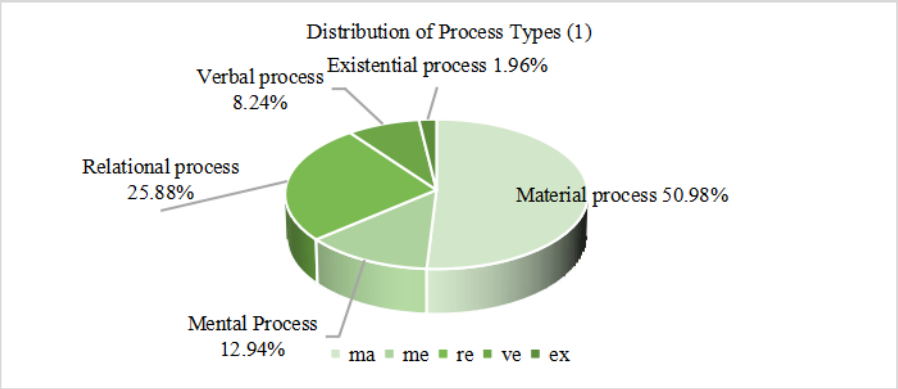

Figure 2. Distribution of Process Types of COP15

For the purpose of comparison with discourses in COP15, 5 discourses from COP26 are selected and analyzed, which consists of 5,047 words and 256 processes in total.

Material process accounts for the most, with the percentage of 57.42; relational process ranks the second, with 33.20%; it is then followed by mental process, with a proportion of 5.47%; the last two are verbal process and existential process, taking the percentage of 1.17 and 2.73 respectively.

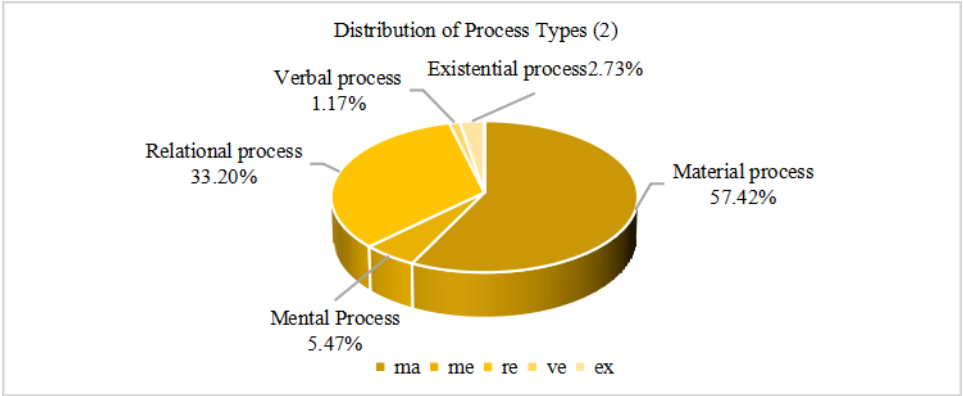

Figure 3. Distribution of Process Types of COP26

The distribution of process types across the discourses from both COP15 and COP26 displays striking similarities. Material process and relational process account for a large proportion of the whole. Existential process occupies a rather small proportion in both sets of discourses, yet their consistent presence underscores their indispensable role in shaping the overall discourse. The counts of verbal process and mental process have undergone notable changes, marked by a relatively significant decline.

B. *Distribution of Participants*

Participants can be divided into four types. The first type is Human, which refers to the real man and the countries governed by human. The second type is the natural entity, any stuff concerning nature, such as forests, wind, and sea. And it can also be divided into two sub-types, that is, climate change and other natural entities. The reason for this subdivision is that climate change is the topic in the current study, and it makes it easier to analyze people's attitudes towards climate change. The last part is the stuff unrelated to both human and nature.

In discourses of COP15, human and stuff that is unrelated to human and nature account for 93.81%. Natural entity accounts for 6.19%; the proportion of other natural entities is a bit more than that of climate change.

