frontiers | Frontiers in Climate

TYPE Methods
PUBLISHED 21 June 2024
DOI 10.3389/fclim.2024.1358503

OPEN ACCESS

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RECEIVED 19 December 2023
ACCEPTED 03 June 2024
PUBLISHED 21 June 2024

CITATION
Roos R (2024) The role of frames in shaping the representation of local knowledge and concerns in scientific texts.
Front. Clim. 6:1358503.
doi: 10.3389/fclim.2024.1358503

The role of frames in shaping the representation of local knowledge and concerns in scientific texts

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Research teams working with indigenous people or local communities in the field of global environmental change represent local knowledge and concerns related to climate or environmental issues in the resulting scientific texts. However, by highlighting some aspects in particular ways and fading others to the background, every representation simultaneously reveals, conceals, and distorts aspects of what is represented. This paper aims to analytically highlight how frames in scientific texts are at work in emphasizing some aspects of local knowledge and concerns while fading other aspects into the background, which inevitably has micro and macro consequences through how local knowledge is incorporated, represented, and added to the body of knowledge of a given field. I have adapted a widely used frame concept from media studies to make it suitable for the analysis of scientific texts. The proposed method identifies main frames of a paper, maps how devices for achieving selective emphases, such as repetitive formulations and strong words, are at work in the text, and elicits how the frame's key functions occur in papers: (1) identify problems, (2) diagnose causes, (3) make moral judgments, (4) suggest solutions or offer a path toward solutions, and (5) attribute roles. Points (4) and (5) are specifically designed for the analysis of scientific texts. In addition, I have added a step that shows how frames shape representations of local knowledge and concerns in scientific texts. This method is meant to develop reflexive awareness among the scholarly community about their writing practices and promote critical thinking about the unintended impacts that uncritical reproduction of taken-for-granted frames may have through their shaping of representations of local and indigenous knowledge and concerns. To illustrate the potential of the frame concept for analyzing scientific texts, I applied the new method to two papers. Further, the paper discusses the potential of frame analysis as a tool for reflexivity among research teams that work with and within local communities.

KEYWORDS

local knowledge, indigenous knowledge, frame analysis, textual reflexivity, representation

1 Introduction

Researchers are increasingly invited to collaborate with local and indigenous communities to develop more robust and inclusive diagnoses and responses to complex societal challenges such as climate change (OECD, 2020; UNESCO, 2022). However, studies involving local or indigenous people and their knowledge face a range of challenges: projects are often initiated

by researchers rather than locals (Castleden et al., 2012; Kouritzin and Nakagawa, 2018; Anderson and Cidro, 2019; Macdonald et al., 2023), researchers experience that indigenous peoples lack confidence in researchers due to negative experiences from previous projects (Macdonald et al., 2023; Roos, 2024), and results are rarely communicated in the local language (Hilhorst et al., 2021). Furthermore, differences in cultural backgrounds of researchers and local people and the use of interpreters may lead to not fully grasping, filtering and misrepresenting what local and indigenous respondents actually said (Roos, 2024). Other researchers mention the dominance of Western theoretical frameworks, and methods in working with indigenous peoples (Bradley, 1993; Nakagawa, 2017; Klett and Arnulf, 2020; Doering et al., 2022; Igwe et al., 2022; Mena and Hilhorst, 2022; Wilson et al., 2022; Macdonald et al., 2023) and the dominance of English keywords "resilience," "vulnerability" or "risk" in projects and publications (Chmutina et al., 2021; Mena and Hilhorst, 2022).

In response to these challenges, part of the literature focuses on ethics in community-based participatory research (Banks et al., 2013), addressing epistemic injustice (Fricker, 2007), decolonization (Keet, 2014) and responsible research (Völker et al., 2023). A further branch of literature focuses on how indigenous knowledge systems and Western science can best be interwoven in environmental research and management, often in the context of major scientific assessment processes such as IPBES and IPCC (Bicker et al., 2003; Ford et al., 2016; Mistry and Berardi, 2016; Tengö et al., 2017; Hill et al., 2020; McElwee et al., 2020; Henri et al., 2021). This literature criticizes the tendency among the scientific community to assimilate local ecological knowledge within Western worldviews but provides little in-depth analysis of how this occurs in scientific texts. A challenge that can have major consequences for local people and that remains difficult to solve is the discrepancy between Western and indigenous ways of knowing, because such differences in epistemic cultures can lead to misinterpretation, misrepresentation, and under-appreciation of the salience of local and indigenous knowledge (Edwards and Holland, 2020; Roos, 2024). All the challenges mentioned above impact the ways in which local knowledge is represented in the resulting scientific texts.

Indeed, in a scientific text, researchers necessarily focus on specific aspects of the issue at hand, based on the researchers' analyzes, interpretations, and theoretical preconceptions. This results in particular representations of snippets of reality. In the literature mentioned above, there is little attention to the role of frames in representing local and indigenous knowledge in scientific texts. Ford et al. (2016) analyzed how indigenous content was framed in the Working Group II (WGII) portion of the Fifth Assessment Report (AR5) and found two overarching frames, one portraying indigenous peoples as victims of climate change and one on indigenous knowledge systems as important to climate change. To my knowledge, there is still a blind spot regarding how frames in scientific texts written by scholars who work with indigenous people or local communities shape the representation of local and indigenous knowledge in their texts.

Hence, the aim of this study is to advance responsible research with indigenous people or local communities by developing a method that enables textual reflexivity on the way researchers represent local knowledge and concerns (LKC) in their scientific papers. The research question addressed in this method-paper is: *what is the potential of the frame concept for making visible how the representation of LKC related to climate and environmental issues in scientific texts is shaped?*

Representation has many meanings and is used in fields such as anthropology, social psychology, media studies, and public policy, but with different connotations in different disciplinary traditions. For example, social representation theory (Moscovici, 1984) focuses on how ordinary people turn difficult abstract concepts into familiar concrete concepts that can be understood and used. In public policy and democracy, representation refers to someone representing someone else's interests (e.g., Pitkin, 2016). Similarly to Hall (1997), I use and understand representation to be a meaningful portrayal of a phenomenon or object of study (see also Fløttum et al., 2014), in my case, the knowledge and concerns of local or indigenous people. Phenomena can be described in various ways using several tools (symbols, narratives, tables, images, and video, etc.), none of which is all-encompassing. Indeed, every representation simultaneously reveals, conceals, and distorts (*cf.* Tufte, 1983). Some parts of the object or phenomenon fade into the background, while others are highlighted in particular ways. A classic example is a map intended to represent a specific area.

Since scientific papers can have micro and macro consequences that may affect society (e.g., by influencing political decisions), Wacquant and Bourdieu (1992) invite researchers to incorporate reflexivity into their work, arguing: "If we do not expose presuppositions inscribed in the fact of thinking the world" (p. 39) to systematic critique, we risk collapsing practical logic into theoretical logic. Bourdieu's concept of reflexivity entails primarily epistemic reflexivity. With his concept, he aimed to "provide cognitive tools that can be turned back on the subject of the cognition, not in order to discredit scientific knowledge, but rather to check and strengthen it" (Bourdieu, 2004, p. 4). It "invites intellectuals to recognize and to work to neutralize the specific determinisms to which their innermost thoughts are subjected, and it informs a conception of the craft of research designed to strengthen its epistemological moorings" (Wacquant and Bourdieu, 1992, p. 46). Reflexivity must be a collective enterprise that primarily targets the social and intellectual unconscious embedded in analytic tools and operations. As such, epistemic reflectivity can guide social inquiry (Wacquant and Bourdieu, 1992, p. 40).

A closely related concept is textual reflexivity: "Texts do not simply and transparently report an independent order of reality" but are themselves "implicated in the work of reality-construction" (Atkinson, 1990, p. 7). Importantly, written representations can never fully constitute the phenomena they account for (Whitaker and Atkinson, 2021). In this context, critical anthropology emphasizes the importance of textual reflexivity that aims for pluralism in terms of perspectives and voices in the representation of "fieldwork," "the field," and "the fieldworker" (*cf.* Van Maanen, 2011). I believe this also applies to other disciplines and projects where researchers collaborate with indigenous people or local communities.

Since text does not reproduce reality, but merely represents it, Whitaker and Atkinson (2021) write that the term representation is itself a significant aspect of reflexivity. Through representation in scientific papers, academics generate images, accounts, and reports of a phenomenon or object studied. But how can we be sure that the representation appropriately reflects the phenomenon studied?

