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DIGITAL SCIENTIFIC DISSEMINATION PRACTICES ON ENVIRONMENTAL ECONOMIC SUSTAINABILITY: AN ANALYSIS OF LEXICAL AND METADISCOURSAL CHOICES

Abstract

This paper seeks to contribute to the analysis of sustainability discourse by examining the lexical and metadiscoursal choices made by scientists and scriptwriters when research on environmental economic sustainability is disseminated in the digital medium. The analysis is based on a corpus of 30 scientific dissemination texts (from *The Conversation*, feature articles and research digests) in the field of Economy dealing with the topics of sustainability and circular economy, in line with SDG 12: Responsible consumption and production of the 2030 Agenda for Sustainable Development. The keyness analysis reveals the research areas that are explored and disseminated, and the metadiscoursal items in a 100-word list generated from the corpus highlight those used to foster comprehensibility, to ensure credibility and to promote engagement with the research disseminated. Such choices play a key role in the construction of persuasive digital dissemination texts to convince readers to adopt sustainable practices.

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Key words

scientific dissemination, knowledge communication, digital discourse, sustainability discourse, recontextualisation, metadiscourse features.

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1. INTRODUCTION

Digital media have revolutionised not only the way in which specialised scientific knowledge is generated but also the way in which it is disseminated and accessed. In this broad digitally-mediated dissemination of knowledge, scientists and scriptwriters play a pivotal role as they embrace diverse digital textual practices to make such knowledge potentially available to diversified audiences. Their discursive choices are of paramount importance to effectively recontextualise such knowledge, ensuring that it is accessible, understood and accepted by experts and (semi)lay persons (e.g., Lorés, 2023; Pascual et al., 2023).

Sustainability has emerged as a key concept with substantial societal impact so much so that it has become a buzzword. Our practices need to be sustainable, sustainability must be integrated into research practices and is a crucial aspect for stakeholders. The discourse of sustainability has, therefore, attracted significant research attention from the perspectives of language and linguistics and communication (Nervino et al., 2024). This paper aims to contribute to the study of sustainability discourse by examining how research on sustainability or with sustainability implications is communicated in the digital medium. In particular, it focuses on frequently used lexical items and metadiscoursal markers employed by knowledge producers in their digital dissemination efforts on the topic of environmental economic sustainability.

Such digital practices for disseminating scientific knowledge must be persuasive, as the ultimate aim is to rely on specialised knowledge to convince diverse audiences of the importance of environmental economic sustainability issues and to prompt them to engage in sustainable practices. As Orna-Montesinos (2015, p. 459) states "[l]inguistic devices such as hedging, evaluation or intertextuality have been shown to perform rhetorical goals and help news magazine writers to move beyond the apparently simple reporting of facts to the construction of a persuasive discourse, which seeks to report, to provide an opinion, to interpret or to instruct the reader on sustainability". Metadiscoursal choices (e.g., Hyland, 2005; Mur-Dueñas, 2011; Mur-Dueñas & Pascual, 2023) play a crucial role in achieving these persuasive goals when research in general and research on environmental economic sustainability, in particular, is digitally disseminated.

Taking a corpus-based approach, the paper seeks to answer these two sets of research questions:

1) What are the keywords in the scientific digital dissemination of environmental economic sustainability issues? What insights do these keywords provide into the nature of such research and its dissemination?
2) What are the most common metadiscourse markers in the scientific digital dissemination of environmental economic sustainability issues? How do frequent metadiscoursal choices contribute to the recontextualisation of this specialised knowledge? How is persuasion achieved by means of metadiscoursal choices?

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2. THEORETICAL FRAMEWORK

The discursive analysis of sustainability to be presented here is grounded on: (i) previous research on this discourse, (ii) the role of digital scientific dissemination in general and of recontextualisation to reach diversified audiences in particular, and (iii) the use of metadiscourse in such dissemination. Each of these pillars will be reviewed in turn.

2.1. The discourse of sustainability

In their systematic review of linguistics studies applied to the discourse of sustainability, Nervino et al. (2024) point out that most analyses have been undertaken on specific themes such as "corporate social responsibility (CSR), corporate sustainability, Sustainable Development Goals (SDGs), sustainable development in abstraction, and the future of certain industries, such as fashion and biotechnology" (2024, p. 869). Further, they highlight that most previous studies on the discourse of sustainability explore "corporate genres such as annual company reports, CSR reports, company sustainability reports, company websites, press/media releases, mission and vision statements, shareholder statements, and promotional materials such as newsletters" (2024, p. 870) as well as media texts, social media texts, and NGO texts. They also found that while language and linguistics analyses centered on collocations, concordances and keywords, communication analyses revealed the use of metaphors and images. Building on the findings, they call for further multimodal analyses of the discourse of sustainability and also for further linguistic analyses on fine-grained lexical markers, stance markers and word choices. One such analysis of sustainability was undertaken in news magazines (Orna-Montesinos, 2015), which reveals the levels of meaning of the concept, together with reporting, interpreting and instructing communicative purposes in this genre realized by the writers' deployment of hedging, evaluation and intertextuality features.