TABLE 1
DISTRIBUTION OF PARTICIPANTS IN COP15

Human/ Country	51.33%
Climate Change	2.65%
Natural entity (Excluding Climate Change)	3.54%
Stuff unrelated to human and nature	42.48%

In discourses of COP26, human and other unrelated stuff account for nearly 92%, with the left 8% used for natural entities. And therein the number of climate change has 2% increase and the proportion of other natural entities remains nearly the same.

TABLE 2
DISTRIBUTION OF PARTICIPANTS IN COP26

Human/ Country	47.33%
Climate Change	4.96%
Natural entity (Excluding Climate Change)	3.05%
Stuff unrelated to human and nature	44.66%

V. DISCUSSION

A. Ecological Meaning Constructed by Material Process

Material process accounts for the largest proportion in both sets of discourses, which as mentioned above, might not be a tangible or real action, but always construes a sequence of transformations that unfold through the progression of events. As the discourses under analysis are sourced from the UNFCCC, an international forum dedicated to tackling a pressing global challenge faced by all humanity, these material processes effectively convey objective information regarding the current climate scenario and the measures undertaken by various nations. Moreover, they function as foreshadowing to achieve the function of "calling for action" and "proposing solutions" to the audience.

In the speeches delivered at COP15, material processes encapsulate six dimensions. These dimensions include the speaker's actions, which bear no ecological meaning (for this reason, they won't be listed in the examples), human actions, the impact of climate change, the function of ecosystem and specific natural entity, the changes of the natural situation and facts or truth presented by the "Agent". Each of these dimensions is illuminated through the following sentences.

(1) If we *[Agent]* **share in** *[Material Process]* **that vision** *[Goal]***, we** *[Agent]* **can share** *[Material Process]* **the will** *[Goal]* **to action that is now required.** [Human action]

(2) Let *[Material Process]* **us** *[Agent]* **keep** *[Material Process]* **in mind the whole** *[Goal]***. Let** *[Material Process]* **us do** *[Material Process]* **all we can to reach this goal** *[Goal]*. [Human action]

(3) We *[Agent]* **all depend on** *[Material Process]* **each other** *[Goal]***— and crucially, on each other's actions** *[Goal]***.** [Human's current situation]

(4) Any decline *[Agent]* **in the fragility of the whole increases** *[Material Process]* **the fragility** *[Goal]* **of the whole.** [Impacts of climate change]

(5) Not only do they (tropical rainforest-ecosystem) *[Agent]* **habour** *[Material Process]* **about half of our terrestrial biodiversity** *[Goal]* **and generate** *[Material Process]* **much of the rainfall** *[Goal]* **that is vital for farming, they also absorb** *[Material Process]* **and hold** *[Material Process]* **...** [Function of ecosystem/ natural entity]

(6) As our planet's life-support system *[Agent]* **begins** *[Material Process]* **to fail** *[Goal]***.** [Change of natural situation]

(7) The need *[Agent]* **fully to engage the private sector reflects** *[Material Process]* **not only the growing determination** *[Goal]* **of business to act in a sustainable way but crucially, its determination** *[Goal]* **to listen to customers.** [Truth presented by the Agent]

Among these material processes, human actions can be categorized into two principal types: those previous actions already undertaken by humans towards nature, which may encompass both beneficial endeavors and detrimental destructions; and prospective actions anticipated for the future. Notably, the frequency of the former is significantly lower than that of the latter. These speakers predominantly emphasize outlining what leaders and people ought to do in the future, rather than critiquing past destructive human behaviors towards nature. Moreover, the current actions being taken are not explicitly highlighted.

Indeed, the current state of climate change has been portrayed through material processes, albeit often in a non-specific manner, evident in the use of adjectives such as "intensified" and "massive" in example [8], which offer a broad yet imprecise depiction of the phenomenon.