Discussing the problem of representation in scientific text in the context of textual reflexivity, Woolgar (1988) argues that, like a

photograph and its frame, a text and its frame "conspire to reinforce the notion of a constructed reality beyond the text" (p. 28). Through its frame, a text presents "a mere extract from a much wider pre-existing reality" (Woolgar, 1988, p. 28), and "a shift in frame would reveal to us another part of the same objective world" as represented in a scientific text (*ibid.*). Woolgar (1988) does not elaborate on these claims, but as I will demonstrate further in this article, the focus on the text's frame can be developed into an analytical method that can serve as a useful tool for research reflexivity.

The concept of frame is widely used to analyze media texts or media news (Cooper, 2002; de Vreese, 2005) or controversies (Rein and Schön, 1993; de Boer et al., 2010). This leads to different definitions of the term frame and different ways of using the term. Below, I focus on how I understand and use the frame concept as an analytical strategy for reflexivity.

Texts, in this case, scientific papers, often contain a main frame or central organizing idea (Gamson and Modigliani, 1989) and several other frames that support or oppose the main frame. This central idea is necessary to give meaning to the content and events the text describes. In addition, frames can have other functions, such as highlighting specific problems with their causes and solutions so that they appear important and compelling to the reader. Some frames may also include moral aspects of the problems described, and the solutions proposed may contain elements of relevant cultural values (Entman, 1993; de Vreese, 2005). Information can be made to appear meaningful and understandable through frames in many ways, depending on the text's genre and purpose. For instance, newspaper articles or some of the theatrical genres, such as comedy, can intentionally operate with multiple frames. to surprise the audience, make them laugh, and the like.

Based on a text's purpose and genre, frames "highlight some bits of information about an item that is the subject of a communication, thereby elevating them in salience" (Entman, 1993, p. 53). This is necessary for readers to "perceive the information, discern meaning and thus process it, and store it in memory" (Entman, 1993, p. 53). In many cases, information is emphasized through such devices as placement, repetition, or widely accepted terms or phrases (Entman, 1993). The recognizable formulations need not be common knowledge, but they must be accepted in the target readers' culture (e.g., in climate science). Entman (1993) explains the need to use recognizable concepts thus: "Once a term is widely accepted, to use another is to risk that target audiences will perceive the communicator as lacking credibility—or will even fail to understand what the communicator is talking about" (p. 55).

In summary, frames in scientific papers emphasize certain elements leading to only some issues, causes, solutions, moral aspects, and/or recommendations appearing correct, important, or credible.

Before presenting the development of the new frame-based analytical strategy for scientific texts and illustrating its application, I briefly clarify this study's context and the corpus used.

2 Context

This study is part of the project "Sense making, place attachment, and extended networks as sources of resilience in the Arctic" (SeMPER-Arctic), which elicits local stories of changes, crises, and shocks in Arctic communities. Working closely with local communities, the project had a dedicated work package on reflexivity. Within this work package, I focused on: (1) the identification of challenges and how they are addressed in different research projects involving local people; (2) how LKC are represented in research articles. The study that I describe in this paper is based on point (2).

I recruited 15 respondents with different backgrounds,[1] informed them about my study, interviewed them, and asked them to select one of their papers that matched my study's theme. Some chose to send me articles published before 2010, while others sent me recently published articles. Some of the articles are based on transdisciplinary projects, while others are based on fieldwork with observations and interviews. This applies regardless of the year in which the articles were published. Interview transcripts and scientific papers are the data material for the study related to point (1) (Roos, 2024). For study (2), I only analyzed the researchers' papers. All respondents were informed that these papers would be analyzed.

In my research project, I developed a new analytical method based on the frame concept as a tool for reflexivity and applied it to all 15 articles in the corpus. The corpus spans work in 14 different countries with 20 different local communities. Several articles are inter- or transdisciplinary and some are mono-disciplinary (e.g., anthropology, human geography). The approaches range from co-creation workshops to ethnographic fieldwork.

Unfortunately, the word-limits set by scientific journals make it almost impossible to present both a newly developed method in a fully transparent way and the results of applying that new method to a corpus of 15 scientific texts in a single paper. Therefore I decided to present my frame-based analytical strategy for textual reflexivity separately in this method-paper and use the 2 papers in the sample that vary most according to the characteristics described above, to illustrate the method and how to apply it: one with an arctic community in Siberia focusing on climate change adaptation using an anthropological ethnographic approach (Crate, 2008), the other with a community in the Global South (Mexico) focusing on biodiversity loss and using a transdisciplinary co-creation approach (López et al., 2020). The results of the analysis of the full sample will be published in a separate, forthcoming research paper.

3 Description of frame-based analytical strategy

The new method developed and presented in this paper starts from the notion that each scientific text usually has a main frame (often implicit) that shapes the representations of local knowledge and concerns. While scientific texts, like other texts, may contain several frames, here, I focus on main frames and investigate their role in

1 1-social anthropology; 2-interdisciplinary, human ecology; 3-sociology; 4-development economics, economic history and history of economic policy; 5-interdisciplinary, human-nature relations; 6-interdisciplinary, Environmental Studies, Ecological Economics; 7-Arctic anthropology; 8-regional development, social science; 9-meteorology, climate and sustainability; 10-political science; 11-social science, climate adaptation; 12-cultural anthropology, anthropology of climate change; 13-interdisciplinary, Environmental governance; 14-anthropology; 15-political science.

shaping representations of LKC. In some contexts, main frames in scientific texts are linked to certain salient concepts or other frames in a way that seems natural and acceptable to readers. In the articles analyzed in my study, this is done with the help of references to international organizations, reports, and seminal papers. This is the case with all 15 texts I have analyzed. A main frame in a scientific text can manifest in the form of a theoretically charged term, a metaphor, a known formulation, or a concept recognizable in a particular field of research. Here it can be mentioned that terms, concepts, etc. can become frames by being repeated in different contexts (books, articles, conferences, and the like). Initially, they may be repeated together with explicit statements of their functions (e.g., causes and problems), but when the concepts, terms and the like become frames, the mere mention of them often implies their functions. Frames can be used intentionally for specific purposes (e.g., to create fear) (Entman, 1993), but can also have unintended implications or effects. As noted above, frames render certain issues highly significant. In the papers analyzed, this occurred through references to authorities such as international organizations, reports, and seminal papers, by using highly charged words and phrases such as "immediate," "alarming," "essential," "a human right," "only one way," and by highlighting possible consequences of the emphasized problems. Also often presented with the problems are causes, moral judgments, and solutions, which can be referred to as functions of frames (Entman, 1993; de Vreese, 2005). Identifying the frame's functions as they occurred in scientific papers was one of my analytical strategies. Entman (1993) proposed the following functions for frame analysis of news media: "identify problems," "diagnose causes," "make moral judgments," and "offer remedies" (p. 52). Simultaneously, he emphasized that the frames need not include all functions. I see the same in the corpus that I analyzed: not all the frame's functions are at work in each scientific text, this can vary according to its goal.

Identifying the main frames in scientific texts proved demanding, possibly because the frames "are part of the natural, taken-for-granted world" (Rein and Schön, 1993, p. 151). *Frames are often implicit and are usually not self-evident*. Concomitantly, the identification process is helped by the frame's functions being recognizable to specific cultures or fields (Entman, 1993). I, therefore, assumed that *to be recognizable, frames must also be used in other scientific texts from the same "culture."* This can be a starting point for tracing a frame's origins, its preconditions, how it evolved, and how it gained acceptance.

My strategy for tracing the frame's origin was to collect and read various references, both from the reference list of the paper that I was analyzing, and seminal papers in the same field on central concepts that were used in the paper I was analyzing. This helped me to better understand from what tradition of academic thought the concepts the researchers used in their papers stem from. Concomitantly, I focused on the frames' functions by examining whether these belonged to frames identified in other relevant texts. *If, during the analysis, I discovered that the main frame's functions were associated with different words, formulations, and justifications than I first assumed, I renamed the frame*.

During the analysis, I discovered that the papers in my sample contain so-called *actors*. Entman (1993) also noted that frames are not only linked to actions and events but refer to or suggest individuals or groups of individuals who may be the culprits or solvers of proposed problems. Note that not all scientific texts are solution-oriented; some focus on, for example, identifying and describing LKC about a particular issue. In such texts, some of the frame's functions may be different or absent. For example, texts focusing on natural disasters. Note that the terms culprit, victim, and solver should not be taken too literally. For example, natural disasters can be seen as "the culprits" and can force local people to migrate. The scientific texts I analyzed attributed specific roles to their actors (e.g., researchers, farmers, participants, or research partners). It became clear that these attributed roles significantly shape how knowledge and concerns are represented. For example, those who are not researchers are often referred to as holders of practical or experiential knowledge, researchers often have scientific knowledge. I, therefore, added the function of roles to the analysis.