Taking up on Nervino et al.'s (2024) call, the analysis to be presented here seeks to be a contribution to language analyses of the discourse of sustainability by focusing on digital texts that have not yet received much scholarly attention, with some exceptions (e.g., Maier & Ravazzani, 2022; Oppong-Tawiah & Webster, 2023). The focus will be, in particular, on scientific knowledge dissemination in digital texts (feature articles, research digests and texts from *The Conversation* in particular). The corpus-based analysis departed from a keyword list to delve into the aspects or themes related to the dissemination of knowledge on environmental economic sustainability. A word list was obtained and frequent metadiscoursal choices examined looking into how these features enable researchers and knowledge mediators to make the research disseminated accessible, comprehensible and

accepted also by non-expert audiences, as well as to express their own stance towards such research.

2.2. Scientific digital dissemination: Recontextualising specialised knowledge

Specialised knowledge in today's digital age is expected to be shared beyond peers and disciplinary experts, making it available and accessible to a broad audience. This global outreach is facilitated by the use of English as the international language of science communication and by digitally-mediated communication (e.g., Lorés, 2023; Pascual et al., 2023). This broad dissemination – encouraged by institutions and demanded by society – is no doubt transforming the science communication ecosystem (Kupper et al., 2021). In this process, recontextualisation becomes essential. Recontextualisation can be understood as a knowledge-building process conducted by experts when addressing both peers and non-experts (Engberg & Maier, 2020). Recognising the potential disparity in knowledge with their diffuse audience, experts employ various strategies to bridge these differences and communicate specialised knowledge effectively. Such strategies entail resorting to verbal and non-verbal resources in order to address and mitigate knowledge asymmetries (Engberg, 2023; Engberg & Maier, 2015). These strategies and verbal and non-verbal resources in the recontextualisation process of scientific and specialised knowledge have been explored in different genres and practices, such as blogs (Bondi, 2018; Luzón, 2013), TED talk videos (Mattiello, 2017; Scotto di Carlo, 2014; Xia, 2023), three-minute thesis presentations (Carter-Thomas & Rowley-Jolivet, 2020; Hyland & Zou, 2021), 60-second science podcastas (Ye, 2021), research digests (Lorés, 2023, 2024a, 2024b), popular science online videos (Bernad-Mechó & Valerias-Jurado, 2023; Ruiz-Madrid & Valerias-Jurado, 2023), tweetorials (Luzón, 2023) or academic trailers (Maier & Engberg, 2023).

This previous research has highlighted the importance of using, on the one hand, explanatory or illustrative strategies to make specialised knowledge accessible by experts and non-experts, and, on the other hand, engagement or attention-getting strategies to draw and keep their attention. In this recontextualisation process, credibility and trustworthiness need to be maintained for such specialised knowledge to be not only accessed and comprehended but also accepted. Whereas previous studies focus on particular digital scientific dissemination practices, the topics on which these practices are based are very varied. The digital texts on which the analysis will be based correspond to three digital practices (feature articles, research digests and texts from the knowledge-sharing platform *The Conversation*) which are commonly employed to disseminate knowledge on environmental economic sustainability. The analysis and interpretation of keywords and frequent words in the corpus will take into

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consideration the features and strategies characteristic of recontextualised digitally disseminated knowledge.

2.3. Metadiscourse in scientific digital dissemination

Metadiscourse has been interpreted and applied in various ways to the study of scientific discourse. In this study it is interpreted as "those aspects of the text which explicitly refer to the organisation of the discourse or the writer's stance towards either its content or the reader" (Hyland, 2000, p. 109). Metadiscourse features are divided into interactive and interactional categories (Hyland, 2005; Hyland & Tse, 2004). Interactive metadiscourse is intended to organise and shape the information presented in the light of the readers' likely needs and expectations, whereas interactional metadiscourse is intended to portray authors and to bind them with readers pursuing similar goals and shared understandings and values. Interactive metadiscourse categories comprise: logical markers, code glosses, sequencers, topicalisers, endophoric markers, and evidentials, whereas interactional metadiscourse categories comprise: hedges, boosters, attitude markers, engagement markers and self-mentions (Mur-Dueñas, 2011). Overall, metadiscoursal choices are essential for conveying information in a manner that ensures it is not only comprehensible and clear to readers but also accepted by them, aligning with their expectations and needs (Hyland, 2005). The use of metadiscourse both shapes and is shaped by the specific relationship between the writer and the reader established through the text (Mur-Dueñas, 2011).