Fortunately, the issues outlined above have undergone partial transformation in the discourses of COP26. In President Xi Jinping's speech (example [9]), he not only criticized the undue exploitation of nature but also denounced the previous harm inflicted by humans on ecosystem balance. Furthermore, in example [11], he highlighted China's commitment to carbon neutrality, specifically mentioning the stringent control over coal consumption and carbon dioxide emissions—a

tangible and achievable goal that shows the country's determination and instills confidence in people to win this competition. Encouragingly, China does not stand alone; the Prime Minister of Australia announced that Australia has doubled its climate finance commitment to 2 billion dollars, while President Sadyr Japarov of the Kyrgyz Republic expressed his ambition to develop renewable energy. This signifies a significant step forward as numerous countries are actively taking measures to mitigate the pace of climate change. The subsequent challenge lies in ensuring the efficacy of these actions undertaken by each nation.

(8) Since time of the industrial civilization, mankind *[Agent]* **has created** *[Material Process]* **massive material wealth** *[Goal]***. Yet it has come at a cost of intensified exploitation of natural resources, which disrupted the balance in the Earth's ecosystem.**

(9) China *[Agent]* **will strictly control** *[Material Process]* **coal-fired power generation protects** *[Goal]* **and strictly limit** *[Material Process]* **the increase** *[Goal]* **in coal consumption over the 14th Five-Year Plan...**

Foremost among these is the unanimous acknowledgment that climate change transcends national borders, constituting a global challenge requiring collective action under the UNFCCC framework. As exemplified in instance [10], a unified alliance among nations is envisioned to tackle this pressing issue, with each country tasked with setting definitive goals. Furthermore, there is a consensus on the necessity for all nations to mitigate carbon dioxide emissions, while developed countries are encouraged to extend financial and technological assistance to developing nations, as highlighted in example [11]. These discourses delve into the intricate interplay between economic growth and environmental preservation, acknowledging the inevitable utilization of natural resources without advocating for their unrestrained exploitation. Instead, the speakers advocate for a nuanced approach to resource consumption, where finances are channeled towards ecological restoration initiatives such as afforestation, as alluded to in example [12]. This suggests that human has a novel attitude towards "consuming the natural resources". This shift in perspective signifies a more pragmatic and responsible stance towards harnessing natural resources. It eschews the extremes of either relentless depletion or absolute abstention, embracing instead a strategy of compensatory investment as a viable means of balancing human needs with environmental stewardship.

Some speakers adopt a more nuanced perspective on the impact of climate change, reframing it not solely as a dire threat but also as a catalyst for transformative change. As evidenced in example [13], they perceive it as an opportunity to reshape the economic system and propel advancements in cutting-edge technology. This optimistic outlook, echoed in discourses from COP26, underscores the potential for climate action to serve as a driving force for positive transformation, fostering innovation and sustainable development.

(10) And the success *[Agent]* **of our endeavors depends on** *[Material Process]* **us** *[Goal]* **forging a new alliance, the global alliance of 192...**

(11) Countries *[Agent]* **with substantial emission of carbon dioxide and other greenhouse gases should take** *[Material Process]* **specific commitments** *[Goal]* **to reduce such emission. Developing countries...** *[Agent]* **can expect** *[Material Process]* **great financial, technical and organizational assistance** *[Goal]* **for adaption to the climate change...**

(12) If we *[Agent]* **can provide** *[Material Process]* **the finance** *[Goal]* **to save our banks from the bankers, we** *[Agent]* **can with the right financial support, save** *[Material Process]* **the planet** *[Goal]* **from those forces that would destroy it.**

(13) They (efforts for prevention of climate change) *[Agent]* **create** *[Material Process]* **also a great opportunity** *[Goal]* **for all nations to introduction of modern, effective and energy-saving technologies...**

B. Ecological Meaning Constructed by Relational Process

Relational process, which delineates the fundamental connections between entities, ranks as the second in these two sets of discourses. According to Halliday and Matthiessen (2004), relational process functions to characterize, identify, and portray the static or inert relationships between two entities. Within the discourses from COP15 and COP26, relational processes predominantly utilize verbs such as "be" and "have". In the former segment of example [14], the speaker employs a relational process to underscore the undeniable reality that our planet is in the midst of a crisis, a fact that is perceived as distressing. Notably, the order of the two clauses in this part can be interchanged, signifying a process of identification. Conversely, the subsequent clause, which underscores humanity's limited window of seven years before the situation spirals out of control, embodies a relationship of "possession", highlighting humanity's exclusive stake in this matter. This clause subtly conveys the important role humans can play in combating climate change, emphasizing human dominance in addressing this pressing natural challenge.

