TERMINOLOGICAL VARIATION AND CLIMATE CHANGE[1]
Terminų variantiškumas ir klimato kaita

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ABSTRACT

This article explores terminological and cognitive variation within climate change discourse. Through the analysis of 80 concepts from environmental glossaries and terminological databases, it identifies how terms evolve and vary–graphically, morphosyntactically, lexically, or by reduction. The study highlights how variant terms, such as *ozone layer, ozone shield* or *ozonosphere*, denote the same concept but propose different approaches and activate different cognitive frames.

KEYWORDS: terminological variation, cognitive variation, climate change.

ANOTACIJA

Šiame straipsnyje nagrinėjamas terminų ir kognityvinis variantiškumas klimato kaitos diskurse. Išanalizavus 80 sąvokų iš aplinkos apsaugos specialiųjų žodynų ir terminų duomenų bazių, nustatyta, kaip terminai evoliucionuoja ir kinta grafiniu, morfosintaksiniu, leksiniu lygmenimis ar dėl redukcijos. Tyrimas atskleidžia, kaip terminų variantai, tokie kaip *ozone layer* (ozono sluoksnis), *ozone shield* (ozono skydas) ar *ozonosphere* (ozonosfera), žymi tą pačią sąvoką, tačiau perteikia skirtingus požiūrius ir aktyvuoja skirtingus kognityvinius modelius.

ESMINIAI ŽODŽIAI: terminų variantiškumas, kognityvinis variantiškumas, klimato kaita.

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INTRODUCTION

From the year 2000 onward, the term *biofuel* became one of the most frequently used terms in the field of environmental science. Biofuel can be used to generate electricity, produce heat or motion, and serve other domestic, industrial, or transport-related purposes. Biofuel is important because it is helping to avoid fossil fuels.

Biofuels are obtained from organic matter (biomass), which can be transformed into liquid, solid, or gaseous fuels through physical, chemical, or biological processes. One such process is *biogasification*, a technique based on the anaerobic digestion (i.e., in the absence of oxygen) of organic waste into biogas. The primary gas produced through biogasification is methane, which is why this process is also known as *biomethanisation* (or *biomethanization*, depending on the variety of English used). However, for reasons of linguistic economy and the semantic neutralisation of the prefix *bio-*, it is commonly referred to simply as *methanisation* (or *methanization*).

These three terms – *biogasification*, *biomethanisation*, and *methanisation* – along with their orthographic variants, provide an illustrative example that introduces the subject of this paper: terminological variation in the vocabulary of climate change. This vocabulary is a particularly fertile ground for the study of terminological variation and, more specifically, for the analysis of cognitive variation. In this paper we will explore the connection between denominative variation–that is, the use of different terms to refer to the same concept–and cognitive variation.

THEORETICAL FRAMEWORK
Terminological Variation

Terminological variation[2] has received considerable attention from scholars in last 25 years, who have approached it from a range of theoretical perspectives. Cabré (1999), in her *Communicative Theory of Terminology*, proposes an integrative approach that connects linguistic, cognitive, and communicative dimensions. From this viewpoint, variation is not considered a terminological flaw but rather a functional response to different usage contexts. Moreover, for Cabré, terms do not belong to closed, uniform systems; instead, they exist within diverse communicative settings, which give rise to multiple expressions for the same specialised content. In this sense, terminological variation reflects not only linguistic differences in usage but also differences in the perception and representation of knowledge.

Freixa (2003; 2006; 2013; 2022) has addressed terminological variation from a multidimensional perspective, also integrating linguistic, cognitive, and communicative aspects. In line with Cabré, Freixa (2003) emphasises that denominative variation should

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[2] *Terminological variation* is, strictly speaking, any variation that affects terms, but in this article we use it in its more common sense, as the variation that affects denominations, and thus we use it as a synonym for *denominative variation*.

not be seen as a marginal or incidental phenomenon, but as an inherent feature of specialised language. Through corpus studies of texts with varying levels of specialisation in the environmental domain, she identifies multiple factors that influence the emergence of variants: the communicative purpose of the text, the knowledge level of both the author and the target audience, the communication channel, and the conceptual structure of the domain, among others. In her 2006 paper, Freixa proposes a typology of the causes of terminological variation that allows us to understand variation not simply as a multiplicity of forms, but as a functional and cognitive strategy that meets diverse communicative needs. In her more recent research (2022), she insists on the dynamic nature of specialised knowledge, showing how this dynamism is reflected in the fluctuating denominations that emerge within the discourses in which knowledge is constructed and communicated. She particularly highlights the roles of scientific popularisation and interlinguistic and intercultural transfer. In this regard, she argues that variation should be seen as a resource that enables the adaptation of specialised discourse to different usage contexts, without necessarily resulting in a loss of terminological precision. Her work thus contributes to consolidating an integrative and non-prescriptive view of terminology.

From a sociocognitive perspective, Temmerman (2000) analyses terminology as a phenomenon anchored in collective experience and shared knowledge. Her model challenges the rigidity of classical approaches and acknowledges the dynamic, flexible, and contextualised nature of concepts, with particular attention to conceptual variation. On the other hand, from the perspective of *Frame-Based Terminology* (Faber *et al.* 2009; Faber 2022), variation is examined at the intersection of cognition, discourse, and language technologies. These approaches demonstrates that terminological variation is a complex and productive phenomenon, one that requires interdisciplinary and dynamic approaches for its full understanding.

