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Knowledge and Its Legitimacy, an Exploratory (Meta)Ethical Framework-Based Analysis of Narratives on Coastal Flooding Risks in a Changing Climate

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Knowledge quality assessment (KQA) has been developed in order to analyze the role of knowledge in situations of high stakes and urgency when characterized by deep uncertainty and ignorance. Governing coastal flood risk in the face of climate change is typical of such situations. These are situations which limit the ability to establish objective, reliable, and valid facts. This paper aims to identify the moral frameworks that stakeholders use to judge flood risk situations under climate change, and infer from these knowledge legitimacy criteria. Knowledge legitimacy, defined as being respectful of stakeholders' divergent values and beliefs, is one of the three broad quality criteria that have been proposed in order to assess knowledge quality in such situations; credibility (as scientific adequacy) and salience (relevance to the needs of decision makers) being the two others. Knowledge legitimacy is essentially the subject of a literature analyzing, *ex-post* (once knowledge has been deployed), how stakeholders' participation is a factor contributing to knowledge legitimacy. Very little is known about *ex-ante* characteristics (i.e.: that can be observed, determined, before knowledge is deployed) that would make some types of knowledge more legitimate (i.e., respectful of stakeholders' divergent values and beliefs) than others. We see this as a significant blind spot in the analysis of knowledge and its role under deep uncertainty. In this paper we posit that this blind spot may be addressed, in part. In order to achieve this we first identify the ethical frameworks that stakeholders use to judge a situation of risk under rapidly changing conditions. We then associate these ethical frameworks to characteristics of knowledge. We tested this conceptualization through a case study approach centered on flood risk on the French Atlantic coast. We have adopted a narrative approach to the analysis of two diachronic corpora consisting of interviews conducted in 2010–2012 (33 interviews) and 2020 (15 interviews). These were approached as narratives of a risk situation. We thematically coded these along themes considered as metanarratives. These metanarratives are associated with predefined (deontology, consequentialism, virtue ethics) and emerging (discourse ethics, connection ethics, and a naturalistic ethic) ethical theories. Our results show that, when faced with flood risks, stakeholders tell stories that mobilizes

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several metaethical frameworks as guiding principles in the form of both procedural and substantive injunctions. In order to respect what we interpret as manifestations of the moral stances of stakeholders, our results indicate that knowledge legitimacy may be assessed against the following criteria: lability, debatability and adaptability; degree of co-production invested; place-based approach; ability to include lessons that would be given by nature. The operationalization of these criteria is promising in a time when the knowledge that is used for decision making under certainty is increasingly contested on the ground of its legitimacy.

Keywords: knowledge quality assessment, ethics, knowledge legitimacy, French Atlantic coast, flood risk

INTRODUCTION

When confronted to flooding risk under a changing climate, decision makers are confronted to a situation where the stakes may be high—including potentially displacing human settlements—while facing uncertainties that can't be easily reduced. Such high stake decision making under uncertainty raises specific challenges in terms of knowledge production and use: "hard" decisions are to be made, yet Science can't provide information endowed with the high degree of certainty that such decisions would call for (Funtowicz and Ravetz, 1990). When decisions are urgent and stakes high, facts and values may become intertwined (Funtowicz and Ravetz, 1993). In these situations, "knowledge quality criteria become unbounded, highly unstable, and contentious" (Bremer et al., 2019, p. 2). In order to face such situations, knowledge quality assessment (KQA) has emerged as an approach to disentangle facts and values: knowledge quality criteria include a reflection on the fitness for function of the knowledge. KQA entails an analysis and critical reflection on uncertainty, underlying assumptions, and associated dissent (van der Sluijs et al., 2008). KQA recognizes that decision makers are not only confronted with epistemic uncertainties (which the present paper does not deal with), they are confronted with moral and normative uncertainties (which is the focus of the present paper) associated to the context in which knowledge is being produced and used. In that vein, in order to tackle issues of sustainability, Cash et al. (2003) propose to qualify knowledge systems in terms of credibility (scientific adequacy), salience (relevance to the needs of decision maker), and legitimacy (being respectful of stakeholders' divergent values and beliefs). The latter criterion has been approached through the *ex-post* analysis of case studies demonstrating that stakeholder engagement in knowledge production and evaluation increases its legitimacy. Yet the *ex-ante* working of this increased legitimacy of knowledge is somehow left in the dark. Contributing to the empirical understanding of knowledge legitimacy, in terms of *ex-ante* conditions, as opposed to *ex-post* observations, is precisely the contribution of this paper. By using a metaethical lens we are able to develop empirically criteria showing whether knowledge coproduction and use is compatible with the ethical theories that stakeholders, in their diversity, seem to favor.

In this paper, we thus propose to revisit the knowledge legitimacy criterion of KQA in order to contribute to an increased understanding of the mechanism through which knowledge may be considered as legitimate. We use descriptive metaethics as an entry point. Descriptive ethics is the study of moral behaviors of individuals and groups as they are observed. Metaethics is the field of knowledge that seeks to understand the metaphysical, epistemological, semantic, and psychological, presuppositions and commitments of moral thought, talk, and practice (Sayre-McCord, 2014).