(14) For the grim reality *[Identified]* **is** *[Relational Process]* **that our planet has reached a point of crisis** *[Identifier]* **and we** *[Carrier]* **have** *[Relational Process]* **only seven years** *[Attribute]* **before we lose the levers of control.**

The intricate relationship between human beings and climate change has been eloquently portrayed through relational process. In contrast to the directness of material process, relational process offers a more nuanced reflection on human activities, as evidenced in examples [15] and [16]. Here, the deliberate use of determiners "unsustainable" and "systemic" serves to characterize human consumption of natural resources as negative and imply disapproval from the speaker. This phrasing subtly conveys a sense of urgency, suggesting that human actions must undergo a transformative shift. Nevertheless, while the sentiment is clear, the depiction of these actions remains somewhat abstract, lacking specific

quantifiers such as precise figures for rainforest depletion or other depleted natural resources. Consequently, the intended urgency and clarion call to action may not resonate with the audience as strongly as intended, as the alarm bells fail to ring with the definitive clarity they deserve.

(15) We *[Carrier]* **appear** *[Relational Process]* **intent** *[Attribute]* **upon consuming the planet.**

(16) Because climate change *[Carrier]* **is intimately connected** *[Relational Process]* **with our systemic, unsustainable consumption** *[Attribute]* **of natural resources...**

The concept of "no national boundary" has been prominently underscored, advocating for a collective "we" rather than "them and us", as exemplified in instance [17]. Paradoxically, the outcomes of COP15 fell short of expectations, with no tangible agreement secured. Despite the frequent invocation of "human solidarity" (as seen in example [18]) throughout the speeches, the reality is that most developed nations prioritize their own interests over the well-being of the global human community. Public speeches can be deceptive. Some capitalist nations, whose foundations rest upon the historical exploitation of labor and natural resources, continue to extract resources from vulnerable developing countries and nature for greater profits while paradoxically proclaiming their good ecological conditions and institutional forms. The essence of human solidarity remains paramount, yet it necessitates concerted efforts from every nation, as aptly stated by the Prince of Wales at COP15, "Our grandchildren will not inquire about what our generation said, but rather what we did." This reminder underscores the urgency and responsibility we all bear in translating ideals of solidarity into tangible action.

(17) This *[Identified]* **is** *[Relational Process]* **not a problem***[Identifier]* **resolvable in terms of "them and us".**

(18) It *[Carrier]* **is** *[Relational Process]* **nothing** *[Attribute]* **more than human solidarity** *[Attribute]***.**

Compared to the discourses presented at COP15, the discourses from COP26 convey a distinct sense that world leaders are armed with more definitive measures aimed at tackling the climate crisis. For instance, in example [19], many countries have invested heavily in renewable energy, which has since flourished globally and is now widely regarded as the pivotal solution to mitigate the climate issue. Furthermore, the Prime Minister of Australia, in his address, commended the advancement in recycling technology within Australia, highlighting the tangible progress being made. These verbal expressions mirror the genuine advancements and achievements being realized in the real world. In contrast to COP15, people possess a more profound comprehension of the tools and advantages available to combat climate change. Inspired by the impassioned speeches and their underlying messages, people are more energized and confident in pursuing collaboration and solidarity. Consequently, as evident in examples [20] and [21], a prevalent sentiment of optimism pervades COP26, with many speakers expressing their belief in a brighter future for addressing climate change.