Cognitive Variation

Unlike denominative variation, which concerns the different denominations used for a single concept, cognitive or conceptual variation[3] refers to the various ways in which a given concept can be constructed, interpreted, and represented depending on contextual, cultural, ideological, or disciplinary factors. This type of variation is often reflected in the use of different terms to approach the concept from distinct perspectives.

Fernández-Silva (2011; 2016; 2022) begins with the need to move beyond the traditional view of the concept as a fixed, universal entity, proposing instead a dynamic, situated, and discourse-constructed conception. According to Fernández-Silva, conceptual variation is inherent to the evolution of scientific and technical knowledge, as well as to its

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[3] In this article, we use these two terms as synonyms, although *conceptual variation* is more frequently used to refer to changes or differences in the concept itself associated with a term, while *cognitive variation* refers to how a speaker conceptualizes or perceives a concept at a given moment or in a specific context.

circulation among different communities. She argues that specialised concepts are not closed entities but open structures shaped through framing processes and recontextualisation. In this regard, she draws on Fillmore's Frame Semantics (1977) to emphasise that concepts are activated through complex cognitive structures that determine which aspects of knowledge become salient in each communicative situation. From this perspective, conceptual variation emerges as a natural and necessary phenomenon in specialised communication, especially when knowledge circulates among communities with different priorities, levels of expertise, or ideological positions.

Within the *Frame-Based Terminology* approach, Faber *et al.* (2009) and Ureña Gómez-Moreno *et al.* (2013) have developed tools to represent conceptual variation in terminological knowledge bases. By combining semantic relations, frame blending, and cognitive dynamics, their approach captures how a single term may be conceptualised differently across disciplines. Benítez and León-Araúz (2023) further explore how conceptual variation can be tracked through computational methods applied to multilingual corpora, revealing how the same concept may be framed differently across languages and cultures. According to the authors, this raises significant challenges for specialised translation, international communication, and global knowledge management. Similarly, Tercedor (2011) addresses the cognitive dynamics of concepts, highlighting the influence of social change on the reconfiguration of specialised knowledge. She examines how concepts evolve over time, generating tensions between older and newer representations, and how these tensions are manifested in discourse. Conceptual variation, then, is also presented as the result of an evolutionary process, not merely a communicative one–a view shared by scholars such as Dury and Lervad (2008), and more recently, Dury (2022) and Dury and Picton (2024), who focus on terminological variation from a diachronic perspective.

In conclusion, conceptual variation is inherent to the situated and dynamic nature of specialised knowledge. Its study enhances our understanding of how terms–and their meanings–are produced, transmitted, and negotiated across discourses that embody diverse worldviews.

Climate Change Terminology

Climate change is a complex phenomenon that demands a precise terminology capable of adapting to the ever-evolving body of knowledge in this field. In recent decades, the vocabulary associated with climate change has developed rapidly, influenced by scientific, political, media, and educational factors. Therefore, it is not only important to identify specific terms, but also to understand how these terms emerge, vary, and are communicated depending on the communicative context, the level of expertise, and other variables that may affect their use.

Guslyakova, Valeeva, and Vatkova (2020) analyse how new environmental terms (*green neology*) emerge and spread in education and the media. These neologisms reflect the emergence of new concepts (e.g. *garbology*) and the need to find effective ways to name and communicate them. The authors argue that ideological and educational components are key to environmental literacy, and that these neologisms serve not only a denominative function but also act as persuasive tools that shape educational and political discourse. Consequently, one of the defining features of climate discourse is its constant production of neologisms. This dynamism is also related to the interdisciplinary nature of climate knowledge. Moore *et al.* (2021), for example, analyse the term *transformation* in the context of climate change mitigation. In their systematic review, they observe that the term is used ambiguously and with multiple meanings, ranging from technological change to deep social reconfigurations. This polysemy reflects the complexity of climate phenomena and the diversity of disciplinary perspectives involved. Thus, terms such as *energy transition*, *systemic transformation*, or *climate justice* carry not only technical weight, but also political and ethical significance. Thus, Moore *et al.* similarly concludes that terminology not only describes change but actively participates in constructing it discursively.

From a pragmatic perspective, Carrió-Pastor and Candel-Mora (2012) also argue that terminology should be understood as a contextual and discursive phenomenon, beyond any presumed normative rigidity. Through corpus analysis, they show that the choice of climate-related terms depends on factors such as text genre (academic, media, educational), target audience (experts, students or laypeople), as well as communication channel and purpose: technical precision, simplified dissemination, or rhetorical effect. They argue that communicative specificity (who speaks, to whom, and for what purpose) is central in terminological choice.

From a more discourse-oriented perspective, Bureau (2024) demonstrates that conceptual representations of climate change vary not only in terminology but also in the frames of reference activated in different discourses. Comparing expert and media corpora, she finds significant differences in how causes, solutions, and responsibilities related to climate change are conceptualised. These findings align with Rogers (2004), who notes that media discourse tends to simplify and reconfigure scientific knowledge about climate, producing hybrid and sometimes imprecise concepts, though more accessible to the general public.

