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The Collective Challenge of Interlocked Risks

1. *New Risks and Collective Agency*

Risk overlapping is a peculiar challenge of global crises. Despite being spatially distant, local hazardous events are often interdependent and cannot easily be disjointed. The frequency of this kind of events is growing in scale and serves as a vector to investigate the various disciplinary notions of risk, in order to develop comprehensive theoretical frameworks for knowing, assessing, and deciding.

More specifically, international institutions, scholars, and practitioners tend now to pair, for instance, ecological[1] and social risk concepts. Nonetheless, this association is challenging. First, climate risks[2] are related to non-linear mechanisms, and pairing them with anything can deepen the complexity in decision-making processes to treat them. Second, the structural intersection of global and local factors varies contextually and engenders different hazards and vulnerabilities. In other terms, understanding how to inhabit the social impact of ecological crises can be conceived as a "wicked problem" that requires a thorough investigation of the different notions of

[1] The terms "ecological risks" and "environmental risks" (see § 3) have been used in similar ways in the scientific literature and institutional documents. The USA tends to prefer the former, and Europe the latter (see G.W.I. Suter, *Ecological Risk Assessment*, CRC Press, Boca Raton (FL) 2016). In the following, I will mainly adopt "ecological risk," broadly referring to risks pending onto non-human organisms.

[2] As it will be clarified below (§ 3), "climate risks" are risks that are engendered by global warming (see IPCC, *Climate Change 2023: Synthesis Report (Full Volume) Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Intergovernmental Panel on Climate Change, Geneva 2023).

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risks at stake with their epistemological and ethical interrelations. This is particularly salient in the effort of preventing global risks, as this demands several coordinated activities, usually developed by collective actors such as groups of researchers, public institutions, and NGOs[3]. Shared awareness regarding hazards is also routinely evoked as a crucial factor in coping with climate crises[4]. Following this line of thought, philosophical contributions on collective epistemology and responsibility might shed light on these issues[5] when different risks are considered in conjunction. However, investigations on risk and collective agency have yet to gain systematicity.

This article examines how we can account for contexts where ecological and social risks overlap. It will be argued that a coherent theoretical image of different kinds of risk should consider how knowledge production, knowledge sharing, and decision-making involve collective agencies.

The investigation will start by analyzing some standard accounts of ecological and social risks, and defining a few open theoretical issues recently highlighted within the scientific literature concerning climate policies. Hence, a critical examination of the links between risk assessment and decision-making processes will be sketched. In the third step, it will be suggested that the notion of collective epistemic responsibility[6] can play a crucial role in investigating risk communication and decision-making processes that involve non-expert laypeople. As a last move, a few implications will be outlined regarding interdisciplinary investigation[7] on risk and expertise.

2. *Interweaving of Risks*

Consider the following case. In April 2022, the regional governmental agency of Tuscany, Italy, claimed the compatibility of a new geothermal

[3] IPCC, *Climate Change 2023: Synthesis Report (Full Volume)*, cit.

[4] F.S. Khatibi *et al.*, *Can Public Awareness, Knowledge and Engagement Improve Climate Change Adaptation Policies?*, in «Discover Sustainability» 2 (2021) n. 1, pp. 1-24.

[5] See S.O. Hansson, *A Panorama of the Philosophy of Risk*, in S. Roeser (ed.), *Handbook of Risk Theory: Epistemology, Decision theory, Ethics, and Social Implications of Risk*, Springer Science & Business Media, Dordrecht 2012, pp. 27-54; S.O. Hansson, *Risk*, in E.N. Zalta, U. Nodelman (eds.), *The Stanford Encyclopedia of Philosophy*, Metaphysics Research Lab, Stanford University Summer 2023, https://plato.stanford.edu/archives/sum2023/entries/risk/

[6] W. Fleisher, D. Šešelja, *Responsibility for Collective Epistemic Harms*, in «Philosophy of Science» 90 (2023) n. 1, pp. 1-20.