(19) Renewable energy *[Identified]***, especially hydro-power, will be** *[Relational Process]* **the driver** *[Identifier]* **of the carbon-free economic development. We intend to develop medium hydro power projects with a view of shifting industry, housing and utilities infrastructure to electricity consumption...**

(20) We *[Carrier]* **remain** *[Relational Process]* **very optimistic** *[Attribute]***.**

(21) There is *[Existential Process]* **cause for optimism.**

C. Ecological Meaning Constructed by Mental Process and Verbal Process

Mental process involves people's consciousness and tends to involve at least one human participant. In discourses from COP15 and COP26, mental process is used to express the speaker's thoughts, the public's awareness and make an appeal to the public through imperative clauses. Verbal process usually adopts verbs concerning "saying", encompassing any exchange of message. In the speeches from COP15 and COP26, verbal processes function in two primary capacities: firstly, they convey the opinions and viewpoints of others; secondly, they evoke emotions within the audience. The frequent use of words such as "say" and "call" underscores the importance of communication and the power of language in shaping attitudes and spurring action.

The integration of mental process and verbal process in the discourses provides a distinct illumination of the functional significance inherent in the public speeches. An examination of mental process reveals that, beyond the shared vision of a "community with a common future" and the universal acknowledgment of the urgency to address "climate change", the discourses underscore the pivotal role of leadership in each nation. These discourses, sourced from the global gatherings, COP15 and COP26 under UNFCCC, are reserved for select audiences: national leaders, esteemed experts, and a handful of celebrities. Yet, the broader ambition of these conferences transcends its exclusive attendees, aiming to inspire a global call-to-action against climate change. To that end, the employment of evocative language that can resonate deeply with the worldwide audience becomes paramount.

In example [22], the use of "we" as the senser effectively conveys a sense of unity, highlighting the widespread anticipation surrounding the conference. The inclusion of words like "we", "all", and "aware" highlights the fact that this notion is a universally shared consensus. Shifting to example [23], although the senser transitions to "I", the relational process maintains a focus on the "possessive" relationship, acknowledging the remarkable nature of the conference. By emphasizing the significance and objectives of the conference, these speeches serve as a reminder to leaders of their pivotal role in addressing climate change. They ignite a sense of responsibility, urging leaders to embrace the aspirations of the people and actively collaborate with each other. Ultimately, despite the variation in senser usage, the speeches achieve their goal of resonating with listeners by presenting a shared understanding and consensus on the matter at hand.

The employment of evocative words, such as "imagine" and "remember", is instrumental in arousing audience awareness. Within the discourses of COP15 and COP26, these potent expressions frequently grace imperative sentences, exemplified in instances like [24] and [26]. By integrating evocative language into imperative clauses, the speaker

effectively conveys a sense of urgency, urging listeners to take action. Here, the senser of the mental process encompasses the entire audience, the global human community, signifying that the responsibility rests on everyone's shoulders.

Imperative clauses, by their very nature, evoke stronger emotions, compelling listeners to engage and respond. In example [24], the speaker invites the audience to envision a "healthier, safer, and more sustainable economically robust world". This vision serves as a beacon of hope, inspiring world citizens to strive towards its realization. Moreover, the aspiration for a sustainable and economically thriving world embodies a profound ecological philosophy that looks towards the future development of the earth with sustainability at its core.

Beyond the analysis of financial investments in natural resources, example [25] delves into the intricate relationship between economy and nature. It underscores the crucial realization that nature is not an endless resource to be exploited without consequence; rather, humans must invest in its preservation and restoration. From this perspective, nature is elevated to a status nearly equivalent to human economy, emphasizing the interdependence and balance that must exist between the two.

(22) We *[Senser]* **all aware** *[Mental Process]* **that the world** *[Carrier]* **has** *[Relational Process]* **exceptional expectations** *[Attribute]* **towards this Conference** *[Phenomenon]*.