Conceptual metaphors have also been shown to play a central role in shaping understanding of climate change. Haddad Haddad and Montero-Martínez (2021) point out that expressions like *carbon footprint* or *carbon capture* function as structuring metaphors, projecting specific cognitive frames onto abstract phenomena. These metaphors not only aid understanding but also orient action, since each frame entails a different way of perceiving and addressing the problem. The transfer of such metaphors across languages and cultures can generate semantic tensions. In their English–Arabic contrastive study, the authors highlight the difficulty of translating conceptual implicatures accurately, which can affect

communicative effectiveness in multilingual contexts. Cabezas-García and León-Araúz (2022) reinforce this idea by demonstrating that climate change communication accommodates terminological variants tailored to different communicative needs. For example, the choice between *global warming* and *climate crisis* is not neutral: it implies differences in ideology, register, and communicative intent. The way terms are used can shape public perception.

However, recent studies such as Goldwert *et al.* (2024) suggest that changing terminology does not necessarily affect behavioural intentions. In their experimental research, they found that replacing terms like *global warming* with *climate crisis* had no statistically significant impact on people's willingness to take climate action. This finding invites a more nuanced view of the direct influence of language on environmental behaviour, although it does not rule out its role in cognitive framing.

DATA AND METHODOLOGY

Empirical research on terminological variation is based on text analysis, since that is the natural environment of terms and where their real behavior can be observed. For this study, we have decided to rely on glossaries, assuming that the variation recorded there will be smaller than the variation that actually exists. In this way, we will base our observations on the examples that have passed through the filters applied by the terminologists or specialists who compiled the glossaries, and which should be the most stabilized in the specialists' usage.

To compile a list of the most representative terms in the vocabulary related to climate change, we consulted several glossaries retrieved through Google searches. These include *Glossary of Climate Change Terms* (United States Environmental Protection Agency), *The Climate Dictionary: An Everyday Guide to Climate Change* (United Nations Development Programme), *Climate Change Glossary* (BBC News), *Climate Change Glossary: Definition of Key Terms* (Sustainable Travel International), and *Glossary* (Office for Climate Education). After selecting the 100 terms that appeared in the greatest number of glossaries, we searched for them in two terminological databases: IATE (Interactive Terminology for Europe, from the European Union) and Cercaterm (by Termcat, Catalan government, Generalitat de Catalunya). The final selection consisted of 80 concepts, each represented by one or more terms, all of which were documented in at least one of the databases (most of them in both). The full list of 80 concepts and their variants is available in the appendix.

For the formal classification of variants, we drew on the typology proposed by Freixa (2003), which groups variants according to whether the change is graphical, morphosyntactic, reduction, or lexical. This classification also allows for analysis of the degree of conceptual equivalence between variants (in cases with more than two denominations, we compared those with the least formal divergence). Finally, to analyse the usage and evolution of terms over time in specialized discourse, we used Google Ngram

Viewer, a tool that allows for the comparison of up to five denominations simultaneously on a single temporal axis, enabling us to track the appearance and relative frequency of each term over time. To compare the results with the usage and evolution of the terms in journalistic discourse, we used Factiva[4], the world's largest press database, by Dow Jones.

RESULTS AND ANALYSIS

In this section, we first analyse the denominative index of the concepts included in our sample of terms. Next, we offer an initial analysis of selected examples based on their formal classification, highlighting the distinctive features of the denominative variants and placing special emphasis on cases of cognitive variation. Finally, we examine selected term clusters to observe how different variants show different cognitive perspectives and how have they evolved over time along the temporal axis.

Denominative Index

Most of our 80 concepts are represented by one term or two. But 20% are represented by 3 terms and, as can be seen in Table 1; one concept is represented by 6 terms and another one by 7. So, the denominative index (i.e., the average number of denominations per concept, following Freixa 2003) stands at 2.37 denominations per concept.

Table 1. Distribution of Denominative Groups by Number of Denominations

Den	Quantity	%
1	25	31,25
2	25	31,25
3	16	20,00
4	6	7,50
5	6	7,50
6	1	1,25
7	1	1,25
Total	**80**	**100%**
Index ----	**2,37**	

Represented by one term we have examples like *desertification*, *greenhouse effect*, *ozone precursor*, *anthropocene*, *rewilding*, and *circular economy*. Interestingly, the first three are older terms (none after 1970), while the latter three are more recent (all appearing around 2010), so, the age of a term does not appear to determine whether or not it has alternate denominations. Nor does frequency seem to be a decisive factor, as all are among the most frequently used concepts in climate-related discourse. Similarly, no specific word formation process appears to govern their variability. Thus, the question of why some

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[4] Dow Jones. *Factiva*. Database. Available at: https://www.dowjones.com/products/factiva.

concepts exhibit terminological variation and others do not will need to be studied in future work. Another third (31.25%) of the concepts is represented by two denominations, while the remaining third (37.50%) are represented by more than two. The concepts represented by the highest number of denominations are: *hydrofracturing* (with *hydraulic fracking, hydraulic fracturing, hydrofracking, hydro-frac* and *HF*) and *eco-friendly* (*environment-friendly, environmentally friendly, green, earth friendly, ecological, environmental*).