Lexical and metadiscoursal choices determine how ideas in general, and specialised knowledge on environmental economic sustainability in particular are conveyed. These choices allow knowledge producers to bring research findings and topics closer to audiences who may not be so familiar with them, thus guiding their understanding, expressing their viewpoints and establishing a specific relationship with such audiences.

Metadiscourse has been widely used as a framework to analyse academic and research genres including research articles, abstracts, PhD theses, and essays from cross-disciplinary, cross-linguistic and cross-generic perspectives.[1] It has also been recently adapted and adjusted to analyse how meanings are conveyed and how relationships between science/researchers–readers/consumers are established in digital texts and genres such as academic posters (D'Angelo, 2016), multimodal elements within academic lectures (Bernad-Mechó, 2017), online academic papers (Carrió-Pastor, 2021), and Twitter for research dissemination purposes (Mur-Dueñas & Pascual, 2023).

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[1] For a systematic review of metadiscourse analyses of academic writing see Pearson & Abdollahzadeh (2023).

In this study of digitally-disseminated specialised knowledge on environmental economic sustainability, metadiscourse is not taken as a point of departure and applied into the corpus-based analysis, but is rather considered in order to determine the function of language choices frequently made by scientists and scriptwriters in their recontextualisation of such knowledge. Thus, a 100-word list produced from the corpus of scientific dissemination texts will be analysed from a metadiscoursal perspective to determine which metadiscoursal markers and interactive and interactional categories are more commonly resorted to. I contend that metadiscourse categories can be aligned with some of the strategies and functions deployed by scientists and scriptwriters when recontextualising scientific knowledge and disseminating it for a broad audience, as indicated in Table 1.

	METADISCOURSE CATEGORY	RECONTEXTUALISATION FUNCTION
Interactive metadiscourse	logical markers code glosses sequencers topicalisers endophoric markers	enhancing comprehensibility by explaining, illustrating and elaborating on content
	evidentials	fostering credibility by appealing to sources and authorial voices
Interactional metadiscourse	self-mentions	
	engagement markers attitude markers	promoting interactivity by appealing to the audience and by stressing novelty and relevance
	hedges boosters	fostering credibility by modulating commitment to claims

Table 1. The role of metadiscourse categories in the recontextualisation of scientific knowledge

Examining the metadiscourse choices made by knowledge producers will provide insights into how the discourse shapes the accessibility of knowledge, the authors' projected stance towards disseminated information, their engagement

with diverse audiences, and the construal of credibility and trustworthiness. In so doing, the analysis will delve into how persuasion is constructed in scientific digital dissemination practices to engage both experts and non-experts in sustainable practices concerning environmental economic issues.

3. METHODS

3.1. The corpus

The analysis is based on a corpus of the SciDis Database (compiled by the InterGEDI research group at Universidad de Zaragoza, Spain) consisting of: 10 texts taken from *The Conversation* platform (TC_ECO), 10 feature articles taken from two different sites (*Nature* and *The Smithsonian Magazine*) (FA_ECO), and 10 research digests taken from other two sites (*Science Daily* and the *European Commission*) (RD_ECO) (see the Appendix). The 30 textual instances exemplify the Economy disciplinary field in the corpus and deal with the topics of sustainability and circular economy, in line with SDG 12: Responsible consumption and production of the 2030 Agenda for Sustainable Development. The text length and specific characteristics of the ECO SciDis corpus are summarised in Table 2.

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	The Conversation (TC_ECO)	Feature articles (FA_ECO)		Research digests (RD_ECO)		TOTAL
		Nature	*The Smithsonian Magazine*	*Science Daily*	*European Commission*	
Nº of texts	10	5	5	5	5	30
Nº of words	8,997	5,742	8,894	3,489	3,579	30,701
Average nº of words per text	900	1,464		707		1,023

Table 2. Description of the ECO SciDis corpus

The analysis draws upon the NOW corpus (**N**ews **o**n the **W**eb) as a reference corpus to generate a keyword list, as indicated in section 3.2. It contains 18.6 billion words of data from web-based newspapers and magazines from 2010 to the present time. The corpus was accessed and downloaded in March 2024 and it contained material up to 11 February 2024. According to the description provided on its website https://www.corpusdata.org/formats.asp, NOW is a structured corpus that shows you what is actually happening in the language. Given the digital nature of the texts scrapped, it is deemed comparable to the ECO SciDis corpus so that it can allow us to delve into some lexical specificities.