(23) I *[Senser]* **think** *[Mental Process]* **each of us should have** *[Relational Process]* **the same feeling that we are taking part in a really remarkable meeting** *[Phenomenon].*

(24) Imagine *[Mental Process]* **a healthier, safer, and more sustainable economically robust world** *[Phenomenon]*.

(25) Surely now, then, it *[Carrier]* **is** *[Relational Process]* **the time** *[Attribute]* **to recognize that we cannot have capitalism without Nature's capital — we cannot sustain or human economy without sustaining Nature's economy.**

(26) Remember *[Mental Process]* **that our grandchildren will ask not what our generation said, but what it did** *[Phenomenon].*

Verbal process is much more straightforward in arousing others' emotion because the participants and acts in verbal process are definite. For instance, in examples [27] [28] and [29], the speaker is the sayer, articulating four wishes in his speech, respectively for the conference, the developed world, the developing world and the average people. This formulation indicates a collective responsibility shared by humanity, emphasizing that no individual should be left to fend for themselves in the face of adversity. Moreover, it serves as a testament to the speaker's ecological attitude, highlighting climate change as a pressing issue that necessitates the concerted efforts of all. It highlights the important role of leaders in addressing this challenge, for should they falter, millions of people would be condemned to "injustice without remedy, to sorrow without hope, to deprivation without end". Thus, the verbal process not only elicits emotions but also fosters a sense of urgency and unity in the face of a global crisis.

(27) I *[Sayer]* **say** *[Verbal Process]* **to the conference** *[Receiver]***: informed by science, moved by conscience, inspired by common purpose we, the leaders of the fragile world, must affirm: we will not condemn millions to injustice without remedy, to sorrow without hope, to deprivation without end.**

(28) To the developed world *[Receiver]* **I** *[Sayer]* **say** *[Verbal Process]* **...; To the developing world I say...**

(29) For people *[Receiver]* **I** *[Sayer]* **rightly say** *[Verbal Process]***: If we can provide...**

D. Ecological Meaning Constructed by Existential Process

Existential process, characterized by the sentence structure "there be", is used to accentuate tone and emphasize facts within the discourses of this research. Despite its proportion remaining relatively constant, it is noteworthy that at least one sentence with existential process appears in every discourse analyzed, with the majority adopting a negative form ("there be not"), thereby serving as a potent emphasis tool. The sentence with existential process inherently conveys a condition-result relationship. For instance, in example [30], the speaker posits that continued deforestation in tropical regions serves as the condition, leading to the dire consequence of an unsolvable climate change problem and an unimproved climate situation. This underscores the urgency and importance of halting tropical deforestation. Similarly, in example [31], the condition that "the climate change comes with the air we breathe and the water we drink" is presented as a factual or current scenario, leading to the realization that climate change transcends national boundaries, emphasizing its global nature.

Furthermore, example [32] highlights the invaluable significance of the planet's shared future, echoing President Xi Jinping's ecological civilization philosophy that the "lucid waters and lush mountains are invaluable assets". In conclusion, existential process is indispensable in speeches aimed at problem-solving, as it effectively emphasizes the gravity, necessity, and inherent attributes of the issues at hand, fostering a deeper understanding and sense of urgency among listeners.

(30) The simple truth is that without a solution to tropical deforestation, there is *[Existential Process]* **no solution to climate change.**

(31) For when it comes to the air we breathe and the water we drink, there are *[Existential Process]* **no national boundaries.**

(32) There is *[Existential Process]* **no greater national interest than the common future of this planet.**

E. Ecological Meaning Constructed by Participants

Participants are necessary in performing a complete process. Through analysis of the distribution of participants, some subtle insights into climate change can be unveiled. It is found that speeches from both COP15 and COP26 converge on the concept of "building the community with a shared future". H. E. Lars Lokke Rasmussen, the Prime Minister of Denmark at that time, stated in his speech:

(33) "**Warming** *[Senser]* **knows** *[Mental Process]* **no border** *[Phenomenon]***. It** *[Agent]* **does not discriminate** *[Material Process]***. It affects us all. No one in the world can duck and cover."**