We therefore depart from the now well-documented empirical demonstration of the connections between broad stakeholders engagement and knowledge legitimacy. Rather than observing *ex-post* that stakeholder engagement increases knowledge legitimacy, we propose its assessment by (a) systemically exploring the ethical theories that are mobilized by stakeholders when conversing on risk issues and, (b) analyzing how these ethical frameworks relate to characteristics of knowledge production and/or use. This approach enables access to parts of the central determinants of the diversity of moral stances stakeholders may adopt—moral stances being understood as utterances where stakeholders express a judgement that appears to mobilize their values. We access these within stories of flood risk situations. We explore such a risk situation through the case of coastal and estuarine flooding risks on the French Atlantic coast under a changing climate. Our result contributes to the field of knowledge quality assessment, focusing on knowledge legitimacy and its determinants.

In order to pursue this goal, we acknowledge that adaptation to climate change entails increasing epistemic uncertainties (that we do not address here) that are accompanied by increasing moral uncertainties (that we wish to partially address here). From these results, we infer conditions for knowledge legitimacy in procedural and substantive terms. We thus share the results of an exploratory research which aims at proposing, developing, and testing an approach to decipher the interplay between moral uncertainties, ethical frameworks, and knowledge.

We begin this paper with a condensed state of the art of (a) the knowledge on the interplay between knowledge and associated uncertainties (section Knowledge Quality Assessment and the Legitimacy of Knowledge), (b) moral uncertainty (section Moral Uncertainties), and (c) metaethical frameworks as ideal types (section Defining and Using Ethical Framework Ideal Types as a Metaethical Approach). Building on this theoretical bricolage (Denzin and Lincoln, 2018, p. 45–46), we propose

to analyze a risk situation using a narrative lens (see section Case Study Description below). We conduct this analysis on diachronic corpora consisting of two series of interviews dealing with the risk of coastal flooding in a changing climate (see section Methodological Stance). This analysis identifies the metaethical theories mobilized when stakeholders express stories of risk situations (see section Data Collection Procedures). Our results show how various metaethical frameworks are mobilized by stakeholders (see section Results). We show how these metaethical frameworks connect with knowledge, both substantively and procedurally (section Discussion).

KNOWLEDGE QUALITY ASSESSMENT AND KNOWLEDGE LEGITIMACY, MORAL UNCERTAINTIES, AND METAETHICAL THEORIES

Knowledge Quality Assessment and the Legitimacy of Knowledge

Decision making situations entailing high stakes and high uncertainties, call for a practice of knowledge production that strays away from what Kuhn (1970) has coined as normal science: i.e., the practice of science within a settled paradigm, or explanatory framework, progressing through the progressive accumulation of stabilized knowledge, while not calling for the questioning of underlying assumptions. When high stakes decisions are urgent, these may be taken before conclusive evidence are available (van der Sluijs, 2005). In such cases the criteria for knowledge assessment need to be expanded, which is the crux of KQA. KQA has been defined as the task of exploring the relevance of knowledge in the face of deep uncertainty and ignorance that limit our ability to establish objective, reliable, and valid facts (Bremer and van der Sluijs, 2019). The KQA literature demonstrates the importance of stakeholder engagement and proactive uncertainty communication. Modes of participatory science making are seen as a mean to nurture, procedurally credibility, salience and legitimacy. More recently knowledge for climate change adaptation has been the subject of various enquiries (Haque et al., 2017; Bremer et al., 2021). In this paper we focus solely on the legitimacy criterion.

In their seminal paper, Cash et al. (2003) define knowledge legitimacy in the following way: "[knowledge] legitimacy reflects the perception that the production of information and technology has been **respectful of stakeholders' divergent values** and beliefs, unbiased in its conduct, and fair in its treatment of opposing views and interests." (Cash et al., 2003, p. 8086, our emphasis in bold). Under such a definition, knowledge legitimacy relates essentially to the perception, by stakeholders, of the knowledge production and use processes: "[knowledge] legitimacy involves the belief that S&T systems are "fair" and consider appropriate values, interests, concerns, and specific circumstances from multiple perspectives." (Cash et al., 2002, p. 5).

Our working hypothesis in this paper is that in order to nurture knowledge legitimacy one has to identify, and take stock, not only of divergent values, but of how these values are underpinned by metaethical theories. We consider that the metaethical justifications of stakeholders judgements on various states of affairs inform us on the nature of the knowledge that they judge as respectful of their understanding of what deserves to be judged and how. We propose to approach moral uncertainties, through the narrow, yet fundamental, lens of metaethical theories.

Moral Uncertainties

In a foundational paper, De Marchi (1995) positions moral uncertainties within other sources of uncertainty in situations of risks management. De Marchi presents moral uncertainties as "linked to the ethical traditions of a given country [...], as well as the psychological characteristics of the persons in charge, their social status and professional roles." De Marchi sees moral uncertainties as the consequences of actors taking decisions in light of likely future legal liability, moral guilt and/or possible ostracism by his or her community.

Similarly, and with increasing precision, Lockhart (2000) associates moral uncertainties with situations where one is uncertain what the morally right thing to do is. Conducting a systematic enquiry into moral uncertainties, Lockhart shows the centrality of moral uncertainties in decision-making when combined with decision criteria not related to ethics.