3.2. The procedure

In accordance with the aims and the research questions of the study, a corpus-based two-fold analysis was conducted using the software AntConc (Version 4.2.4, Anthony, 2023). First, a keyword list of the ECO SciDis corpus was generated using as reference corpus the NOW (News on the Web) corpus. A close look was taken at those words included among the first 30 found in at least half of the texts in the corpus, that is, featuring in at least 15 scientific dissemination texts. Concordance analyses were also performed on selected keywords to identify the key topics in the disseminated and recontextualised research. The results are presented in section 4.1.

Second, a 100-word list of the ECO SciDis corpus was created and metadiscoursal items present in more than half of the texts were identified and explored. Drawing on previous research on the recontextualisation of scientific knowledge and metadiscourse (see section 2.3.), these items were categorised in terms of their metadiscourse function in the dissemination of specialised knowledge on economic environmental sustainability, as detailed in section 4.2.

4. RESULTS AND DISCUSSION

4.1. Keywords in the SciDis Economy corpus

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As indicated in section 3.2., once the keyword list was generated, words among the first 30 found in at least half of the texts in the corpus were looked into. The keywords meeting these criteria are presented in Table 3. Unexpectedly, the words "sustainable", "economy" and "environmental" featured in the keyword list. Other items – such as the lexical nouns "waste", "energy", "materials" – provide insights into the type of research areas that are explored and disseminated and how economic environmental sustainability is conceived of. Additionally, the presence of "researchers" as a keyword highlights the characteristic nature of these digitally-mediated scientific dissemination texts, underscoring the idea that specialised knowledge is mediated and recontextualised for a broad audience. The frequent reference to the agents of the investigation serves to enhance credibility and rigour so that audiences accept the knowledge digitally disseminated.

Type	Rank	Nº of texts including it
waste	3	16
energy	6	16
sustainable	7	19
materials	7	16
economy	13	17
researchers	17	16
environmental	30	19

Table 3. Top keywords in the ECO SciDis corpus (range <15)

The concordances of the keyword "sustainable" in the corpus are highly diverse: "production methods", "business models", "(business) practices", "consumption and production", "aquaculture management", "behaviour", "design", "development", "food choices", "product choices", "forests", "growth", "living", "plastics economy", "smartphones", "source of funding", "wellbeing and care". These findings suggest that a sustainable approach needs to be taken by all businesses regardless of the sector and that it influences numerous stages of the business transactions as well as the agents involved. The word "sustainability" does not appear in Table 3 as it ranks 36 and was present in 14 texts. Nevertheless, its concordances, such as "of information and communication technology", "progress", "gains", "improvements", "performance", "problem", indicate that it is to be embraced by all sectors and that it is something positive and requires ongoing attention and improvement. These findings are in line with Orna-Montesinos's (2015) corpus-based analysis of sustainability in news magazines, in which she also reports a higher prevalence of positive views associated with it, and fewer negative and neutral views.

The term "economy" strongly collocates with "circular" in the corpus, establishing a strong connection between sustainable practices and circular economy. They seem to reinforce each other: sustainability in business practices will lead to circular economy and circular economy will ensure sustainability. Concordances of "environmental" show its frequent combination with words such as "impact", "performance", "management", and "challenges", suggesting that environmental issues deserve attention in the Economy field and require businesses to address them, through the adoption of sustainable practices. The terms "waste", "energy" and "materials" appear to be the central themes in the research being undertaken, reflecting areas on which researchers' attention focuses in order to promote sustainability in businesses. The need for careful management of resources, such as materials and energy, is highlighted, and for reducing, avoiding or repurposing waste in business. Lastly, as highlighted above, the recontextualised nature of the scientific knowledge disseminated is evident in the keyness of "researchers". This word frequently collocates with reporting verbs such as, "suggest", "report", "found", "acknowledge", and "note", bringing authorial voices into the dissemination of texts enhancing the persuasiveness of recontextualised specialised knowledge for expert and non-expert readers. Such intertextuality has been identified as a common feature of science dissemination (e.g., Bondi, 2018; Engberg & Maier, 2015; Lorés, 2023; Orna-Montesinos, 2015).

4.2. Most frequent metadiscoursal choices in the SciDis Economy corpus

A 100-word list was generated (section 3.2.) to identify the most frequent metadiscoursal choices used to construct a persuasive discourse in the digital

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disseminating texts analysed. Table 4 displays the metadiscoursal markers found in at least 15 out of the 30 texts in the corpus, ranked by frequency.

Type	Rank	Nº of tokens	Nº of texts including it
can	26	109	27
could	28	102	26
also	30	98	27
we	30	98	20
which	33	97	26
such	42	80	26
new	49	68	24
some	59	55	23
researchers	64	53	16
much	65	51	20
all	66	50	17
study	66	50	15
most	75	47	26
example	76	46	22
would	76	46	20
will	81	44	18
may	84	43	16
high	86	42	15
need	86	42	22

Table 4. Most frequent metadiscoursal markers in the ECO SciDis corpus (range <15)

Table 5 shows how the metadiscourse choices included in the 100-word list fall into the categories established and are linked to the particular functions of recontextualisation of specialised knowledge in scientific digital disseminating texts.