[7] J. Persson *et al.*, *Toward an Alternative Dialogue Between the Social and Natural Sciences*, in «Ecology and Society» 23 (2018) n. 4, pp. 1-11.

power plant on Mount Amiata[8], built by the multinational corporation Sorgenia, and the official energy transition strategy[9]. Nonetheless, recent sociological field investigations have observed rising social tensions linked to the project:

> Both the committees opposed to [geothermal] cultivation or some of its methods, as well as the plant operators and others in favor (most local governments, regional institutions, various experts, and technicians) use data and information to give strength to their arguments […]. For example, about the possible problems of dispersion and emission of chemicals and CO_2 and consequent impacts on health, the land, and the climate […]. In this context, expert opinions […] have become tools for developing conflicting plausible narratives[10].

At first glance, this case concerns a situation where a policy aimed at tackling global warming engenders different, overlapping risks. As a result, decision-making processes increase conflicts between parties with divergent knowledge sets and values, thus potentially slowing down the achievement of global emissions targets (i.e., the paramount goal of the policy itself). Social policy researchers[11] classify this situation as an instantiation of climate change's «superwicked problems»[12].

[8] «At Mt. Amiata (Italy) geothermal energy is used, since 1969, to generate electricity in five plants» (E. Bacci *et al.*, *Geothermal Power Plants at Mt. Amiata (Tuscany-Italy): Mercury and Hydrogen Sulphide Deposition Revealed by Vegetation*, in «Chemosphere» 40 (2000) n. 8, pp. 907-911, p. 907).

[9] Redazione t24, *Via libera alla centrale geotermica Sorgenia - Pronuncia positiva di compatibilità ambientale della Regione all'impianto sul Monte Amiata, ma la Soprintendenza potrebbe opporsi*, t24 Il quotidiano economico toscano, April 23, 2022, https://t24.ilsole24ore.com/art/geotermia-ok-della-regione-al-progetto-sorgenia-amiata (accessed December 11, 2023).

[10] «Nel caso geotermia, tanto i comitati che si oppongono alla coltivazione o alcuni suoi metodi, quanto i gestori degli impianti e altri soggetti favorevoli (gran parte delle amministrazioni locali, istituzioni regionali, vari esperti e tecnici) utilizzano dati e informazioni per dare forza alle proprie ragioni. […] Per esempio, in relazione agli eventuali problemi di dispersione ed emissione di sostanze chimiche e CO_2 e conseguenti impatti su salute, territorio e clima […]. In tale contesto, i pareri esperti e i differenti tempi e modi dei processi conoscitivi degli attori sono divenuti strumenti per l'elaborazione di storie plausibili contrastanti» (M. Villa, *Cambiare o traccheggiare? Politica e lavoro eco-sociale, transizione ecologica e la sfida della complessità: note di campo*, in E. Matutini (ed.), *Eco-social-work*, PM edizioni, Varazze (SV) 2023, pp. 33-88, p. 51 my translation).

[11] See M. Villa, *Crisi ecologica e nuovi rischi sociali: verso una ricerca integrata in materia di politica sociale e sostenibilità*, in G. Tomei (ed.), *Le reti della conoscenza nella società globale. Possibilità, esperienze evalore della mobilitazione cognitiva*, Carocci, Roma 2020, pp. 151-182.

[12] K. Levin *et al.*, *Overcoming the Tragedy of Super Wicked Problems: Constraining our Future Selves to Ameliorate Global Climate Change*, in «Policy Sciences» 45 (2012) n. 2, pp. 123-152, p. 123.

However, some authors, such as Catarina Dutilh Novaes[13], have recently claimed that the wickedness of these challenges may leave room for new conceptual inquiry and theoretical syntheses, suggesting a decisive role for philosophy in interdisciplinary investigation. In fact, the case underlines a potential conflict to scrutinize. On the one hand, preventing global climate risks demands more and more local policies to reduce GHG emissions, such as building new low-emissions geothermal power plants. On the other hand, local communities resist top-down energy transition policies that may change their economies and rural landscapes. This situation uncovers new hazards related to health conditions and unemployment.

Following this insight, it is worth noting that inquiry on eco-social work[14] is inclined to organically link the different notions of "climate risks"[15], "ecological risks", and "social risks"[16]. At the same time, this trend connects different scales of risk: global[17], related to climate change, and local, such as the worsening of living conditions of locals.