The opening sentence in example [33] embodies mental process, as the verb "knows" indicates human consciousness. Here, "warming" serves as the senser and "no border" is the phenomenon. The speaker employs personification to discuss "warming". By ascribing minds and actions to this ecological phenomenon, the speaker imparts a profound message: climate change transcends borders and impacts us all. By presenting the natural entity of "warming" as the senser, the speaker fosters a sense of inclusivity among the audience, conveying that this phenomenon is a shared concern affecting everyone. This approach heightens our awareness of the interconnectedness of the world, emphasizing that there is no "them" and "us" in the face of climate change; rather, it highlights the importance of unity and collective action.

(34) ***The door*** *[Agent]* ***of our future is closing*** *[Material Process]*.

The sentence in example [34] contains material process, where the agent "the door" is an artificial entity and serves as a metaphor. The study of metaphor can be dated back long before that of EDA. Metaphor has evolved from a mere linguistic device to an important tool for unraveling the cognitive orientations and ways of thinking within discourse communities (Wu et al., 2020). Therefore, it can be applied to participant analysis to discern the speaker's attitudes towards ecology. This sentence is chosen from speech of the Prince of Wales in COP15 held in Copenhagen, in which he likens the evolving climate situation to the impending closure of a door. The metaphor implies that the key to keeping "the door" open is to contain climate change, thereby emphasizing the paramount importance of this issue and foreshadowing the subsequent metaphor "It is a truly vicious circle". The impending closure of "the door" metaphorically portrays a bleak future for humanity, rooted in both the immediate cause of a deteriorating climate and the underlying culprit: human "actions" and "inactions". On the one hand, "actions" refer to the excessive emission of carbon dioxide by human activities. On the other hand, "inactions" allude to the absence of measures to mitigate these destructive practices. These two metaphors are grounded in the fundamental question "What is climate change?" and convey two important messages: firstly, climate change is intricately linked to other environmental issues; secondly, it holds the key to shaping humanity's future. By employing these metaphors, the speaker aims to awaken public consciousness to the gravity and urgency of addressing climate change correctly, urging immediate and concerted efforts to avert the looming catastrophe.

In contrast to the discourses presented at COP15, those from COP26 feature a greater number of sentences that employ natural entities as participants. This shift serves as a testament to the heightened importance and elevated status accorded to natural entities. As exemplified by sentence [35], the speaker emphasizes that both the environment and humanity are enduring the adverse consequences of climate change. This also indicates that humans must transcend their sole focus on personal gains and instead cultivate a mindset that respects, aligns with, and safeguards nature.

(35) Our country's environment *[Agent]* **and people** *[Agent]* **have begun to suffer from** *[Material Process]* **the negative impacts of climate change.**

VI. Conclusion

The following part will focus on the major findings of the current study, implications, limitations and suggestions for future research.

A. Major Findings

Based on the findings and subsequent discussion, the study reveals that different processes operate distinctively yet collaboratively within the discourse, collectively facilitating the speakers' objectives. A compelling public speech necessitates a harmonious blend of content and emotion, where ideas and appeals are articulated persuasively through statistics, narratives, and factual evidence. In the present research, material process and relational process are most frequently employed, predominantly contributing to the narrative and factual presentation. Material process emphasizes the "doing" aspect, detailing human actions, anticipated actions, the impact of climate change, the function of ecosystem or specific natural entity, transformations in natural phenomena, and established facts. However, the study observes that in discourses from COP15, self-criticism of human-induced destruction, current human actions, and the current situation of the earth is not adequate, hindering the intended urgency to mobilize public action against climate change. Discourses from COP26 exhibit progress, characterized by more precise and concrete descriptions. Relational processes underscore the intricate connections between humanity and nature, encompassing the interrelationships among humans, climate change, and other natural entities. Through relational processes, facts such as the inextricable link between human actions and climate change, and the urgency to address this issue, are eloquently conveyed.