	Metadiscourse categories	Metadiscourse features in ECO SciDis word list	Recontextualisation function
Interactive metadiscourse	logical markers code glosses sequencers topicalisers endophoric markers	*also* *which, such, example*	enhancing comprehensibility by explaining, illustrating and elaborating on content
	evidentials	*researchers, study* *we* (exclusive)	fostering credibility by appealing to sources and authorial voices
	self-mentions		

	engagement markers	*we* (inclusive), *need*	promoting interactivity by appealing to the audience and by stressing novelty and relevance
Interactional metadiscourse	attitude markers	*new, much, high*	
	hedges	*can, could, some, would, may*	fostering credibility by modulating commitment to claims
	boosters	*all, most, will*	

Table 5. Frequent metadiscoursal choices within categories in the ECO SciDis corpus

Results reveal that among the most frequent metadiscoursal choices are the following interactive features: "also", "which", "(for) example" and "such (as)". These markers introduce details, explanations and instances so that specialised knowledge can be accessed and understood by multiple audiences, and thus contribute to enhancing comprehensibility. The additive logical marker "also" is used to present further ideas or arguments in a sequential manner, establishing a linear progression, and a logical flow between ideas (see example 1). The use of this interactive metadiscourse marker can be considered to make content more readily understood by (semi)lay persons accessing scientific dissemination digital texts. "Which" frequently introduces a non-defining relative clause providing extra information that knowledge producers judge necessary for their readers, as example 2 illustrates. In fact, it has been found to be used in this way in 85 of its 97 tokens in the corpus. Out of the 46 tokens of "example", 42 are used in combination with "for" (see example 2), the rest of the tokens are preceded by "a (good)", "another" and "one". "Such" very commonly collocates with "as" (54 out of 80 tokens), that is, it is used as part of a code gloss to introduce an instance (example 3a). "Such" is also found to be used with an anaphoric function (as in example 3b) in which a cohesive tie is established with the preceding ideas or arguments facilitating readers' access to and understanding of specialised knowledge.

(1) The researchers suggest that the most successful efforts are those that adopt a broad environmental and societal scope beyond the concerns of the business itself. They **also** argue that such transitions require governmental incentives and support as well as more robust accreditation systems. (RD_ECO02_04)

(2) In many other areas, conflicting goals arise. Take, for **example**, the production of synthetic fuels, **which** is extremely energy-intensive, or the use of biomass, **which** competes with food production. (RD_ECO01_03)

(3) a) The latter may be waste sources (**such** as waste water, bio-matter or waste heat), internet and connectivity networks, and human labour (**such** as the immediate community). (TC_ECO_09)

b) Overwhelmingly, used textiles go to landfill (in the United States, the proportion is around 85%), in part because there are relatively few systems (at scale) that collect, recycle and reuse materials. **Such** recycling requires the manual separation of fibres, as well as buttons and zips. (FA_ECO01_05)

No sequencers, topicalisers or endophoric markers are among the most frequent words in the ECO SciDis corpus (Table 5). This may be due to their overall lower possible incidence of use, to the rather short nature of the texts – which does not make it necessary to introduce topics or establish links among different sections or parts – or to the fact that some of these textual connections are established by means of typographical and other visual ways.

The frequently used words "researchers" and "study" (Table 4) act as evidential metadiscourse markers in these texts (Table 5) since they work as indicators of the source of the information (the recontextualised source text(s) and their authors) fostering credibility of the specialised content disseminated (examples 4 and 5).

(4) The **researchers** note that when longer building lifetimes are considered, impact per year decreases significantly, especially since the construction phase makes a high contribution to the overall impact.
[...]
The **researchers** acknowledge that the building plans they used were at pre-project stage, therefore actual quantities of building materials used may differ from projections. (RD_ECO02_02)

(5) In the **study**, published in *JAMA Network Open* last week, scientists asked more than 5,000 participants to select a hypothetical meal from a sample fast-food menu. (FA_ECO02_05)

Table 4 further shows that "we" ranks among the most common 100 words in the ECO SciDis corpus. This metadiscourse feature can have two different functions. First, it serves to reinforce the authorial voice by referring to scientists and knowledge producers, contributing to enhancing credibility, as in example 6; this has been its most common function (60 out of 98 tokens). Second, "we" functions as an inclusive pronoun, referring jointly to knowledge generators and users, which would then function as an engagement marker, promoting interactivity and appealing to shared views or ideas (see example 7). "We" has been used as an engagement marker in 37 out of 98 tokens.