Formal change distribution

We approach the study of semantic equivalence among denominations that alternate for the same concept by analyzing the type of formal variation observed. As shown in Table 2 and following the classification proposed by Freixa (2003), we have grouped the examples into four categories based on whether the change is graphical, morphosyntactic, reduction, or lexical.

We can see that most of the examples cluster at the two extremes: the minor change, which is simply graphical, and the major one, which involves a lexical change.

Table 2. Classification by Type of Formal Variation

Type	Quantity	%	Examples
Graphical	29	29.89	*paleoclimatology / palaeoclimatology*
Morphosyntactic	13	13.40	*greenwash / greenwashing*
Reduction	20	20.83	*living biomass / biomass*
Lexical	35	36.45	*carbon market / carbon trading*

Graphical variation

The examples of graphical variation represent the highest degree of semantic equivalence. These include alternations involving hyphenation (e.g., *agroecology / agro-ecology*, *biofuel / bio-fuel*, *net zero / net-zero*), spacing (*heat wave / heatwave*, *waste water / wastewater*, *salt water intrusion / saltwater intrusion*), and orthographic differences between British and American English (*paleoclimatology / palaeoclimatology*, *biomethanisation / biomethanization*, *reforestation / reafforestation*). All of these examples are semantically identical and do not carry distinct connotations beyond regional spelling conventions.

This category also includes numerous cases of full forms and abbreviations, such as acronyms (*global warming potential / GWP*, *sea level rise / SLR*, *greenhouse gases / GHG*), chemical formulas (*carbon dioxide / CO_2*), or other shortened forms (*redox potential / oxidation-reduction potential*, *biological diversity / biodiversity*, *ecological anxiety / eco-anxiety*). In many of these cases, abbreviated forms (like *SLR* or *GWP*) tend to appear more frequently in texts with a higher degree of specialization.

Morphosyntactic variation

Morphosyntactic variation is less frequent (13.40%) and is mostly associated with morphological shifts, such as between nominal and verbal forms (*carbon offset / carbon offsetting*, *greenwashing / greenwash*), or variation involving suffixation (*climate change / climatic change*, *nitrogen fertilizer / nitrogenous fertilizer*, *environment–friendly / environmentally friendly*). Some examples show syntactic restructuring, as in *loss of biodiversity / biodiversity loss*. Most of these cases display a high degree of equivalence, with little to no denotative or connotative difference.

The alternation between *climate change* and *climatic change* deserves particular attention. As it can be seen in figure 1, both terms were rarely used before the mid–1980s and were largely restricted to scientific texts. However, with the advancement of climatology and the development of more sophisticated climate models, *climate change* gained traction as the general term for describing shifts in global weather patterns. In 1988, the Intergovernmental Panel on Climate Change (IPCC) was established as the main body assessing climate science, consolidating *climate change* as the standard term in international political and scientific discourse. This explains the steep rise in usage (blue curve) after 1985, a trend that has continued uninterrupted, while *climatic change* has remained marginal in frequency.
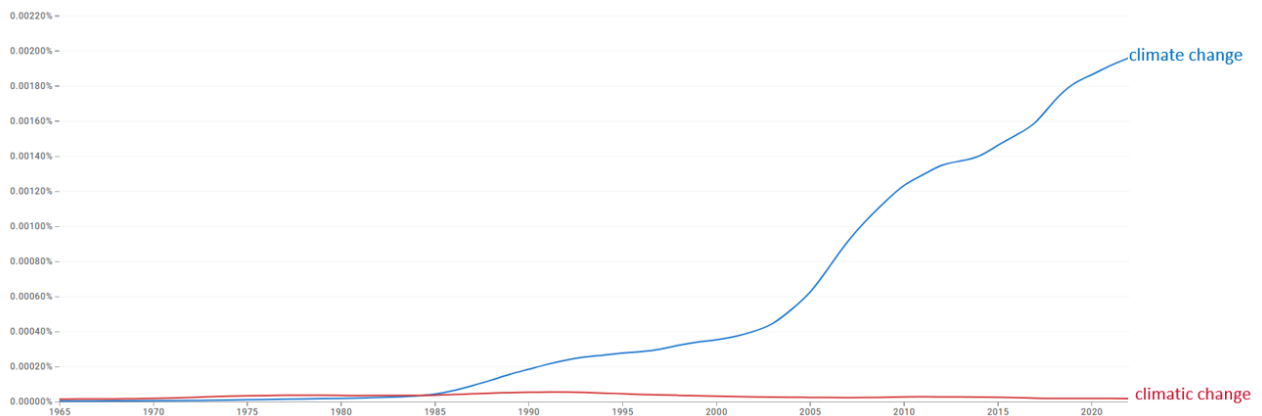

Figure 1. Temporal evolution of *climate change* and *climatic change*

Reduction

One type of terminological variation that is often overlooked, despite its quantitative relevance (20.83%), is that which results from the **reduction** of syntagmatic forms. These are often anaphoric reductions, where the elided part is recovered from context, but in other cases the reduced form is not anaphoric, either because it has become lexicalized, or because the extended form includes less relevant or redundant information. The semantic distance between alternating forms depends on whether the reduction is anaphoric (in which case the equivalence is just context–dependent) or lexical (typically showing a high degree of semantic equivalence).