In line with IPCC documents, implementing transition policy at a local level is strongly related to mitigating climate change. However, as the geothermal plant case shows, identifying all the consequences of relevant decisions and acts seems to be entangled with uncertainty. Actors only partially know the future global outcomes of their decisions for local communities. Furthermore, institutions, power plant developers, experts, and citizens follow conflicting epistemic settings and values in assessing future implications of the energy transition project, and no "optimal solution"[18] seems to be in sight. In addition to this, preventing risks implies coordinated actions by many players. Simply aggregating individuals' deeds does not seem enough

[13] C. Dutilh Novaes, *A Plea for Synthetic Philosophy*, in «Daily Nous», May 30, 2023, https://dailynous.com/2023/05/30/a-plea-for-synthetic-philosophy-guest-post/ (accessed October 20, 2023).

[14] E. Matutini (ed.), *Eco-social work: politica e lavoro sociale nella crisi ecologica*, PM edizioni, Varazze (SV) 2023.

[15] H. Johansson *et al.*, *Climate Change and the Welfare State: do We See a New Generation of Social Risk Emerging?* , in M. Koch, O. Mont (eds.), *Sustainability and Political Economy of Welfare*, Routledge, London 2016, pp. 94-108.

[16] For instance, see T. Hirvilammi *et al.*, *Social Policy in a Climate Emergency Context: Towards an Ecosocial Research Agenda*, in «Journal of Social Policy» 52 (2023) n. 1, pp. 1-23, p. 13.

[17] As defined by World Economic Forum «as an uncertain event or condition that, if it occurs, can cause significant negative impact for several countries or industries within the next 10 years» (E.G. Franco *et al.*, *The Global Risks Report 2020*, World Economic Forum, Cologny-Geneva 2020, p. 86).

[18] C. Helgeson, *Structuring Decisions Under Deep Uncertainty*, in «Topoi» 39 (2020) n. 2, pp. 257-269.

to address global climate change and future social risks efficiently. As IPCC reports stress, "active involvement" of laypeople is keenly recommended. In brief, coping with climate change can be defined as a collective problem that requires new collective agents[19], not a mere sum of individual actions.

Against this background, at least three different research issues can be identified. First, the conceptual relationship between climate, ecological, and social risks. More specifically, global climate risks can elicit diverse contextual social risks depending on local institutional and normative frameworks. As highlighted by some authors and IPCC reports[20], climate and social risks relate to each other through the notion of vulnerability (see §3 below), which is context- and subject-dependent.

Second, connecting different kinds of risks in decision-making could engender "plural"[21] or "deep uncertainty"[22] The conflicting risks at stake not only make their interlocking more challenging to manage for institutional decision-makers but could significantly hinder bottom-up approaches[23] to risk-prevention.

Third, the growing number of situations where local and global, social and climate risks intertwine, coupled with the demand to exploit a closing window of opportunity[24], increase the circumstances where decision-making under deep uncertainty (DMDU) happens. In such cases, the effort to evaluate risk overlapping is increasingly resource- and time-consuming. Drawing on some contributions this tendency might push us to reconsider our traditional grasp of the distinction between risk and uncertainty[25].

That said, two broader topics of investigation should be taken into consideration. Recognizing that only collective actions can treat overlapping risks leaves room for a general question: who can be held responsible for

[19] R. Tuomela, *Social Ontology: Collective Intentionality and Group Agents*, Oxford University Press, Oxford-New York 2013.

[20] IPCC, *Climate Change 2023: Synthesis Report (Full Volume)*, cit.

[21] M. Ongaro, *Making Policy Decisions under Plural Uncertainty: Responding to the COVID-19 Pandemic*, in «History and Philosophy of the Life Sciences» 43 (2021) n. 2, pp. 56 (1-5), p. 56 (1).

[22] "Deep uncertainty" «refers loosely to contexts in which decision-makers lack complete information about (or cannot agree on) the probabilities for key contingencies, the availability of present and future actions, the outcomes to which available actions lead, or the value of these outcomes» (C. Helgeson, *art. cit*, p. 257).

[23] C. Costella *et al.*, *Can Social Protection Tackle Emerging Risks from Climate Change, and How? A Framework and a Critical Review*, in «Climate Risk Management» 40 (2023) n. 100501, pp. 1-6.