(6) **We** observed certain strategies and trends.
[...] **We** documented farms ranging from 3,220m² to 4m².

[…] But **we** also came across urban farmers who actively discouraged a multifunctional approach.
[…] Finally, **we** saw a range of technological applications and solutions. (TC_ECO_09)

(7) Circularity requires a complete rethink of our perception of resources — and how **we** build our economic activities around them. (FA_ECO01_02)

The metadiscourse feature "need" is found among the most frequent words in the ECO SciDis corpus (Table 4). It can function as an engagement marker when used in combination with "to" as an obligation modal, and thus as a type of directive (Hyland, 2000, 2005), so that the potential audience (whether lay people or specific stakeholders) takes a particular course of action or thinking (example 8). Out of the 42 tokens of this frequently used word, 30 function as direct appeals to the readership, 9 cannot be considered metadiscoursal (e.g., "those in need", "if they don't get what they need") and 3 function as attitude markers (e.g., "the need to protect other living things"). Although "has" and "have" appeared also as very frequent words in the corpus (125 and 101 tokens, respectively), they have not been included in the list of common metadiscoursal choices in Table 5, since a very small number of them (2 and 13, respectively) are used metadiscoursally as semi-modals functioning as obligation modal with an engaging function.

(8) These are important proofs of principle, but such techniques **need to** become mainstream. (FA_ECO01_06)

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In the process of recontextualising scientific knowledge, attention getting and engagement strategies have been reported to be salient (e.g., Carter-Thomas & Rowley-Jolivet, 2020; Lorés, 2023; Luzón, 2013; Xia, 2023). However, just two engagement markers (inclusive "we" pronoun and "need (to)") are among the most common metadiscoursal choices in this corpus of scientific disseminating texts on economic environmental sustainability. It may be the case that imperatives, which are realised in various lexical forms, are a key engagement feature as well, together with questions and other non-verbal features.

Interactivity with a global audience may also be achieved by attitude markers, expressing knowledge producers' viewpoints. As Table 5 indicates, novelty and relevance are frequently highlighted through the use of "new", "much" and "high". The adjective attitude marker "new" can express evaluation towards research (thus working as a research-oriented marker) or towards aspects related to the content (thus working as a topic-oriented marker). In the corpus, "new" is a research-oriented marker and collocates with "study", "research" and "paper" in 19 out of 68 tokens (example 9a), and it is a topic-oriented marker and collocates with diverse topic entities, such as, "technologies", "materials", "products" in 47 out of 68 tokens (example 9b). In the latter case, scientists and scriptwriters appeal to how changes need to be undertaken to embrace economic environmental sustainability practices. The remaining two tokens cannot be considered metadiscoursal.

(9) a) To meet the circular economy goals of reusing, repairing and recycling existing materials and products, the clothing industry needs to change, and consumers must raise their expectations of clothing lifetime, say researchers behind a **new** study that takes data from a number of projects convened by the UK's Waste and Resources Action programme (WRAP) and Department for the Environment, Food and Rural Affairs (DEFRA). (RD_ECO02_01)

b) Reducing our waste's impact on the planet requires **new** technology and materials – and, more importantly, a complete rethink of how we incentivize the production and use of resources. (FA_ECO01_02)

Out of the 51 tokens of "much" (Table 4), 43 can be considered to fulfil an attitudinal function intensifying the relevance of the argument made or idea exposed (example 10), the rest of them are either examples of neutral equal comparison or of the question phrase "how much". The third attitude marker among the most frequent words in the corpus, "high" is used as a metadiscoursal item in half of the tokens (21 out of 42) in combination with "quality", "impact", "amount", etc. (example 11). It is, however, commonly used to express propositional meaning (e.g., high emissions, high street).

(10) For example, technology is certainly going to play a **much** bigger role in the way that we supply water, and in the way that we use water. (RD_ECO01_02).

(11) In export markets, Africa's agribusiness products are likely to benefit from the continent's reputation for **high**-quality natural resources. (TC_ECO_07)

The remaining metadiscoursal choices among the 100 most frequent words in the corpus refer to how knowledge generators modulate their commitment to the recontextualised claims. This modulation entails the expression of tentativeness through hedging modal verbs "can", "could", "would" and "may", and approximator "some", and to a lesser degree, the expression of certainty through boosters such as "all", "most" and "will" (Tables 4 and 5). The high number of hedges among the most frequent words in the corpus and their high frequency of use is somehow unexpected, as popularised texts tend to be characterised by a high degree of commitment (e.g., Hyland & Zou, 2021; Scotto di Carlo, 2014). It may be argued that the blurred audience addressed comprising both expert and non-experts may call for mitigated statements which reflect the indefinite nature of results in any published research work (e.g., Hyland, 2000, 2005, inter alia).