Another strategy that emerged during the analysis is the focus on what I called *the path toward solutions*. Contrary to news media, scientific texts do not always contain solutions that connect to their main frame. Instead, they may present methods or paths that might lead to solutions. The solutions can also be mentioned, but the path toward them is fundamental. Such paths toward solutions are fitted into the main frame of a scientific paper by using references to authorities, powerful words, or justifications that appear credible because they are supported in the paper's main frame.

The final step is to show how the papers' main frames and their functions, justifications, repetitive formulations, metaphors, and the like shape how (LKC) are represented,. The steps in the method are summarized in Figure 1, and the differences with Entman (1993) frame-concept are summarized in Table 1. Note that not all the frame's functions need to be at work in each text. After the main frames with their functions are identified, the reflexive part can begin. How does the main frame with its functions affect the representation of LKC? An example of this could be: if, for instance, local people are referred to as co-researchers or research partners in various projects, they are involved in, it is important to reflect on these roles. This has to do with the fact that the expertise of local people (fishermen, bakers, carpenters, hunters and the like) can be neglected. It can be perceived as more privileged to be a researcher than, for example, a fisherman. A reflexive practice can help us to pause before we label local people and ask them how they want to be referred to in scientific texts.

4 Illustration of the analysis

In this section, I illustrate how I use frame analysis to show how LKC is represented through main frames in two papers that I will refer to as P1 (Crate, 2008) and P2 (López et al., 2020). The point is not to criticize the authors of the selected articles. A text without frames is not possible. Any framing can have unintended implications or consequences. My intention with analyzing the role of frames in shaping the representation of LKC in scientific texts is to help develop reflexive awareness among the scholarly community about their writing practices and promote critical thinking about the unintended consequences that uncritical reproduction of taken-for-granted frames may have. The point is to shine a light on the taken for granted and explore its possible implications and impacts on the inclusion and representation of LKC and open up reflection and discussion.

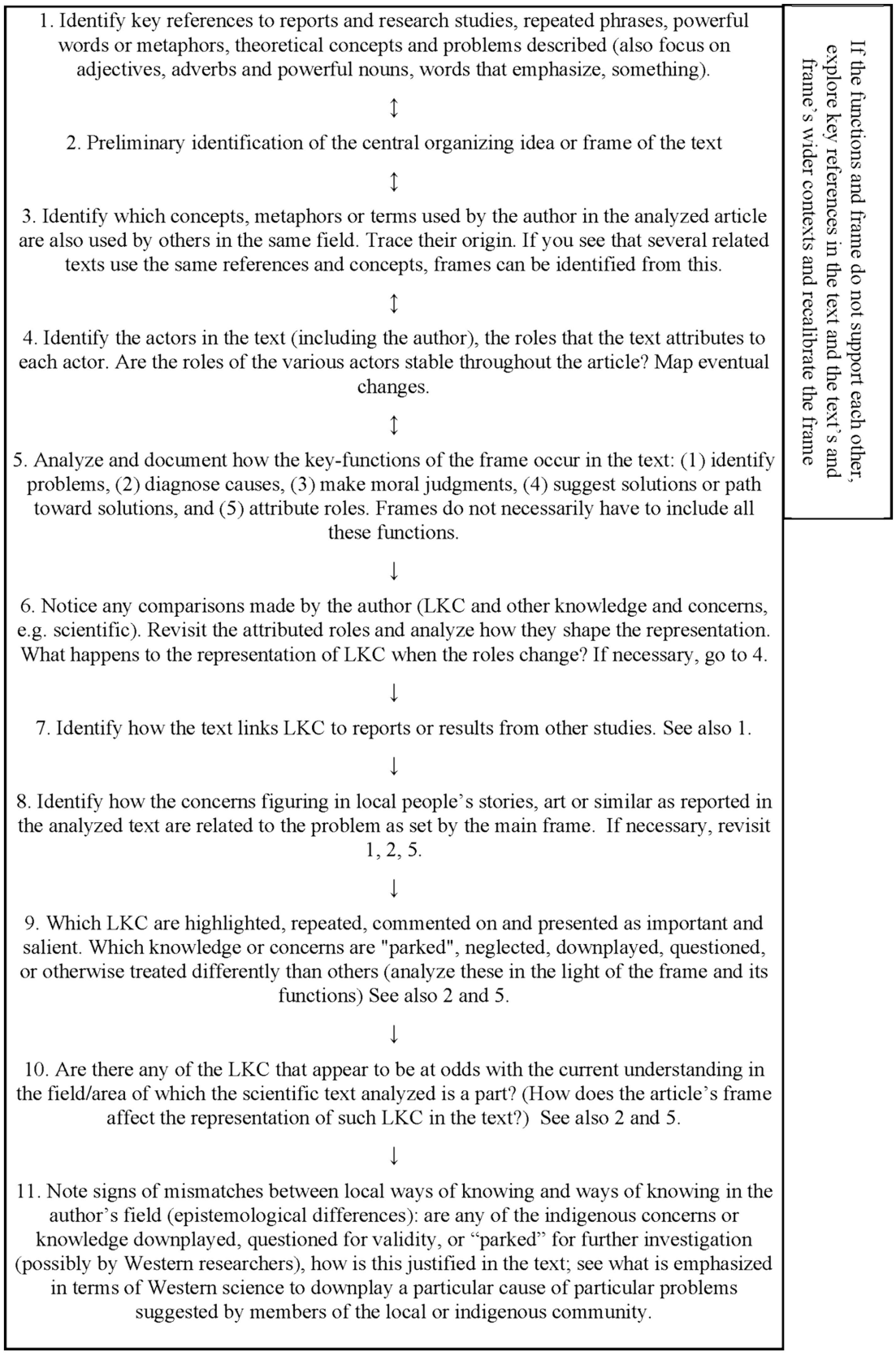

FIGURE 1
Proposed method for analyzing how frames shape the representation of local communities' concerns and knowledge in scientific texts. Note that the analysis normally proceeds in an iterative and non-linear way through the steps outlined in this figure.

TABLE 1 Comparison between Entman (1993) framing concept for analysis of news media and the frame concept as operationalized in the method presented here for frame analysis of scientific texts.

	Entman (1993)	Frame-based method presented in the present paper
Focusses on	Journalistic practice	Research with local communities
Domain of application	News media	Scientific texts
Framing of what?	News	Knowledge and concerns of local communities
Framing analysis helps to reflect on	The way in which frames shape communicative processes and effect audiences' predispositions.	The way a frame and its functions shape the representation of local knowledge and concerns, highlighting some aspects in particular ways while fading others to the background
Functions of frames included	(1) Identify problems; (2) diagnose causes; (3) make moral judgments; and (4) offer remedies.	(1) Identify problems; (2) diagnose causes; (3) make moral judgments; (4) suggest solutions or offer a path toward solutions; (5) attribute roles

In my text, I will refer to the researchers as R1 for P1 and R2 for P2 because I do not mean to criticize a particular paper or researcher. Indeed, for the goal of the text analysis here, it is irrelevant who authored the texts that were analyzed.

The first paper analyzed to illustrate the method is *Gone the Bull of Winter? Grappling with the Cultural Implications of and Anthropology's Role(s) in Global Climate Change,* (Crate, 2008) (henceforth referred to as P1). It presents ethnographic fieldwork in northeastern Siberia, where, faced with rapid local environmental changes, a local community increasingly encounters limitations to applying local, experiential, climate knowledge for sustaining their subsistence practices. R1 highlights the cultural significance of that crisis and extensively discusses the implications for anthropologists' roles.

Paper 2 (P2) (López et al., 2020) is *Bridging different perspectives for biocultural conservation: art-based participatory research on native maize conservation in two indigenous farming communities in Oaxaca, Mexico*. It focuses on the problem that maize-based traditional practices and the way of life of these communities are challenged by globalization, international trade, and neoliberal agricultural policies. Through a stepwise art-based method to elicit heterogeneous perspectives on biocultural conservation, it identifies the main challenges and strategies for native maize conservation, as perceived by two farming communities.

Because the audience of this journal does not necessarily have a background in social science and textual analysis, I will use reflexive intermezzos to make the added value of revealing the hidden or taken-for-granted elements in scientific texts through frame analysis more accessible for a broad academic audience.

4.1 Frame and the frame's functions in P1

I identified *global climate change linked to culture* as the central organizing idea in P1. Already in the summary, R1 writes that "global climate change is intimately linked to culture" (p. 569). The terms "global climate change" and "culture" are recognizable to both Western and non-Western researchers. That is a precondition for being understood by readers and appearing credible (Entman, 1993). Global climate change is understood in P1 as a very open and inclusive phenomenon, which enables it to be linked the concept of culture: "Global climate change is a complex of multiple processes, dimensions, influences, feedbacks, and impacts" (p. 569). The concept of culture is also rooted in anthropology. As an anthropologist, R1's understanding of it is:

> ""Culture" [refers to] both the series of prescribed human activities and the prescribed symbols that give those activities significance; both the specific way given people classify, codify, and communicate experience symbolically and the way those people live in accordance with beliefs, language, and history" (p. 570).