More recently, in a groundbreaking contribution, Taebi et al. (2020) have further developed the associated concepts in the context of climate change. They develop a broad category of normative uncertainties: "that is, when there is not one unequivocal right or wrong answer to an ethical question regarding risk" (p. 2). They further classify normative uncertainties into four categories: evolutionary (uncertainty about the moral norms that will be applicable in the future for a future risk situation), theoretical (when different [meta (our addition)]ethical theories lead to different recommended courses of actions), conceptual (situations when different ethical concepts or values are mobilized, prioritized or interpreted differently), and epistemic (those associated with ignorance).

In this paper we see the deciphering of the metaethical ethical sources of moral uncertainties as central to the challenge of achieving knowledge legitimacy. We focus on the analysis of theoretical normative uncertainties as identified by Taebi et al. (2020).

Defining and Using Ethical Framework Ideal Types as a Metaethical Approach

Metaethics is not about the content of moral claims, but it is about their status—it is about the justifications used to reach a judgement, rather than about the content of the judgement itself, "it asks about the status of ethical claims, rather than about their content" (Shafer-Landau, 2012, p. 2). Metaethical frameworks set the stage for identifying a source for moral judgement. Metaethical frameworks are not so much about what people ought to do. They are about what they are doing when they talk about what they ought to do (Hudson, 1970, p. 1, in Miller, 2013). Our working hypothesis in the course of this research, is that it is possible to capture, describe and analyze, partially, yet productively, the diversity of stakeholders' moral

stance through the identification of a limited number of ethical framework ideal types. Conditional to this working hypothesis we are in a position to associate utterance expressing judgement with specific ethical theories.

We have identified and defined, metaethically, a series of ethical frameworks that we had observed, rather informally and conversationally, in the course of past fieldwork. We observed that moral issues lay at the center of the concerns expressed by coastal flooding stakeholders on flood risk and its mitigation. While not being engaged into research on ethics and metaethics *per se* at the time, we observed a tension between various expressions of what we identified as consequentialist statements and deontological statements, that were somehow intertwined with expressions of virtue ethics. This observation led us to the work that we present here. We are metaethically analyzing our corpora through the lens of these three dominant ethical frameworks: consequentialism, deontology and virtue ethics. Many other frameworks exist, yet we collectively considered that these three fundamental categories should be used as a starting point because of their importance in the literature.

For this paper we consider that consequentialist ethical frameworks are frameworks that guide moral claims according to some sort of end results (for a more formal presentation see for instance Frankena, 1973, p. 14–16). Within flood risk management assessing options in terms of their end-results amounts to consequentialism. For instance cost-benefit analysis, which focus on the difference of the total costs and benefits of a risk mitigation approach does not take into account the associated process.

Deontological ethical theories, on the other hand, focus on formal and non-formal rules to be respected regardless of the outcome (see Frankena, 1973, p. 16–17). Considering that existing regulatory frameworks must always be respected corresponds to a deontological ethical stance. In such a context formal regulations are seen as non-negotiable regardless of their outcome.

Finally, for the purpose that we are pursuing, virtue ethics focus on the moral character of decision-makers, e.g.: generosity, self-discipline, fairness, compassion. For instance expressing that a decision-maker is fair or unfair for considering a specific flood risk mitigation option corresponds to a stance that we associate to virtue ethics.

It must be noted that these categories are by no means categories that exist in a pure form: ≪ any plausible normative ethical theory will have something to say about all three ≫ (Hursthouse and Pettigrove, 2018). We use these as ideal types and use interpretation in order to identify which ethical theory is central to specific utterances that are made by stakeholders.

MATERIALS AND METHODS

Case Study Description

Flood risk management on the French Atlantic coast has gone through several phases. A first phase, relying mostly on structural mitigation options (mainly dikes and levees) and a state-guaranteed post-catastrophe reinsurance scheme, lasted up to the mid to late 1980s. A second phase followed, characterized by a maze of structural and non-structural measures, none fully implemented (Gilbert and Gouy, 1998; Barraqué and Gressent, 2004). A critical turning point occurred following the Xynthia storm in 2010 (Touili and Vanderlinden, 2017). Since then, non-structural measures have been refined in a third ongoing phase including land-use planning, emergency planning, risk perception analysis and warning systems. These have been more thoroughly implemented than before (for a more detailed description of flood risk management on the French Atlantic coast and its post-Xynthia evolution, see Hissel et al., 2015).

Considering our research objectives, flood risk management on the French Atlantic coast is a particularly relevant case study. First, flood risk has been identified as a major challenge in terms of public research. Flood risk has also been identified as a priority area for public education campaigns targeted at the communities that are exposed. Issues around knowledge and its articulation with decision-making are always present in stakeholder discourses—an abiding part of the technocratic French culture that somehow seems under siege in these highly uncertain times. Second, and more importantly, the Xynthia storm and its impacts is seen as a turning point in the discourse around climate change adaptation. Storm Xynthia has been framed by many as a window into what the future has in store (e.g., Galliot, 2012; Jouzel, 2012). Ten years after the Xynthia storm, one outcome is that stakeholders are willing and in a position to express themselves on coastal adaptation in a changing climate.