In climate change related terms, we find some clear cases of lexical reduction, such as *sensitivity*, commonly used in the field to refer to *climate sensitivity*, or *tipping point*, frequently used as a shorthand for *climate tipping point*. However, most examples are anaphoric reductions, where the reduction can occur in the central part of the phrase (*carbon dioxide emissions / carbon emissions*) or at the extension(s) of the phrase (*climate change adaptation / climate adaptation / adaptation*, *carbon dioxide sink / carbon sink / sink*).

Lexical variation

The most frequent type of variation in our data (36.45%) involves lexical changes, and the semantic distance between variants depends on several factors. A lexical change may result in cognitive variation if it emphasizes different perspectives or features of the concept. Within this kind of terminological variation, we must distinguish between different situations: 1) lexical variation can be total if the term is simple, as in *reforestation / restocking* or *albedo / reflectance*, or if all the lexemes change in a syntagmatic term, as in *heat wave / warm spell* or *waste water / sewage effluent*; (2) lexical variation can be partial, when one lexeme changes and the other remains. Those are more freqüent and can be classified by where in the term the change occurs: in the head or the extension of the term.

Lexical and cognitive variation

We will devote the next part to lexical variation with cognitive variation, and for that we assume that terms not only denote but also mean. That is, in a certain sense, they are labels for a concept –referential units, which is why we call them denominative units or denominations–, but they also have meaning, because when different denominations refer to the same concept, they do so in different ways, highlighting different characteristics of that same concept.

Total change: simple terms

At the European Union's terminological database (IATE), *reforestation* is defined as "The reestablishment of forest cover either naturally (by natural seeding, coppice, or root suckers) or artificially (by direct seeding or planting)", and it offers two denominations more for the same concept: *reafforestation* and *restocking*.

The alternation between *reforestation* and *reafforestation* is morphological rather than lexical, and a slight semantic nuance can also be observed, since *forestation* is directly a noun of action and effect, whereas *afforestation*, with the prefix *a-*, emphasizes the idea of action ("the action of turning something toward being a forest"). But the alternation that involves a lexical and cognitive change is the one between *reforestation* (or *reafforestation*) and *restocking*, since the former prioritizes the idea of a forest, while the latter emphasizes the idea of repopulating and supplying.

As said in the methodology part, to know which form is preferred in specialized discourse we consulted Google Ngram Viewer and the results show, as it can be seen in figure 2, that *reafforestation* constitutes a marginal variant in terms of frequency, whereas *reforestation* displays a considerably higher rate of usage than *restocking*, despite the latter's earlier attestation. Contemporary specialized usage–referring here to the past one hundred years–shows a clear preference for *reforestation*.
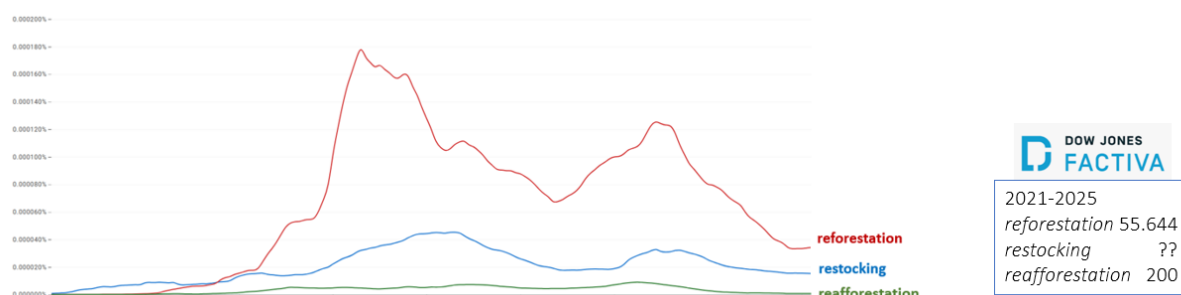

Figure 2. *Reforestation*, *reafforestation* and *restocking* in Google Ngram Viewer and Factiva

The figure also shows the results for journalistic texts (Factiva) for the last five years and the tendency resembles that observed in specialized discourse. However, as *restocking* is a polysemic word in journalistic texts, it is not possible to ascertain its specific frequency within the forestry domain.

Total change: syntagmatic terms

A period of abnormally and uncomfortably hot weather is called a *heat wave*, but also a *hot spell* or a *warm spell*. Between *hot spell* and *warm spell*, we observe a distinction in terms of temperature, with *hot* denoting a more intense degree than *warm*, a difference that already carries cognitive implications.

The variation between *wave* and *spell* has an even greater cognitive impact, as *wave* and *spell* evoke different frames: in *heat wave*, *heat* is conceptualized as a natural force that moves and strikes like a wave, activating a frame of physical movement of a fluid; in contrast, the presence of *spell* evokes a temporal and episodic frame, where *heat* is perceived as a phase or transient period within a temporal continuum.