[24] IPCC, *Climate Change 2023: Synthesis Report (Full Volume)*, cit., p. 24.

[25] See D. Roser, *The Irrelevance of the Risk-Uncertainty Distinction*, in «Science and Engineering Ethics» 23 (2017) n. 5, pp. 1387-1407; S.O. Hansson, *Risk*, cit.

fostering the demanded collective agents? This insight might organically connect the recent lively debates on collective responsibility[26] and collective action in social ontology[27] to more concrete applications. More specifically, this link can shed light on some individualistic ontological premises in the social sciences[28], which could overshadow what a shared or «common understanding»[29] of risks may be. This point is relevant considering how risk-taking and risk-imposing[30] activities open the problem of who, individually or collectively, is assessing and deciding about risks.

Keeping in mind this rich framework of questions, I will first attempt to chart the different notions of risks most prevalently used in the literature. Hence, I will question some aspects of the traditional interpretation of the risk/uncertainty distinction, as suggested by some voices in the debate as well as by my above case study. Furthermore, drawing on the issues arising from DMDU, I will argue for a line of research about collective agency in risk prevention.

3. *Kinds of Risks*

At least three notions have emerged in the scientific literature regarding risks and ecosystems. In different ways, the concepts of "ecological risk" and "environmental risk" have played a role in identifying potentially damaging events or sources of hazards. By analyzing three different definitions formulated a few decades apart[31], it is possible to identify some evolutionary trends thereof.

[26] M. Smiley, *Collective Responsibility*, in E.N. Zalta, U. Nodelman (eds.), *The Stanford Encyclopedia of Philosophy*, Metaphysics Research Lab, Stanford University Fall 2023, https://plato.stanford.edu/archives/fall2023/entries/collective-responsibility/

[27] B. Epstein, *Social Ontology*, in E.N. Zalta, U. Nodelman (eds.), *The Stanford Encyclopedia of Philosophy*, Metaphysics Research Lab, Stanford University Winter 2023, https://plato.stanford.edu/archives/win2023/entries/social-ontology/

[28] For instance, see J.R. Searle, *Making the Social World: The Structure of Human Civilization*, Oxford University Press, Oxford-New York 2009; D. Tollefsen, *Social Ontology*, in N. Cartwright, E. Montuschi (eds.), *Philosophy of Social Science: A New Introduction*, Oxford University Press, Oxford-New York 2014, pp. 84-101; B. Epstein, *The Ant Trap: Rebuilding the Foundations of the Social Sciences*, Oxford University Press, Oxford-New York 2015.

[29] C. Taylor, *Philosophical Arguments*, Harvard University Press, Cambridge (MA) 1995, p. 139.

[30] S.O. Hansson, *A Panorama of the Philosophy of Risk*, cit.

[31] See S.M. Bartell, *Ecological Risk Assessment*, in S.E. Jørgensen, B.D. Fath (eds.), *Encyclopedia of Ecology*, Academic Press, Oxford 2008, pp. 1097-1101, p. 1097; G.W.I. Suter, *op. cit.*, p. 3; L. Na *et al.*, *Regional Ecological Risk Assessment Based on Multi-scenario Simulation of Land Use Changes and Ecosystem Service Values in Inner Mongolia, China*, in «Ecological Indicators» 155 (2023) n. 111013, pp. 1-13, p. 2.

"Ecological risks" and "environmental risks"[32] have initially been identified as the outcome of the impact on populations of natural organisms and ecosystems of specific factors, e.g. toxic chemical pollutants. Lately, the focus has increasingly turned on events, directly or indirectly, elicited by human activities. Therefore, according to the literature, the adverse repercussions of building a geothermal plant on local ecosystems can be identified as a "new ecological risk" engendered by a strategy of energy transition.

In keeping up with this recent line of thought, IPCC documents have introduced a new notion of risk related to climate change, or "climate risk", which has undergone some conceptual evolution in its own right. The 2023 IPCC *Full Report* indicates that:

> In the context of climate change […] risks result from dynamic interactions between climate-related hazards and the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure, and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence, and each may change over time and space due to socio-economic changes and human decision-making[33].