"Can" ranks highest among the metadiscoursal markers among the 100-word list generated from digital disseminating texts on economic environmental sustainability (Table 4). When selecting the modal verb "can" meanings of ability and possibility often overlap, making it challenging to determine its use as a hedge in scientific and academic discourse. Indeed, "can" is especially ambiguous in

academic prose, since it can often be interpreted as marking either ability or logical possibility'' (Biber et al., 1999, p. 492). In any case, its use modulating commitment to claims (example 12) is considered to contribute to seeking credibility, and thus knowledge recontextualised gaining acceptance by readers. The same function is fulfilled by the use of the modal verbs "could", an indicator of lack of absolute certainty (example 13), "would", employed in all cases to express uncertain predictions (example 14), and "may" (41 tokens overall), which has been deployed as an epistemic marker (example 13) in all cases but two (in which it refers to the month of the year). Finally, "some" (example 15) reduces the absoluteness of a claim. These hedging metadiscourse markers have a persuasive function in as much as by modulating scientific findings and courses of action proposed, they may be more readily accepted by experts and (semi)lay persons.

(12) Anaerobic digesters **can** also tackle another problem: Americans throw out 30 to 40 percent of all the food we grow. (FA_ECO02_01)

(13) Solutions **could** include higher-quality dyes appropriate for the fabric, and gentler aundry detergents. UV-absorbing agents **may** also be added during processing. (RD_ECO02_01)

(14) Addressing this attitude to nature in much of the business world **would** require changing economic theory and belief systems to recognise the sentience of all life on earth and the need to protect other living beings. (TC_ECO_03)

(15) Still, floating solar panels do have **some** downsides. (FA_ECO02_04)

On the other side of cline, the boosting metadiscoursal markers "all" and "will" as a modal verb (not as a marker of pure futurity), expressing full commitment to the claims made, have been found among the most frequent words in the ECO SciDis corpus (Table 4). In examples 16 and 17 knowledge generators assert confidence in solutions for economic and environmental sustainability.

(16) To counter **all** that waste, researchers and start-up companies are developing methods to recover and reuse the material. (FA_ECO01_01)

(17) These actions **will** ensure that the aquaculture industry can provide food security and boost the ocean economy, without harming the environment or the local communities. (TC_ECO_08)

5. FINAL REMARKS

This paper aimed to analyse the frequent lexical and metadiscoursal choices in digital dissemination texts to contribute to the study of sustainability discourse and

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to explore the role that such choices have in the recontextualisation of specialised knowledge for diversified audiences. The analysis, based on a corpus of digital disseminating texts, comprising 10 research digests, 10 feature articles and 10 texts from the knowledge sharing platform *The Conversation*, revealed significant use of nouns related to key themes in the research disseminated, namely, "waste", "energy" and "materials". The research disseminated on economic environmental sustainability is indeed to a great extent focused on how to reduce waste, how to make an appropriate use of energy and materials to foster sustainable practices by businesses and users. These topics not only hold academic interest but also resonate with institutional and societal concerns.

The study has identified the frequent metadiscourse markers used by knowledge generators to disseminate specialised knowledge. First, it has been found that the additive logical marker "also", the code glosses "such (as)" and "for (example)" are used as interactive metadiscourse features to present specialised knowledge in a way that is comprehensible by expert and non-expert audiences reducing knowledge asymmetries between knowledge producers and knowledge consumers (Engberg, 2023; Engberg & Maier, 2015). Second, the use of "researchers" and "study" as evidential markers, and exclusive "we" as a self-mention marker feature as highly frequent introducing intertextual links with the original research and bring other voices in the scientific dissemination texts promoting credibility and readers' trust on the content and knowledge conveyed. Third, the corpus-based analysis has shown the use of inclusive "we" bringing together knowledge producers and knowledge consumers, and the obligation modal "need (to)" as an appeal to action directing diverse stakeholders to take action and embrace sustainable economic practices. In appealing to the audience and promoting interactivity and engagement, the attitude markers "new", "much" and "high" have been found to be most frequent metadiscoursal choices. Finally, by employing hedging metadiscourse markers, especially modal verbs "can", "could", "would" and "may" as well as approximators "some" and "most", scientists and scriptwriters modulate the commitment to the claims made from recontextualised specialised knowledge, which is highly tentatively presented among experts. In contrast, two boosting metadiscourse markers have been found among the most frequent 100 words in the corpus, "will", which on many occasions has just a futurity meaning (not a certainty one) and "all". Through these knowledge generators stress their conviction especially as regards finding definite solutions to environmental problems in economic matters, which refer to embracing sustainable practices and circular economy. Overall, the most frequent lexical and metadiscoursal choices made by disseminators of specialised knowledge on environmental economic sustainability have clearly contributed to not only reporting on such knowledge, making it comprehensible and accessible to a blurred audience, but also to persuading them of its credibility and legitimate nature and therefore to be more readily accepted.