As shown in figure 3, for this case of variation we also find a strong similarity between specialized discourse in Google Ngram Viewer and journalistic discourse in terms of frequency of use: by far, *heat wave* (including the variant *heatwave*) is the most stabilized form in usage, whereas *warm spell* and *hot spell* both appear in use but at a much lower frequency level.
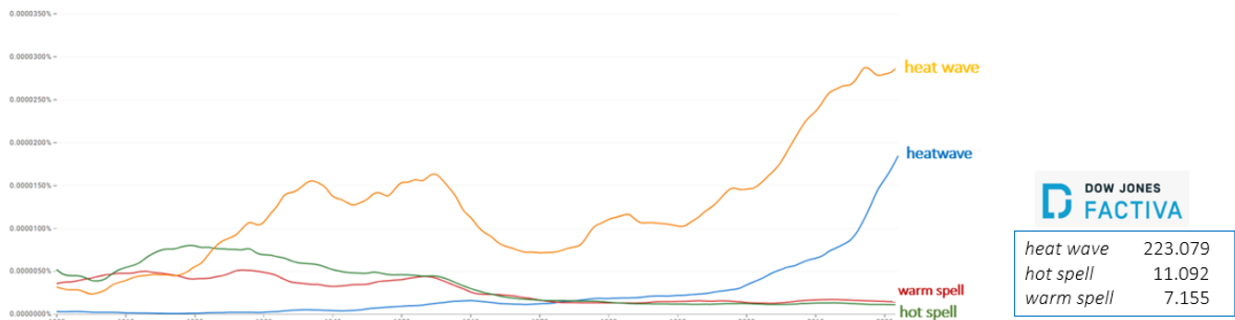
Figure 3. *Heat wave*, *hot spell* and *warm spell* in Google Ngram Viewer and Factiva

Partial change: variation in the extension of the syntagmatic terms

Let us now analyse examples in which variation occurs between syntagmatic terms, that include more than one lexeme. First, we will focus on cases where the base, which constitutes the conceptual category, remains the same, and the change takes place in the extension, where the characteristic of the concept highlighted in the denomination shifts.

IATE database defines *drinking water* or *potable water* as the water that is safe for ingestion, either when drunk directly in liquid form or consumed indirectly through food preparation. The lexical unit *water* constitutes the conceptual category common to both designations; however, the semantic feature highlighted in each differs (*drinking* versus *potable*), as does the mental representation they evoke. In *drinking*, the focus is on the action of ingestion, whereas in *potable* the emphasis lies on the quality of being safe for consumption. This is particularly noteworthy given that *potable* derives from the Latin *potare* ('to drink'), which makes both designations fully equivalent from an etymological standpoint, despite their distinct cognitive associations.
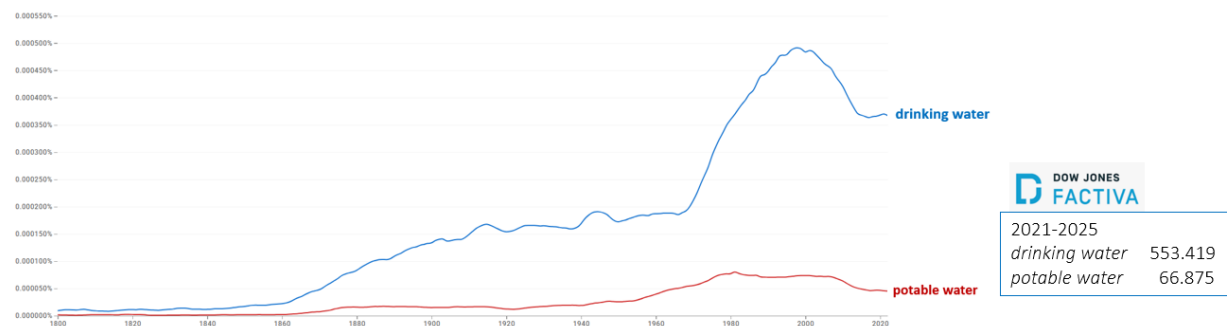

Figure 4. *Drinking water* and *potable water* in Google Ngram Viewer and Factiva

Examples of cognitive variation between terms that share the same conceptual category yet exhibit different cognitive approaches are frequent. The following example involves *indigenous knowledge*, *local knowledge*, and *traditional knowledge*. These terms all refer to knowledge systems rooted in long-standing interaction with specific environments. Although all three designate the same concept, each activates a distinct cognitive frame. In

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local knowledge–the most frequent and historically earlier term–the underlying focus is on *place*; in *traditional knowledge*–the second most frequent but considerably more recent, with usage increasing from the 1980s onwards–the focus shifts to *time*; and in *indigenous knowledge*, the conceptual emphasis is placed on *people*.
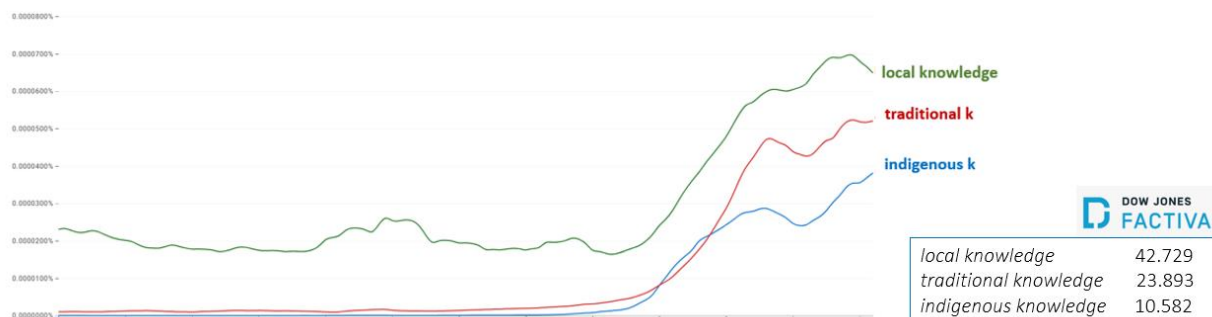

Figure 5. *Indigenous knowledge*, *local knowledge*, and *traditional knowledge* in Google Ngram Viewer and Factiva

Figure 5 once again shows that both textual corpora display the same prioritization in terms of frequency.