This comprehensive definition gives the term a natural place alongside the term global climate change. Already in the paper's first pages, several *problems* and challenges are highlighted, and the *guilty* and the *victims* are mentioned. These link culture to ethics, morals, and justice and reinforce the need to focus on culture in relation to global climate change. The victims mentioned are indigenous people and smaller communities, "peoples that have been largely ignored. These are the same peoples whose territories have long been dumping grounds for uranium, industrial societies' trash heaps, and transboundary pollutants" (p. 571). These *unjust and immoral* behaviors are referred to as "environmental colonialism at its largest scale, with far-reaching social and cultural implications" (p. 571). Immediately afterward comes a *statement that helps to evoke sympathy* or pity for the abovementioned victims: "Global climate change is the result of global processes that were neither caused by nor can be mitigated by the majority of the regions now experiencing most of its effects. Thus, indigenous peoples find themselves at the mercy of changes beyond their control" (p. 571).

There are many relevant problems in the context of global climate change, but since the main frame is linked to the concept of culture, some of them are emphasized as the most significant while others fade into the background. As mentioned above, these problems affect vulnerable groups, namely indigenous peoples (the paper uses the Viliui Sakha, Russian Republic as a case study).

R1 links the challenges witnessed by indigenous peoples to the cultural change in Western countries and presents this change as a major *cause* of global climate change. It relates to degenerating consumer culture based on materialistic values. R1 writes:

> "I argue that global climate change—its causes, effects, and amelioration—is intimately and ultimately about culture. It is caused by the multiple drivers of Western consumer culture, it transforms symbolic and subsistence cultures (…), and it will only be forestalled via a cultural transformation from degenerative to regenerative consumer behavior" (p. 570).

Here, culture takes on multiple functions. Western culture (including industrialized countries) causes climate change and changes indigenous peoples' culture, and it proposes the *solution* to the problems mentioned: changing the Western degenerative culture to regenerative.

Reflexive intermezzo: At this point, let us step back and reflect on and explore the implications of this particular frame. Can this frame [culture related to global climate change] fade other concerns that local people consider salient into the background? How might the focus on culture affect the future lives of the people involved in the study? How, for example, will politicians interpret the article where the cultural challenges of local people come first? [end of intermezzo].

The concept of consumer culture as mentioned in P1 is recognizable to researchers in various fields and as an anthropological concept. According to Joy and Li (2012), Consumer Culture Theory as a field of study in anthropology started with Miller (1987) seminal book *Material Culture and Mass Consumption* and his call on the anthropology community to redirect their focus to the material culture of consumers and their commodities (Miller, 1995). This academic tradition can be further traced back to Douglas et al. (1978/2021) book *The World of Goods*. Similarly, R1 writes that it is important to "move anthropologists conducting research with indigenous communities and global climate change from impartial observers into the realm of action-oriented researchers" (p. 571). R1 proposes what anthropologists can contribute: "Considering anthropologists' recent encounters with global climate change, (…) and given the cultural implications of global climate change, I contend that we can be most effective by using the tools of applied, advocacy-oriented, and public anthropology" (p. 573). Regarding public anthropology, R1 writes:

> "A public-anthropology approach is appropriate for anthropologists working in Western societies to transform consumer culture and facilitate social change explicitly to reduce the local effects of global climate change in our research partners' homelands and other vulnerable areas of the world" (p. 573).

Western anthropology can achieve this transformation through "compelling messages and projects to persuade home audiences to move toward a carbon-free, sustainable society" (p. 570). According to R1, this can be achieved using an anthropological approach to *advocacy* where anthropologists can.

> "Work as communicators both to our indigenous research partners [understanding and potentially providing information they need about global climate change (…)] and also as facilitators of advocacy by sharing the experiences of other indigenous groups and seeking out the local, regional, and national channels to express local concerns and inform policy. Similarly, we can link our research partners with other place-based communities of risk" (p. 574).

Anthropological advocacy is fundamental according to the paper, and R1 positions herself and other anthropologists as an *advocate* for those she calls *research partners*. Her paper presents advocacy by anthropologists as a *pathway to a solution* that can contribute to transforming degenerative to regenerative culture. "Addressing the issues of indigenous communities confronting unprecedented climate change" is "awareness and empowerment" (p. 585). R1 contends that anthropology has "a unique role," arguing that anthropologists "are trained as cultural interpreters, translators, advocates, educators, and mediators" (p. 584). Additionally, R1 argues that there is a need to develop collaborative projects where anthropologists work with other social and natural scientists (p. 585). This can be understood as what I call *the path to a solution*.

Reflexive intermezzo: Here we can reflect on the function *The path to a solution*. First, strategies and solutions are proposed for the above-mentioned problems related to climate change linked to culture. The anthropologist role appears convincing because they are the ones who work with culture. However, global climate change has no natural connection to anthropologists as solvers of climate problems. This may be why R1 further proposes the establishment of collaborative projects with other social and natural scientists. Note that local people are not mentioned here as collaborators that can be involved as problem solvers, so in a way they are implicitly excluded. Would for instance the representations of their knowledge and concerns be different if they were explicitly attributed a role as problem solver instead of a role as victim? The point here is not to criticize studies that do not actively involve local people but to promote awareness of the implications of frames. [end of intermezzo].

Having outlined the paper's main frame and its functions (the proposed problems, whom they affect, the culprits, causes of problems, solutions, and solvers) I will discuss what *legitimizes* the frame's functions and *makes them convincing*. The problems, causes and solutions are legitimized through references to various theoretical concepts in anthropology, various scientific research publications, and authoritative international reports such as the 4th assessment report by *The Intergovernmental Panel on Climate Change* (IPCC, 2007) and the *Arctic Climate Impact Assessment* (ACIA, 2005). R1 argues that the 2005 ACIA report is the "most comprehensive source of research on global climate change and indigenous peoples in the Arctic" (p. 572). Referring to this report, R1 emphasizes that the rate and extent of current and projected climate change in the Arctic give "cause for alarm" and that preparing and adapting to these impacts "require urgent and special attention." These aspects help legitimize the issues described in the paper in the context of the paper's frame. The ACIA report itself does not emphasize alarm or consumption in its 146-page summary.

R1 highlights several areas where the report points out a lack of knowledge or research. Concomitantly, R1 mentions that the need to research culture is not mentioned in ACIA (2005). R1 legitimizes the need by *referring to scientific publications*. The solutions to the problems caused by the Western degenerating consumer culture may be different, but through the paper's main frame legitimizes the importance of anthropologists who are experts in the cultural aspects. To emphasize anthropologists' role in this context, the word "key" is used, (e.g., "key roles" and "advocacy is key"). One of the main solutions has its roots in advocacy-oriented and public anthropology. The solution's reliability is asserted using *authoritative references*: "The practice of applied anthropology reaches back at least 75 years (Gould and Kolb, 1964, p. 32). Its central aim is to help solve human problems and facilitate change (Chambers, 1985, p. 8)" (p. 573). R1 assigns the important role of problem solvers to anthropologists more than once: this thinking is fundamental and is justified and connected to global climate change and the cultural challenges several times in the paper. "In the past two decades, while anthropology has increasingly adopted applied and public approaches, there has also been an increase in anthropologists' acting as advocates as they witness ethical and human

rights abuses in the field" (p. 573). R1 mentions *successes achieved by anthropologists*: "advocacy has a strong history and many success stories (Rylko-Bauer et al., 2006, p. 181)" and "advocacy has a similar place in global climate change research as it has had in other cases of environmental justice" (p. 574). And R1 emphasizes how long anthropologists have been working on the abovementioned issues ("at least 75 years" and "in the past two decades"): anthropologists' *long experience* and *great expertise* make them appropriate solvers of the problems presented.