The findings have important pedagogical implications. The metadiscourse categories and the most frequent realisations aligned with the functions they perform

can be used by knowledge producers in their process of recontextualising specialised knowledge for diversified audiences in digital disseminating texts. Looking into most common lexical items and metadiscoursal markers can allow knowledge producers to make appropriate discursive choices when embracing digital practices to disseminate research results. They can also be the starting point for training sessions designed for knowledge communicators, including scholars, scriptwriters, or novice researchers, to make effective discursive choices in their digital dissemination endeavours, which are increasingly institutionally and socially demanded.

The study has some limitations. First of all, even if the corpus on which the study draws is to be considered representative of digital disseminating practices, it may be enlarged to include further sites, texts and practices. Second, the study has centred on digital dissemination practices on a very specific topic. Therefore, the findings need to be interpreted with caution and generalisations to such practices in relation to the dissemination of research in other disciplinary specialised areas and topics should not ensue. Finally, as mentioned above, looking into the keyword choices may leave out features which also fulfil the specific functions determined in relation to metadiscourse categories. Such functions can be realised through other discursive and non-verbal choices.

Future research should aim to take a similar perspective to explore other digital dissemination practices, on the same and other topics within and beyond sustainability, to confirm whether the findings presented are unique to the specific discourse of economic environmental sustainability or whether differences and similarities can be drawn. Also, further analyses in the digital dissemination of specialised knowledge, in general, or of sustainability (given its current prominence), in particular, need to take a combined verbal and non-verbal approach, looking at multimodal ways in which comprehensibility is enhanced, commitment to claims modulated and intertextual links established ensuring credibility, and interactivity and engagement with a blurred audience promoted.

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Appendix

ECO SciDis corpus

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RD_ECO (Research digests)

RD_ECO01_01: Heat or eat? Prepayment users consume less fruit and vegetables, study finds
RD_ECO01_02: Tech could help BC farmers reach customers, mitigate climate change impacts
RD_ECO01_03: A wholly sustainable plastics economy is feasible
RD_ECO01_04: SMEs are likely to achieve higher environmental performance through circular economy adoption, new research finds
RD_ECO01_05: Green' hydrogen: How photoelectrochemical water splitting may become competitive
RD_ECO02_01: Fast fashion: common reasons garments are discarded
RD_ECO02_02: Circular building design: assessment of two versions of the same residential building highlights benefits of adaptable building
RD_ECO02_03: Sustainable smartphones? Modular design promotes do-it-yourself repair to extend device life
RD_ECO02_04: Understanding of the broader context is important for small and medium-sized enterprises transitioning to circular economy
RD_ECO02_05: Factors promoting green growth include access to information on funding opportunities

FA_ECO (Feature Articles)

FA_ECO01_01: How to fit clothing into the circular economy
FA_ECO01_02: To get serious on the circular economy, upend how global business works
FA_ECO01_03: Tackle ever-growing consumption to safeguard sustainability gains
FA_ECO01_04: Recycling our way to sustainability
FA_ECO01_05: How fast fashion can cut its staggering environmental impact
FA_ECO02_01: How Dairy Farmers Are Turning Manure Into Money

FA_ECO02_02: The Future of Recycling May Be in Microbes
FA_ECO02_03: This Canadian Ski Area Doesn't Make Snow—It Farms It
FA_ECO02_04: Are Floating Solar Panels the Future of Clean Energy Production?
FA_ECO02_05: Could Climate Impact Labels Change the Way We Eat?

TC_ECO (The Conversation)

TC_ECO_01: South Africa can reduce emissions and create jobs. A tough task, but doable
TC_ECO_02: How equity, diversity and inclusion policies are becoming a tool for capitalism
TC_ECO_03: What ancient wisdom can teach businesses about sustainable finance
TC_ECO_04: Indonesia's 'blue carbon credits' are crucial for global climate mitigation. Here's how to help them flourish
TC_ECO_05: Participation income: the social welfare model that could help communities fight climate change
TC_ECO_06: How to make roads with recycled waste, and pave the way to a circular economy
TC_ECO_07: Africa's agribusiness sector should drive the continent's economic development: Five reasons why
TC_ECO_08: 3 ways to help Indonesia grow more seafood from aquaculture, with less local impact
TC_ECO_09: Farms in cities: new study offers planners and growers food for thought
TC_ECO_10: Local nonprofits play a key role in recovery from disasters – while also having to get back on their own feet

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