Finally, the co-authors collectively have access to uniquely diachronic corpora. This gave us access to two types of narratives. A first series of narratives, collected between 2010 and 2012, dwell on Xynthia, its aftermath and provide a window into the discourse on the future that ensued. A second series of narratives, collected in 2019–2020, is more reflexive on the side of the interviewee, and focuses on "now that 10 years have passed, what did we achieve in terms of adaptation?" Such a pair of corpus allows for the joint capture of both prospective (relating to future, potential events) and retrospective (relating to past events) stances.

Methodological Stance

For this analysis, we adopted a narrative methodological approach. It is based on the assumption that people understand their lives in storied forms, connecting events in the manner of a plot that has beginning, middle, and end points (Sarbin, 1986; Josselson, 2011). Narratives are dynamic, dialogical, often contested, and reveal values and meanings (Krauß, 2020; Krauß and Bremer, 2020). Narratives grant us access to lay ethics, the value system of narrators that are not professional ethicists (see Nordmann and Macnaghten, 2010). In addition to their important capacity to encapsulate human experience in its diversity, narratives also inform us through metanarratives. Metanarratives exist as collective shared visions of the world, of its governing forces or of what should govern it. Metanarratives are: "larger explanations of our reality that guide us through our smaller narratives. Metanarratives explain in big-picture fashion why we do what we do and thus define our view of the world or a portion of it" (Badke, 2012, p. 104). In our

analysis here, we recognize that narratives are carried by one or more metanarratives. We consider that these metanarratives summon the lay ethics of the utterers. We posit that these metanarratives may, when judgement is being expressed, be organized thematically in order to conduct a metaethical analysis of the ethical theories that we are observing.

Data Collection Procedures

Our corpora consist of two sets of interviews. These interviews were collected in the course of various research projects and archived for further use—provided that these were in line with the ethical guidelines that our research center adheres to (see section Research Ethics Protocol). These corpora are presented in this section.

The first series of interviews from the 2010 corpus is made up of 33 semi-directed interviews conducted between 2010 and 2012 with stakeholders in flood risk management and the general population in the Gironde area. This sample was constituted from a first series of interviews with nine key respondents that were identified in order to capture a diversity of experience in terms of flood risk. We then proceeded with a snowball sampling procedure—i.e. interviewed people identified as "important, yet different" by the interviewee belonging to the initial core sample. The sampling was designed in order to capture a high variety of differing experiences in relation with flood risk in the Gironde estuary (see **Table 1**). The sample size has been defined by saturation: constant comparisons were made between a broad initial thematic coding and the raw data until no new findings or views emerged regarding central flood risk governance concepts. The interview framework focused on coastal risks and the management of them. In the immediate aftermath of Xynthia, this was the subject of a dynamic debate and respondents express themselves willingly, sometimes in heated fashion. This corpus has been used in the past to analyze qualitatively the stakeholders' social representation of risk mitigation, in a comparative setting with several other European sites (Touili et al., 2014; Touili and Vanderlinden, 2017; Vanderlinden et al., 2017). The analysis conducted for the present paper is original and has not been published as part of these papers.

A second series of interviews constitutes the "2020 corpus." It is made up of 15 semi-structured interviews conducted between mid-2019 and mid-2020 with coastal risk management stakeholders. These interviewees were selected using a stratified, informed selection process (selection criteria based on geography and type of responsibilities). This selection was associated with a limited snowball sampling. The interviews were centered on how risk management has evolved since the Xynthia storm. The sample representativeness was ascertained through saturation and further checking with local stakeholders through the snowball procedure. The results associated to this corpus are about to be published. It has been used for an analysis of the evolution of the regulatory environment and the learning process associated to the Xynthia storm.

TABLE 1 | Categories of interviewees.

	2010 corpus	2020 corpus
River basin authority/erosion manager	X	X
Land use planner	X	X
City council employee		X
Regional level employee of the Ministry for Environment	X	X
Flood risk manager	X	X
Harbor administrator	X	
Coastal manager at the local or regional level	X	X
Representative of the local Chamber of Commerce and Industry	X	
Scientist	X	X
Employee from an NGO dealing with environmental protection	X	
Citizen living in flood prone area	X	X

Some categories were represented by more than one interviewee, some interviewees self-identified as belonging to more than one category. These sample were geared at capturing the diversity of possible relations that stakeholder may have with flood risk and its governance. Both sample showed features indicating that the information had saturated.

Research Ethics Protocol

These interviews followed a research ethics protocol—which while being quite standard, is specific to our research team. There were, and still are, no formal requirements neither institutionally nor legally. The interview process has been collegially identified as a minimal risk process—i.e., a process for which the, discursively assessed, probability and magnitude, in lay persons terms, of possible harms implied by participation in the research is no greater than those encountered by participants in those aspects of their everyday life that relate to the research. Informed consent was obtained orally and recorded.