Reflexive intermezzo: Here, we can reflect on how particular references are used as a device to grant authority to certain claims in P1, highlighting some of the problems, causes, solutions, and the like in a scientific text. R1 draws on two assessment reports in the field of global climate change produced by intergovernmental institutions (IPCC and ACIA). These, R1 writes, do not mention cultural challenges related to climate change. By using other relevant studies and such devices as the powerful words "alarm," "urgent," "special attention," "key," and the long experience that anthropologists have in working with relevant problems, the need to equate the problems described in key reports with problems of a cultural nature are legitimized. Obviously, referring to authoritative organizations or key names in a particular field of research is a widely accepted and almost expected practice. But at the same time, there are international agreements, organizations, key names in various research fields and important reports that regulate, for example, which projects receive funding and what research is considered necessary and relevant. The choice of references in scientific texts links established frames to particular authorities, political power structures and academic establishment, incumbents and dominant schools of thought, and together, these help to create a particular representation of LKC. Therefore, it is important to question the references we use and how they shape and sustain particular representations of LKC. In addition, it is important to question the way we use particular references. What do we support with particular references? What comes into view and what goes into the background? Can solutions to described problems change if we refer to other parts of, for example, the same reports? How might the representation of LKC change if we choose other references or reports or refer to other parts of them? [end of intermezzo].

The final framing devices that help emphasize something specific are certain *adjectives, adverbs*, and *powerful nouns*. Reinforcing the problem: "We find ourselves in a state of emergency as field researchers" (p. 569) and "The rate and extent of current and projected change give cause for alarm" (p. 572). The words alarm and emergency give the problems topicality and create the need for action. Another example is the word "only," which excludes or mutes all solutions to problems other than those proposed in the paper: "the best, if not the only, way to bring about a change […]" (p. 584) or when R1 notes which direction cultural change must go to prevent further aggravating anthropogenic climate change: "it will only be forestalled via a cultural transformation from degenerative to regenerative consumer behavior" (p. 570).

4.2 The impact of frames on how knowledge and concerns are represented in P1

P1's main frame importantly shapes how indigenous knowledge and concerns related to climate change impacts are represented. To make this visible, my proposed method first focuses on the *roles* R1 assigns to actors in the paper. Her roles are anthropologist and advocate and entail among others, listening, understanding, presenting, and defending someone's interests. Indigenous people also have two roles. They are referred to as research partners, i.e., those R1 "conducts research with" (p. 569) — a phrase meaning that she conducts ethnographic work including listening to indigenous people's stories to understand "the research partners' ways of knowing," and that she brings Western scientific knowledge to the local people and complements their ways of knowing to "expand existing adaptation strategies" (p. 583). In addition, indigenous peoples have the role of the victims of climate change, or in R1's words: "peoples that have been largely ignored" and "the same peoples whose territories have long been […] industrial societies' trash heaps, and transboundary pollutants" (p. 571). *Both roles align with the paper's main frame*. A clear distinction between the actors' roles in the paper leads to their cultures, knowledge, and concerns being presented differently. R1 has Western scientific knowledge, whereas indigenous people have cosmological understanding, practical understanding, and ecological knowledge about how the climate was and how it has changed.

Reflexive intermezzo: Why is it important to reflect on the roles given to actors in scientific texts? In the section above, we see that the roles assigned to both the author of the text and indigenous peoples are in line with the text's frame. The frame global climate change related to culture (e.g., focus on degenerative and regenerative consumer culture) implies through its functions that there is someone who has caused this change (the culprits), that some are victims and that someone should solve climate challenges. Through this frame, participants in the project may consciously or unconsciously be given a role, e.g., a victim. A reflection on why, for example, local people are given the victim-role and whether that can have unintended consequences is necessary because, firstly, this may not correspond to what they themselves experience and may affect them and other members of the community's future lives. I'm not saying that researchers cannot or should not refer to local people as victims, the point here is awareness of the importance of frames in texts and reflection on potential real-world consequences. For instance, being attributed the role of victim may differently impact one's capacity to assume agency than being attributed the role of problem solver. Such reflexive work may trigger the need to rethink and rephrase what is common in a particular academic tradition to write or say, draw in some arguments or, for example, include a statement from local people where they present themselves as victims. Alternatively, one could present a statement to the contrary, but argue why we should see them as victims even if they themselves do not. [end of intermezzo].

R1 presents the case of Viliui Sakha. Before presenting it and these indigenous people's encounter with global climate change, R1 *highlights some studies* (with references) that show challenges other indigenous groups faced when they had to leave their homes and countries: "The cultural implications could be analogous to the disorientation, alienation, and loss of meaning in life that take place when people are removed from their environment of origin, for example, when Native Americans were moved onto reservations" (p. 573). R1 argues that Viliui Sakha's indigenous people similarly risk losing their native place, but because of climate change. Such a *powerful comparison*, in which she also refers to other studies, aligns with her *role* as an advocate and is an important tool for subsequent assertions of the importance of focusing on cultural problems arising

from climate change. Here too, R1 deploys *references* to show the consequences of global climate change on cultural aspects: "The result will be a great loss of wisdom, of cosmologies and worldviews, and of the human–environment interactions that are a culture's core" (p. 573). Wisdom, cosmological understanding, practical understanding, and the interaction between humans and the environment are components that she *emphasizes* further in the paper by citing her respondents. Conversations with the elders represent the knowledge, culture, and concerns of Viliui Sakha: they have "cosmological and practical understandings of how resources [for subsistence] are given" (p. 582). From the narratives presented, one can also read that they have "ecological knowledge about how the climate was and how it has changed" (p. 577) and they describe climate change at a local level over 50–60 years. The cosmologically oriented Viliui Sakha culture is strongly connected to climate change and, taking an *advocate role*, R1 expresses concerns that the consequences of global climate change may cause these people to lose their culture: "Global climate change is transforming the natural grassland and taiga ecosystem of northeastern Siberia to the extent that cows may not be able to live there" (p. 575) and "knowing the centrality of cows to rural Viliui Sakha subsistence and cosmology, I found it difficult to fathom how my research partners could adapt to the loss of an animal that is the foundation of their culture" (p. 575). When R1, in the role of advocate, highlights the problems affecting culture, she *cites cases of other indigenous groups* who are also losing their livestock due to climate change. Another strategy R1 uses in her advocate's role is to refer to excerpts from her respondents' interviews as *testimony*. For instance: "It was during these testimonies that elders referred again and again to Sakha's legendary bull of winter" (p. 578). That legend belongs to the cosmological understanding of indigenous peoples. It "explains the 100°C annual temperature range of Sakha's subarctic habitat" by personifying it "in the form of a white bull with blue spots, huge horns, and frosty breath" (p. 570) that retains the cold in winter and, whose melting horns signal the ending of winter, and whose melting head is a sign of the arrival of spring. The respondents express the challenge of linking the legend to climate change as: "It seems that now with the warming, perhaps the bull of winter will no longer be" (p. 570). In the paper, the increasing mismatch between the traditionally reliable local weather calendar in the form of "the bull of winter" legend and the drastically changed climate experienced nowadays serves as an important representation of local concerns, knowledge, and part of culture, and of the huge challenges indigenous peoples face from the consequences of climate change. For example: "Both the transformation of their symbolic culture—represented here by the bull of winter—and of their subsistence culture—the increasing challenge to maintain their herds as warming continues—reframe the implications of unprecedented global climate change" (p. 570). In connection with this legend, R1 shows how indigenous peoples have previously adapted to other challenges: "In the post-Soviet context, Viliui Sakha have adapted to the rapid change from a socialist centralized system to decentralized household-level production" (p. 571), and "cows-and-kin, in some ways a return to pre-Soviet subsistence, represents a unique adaptation that is historically founded, environmentally sustainable, and culturally resilient" (p. 577).

On the one hand, P1 highlights that Viliui Sakha's natives have always adapted and are described as people accustomed to living in extreme weather conditions. On the other hand, P1 *portrays* them as disoriented and almost powerless in the face of the consequences of climate change, underpinning this by citing the interviewees: "From long ago we could read the weather and know what weather would come according to our 'Sier-Tuom' [Sakha sacred belief system]. But we cannot do that anymore" (p. 577). And "Before we could tell from the star constellations […] Now if you try and read based on that old way, you cannot predict the weather. It does not follow the old patterns" (p. 577–578). Moreover, P1 *links the legend to the ACIA report*, so that issues highlighted through the article's frame appear to be important for areas elsewhere: "The bull of winter story and the cultural transformation that the loss of that story represents is testimony in itself to an uncertainty about limits to adaptation apparent in other circumpolar contexts (ACIA, 2005, p. 10)" (p. 583–584).