Although the other three process types constitute a relatively small portion, they nonetheless bear an important responsibility in public speeches. Sentences that embody verbal process and mental process can evoke emotional responses from the audience and make appeals to the audience. Furthermore, existential process primarily serves to emphasize by establishing conditions and describing the corresponding outcomes.

Through different processes and the use of participants, ecological concepts and perspectives can be articulated with

precision. In discourses from COP15, the relationship with climate change can be classified into two types: "man and climate change" and "economy and climate change". The idea that climate change is a global issue is a universally accepted consensus. Addressing this challenge necessitates the concerted efforts of people worldwide, embodying the essence of community with a shared future. In the human dimension, each individual, regardless of their identity, bears a unique responsibility in tackling this issue, with national leaders occupying a pivotal role. The majority of sentences within these discourses adhere to the ecological philosophy embraced in this study, thereby contributing positively to environmental protection efforts.

The transition from COP15 to COP26 marks a significant shift in global understanding and preparedness for climate change. The world now possesses a far more definitive vision of how to confront this pressing issue. Furthermore, the measures devised to tackle climate change have evolved into more tangible and actionable strategies, a development largely fueled by technological advancements and progress. Another noteworthy change lies in the attribution of participants. At COP26, speakers use a higher percentage of natural entity as participants, emphasizing the elevated status accorded to nature and reflecting a more environmental-friendly awareness among people. This shift signals a more holistic and inclusive approach to addressing climate change, recognizing the interconnectedness between humanity and the natural world.

B. Implications

First of all, the aforementioned analysis offers valuable insights into crafting compelling public speeches. An effective and evocative speech inherently intertwines vivid descriptions with a robust theoretical foundation, expertly conveyed through the use of material process and relational process. To ignite emotions within the audience or inspire them to take action in mitigating climate change, incorporating verbal process into the speech is a potent strategy. By judiciously leveraging various process types, public speeches can become truly captivating and contagious, igniting a sense of urgency and purpose among listeners.

Next, regardless of one's individual identity or capacity, every global citizen bears the responsibility of addressing climate change. It is imperative that every citizen should be mindful of their words and actions, and strive relentlessly to safeguard the earth.

In conclusion, the social development is evident, with technology advancing at an unprecedented pace. Perhaps most significantly, there is a burgeoning ecological awareness sweeping across the globe. The more adeptly humanity navigates the delicate balance between nature, commerce, and technology, the greater the likelihood of creating a more aesthetically pleasing environment. Consequently, human intervention is paramount, and there lies a vast expanse of progress yet to be achieved in this noble endeavor.

C. Limitations and Suggestions

Firstly, the limitation of discourse sources, confined to merely COP15 and COP26, restricts the scope of analysis. This choice permits only the identification and comparison of ecological characteristics within these two periods, hindering the ability to discern broader-scale changes without incorporating additional public speeches spanning various timeframes. Secondly, different process types and participants are marked manually because of the relatively small numbers of discourses, which becomes significantly less convenient and accurate as the volume of data increases.

In conclusion, this paper, drawing upon the intricate link between language and cognition, encapsulates the essence of ecological ideologies and the prevailing ecological challenges. EDA emerges as a potent tool to scrutinize the underlying ecological values, as language acts as a mirror, faithfully reflecting ecological mindset. Recognizing ecological relationships within EDA is paramount, as minds shape actions. Looking ahead, future research can broaden the horizons of EDA by examining diverse discourse genres, encompassing poems, advertisements, slogans, and beyond. Additionally, the analytical tool can be refined for greater efficiency and convenience, transcending the bounds of SFL. Cognitive linguistics can be another good choice.

It is hoped that the insights gained from EDA will inspire people to be more attuned to the ecological nuances embedded in everyday language use. By continually nurturing an ecological mindset and translating it into meaningful actions, people across the globe can collectively forge a harmonious co-existence between humanity and nature, ensuring a sustainable future for all.

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