Data Analysis

Our corpora were analyzed using thematic analysis. Thematic analysis consists of identifying sections of a corpus that are deemed relevant to the issue under scrutiny, in our case, phrases expressing judgments. These sections are then (re)-organized along thematic lines—here, predefined or emerging ethical theories. **Table 2** presents the various predefined coding categories or themes (see section Defining and Using Ethical Framework Ideal Types as a Metaethical Approach for the rationale for these choices). These themes were used to analyze utterances that express a normative judgment either explicitly (use of verbs such as "ought to," "must," "should," and adjectives such as "good," "bad," "preferred," "desirable") or implicitly (narration expressing positive or negative judgment, yet without explicit and clear direct normatively loaded vocabulary). Throughout the analysis we refined these categories by identifying subcategories (see Results, section On the Three Initially Identified Ethical Frameworks to 4.3). Along the way we identified ethical theories that we had not preidentified and that are described in the results section (see **Table 3**; Section 4.4)

RESULTS

Through the analysis we coded and grouped thematically utterance that we identified as manifestation of consequentialism,

TABLE 2 | Predefined thematic coding categories.

Ethical theory serving as a coding theme	Instance of utterance coded under this theme
Deontology: groups ethical theories that define courses of action regardless of their consequences or of the ends being pursued. These rely on shared norms and values. This broad family is also identified as Kantian deontology or Kantian categorical imperatives. It is not used here in the narrower meaning of "professional deontology."	"*What should be achieved, as a public service, is to ferociously prohibit. We should not be "forbidding, while authorizing"* [at the same time]" (County-level civil servant and risk manager, speaking on the links between climate change and the regulatory context, 2010).
Virtue ethics: groups ethical theories that consider that there are some fundamental characteristics within decision-makers that are seen as virtuous, it is the decision-maker and his or her intention that are evaluated, not their actions in context	"*[disapprovingly] Elected officials today are saying, we are here now, in the future they will see what they will do*" (Local authority manager reflecting on climate change uncertainty and how to integrate it into planning, 2020)
Consequentialism: groups ethical theories that define desired courses of action in terms of their consequences, for the ends being pursued. In Kantian terms, these are identified as hypothetical or conditional imperatives.	"*I don't see that it's impossible to live in risk zones as long as the building is adapted and there is the possibility of making people safe and the dwelling easily resilient.*" (Local authority manager talking about long-term impacts and the possibility of living with these, 2020).

deontology, and virtue ethics. While coding we identified utterance that we associated to other ethical theories—some existing and being well-defined in the literature (discourse ethics, some being generic (naturalistic ethics) and one that we named ourselves (connection ethics). We thus enriched our coding themes with that of discourse ethics, connection ethics and naturalistic ethics. These are described in **Table 3** below and further discussed as part of the results.

On the Three Initially Identified Ethical Frameworks

Consequentialism, i.e. the assessment of a decision or an action in terms of its consequences, manifests itself in the 2010 corpus in several forms. First, there are regular utterances stressing the fact that flooding and flood risk management is purely a pragmatic issue: it is about water not damaging things of value: "*If we want to preserve inhabited areas [. . .] then it is into the empty spaces that we must send water. It's somehow a practical reality.*" (Executive at county level, speaking about the potential for transforming the territory under the pressure of evolving risks, 2010) Second, consequences are called upon to assess the seemingly unforeseen distributive consequences of decisions taken. "*We have farmers who don't understand the rationale for increases in risk with the disappearance of dikes [. . .] to protect the Bordeaux conurbation, a conurbation that has happily spread over flood-prone areas*" (Engineer and researcher in a public research center, talking about land use planning issues in relation to risk management, 2010). In the 2020 corpus, consequentialism manifests itself in the concerns associated with adaptation to climate change. Some interviewees believe that *ex-post* assessment of risk management should be based on whether the area has remained "habitable" and losses were actually reduced.

In terms of deontology, legal rules and associated regulations are frequently referred to in the 2010 interviewee narratives. In the aftermath of Storm Xynthia some interviewees would like them to be strictly enforced: Others criticize these legal rules and regulations for their inability to efficiently address flood risk while taking into account local specificities: "*It is working in the opposite direction that makes more sense, there is no need to only look at the regulatory document, [... it is preferable to] think about the safety aspect, the economic damage that a flood could generate.*" (Local government civil servant, responsible for environmental risk management, speaking about the stakes for land use planning in relation to risk management, our emphasis, 2010) Legal rules and associated regulations are also contested because of their impacts on specific categories of stakeholders: "*We don't know how to strike a middle ground or be balanced: we either do almost nothing or too much. Typical example: you have a farmer who wants to build a shed to protect his equipment, he can't, it's forbidden to build—an industrialist who needs to enlarge, he can't. We have managed to do too much and too badly.*" (Member of a citizen association speaking on its behalf, talking about the interactions between land use planning and flood risk management, 2010). Legal rules and regulations are mentioned in the 2020 corpus to show how they have evolved. They are presented in a less clear-cut way than in the 2010 corpus. Acceptance through learning are central to the narrative we identified: "*In the past, the mayor fought with the director of the DDTM [national authorities] to get some building permits accepted. After the storm [Xynthia], [. . .] Bylaws forbidding any real estate developments are [now] accepted.*" (Local authority manager, talking about urban restrictions immediately after Storm Xynthia and today, 2020).