Reflexive intermezzo: Here we can reflect on the significance of the main frame, its function of roles, and the framing-device *use of references* for how LKC is represented. The sections above show how the roles that are attributed to different actors in the text can be seen as an important function of the text's frame. The role of advocate helps R1 to highlight specific concerns of the local people. This unavoidably pushes other local concerns into the background. The frame analysis helps to show what is highlighted in the article, namely cultural challenges arising from climate change. It mentions that the traditionally reliable local weather calendar loses its power in the face of climate change and R1 writes that she found it difficult to fathom how her research partners could adapt to the loss of an animal that is the foundation of the local people's culture. The framing-device *use of references* reinforces the importance of cultural challenges. One example is that by referring to other research studies writing about Native Americans and other indigenous groups, it is mentioned that cultural challenges can lead to "disorientation, alienation, and loss of meaning in life." The consequences of cultural challenges for Viliui Sakha are thought to be: "a great loss of wisdom, of cosmologies and worldviews, and of the human-environment interactions that are a culture's core." At the same time, we can see that what is pushed into the background (even while it is mentioned) is that local people, over several years, managed to adapt to various and relatively extensive changes. In the text, I can also find other challenges (e.g., ecological and environmental) mentioned by local people, but the strong focus on cultural challenges and the main frame of the article overshadows these so that they appear not particularly salient. [end of intermezzo].

As P1 highlights, indigenous people have to adapt to a multitude of changes in nature and the local environment. R1 says the elders talked about these concerns based on their ecological knowledge "about how the climate was and how it has changed" (p. 577). For example, they told of observing a lake island that will soon disappear underwater: "I've been watching the island for the last 10 years and I see that this is about to happen" (p. 579). Other presented concerns attributed to unusual weather shifts are the soil becoming too wet to harvest grass for livestock, horses, and cows having difficulty finding food (especially in winter), too much rain to grow vegetables, hunting hampered by excessive snow in the winter, and by waterlogging in the fall and spring, and sightings of invasive insect, bird, and plant species. However, the most prominent consequence of climate change in the paper is "the sinking of land" and "softening of the climate." These are *highlighted by the repetition* of these words, R1's worried comments, and excerpts from interviews with the elders: "The climate has softened. Winters have warmed and summers are not so warm. All is

softer. […] It was never like that when I was a child." (p. 578) and "the flat fields are sinking in" (p. 579). R1 expresses her concerns as follows: "When I heard these testimonies, I was more concerned and curious about how the perception of the lands actually sinking was affecting how Viliui Sakha orient themselves to their environment" (p. 579). The statement *emphasizes* the words "orient themselves" above all other concerns that could be linked to the consequences of what the elders called "the sinking of land" and "softening of the climate." Note that the word orientation is *consistent with the main frame* and its functions. The aforementioned ecological and cosmological knowledge and related concerns appear credible because R1 links them to indigenous ways of understanding the world and to what can be called experiential knowledge emerging from respondents' observations over time. Additionally, R1 mentions *other indigenous knowledge and concerns, which she says appear to run counter to scientific research on global climate change*. For example, she notes (p. 581) that many of the elders mentioned the Viliui hydroelectric station (built in the 1950s) as a cause of climate change but refutes this claim because "studies have shown that the presence of the reservoir only results in a microclimatic change that would not include the extent of the changes observed by the elders" (p. 581). Other causes, consequences, and concerns include "the 'destruction' of the atmosphere by rockets and bombs," "too much human spacewalking and sky mixing," and "too many atomic bombs" which leads to "changes in the atmosphere that make it very warm and all that air polluting" (p. 581). R1's reaction to these statements is: "Although at first consideration, some of the contributing factors these elders mention seem irrelevant to Western scientific thought on the subject, their ideas are tangentially relevant and culturally provocative" (p. 581). It seems R1 is quickly rounding off her interpretation, commenting briefly or, as she does elsewhere, downplaying the immediate importance of these indigenous knowledge claims by parking them for further Western research to validate them: "These are important historical events that need further investigation" (p. 581). It seems that these observations and knowledge are not supported by the functions (problems, causes, solutions, etc.) of the paper's main frame.

Reflexive intermezzo: Here I will reflect on devices of the main frame. Even though cultural challenges are strongly emphasized in light of the article's frame, statements from local people about ecological challenges and their observations regarding climate change are also mentioned. The main frame's devices help make some of the concerns more salient than others, here "the sinking of land" and "softening of the climate" and by repeating certain words several times, such as "orient themselves." These devices highlight the above-mentioned ecological challenges and observations regarding "the sinking of land" and "softening of the climate" and link them to R1's concern about how Viliui Sakha orient themselves to their environment. If R1 chose to focus on other observations or concerns of local people, they would overshadow those highlighted in the text, as would the phrase "orient themselves." If R1 had focused on local people's economy or health, the representation of LKC would be different. Frame analysis can help to see the implications of the frame and which aspects of LKC are emphasized.

Furthermore, one can reflect on how LKCs that do not fit the article's main frame are represented in the text. When local people talk about their observations and concerns, they mention causes of climate change that are "the 'destruction' of the atmosphere by rockets and bombs," "too much human spacewalking and sky mixing," and "too many atomic bombs." These do not fit with the article's main frame global climate change related to culture and are therefore parked by the author for further research. [end of intermezzo].

4.3 Frame and the frame's functions in P2

The central organizing idea in P2 (López et al., 2020) is *agricultural biodiversity loss* connected to *biocultural approaches to conservation*. It focuses on conserving domesticated native maize that is traditionally grown without modern technology and pesticides. Drawing on *previous research*, R2 shows that native maize and seeds are declining, which reinforces the need to focus on this issue. This is linked to the second part of the article's main frame, biocultural approaches to conservation, in an argumentative and convincing way. R2 writes: "Our study adopted a biocultural approach to conservation. This approach recognizes that there is a high degree of interconnection between culture and biodiversity" (p. 7441) [maize-related]. This interconnection is *underpinned with references* and presented as "fundamental to the conservation of biodiversity" (p. 7429). It is noteworthy that the biocultural approach to conservation encompasses many fields and concepts [biocultural diversity and heritage, social–ecological systems theory, and different models of people-centered conservation (Gavin et al., 2015)] and emphasizes the importance of building biodiversity conservation on local communities' knowledge and practices. This *highlights* the relevance of including local or indigenous people in research projects, as R2 has done. They focus on indigenous peoples' perceptions of challenges leading to the decline of maize diversity.

Within the article's frame, the main *problem* is presented as twofold. One part is directed toward "agrobiodiversity decline" and the other is farmers' lack of motivation, interest, and opportunities to maintain the abovementioned diversity that requires a traditional approach to cultivating maize. What *causes* problems are "multiple forces associated with globalization, international trade, and neoliberal agricultural policies" (p. 7427). Also mentioned are the international binding trade agreements and the policy of rewarding farmers who have competed effectively on the international market with state aid. Competitiveness required traditional farming practices to be changed to modern ones. Many farmers have adopted "high-yielding hybrid seeds in monocultures dependent on agrochemicals" (p. 7428). In several places, "transgenic flow" is also mentioned as a cause of biodiversity decline and is referred to as an "internationally recognized ecological threat" (p. 7444). Highlighting that transgenic flow is a threat to something that humans value, relates to the frame's *make moral judgment*s-function. R2 notes that climate change (e.g., increased droughts) and political measures (e.g., reduced access to government subsidies and credit) caused some traditional farmers to go bankrupt, which accelerated migration to the cities. All these reasons are also relevant for farmers' declining motivation and interest in traditional maize cultivation.

Reflexive intermezzo: The problems described in P2 are of a global nature. In the frame of the organizing idea, problems related to motivation and opportunities that farmers have to maintain traditional approaches to cultivating maize are emphasized. The problems posed by the introduction of genetically modified maize also appear natural and convincing in the light of the article's frame. At the same time, climate change only figures in the background and is mentioned in

passing in this article, without getting centre stage. The method I propose helps to make such aspects visible. [end of intermezzo].

The possible *solutions* to the problems presented in the article are those R2 arrived at by collaborating with indigenous peoples. I refer to this frame's function as the path to the solution. The article presents an approach that can help to identify "the main challenges and strategies for native maize conservation" (p. 7427) in collaboration with indigenous people. The focus on collaboration with the locals aligns with the main frame. In addition, R2 *finds support* in two *authoritative references*: the UN Permanent Forum on Indigenous Issues (an advisory body to the Economic and Social Council) and the Indigenous Biocultural Heritage Approach (IBCH); both see indigenous communities as local custodians of agrobiodiversity.

The paper refers to indigenous people as "farmers," "indigenous farmers," "indigenous peoples" or "community members" except in section 2.2 Methods, where those who opted to participate in the project are given the *role* of "participants" while R2 takes on the role of "researchers who do not interfere too much" (p. 7432) and "researchers with limited influence" (p. 7429). All these roles align with the main frame, which has an underlying expectation that local and indigenous people should participate in local biodiversity conservation projects (e.g., Gavin et al., 2015). The approach proposed in this context is: "participatory research that creates collaborations among researchers, farmers, and indigenous peoples" (p. 7429). Part of R2's research approach was art-based, aiming to "motivate people to reflect upon the past, present and future of native maize farming, to facilitate conversations and to stimulate creative thinking and deliberations over community members' feelings and their relationship to maize conservation" (p. 7430). Drawing on *references*, R2 justifies the relevance of using art: "art is highly integrated in the Oaxacan way of life and is important for expressing social, cultural and political issues in the communities" (p. 7430), and this is further linked to the article's main frame: "Oaxacan art is therefore valuable for the intergenerational transmission of knowledge, practices, and beliefs and thus also arguably for long-term biocultural conservation" (p. 7430).