Partial change: variation in the head of the syntagmatic terms

In specialized discourse *climate crisis* has two synonyms, according to IATE information: *climate emergency*, and *climate breakdown*, but in general discourse, *climate change*, *global warming*, and *global heating* are frequently used interchangeably, as if they were equivalent. As we can see in figure 6, in both specialized and journalistic usage, *climate crisis* is the most frequent form, while the variants *climate emergency* and *climate breakdown* are used much less, although it is well known that *climate emergency* is preferred in political and activist discourse.
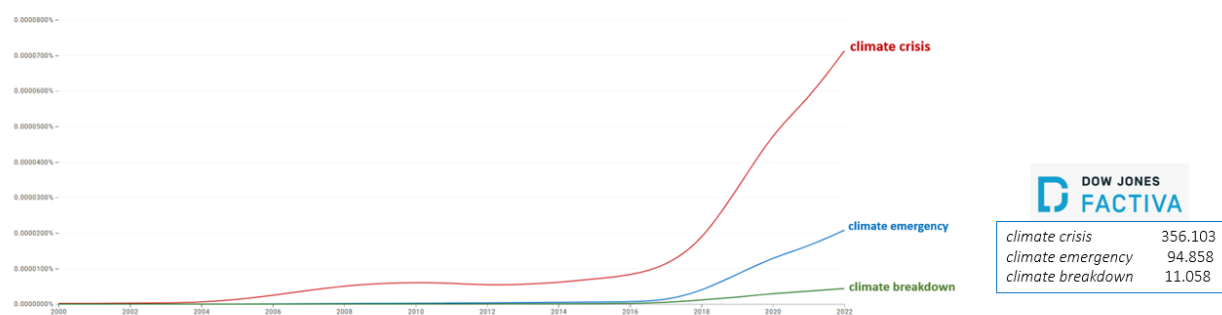

Figure 6. *Climate crisis, climate emergency* and *climate breakdown* in Google Ngram Viewer and Factiva

The three designations carry different connotations and rhetorical purposes and can be arranged along a scale of intensity: *climate crisis* denote the systemic risks and escalating consequences of climate change; *climate emergency* implies the need for immediate action;

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climate breakdown suggests systemic collapse. In this case, the cognitive frame remains the same, but what varies is the intensity, that is, the degree of perceived danger.

A second example where variation occurs in the conceptual category is between *ozone layer*, *ozone shield*, and *ozonosphere*. Once again, the frequency results coincide in both specialized discourse (as illustrated by the Ngram Viewer diagram) and journalistic discourse (as evidenced by the Factiva corpus): among the three, *ozone layer* appears as the most institutionalized form, while *ozone shield* and *ozonosphere* display significantly lower frequencies of use.
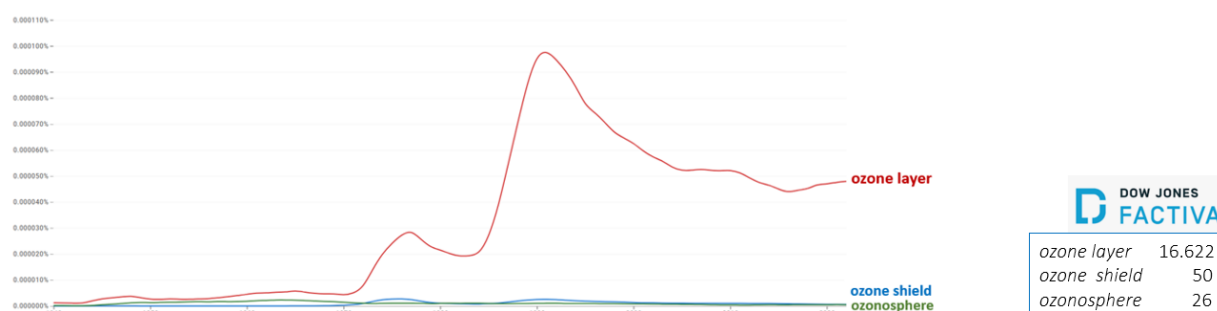

Figure 7. *Ozone layer*, *ozone shield* and *ozonosphere* in Google Ngram Viewer and Factiva

In this case, cognitive variation emerges from the activation of different conceptual frames associated with each denomination. The term *ozone layer* evokes a structural frame, in which the stratosphere is understood as being organized in distinct layers. In contrast, *ozone shield* activates a functional or metaphorical frame, emphasizing the protective role of ozone as a barrier that safeguards the Earth from ultraviolet radiation. Finally, *ozonosphere* foregrounds a geometrical or systemic perspective, conceptualizing this atmospheric region as a spherical domain.