Fine-tuning of the deployment of rules and regulations is often stressed with an emphasis on the fundamental importance of spatial and historical variability when it comes to flood risk management: "*It would be a mistake to try to contrast the approaches by saying that there are good approaches and there are bad ones, [. . .].*" (Public-service manager for coastal land management, sharing his view on the options and approaches for coastal risk management, 2020). More importantly for our purpose, in the 2020 corpus, narratives are centered on the interplay, or potential future interplay, between rules and regulations, on the one hand, and a changing climate and necessary adaptation, on the other hand: "*We must also learn to live with these events, it is not because we are in a risk zone that we can no longer live there.*" (National authority manager talking about adaptation in flood-prone areas, 2020) These results point to the need for rules and regulations to evolve in a way that is attuned to the evolution of the climate.

Virtue ethics appears in the 2010 corpus in two forms. First, as an injunction, not to envision degrading the situation of some stakeholders by implementing risk management measures intended to protect others—an injunction at being fair, seen as a virtue. Virtue ethics is about who one is, as seen through one's intention: "*you don't want to protect us, you want to flood us to protect Bordeaux*" (County-level risk manager, presenting the challenges facing his department, 2010). Second, virtue ethics manifests itself as an injunction of solidarity to correct a sense of injustice, in this case, in support of the victims of hazards in order to correct a differential in exposure, taking the form of a state-guaranteed insurance fund: "*solidarity measures* [will have to] *ensure that all the rest* [of the population] *takes care of that fraction*." (Harbor manager, listing the issues he observes along the Gironde, 2010). The focus in 2020 is also on distributional issues. These are raised in terms of both territorial and intergenerational justice that must be motivating key decision makers—they are judged, their virtue is assessed.

On Ethical Frameworks Emerging in the 2010 Corpus and Increasingly Present in the 2020 Corpus

When analyzing the 2010 corpus, a series of ethical theories appeared from the narratives that we coded. We grouped these under the general category of "emerging ethical theories." These belong to three broad domains: discourse ethics, connection ethics and naturalistic ethics.

First, most interviewees referred to concepts in discourse ethics (i.e., norms are to be established on the basis of rational argumentation in practical discourse, see Habermas, 1991). Deliberation are seen as either as a way of reaching more acceptable decisions, or as a way of providing awareness of multiple perspectives for better informed decision-making. This was confirmed in the 2020 corpus where we found clear signs that discourse ethics were progressively being transferred into practice. The following quotes illustrates the situation in 2010, contrasting the 2020 sample quote provided in **Table 3**: "*Land use planning decisions are imposed on us by the state, without any consultation. [. . .]* [disapprovingly] *they put us in front of a ≪ fait accompli ≫*" (Engineer in charge of research, research center, talking about the stakes of land use planning in relation to risk management, 2010).

Secondly, interviewees identify that spatial and temporal connections are central to risk situations: history matters, as well as do future generations. Neighbors and larger territorial units, must be taken into account. We considered that these utterances were sufficiently normative to deserve a separate category, not necessarily associated with any

TABLE 3 | Emerging thematic coding categories.

Emerging themes	Theme descriptive content	Sample quote
Discourse ethics: under this category we grouped utterances associated with discourse ethics. In our corpora, these utterances are expressing the benefits of deliberative decision-making either in terms of acceptance of decisions or in terms of the substantive quality of the decision that is taken.	Utterances expressing the importance of a deliberative process in order to reach compromises that are beneficial to all involved Utterances connecting the acceptance of a decision by a party to his or her participation in deliberations regarding this decision. Utterances stating that the substantive performance of a decision is associated with many perspectives being considered in a deliberative process	"It [the SLGRI—a recent, post-Xynthia implemented, regulatory tool named 'local strategy for flood risk management'] has the merit of increasing cooperation in the territories and making people, users, elected officials, consular chambers, etc., talk better to each other. It has been a place for exchange and discussion." (Public service manager for the estuary basin reflecting on the local strategy for flood risk management in place in the area, 2020)
Connection ethics: under this category we group utterances associated with either spatial connections (between places, spaces, and scales) or temporal connections (through historicity, foresight, or intergenerational consideration).	Utterances judging the importance of taking the historical dimension into account in a current process Utterances judging the importance of taking the future into account today. Utterances judging the importance of taking multiple scales and their interactions into account.	"The geographical scale of the SCoT [land use planning regulatory tools] needs to be changed, of course. A coastal SCoT should be made on the scale of the department [county] of Charente Maritime. The inter SCoT between us and the Rochefort and Royan [neighboring communities whose risk governance has influence] has been latent for a very long time" (public service manager for land management, speaking about land use plans in their interactions with coastal risk management, 2020)
Naturalistic ethics: Under this category we group utterances referring to nature as a normative frame in a general sense.	Utterances expressing that nature always wins and that it is better to be respectful of its strength. Utterances indicating that nature should serve as a model for human action. Utterances questioning the nature/culture divide.	"*Why not give back the natural character to these dikes, let nature finally take back its rights, and manage the bays, colonize them either with plants, and let the animals, the small beasts, come and settle on this territory*?" (R&D manager, State service, risk management, envisaging the paths for the future, 2010)

These themes emerged from the analysis of the 2010 corpus. We then included them in the analysis of the 2020 corpus and in further iterations of analysis of both corpora.

currently clearly identifiable ethical theory, and that we named connection ethics.