Reflexive intermezzo: The researchers justify their choices and actions with references to key research studies and relevant organizations. Through these references, indigenous peoples are referred to as local custodians of agrobiodiversity. This and the previously described functions of the frame in the article contribute to local people being attributed responsibility for maintaining maize biodiversity, and this expectation appears correct and convincing. Framing analysis invites us to reflect on the implications of the phenomenon that one cannot highlight something without something else fading into the background. For example, why is the responsibility placed on local people and not on politicians, governments or producers of pesticides or GMOs? [end of intermezzo].

4.4 The impact of frames on how knowledge and concerns are represented in P2

P2's main frame emphasizes the relationship between biodiversity and culture, cultural heritage, agricultural biodiversity loss, conservation of biodiversity, and the importance of involving local people and their knowledge in the conservation of biodiversity in a particular place. In line with this, local knowledge, and concerns are represented *using such words as* biocultural, biodiversity, indigenous, farming, generation, collective/collectively, solidarity, culture, heritage, way of life, knowledge developed locally, interactions with environment, land, and maize.

After describing Oaxaca state, *emphasizing the diversity* of indigenous people living there and different traditions of growing maize, knowledge and concerns are represented, based on two communities: Santiago Apostol in Central Valleys and Nuevo Santiago Tutla in Sierra Mixe, selected "because they portray a diverse set of realities within Oaxacan indigenous communities growing maize" (p. 7431). "Apostol is a Zapotec indigenous community, located just 1-h drive from the capital city of Oaxaca" (p. 7431). "Tutla is a Mixe people community located 8-h drive from the capital city and 2-h drive from the nearest urban area" (p. 7431). *The distance* to major cities is relevant because it contributes to specific representations of LKC. Apostol's proximity to the capital has led to cultural changes such as: "a stronger focus on 'for-profit' farming practices based on modern industrial systems" (p. 7432). At the same time, Apostol people have retained their language (Zapoteco), and some of their cultural traditions. They still make decisions collectively, even though the farmland is owned privately. Tutla is much further away from the capital. Its indigenous people have retained their original language Mixe "and their traditions are still strongly rooted in native maize farming" (p. 7432). Tutla is "under a collective community land property regime" and all decisions are made collectively (p. 7432). *The researchers alternate between focusing on the two communities and on Oaxaca state.* This allows the knowledge and concerns applying to Apostol and Tutla to be interwoven with knowledge and concerns that apply to the state so that they appear as a whole. Thus, the researchers mention local traditions related to maize cultivation, language preservation, and festivals when describing Oaxaca, Tutla, and Apostol. R2 *highlights* the importance of festivals for indigenous peoples: "The biocultural richness of Oaxaca includes popular traditions such as Guelaguetza festival. This is a traditional festival where communities celebrate solidarity to overcome scarcity in a joyful way" (p. 7431). Solidarity and strong ties between farmers are presented as "crucial for maintaining native maize farming" (p. 7431), which aligns with the main frame.

Maize is mentioned as *an important element* in indigenous cooking and art. "Art is highly integrated in the Oaxacan way of life and is important for expressing social, cultural, and political issues in the communities" (p. 7430). Art is additionally linked to the preservation of maize: "Oaxacan art is valuable for the intergenerational transmission of knowledge, practices, and beliefs and thus also arguably for long-term biocultural conservation" (p. 7430).

Reflexive intermezzo: Here, we reflect on how the frame affects the representation of LKC. It seems that the main frame in P2 helps to link biodiversity and culture. The cultural aspects of indigenous peoples are clearly at the forefront of the text. R2 describes both the traditions of local people in the two communities involved, their language and traditions. It also emerges that the distance to larger cities changes local culture. R2 mentions traditions of collective decision-making and thinking and solidarity. Collective thinking and solidarity are also mentioned in connection with festivals and traditional art. Solidarity and strong ties between farmers are presented as "crucial for maintaining native maize farming" (p. 7431),

which aligns with the main frame. A strong focus on the cultural aspect of solidarity and collective thinking is prominent and necessary as local people are portrayed as "local custodians of agrobiodiversity" and given a role based on responsibility and action. Culture and traditions of festivals, cooking and art are also strongly associated with native maize. When all this comes to the forefront, other parts of the real-world fade into the background. For example, there is very little focus on crops other than maize and this helps to create a specific representation. [end of intermezzo].

As shown above, R2 indicates that local people have their own traditional knowledge and practices, but without making these explicit. Local people's knowledge and concerns are also expressed through their role as "participants," which involves reflecting on challenges (and solutions) related to maize diversity loss, discussing with others, and engaging with researchers to rank challenges in order of importance. The challenges were identified through indigenous people's perceptions of what leads to the loss of maize diversity.

The results section notes that the project involved 16 men and 15 women from Apostol and 18 men and 23 women from Tutla (p. 7436). The knowledge and concerns expressed through art were represented in connection to age and gender groups. It is mentioned that those who participated were those who wanted to preserve native maize or grew maize traditionally. This can be understood in the sense that the knowledge and concerns expressed in the article are represented through the lens of these groups. The age and gender groups produced artworks expressing their concerns about maize. Art helped these indigenous people to share their knowledge, experiences, and stories with researchers and each other.

Reflexive intermezzo: In the two sections above, I have shown that although R2's representation of local people is linked to culture, solidarity and responsibility, it emerges that those who participated were those who wanted to preserve native maize or grew maize traditionally. This shows that some of these elements are in the background and the strong focus on solidarity and collective thinking overshadows this. [end of intermezzo].

Four artworks are included in the article (one embroidery, two drawings, and one mural), accompanied by their creators' statements, but these are less prominent than the results tables and text reporting the concerns and solutions the participants came up with during the project. Concerns in the paper are also presented based on age groups ("elders" "adults" "youth"), gender ("women," "men") and the community they belong to ("Tutla," "Apostol"). The tables summarize concerns, ranking them in the order of importance suggested by the participants. Local knowledge is not described in detail but only appears as a necessary element of the identified concerns since these are based on indigenous knowledge.

Tutla and Apostol are *represented in contrast* with each other. Tutla has kept the traditional way of growing maize (native maize) and does not have contemporary concerns related to the decline of maize diversity. Apostol has integrated modern technologies, pesticides, and transgenic maize and notices the decline of native maize. R2 says Tutla participants emphasize certain concerns are very important, one of which is represented by an expression indigenous people used during the discussions ("farmers' laziness")—meaning that farmers strive for maximum profits from minimum work. Mentioned as a concern related to this is the reduction in plant diversity after abandoning the traditional multi-cropping system. The way this concern is presented is surprising because R2 includes the participants' own words and links the concern to one of the artworks: a painting made by a Tutla participant, which, like the other three artworks, represents concerns related to traditional farming. Since the artworks were produced by indigenous people they show "first-hand representation" of what the participants expressed and how they expressed it. Each image is accompanied by a short statement by the artwork's creator. The mural statement highlights the following concern: "We are now in a war and we have to defend native maize from transgenic corn and industry," while the statement for two drawings shows both local knowledge and concern: "When the land was cleared with a machete, we could get pumpkins, string beans, purslane, quelite, nightshade, but now with the use of agrochemicals, all of this is finished" (p. 7436–7437). All four artworks (plus their creators' statements) bring out several elements that are otherwise *muted* in R2's text. In their statements, indigenous respondents use metaphors, comparisons, and strong words; their artworks depict people working in the fields, their tools, various plants, work animals, cooking, and many other practical skills. The article otherwise places little emphasis on the concretization of local knowledge, and the concerns are described without quoting indigenous people.

Reflexive intermezzo: Here we can reflect on how repetitive formulations contribute to shaping representations of LKC. Examples of such repetitive formulations are "collective", "solidarity" and "responsibility". Concerns, solutions, and knowledge are represented in two different ways. The first has a scientific character, the concerns were ranked by importance and represented using a table, making it more understandable to the western politicians and scientists. The second is less prominent: local art with accompanying text written in small font. The pictures of the local art with the descriptions in small font have a specific non-scientific language with metaphors, comparisons, and strong words. In addition, it shows local culture and tradition in a different way than the scientific representation that is more prominent in the article. We can see people working in the fields, their tools, various plants, work animals, cooking, and many other practical skills and tacit local knowledge. Here it is important to stop and reflect on what would happen to the representation of LKC if R2 would put more emphasis on the images and accompanying texts, images created by local people and text with words and metaphors that are closer to their own ways of knowing of the issue at hand. [end of intermezzo].