The examples analysed reveal a clear pattern: one term tends to achieve significantly higher frequency of use than the others, which subsequently serve more specific discursive or rhetorical functions, while the most frequent term assumes a primarily referential role. The referential denomination may correspond either to the earliest form, originated within scientific discourse, or to a later variant that has become more appealing and thus more widely adopted in other types of discourse – such as activist, media, or educational contexts.

CONCLUSIONS

Terminological variation reflects conceptual perspectivization: each denomination activates a distinct conceptual frame or perspective on the same referent. This variation is not merely a matter of lexical diversity but represents different ways of constructing and understanding the underlying concept, or the need to foreground alternative perspectives on it in specific contexts.

Terminological variants fulfil complementary discursive functions: while one denomination often becomes institutionalized as the preferred referential term, others persist because they serve specialized rhetorical, evaluative, or metaphorical roles across different types of discourse (scientific, media, educational, activist, etc.). It should also be acknowledged that cognitive differences arise *within* specialized discourse itself, which cannot be regarded as monolithic, neutral, or homogeneous. Rather, specialized knowledge accommodates a diversity of conceptualizations and perspectives on the same scientific phenomena. In fact, the examples analysed reveal a strong similarity between specialized and journalistic discourse: the same variants appear in both, and their frequency patterns are remarkably similar.

Variation contributes to conceptual accessibility and dissemination: the coexistence of multiple denominations facilitates knowledge transfer across expert and non-expert communities by enabling the same concept to be expressed through diverse cognitive and communicative lenses.

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APPENDIX 1: LIST OF TERMS

1. agroecology, agro-ecology
2. albedo, reflectance
3. anthropocene
4. anthropogenic
5. atmospheric aerosol
6. atmospheric lifetime
7. biodiversity, biological diversity
8. biodiversity loss, loss of biodiversity, loss of biological diversity, biodiversity erosion, erosion of biodiversity
9. biofuel, bio-fuel
10. biogasification, biomethanisation, biomethanization, methanization, methanisation
11. biomass, living biomass
12. biosphere
13. blue economy
14. carbon capture, CO2 capture, carbon dioxide capture, capture of CO2
15. carbon cycle, circulation of carbon
16. carbon dioxide, CO2
17. carbon dioxide emissions, carbon emissions, CO2 emissions
18. carbon footprint, CO2 footprint, carbon dioxide footprint
19. carbon intensity, CO2 intensity, carbon dioxide intensity, CI
20. carbon market, carbon trading, emissions trading
21. carbon neutral, carbon-neutral, climate neutral, GHG emissions neutral, greenhouse gas emissions neutral
22. carbon offsetting, carbon offset
23. carbon removal, carbon dioxide removal, CDR
24. carbon sequestration, CO2 sequestration, carbon dioxide sequestration, carbon dioxide storage, storage of carbon
25. carbon sink, carbon dioxide sink, sink
26. circular economy
27. climate change, climatic change
28. climate change adaptation, adaptation to climate change, climate adaptation, adaptation
29. climate crisis, climate emergency, climate breakdown
30. climate justice
31. climate resilience, resilience to climate change, climate resiliency
32. climate sensitivity, sensitivity

33. climate strike, Fridays For Future, FFF, School Strike for Climate, Youth For Climate
34. climate tipping point, tipping point, point of no return
35. climate transition
36. climate variability, climatic variability
37. compostable
38. cryosphere
39. desertification
40. drinking water, potable water
41. eco-anxiety, ecological anxiety, environmental anxiety
42. eco-friendly, environment-friendly, environmentally friendly, green, earth friendly, ecological, environmental
43. eco-refugee, environmental migrant, environmental refugee
44. energy efficiency
45. energy transition
46. environmental certification
47. evapotranspiration
48. extreme weather event
49. global warming, global heating
50. global warming potential, GWP
51. greenhouse effect
52. greenhouse gases, GHG
53. greenwashing, greenwash, green sheen
54. heat wave, heatwave, warm spell, hot spell
55. heavy metal
56. hydrofluorocarbon, fluorohydrocarbon, HFC
57. hydrofracturing, hydraulic fracking, hydraulic fracturing, hydrofracking, hydro-frac, HF
58. indigenous knowledge, local knowledge, traditional knowledge
59. indirect emissions
60. megacity
61. nature restoration
62. net zero, net-zero
63. nitrogen fertilizer, nitrogenous fertilizer
64. ozone layer, ozone shield, ozonosphere
65. ozone precursor
66. paleoclimatology, palaeoclimatology
67. permafrost, pergelisol
68. photochemical smog, oxidant smog, oxidizing
69. redox potential, oxidation–reduction potential
70. reforestation, reafforestation, restocking
71. regenerative agriculture, regenerative farming
72. renewable energy, energy from renewable sources
73. rewilding
74. salt water intrusion, saltwater intrusion, saline intrusion, saltwater encroachment
75. sea level rise, SLR
76. soil degradation, soil deterioration
77. species reintroduction
78. suspended particulate matter, SPM, particulate matter, PM, suspended particulates
79. sustainable development, SD
80. wastewater, waste water, sewage effluent, sewage