Finally, we identified utterances that refer to nature as either a model to be followed or as a force to be respected. In these utterances nature, and its functioning, has metaethical properties: *"we have to work with nature and perhaps accept to retreat"* (public service manager for coastal land management explaining the context for people's lack of understanding of depolderisation, 2020). We named the associated ethical theory "naturalistic ethics" as the source of moral judgement lies externally to humans.

DISCUSSION—ARTICULATING ETHICAL FRAMEWORKS WITH ASSESSMENT OF KNOWLEDGE LEGITIMACY

As pointed out in the introduction, and in section Knowledge Quality Assessment and the Legitimacy of Knowledge, knowledge legitimacy entails that the divergent values of stakeholders be respected (Cash et al., 2002, 2003; Cash and Belloy, 2020). Our approach posits that such a respectful stance may be guided in part through analysis of the ethical theories identified as metanarratives in stakeholders' stories, and in our case study of risk situations. Such an approach entails connecting, adopting the posture of metaethics, ethical theories with knowledge production and use.

Connecting ethical theories with knowledge production and use is thus the purpose of this discussion which is organized around four threads: (a) knowledge lability in connection with the manifestations of deontology and consequentialism that we observe in our corpus; (b) knowledge co-production in connection with the manifestations of discourse ethics that we identify in our corpus; (c) place baseness in connection with connection ethics; and (d) reliance and the nature-culture divide in relation with naturalistic ethics as it manifests itself in our corpus.

We do not address here issues relating to the legitimacy of decision and decision making. Our goal lies strictly in connecting ethical theories as a source of value diversity when envisioning knowledge legitimacy. We thus consider that knowledge legitimacy relies, in part, on a convergence of knowledge's characteristics with the ethical frameworks that appears to underpin the stakeholders' utterances. We see this as a novel way to ascertain knowledge legitimacy. Rather than assessing *ex-post* how stakeholders assess the legitimacy of knowledge, we are in a position to qualify knowledge substantively *ex-ante*. We see this as the central contribution of this paper, within the field of KQA.

The deontological and consequentialist underpinning that we have observed in our results points to knowledge that is labile, debatable in the face of local specificities and revisable. In the case of flood risk in the Gironde, such a knowledge would allow for respecting the diversity of judgements that are expressed. Knowledge legitimacy would in part rely on a convergence of knowledge's characteristics with the ethical framework that appears to underpin the stakeholders utterances.

Sections On the Three Initially Identified Ethical Frameworks of the results indicate a longing for a constant *ad hoc* tuning of rules and regulations. Yet there is a need for predictability when it comes to rule systems. This tension is an important characteristic of our corpora. The central issue for this paper is to ascertain how such a tension translates into issues of knowledge production and use. Flood risk is unevenly allocated spatially. It is currently changing because of climate change. The knowledge that is mobilized needs to be attuned to local specificities while being adapted to changing risk envelopes.

These characteristics, spatial and temporal variability, do relate to knowledge. With these results we observe that we live in a "rapidly shifting world of knowledge and action" (Cash and Belloy, 2020, p. 1) and this has consequences for knowledge production (Cash and Belloy, 2020). Our interviewees stress, through their partial rejection of rule-centered deontology, that rules and regulations must be attuned to the dynamic nature of the temporally and spatially changing environment. In this context, knowledge is seen as labile and debatable in the face of local specificities. Furthermore, the uncertainties surrounding the future climate are consubstantial to knowledge that conveys the possibility for change. The production of knowledge has to connect in real-time with the way that climate evolves. These results resonate with the concept of "iterativity" as presented by Sarkki et al. (2015, p. 507): "a continuous multi-directional interaction that goes beyond simple repetition, building on previous practices, learning from success and failure, and fostering evolution of constructive relationships and knowledge itself among all participants at the interface, and between SPIs and external audiences." While we see lability, debatability, and flexibility as substantive features of the knowledge that is called upon by our results, the concept of Sarkki et al. points to the fact that such characteristics have a procedural origin as well.

Secondly, the desire for deliberative decision-making and the associated discourse ethics points to the need for procedures in the continuous co-production of knowledge. We see this as a second essential feature in the revision of the knowledge legitimacy principle. Such a revision needs to be procedural. When analyzing the 2010 corpus, the presence of discourse ethics initially surprised us (see section On Ethical Frameworks Emerging in the 2010 Corpus and Increasingly Present in the 2020 Corpus). The importance of this ethical metanarrative is confirmed by the analysis of the 2020 corpus—with a focus on the need for institutional stakeholder to engage into deliberations—not necessarily with the general population. These results indicate that, beyond their effects, decisions are assessed in terms of procedure so that the risk management process matters. Our interviewees request that a voice be given to those affected by the decisions that are envisioned. This points to the need that the knowledge used to take such decisions be co-coproduced. Co-production is understood here as a normative practice that consists of "the deliberate collaboration of different people to achieve a common goal" (Bremer and Meisch, 2017, p. 2). Knowledge co-production is now widely accepted as a central feature of knowledge production for climate change adaptation (see Bremer et al., 2019). Within the context of adaptation to climate change, the acceptance of knowledge

co-production reconciles the desire for discourse ethics in decision-making with the need for new knowledge. Furthermore, the co-production of knowledge finds a new justification: the management of knowledge lability, iterability, and debatability attuned to local specificities.