Another interesting representation of concerns relates to the cultivation of transgenic maize. This concern can be understood as part of the frame's functions: problem, cause, and moral. R2 *highlights some studies* that show that this cultivation can be seen as a challenge to biodiversity. Their own results show that the participants did not see this issue as major: "Both communities had previously been informed about the presence of transgene flow in Oaxaca […] when challenges were prioritized, transgenic corn was not one of the most important challenges to native maize conservation" (p. 7438). Interestingly, R2 emphasizes that youth initially identified *transgenic maize* as a concern. R2 links these concerns to "new knowledge, technologies and phenomena" and they write that this "is not built on the type of practical experience that elders and adults relied more upon" (p. 7439). When the participants discussed priorities, transgenic maize was nevertheless downplayed and therefore, the indigenous people's ranking of challenges does not match the article's main frame. This may be why R2 emphasizes that transgene flow is an "internationally recognized" threat and contrasts local people's priorities with this.

The final example of how concerns are represented is in terms of gender comparisons. R2 clearly shows that males and females have *different priorities*. The women focused on "concern about the culinary

changes and health impacts brought about by a loss of native maize farming," while men prioritized "challenges related to migration, markets and changing values from a specifically agronomic point of view" (p. 7439). R2 does not discuss these differences in relation to traditional divisions of roles within indigenous communities.

5 Conclusion

The new method presented and illustrated here allowed me to identify main frames and their functions in scientific texts and show how these frames contribute to shaping the representation of LKC. Each scientific paper has a main frame (and other frames) that gives meaning and context to the information presented and, importantly, thereby shapes the representation of LKC. This leads to only some issues, causes, solutions, moral assessments and/or recommendations appearing correct, important, or credible. Within a frame, information is emphasized through linguistic and rhetorical devices and by citing authorities. Identifying these devices at work in the scientific text is essential to eliciting a paper's main frame. I modified Entman (1993) classification of functions of frames in news media to make it fit for analyzing scientific texts. This yielded five key functions of frames in scientific papers: (1) identify problems, (2) diagnose causes, (3) make moral judgments, (4) suggest solutions or offer a path toward solutions, and (5) attribute roles. I modified function (4) because scientific texts do not always contain solutions that connect to their main frame. Instead, they may present methods or paths that might lead to solutions. I added (5) because the attributed roles significantly shape how knowledge and concerns are represented.

In an iterative and non-linear way, my new method seeks to identify the main frame and its functions and map how devices for achieving selective emphasis are at work in the text. Next, one analyzes and shows how the papers' main frames and their functions, justifications, repetitive formulations, metaphors, and the like contribute to shaping the representation of LKC (see Figure 1).

I have illustrated the new method by applying it to two scientific papers, one on the cultural impacts of climate change in Siberia (P1) and one on challenges and solutions related to the decline of maize biodiversity in Mexico (P2). Both studies involved indigenous people and have a strong focus on culture. In P1 the main frame is global climate change linked to culture. In P2 it is agricultural biodiversity loss connected to biocultural approaches to conservation.

The articles have different purposes, they are written by researchers with different backgrounds and they involve local people in different ways (P1 through ethnographic fieldwork and the elders' stories, P2 through a collaborative project). There is still a need for different types of research. At the same time, it is important to exercise reflexivity when both Western and non-Western researchers write scientific publications where LKC is included.

The method I present here helps to show how main frames and their functions shape the representation of LKC. Frame and the functions roles, problems and the path toward solution in P1 contribute to the researcher taking on the role of anthropologist and advocate. The role implies that the person is active and responsible for the victims, here local people. The problems presented are of a global character and by showing the world how local people are affected by climate change, others are also made responsible, such as politicians, other researchers, etc. The focus on culture in P1 contributes to the representation of local people's concerns taking on a cultural character and other concerns fade into the background. In P2, the causes of the problems of agrobiodiversity decline are of a global character, in the same way as in P1. Globalization, international trade, and neoliberal agricultural policies are mentioned as causes. The roles that operate in the text differ from those in P1. Here, local people have the role of local custodians of agrobiodiversity. This is an active role with an expectation of responsibility. The researchers, on the other hand, are given a more passive role. In P2, they are described as follows: "researchers who do not interfere too much" and "researchers with limited influence." This has implications for how LKC is represented in the text. Local people, through joint discussion, identify causes of the decline of native maize, concerns they have related to this and possible solutions. In addition, local people themselves are given the responsibility to rank these from most important to least important. Culture in P2 is linked to collective thinking and solidarity, which in turn supports the expectation that local people have both individual and collective responsibility for native maize.

Identifying main frames and their functions in a scientific text is demanding and goes well beyond close reading and coding. It requires multiple iterations and involves exploration of the context and origins of the text. To clarify the *how-to* of identifying frames and their functions, I illustrate the application of my method step by step, using two articles. To help researchers who do not have a background in social science or textual analysis, I introduced "reflexive intermezzos" to help the reader to make sense of what the method shows. Such reflexive intermezzos can be used during the analysis, especially in the step where one shows how the frame shapes the representation of local knowledge and concerns. The time this requires should not be underestimated. The illustrative application shows that the frame concept has significant potential in making visible how frames in scientific texts shape the representations of the knowledge and concerns of the indigenous peoples engaged. Still, I do recommend further follow-up studies for documenting the value of the new method in other contexts and for other types of scientific texts.

On its own, this strategy cannot solve all challenges in responsible research with indigenous people or local communities. It must be used with other tools and approaches to reflexivity, responsible research, and ethics of community-based research. It can, however, help make the representation of LKC more reflexive, explicit, responsive, and transparent.

6 Epilogue

Apart from its use as an analytical strategy to explore the role of frames in shaping the representation of LKC in published scientific texts, I believe that my method also has a potential to be used as a tool for textual reflexivity during the writing of scientific texts, or during the research work prior to the writing. The method may allow researchers who work with indigenous people or local communities to critically reflect on how they represent LKC in their texts (draft papers, draft reports, draft research proposals). Proactive use of the method's mode of thinking, upstream in the design of new research projects with indigenous people or local communities, may help researchers to mitigate unintended implications of their own framing tendencies. While the identification of frames in a published scientific text by someone who was not an author can be demanding, I think it might be easier to apply frame analysis to one's own texts, that is, while researchers are drafting their texts. Researchers know their own field, concepts and references and can more easily identify the frame and its

functions. But this requires thorough, reflexive work because frames, as Rein and Schön (1993) write, "are part of the natural, taken-for-granted world" (p. 151). In addition, I suggest using my "reflexive intermezzo" as an aid to systematize the critical reflection on how LKC is represented in scientific texts that are under development.

While working on this and other articles, I have noticed that indigenous epistemologies and Western epistemologies are not always compatible. Researchers in particular highlight the challenges of interpreting indigenous knowledge in the form of narratives, art and the like in light of Western epistemologies (Roos, 2024). The method I present in this article has the potential to show that some indigenous knowledge, concerns, solutions, or proposed causes of problems tend to be parked for later investigation or neglected in texts. Most likely this happens because they do not fit with Western epistemologies. Knowledge claims drawing on non-Western epistemologies are not widely accepted by the Western scientific establishment, and it is not easy for Western scholars to integrate such knowledge in a meaningful way in their texts. Frame analysis does not provide solutions to such challenges, but it can make researchers more attentive to this. My suggestion is that Western researchers should more often invite academic researchers with a background from the local communities that their projects target and make use of scientific literature written by academic researchers with an indigenous background. This is because having both an indigenous background and Western academic training makes one best positioned to bridge the different ways of knowing.

Data availability statement

The data that support the findings of this study are included in this published article, further inquiries can be directed to the corresponding author.

Author contributions

RR: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. This work was conducted as part of the SeMPER-Arctic project (Sense Making, Place attachment and Extended networks as sources of Resilience in the Arctic), a research project which received a grant as part of the Belmont Forum call "Arctic Resilience" (2019) for which the author's work was funded by the Dutch Research Council under project number ALWPP.1.

Acknowledgments

I acknowledge the support of the wider international SeMPER-Arctic project team (see Funding) for creating the conditions for writing this article and providing an inspiring and supportive academic environment. I thank the participants of the International AFINO (responsible research and innovation in Norway) workshop "Inter- and transdisciplinary challenges in practice," 30 July – 6 August 2023 at the Metochi Study Centre, Lesvos, Greece for comments on an earlier draft. I am grateful to Joy Burrough-Boenisch for linguistic and stylistic improvements.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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