Thirdly, place and time are key sources of concern within our corpora. Ignoring the past, or making abstraction of the future, is judged negatively by our interviewees who express views that flood risk management should be clearly situated within a timeline that has explanatory power, and that has moral weight as well. Not acknowledging where one comes from, and one's place in history is seen as wrong. Not preparing the path ahead for those to come is seen as wrong. Spatially, the central issue is that various territorial units are connected, sometimes distantly, by hydrology, sedimentary basin, etc. Our interviewees stress that places are not isolated entities and correct management of risk necessarily entails taking both local and distant interactions into account. The importance given to space and place indicates that risk narratives find one of their sources in the metaphysics of place. Malpas's "Proustian principle" applies. "People are who and what they are through their inhabiting of particular places and their situation within particular locations" (Malpas, 2004, p. 176). Such a stance entails that knowledge be place-based (Groulx et al., 2014)—i.e. be intimately connectable in space and time to specific places, their history and future, their intra- and inter-connections. Place-based approaches to climate change adaptation knowledge production have been experimented with promising substantive results (e.g., Schweizer et al., 2013; Krauß, 2020; Marschütz et al., 2020). Our results show that the degree of place-based approach (maybe place-basedness) may be proposed as an additional third area for revision of the knowledge legitimacy criterion.

Finally, the emergence of naturalistic ethics in our corpus may call for a radical move in the assessment of knowledge legitimacy. Naturalistic ethics call into question the ethical autonomy of decision-makers that is foundational in current scientific practices. Knowledge legitimacy could be assessed in terms of the ability of knowledge to accept a broader order, that of nature. Such an assessment criterion is both procedural: it is about how, and under what assumptions, we conduct science—and substantive: it is about the place that nature occupies in scientific narratives, about the very essence of scientific results as cultural artifacts.

CONCLUSION

In this paper, we used an empirical approach to revisit the concept of knowledge legitimacy through the metaethical lens of identifying ethical theories appearing as metanarratives shared by narratives of risk situations. We focused on a risk situation closely associated with climate change: risk management of coastal flooding on the French Atlantic coast.

Such a case study approach raises the question of the generalization of our results to other settings—other case studies and, or, risk situations other than flood risks. It seems that flood risk at the coast, under a changed, and still changing climate, captures many of the characteristics of high stake, high uncertainty situations, that are calling for urgent decisions. Generalizing the *applicability* of the method seems in such a light fairly safe. Nevertheless, generalizing the results themselves should not be envisioned lightly. Such a generalization would betray the very contextual, and culture-specific nature of situation of risks. It would also betray the very contextual, and culture-specific nature of situations where stakeholders mobilize the ethical underpinning of the judgement that they express over various state of affairs. Yet, our results open what we see as windows of opportunity into furthering the understanding of knowledge legitimacy. For instance our results raise the following questions. Are there other situations where connection-ethics would make sense when assessing the legitimacy of knowledge? How far, in operational terms, would the mobilization of a naturalistic ethics make sense when assessing knowledge—could we judge knowledge using nature as an ethical benchmark? This last question may deserve extra care. Many current risk situations are driven by the inability for some human to see themselves as an integral part of the natural world. The nature-culture divide is consubstantial to environmental degradation and to modern science as inherited from the Age of enlightenment. Yet this science is the central reference knowledge when managing risks. Further work is thus needed to go beyond the *Catch 22* situation that seems to be at hand—this work is beyond the scope of the present paper.

Considering the exploratory nature of the work that we are presenting here, we are not in a position to propose an operational framework as of now. Such an operational framework would allow for a systematic analysis of knowledge legitimacy before starting to use knowledge in applied settings. It seems that such an operationalization would entail working on ethical frameworks, transparently, with stakeholders. Rather than identifying ethical frameworks indirectly through narratives and metanarratives, as we did, one could envision engaging a conversation with stakeholders on these subjects. Such a conversation, connecting, through metaethics, in explicit terms ethical frameworks and knowledge legitimacy, would allow for the adoption of a reflexive conversation as to what counts as legitimate knowledge and why. We see the setting up of such an experimental action research design as a potential first step toward a more operational framework where lay ethics would be at the center of the conversations on knowledge legitimacy.

Finally, we started our paper by presenting KQA as an exercise analyzing the fitness for function of knowledge. We then engaged an empirical conversation connecting ethical frameworks with precise characteristics of knowledge that could be identified as nurturing its fitness. This seems to open a potential enquiry into the analysis of fitness for function in ethical terms—something we are tempted to name the ethical fitness of knowledge. Such an avenue seems promising in a time when knowledge is increasingly contested on grounds that seem to go way beyond its credibility, or its fitness for function in a narrow sense—knowledge legitimacy needs to be further enquired and we believe that this paper opens a promising avenue in that direction.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: Commitment was made to the interviewees that the data would not be shared beyond the research team without their authorization. Requests to access these datasets should be directed to Jean-Paul Vanderlinden, jean-paul.vanderlinden@uvsq.fr.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

J-PV designed, led and contributed to the study, contributed to the data analysis and discussion and was responsible for writing up. ER and NT designed the data collection process and contributed to the writing up, the data analysis, presentation of results and discussion. All authors contributed to the article and approved the submitted version.

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