It should be noted that an emphasis is placed on the dynamic interplay between hazards, exposure to hazards, the vulnerability of humans and ecological systems, and anthropic responses to climate change. Therefore, as some have recently pointed out, a progressively central role has been played by the newcomer notion of vulnerability[34].

With this in mind, risks associated with climate change have two main challenging features. First, the relationship between global causes and local effects is indirect, which points out that social risks are considered both certain and uncertain[35]. Second, traditional classifications of risks that affect human social life, i.e. social risks, were based upon the premise that a (national) community could bear the burden of risk-sharing. However, the distance between causal factors and effects makes the inequalities generated increasingly intractable due to the complex interplay of climate change and mitigation policies. This link seems apparent in the case of the geothermal

[32] G.W.I. Suter, *op. cit.*

[33] IPCC, *Climate Change 2023: Synthesis Report (Full Volume)*, cit., p. 128.

[34] C. Costella *et al.*, *art. cit.*, p. 5.

[35] «One of the IPCC's key conclusions is that the social risks associated with climate change are both certain and uncertain. […] since multiple climate hazards will occur simultaneously, and multiple climatic and non-climatic risks will interact, resulting in compounding overall risk and risks cascading across sectors and regions» (T. Hirvilammi *et al.*, *art. cit.*, p. 4).

plant above. It shows how "new social risks" engendered by energy transition strategies are imposed on local communities that, by having hosted geothermal energy plants in the past, have not significantly relied on fossil fuels and whose future social risks caused by climate change are partially unknown. In addition, the identification of "certain" and "uncertain" risks shows the ambiguities related to practical applications of the distinction between risk and uncertainty[36]. In the background, a more conceptual issue stands open: the plurality of interpretations of social risks.

As highlighted by interdisciplinary investigations[37], there is a wide variety of notions of social risks, ranging from the influential conception that they «represent the probability of some threats and uncertainties which have arisen as a result of modernizing the society, which imply irreversible damage for all forms of life (Beck 1992)» [38], up to the idea (influential in public policy) that «social risk represents the probability for a person to be affected by an unexpected, uncertain situation […] associated with loss of control over one's personal actions (Sirovatka, Winkler 2010)»[39]. Notwithstanding the different orientations, a crucial role is played by the notion of "vulnerability" everywhere. In this sense, vulnerability may be understood as «the degree to which an individual, a community, a system is exposed to the effects of a hazard based on some essential conditions»[40].

After this concise topography, some elements regarding the conceptual relations between climate, ecological, and social risks can be drafted. In broad terms, the scientific literature converges in recognizing that the vast plurality of losses and vulnerabilities due to climate change can affect both individuals and communities. Nonetheless, hazards affecting collective subjects do not seem to be treated specifically, and it seems that they are rather conceived as mere aggregations of individual ones.

This issue can be related to the unclear relation between climate and new social risks through the concept of vulnerability and «policy solutions»[41]. If new social risks are (directly or indirectly) related to global warming "and"

[36] S.O. Hansson, *Risk*, cit., par. 2.

[37] L. Lupu, *The Concept of Social Risk: A Geographical Approach*, in «Quaestiones Geographicae» 38 (2019) n. 4, pp. 5-13, p. 6.

[38] *Ibidem*; P.U. Beck, *Risk Society: Towards a New Modernity*, SAGE, London 1992.

[39] L. Lupu, *art. cit.*, p. 6; T. Sirovátka, J. Winkler, *The importance of new social risks in the current social sciences*, in «Sociální Studia» 2 (2010), pp. 7-21.

[40] L. Lupu, *art. cit.*, p. 8; UNISDR, *UNISDR Annual Report 2017 (2016-17 Biennium Work Program Final Report)*, United Nations Office for Disaster Risk Reduction, Geneva 2018, pp. 1-64.

[41] C. Costella *et al.*, *art. cit*., par. 2.1.

transition policies, they can seemingly be fully assimilated ontologically and epistemologically. Nonetheless, recent social ontology investigations have highlighted that "social kinds"[42], such as vulnerability, have different ontological properties than "natural kinds". In fact, the contrasting views about the vulnerabilities at stake in the mentioned case point to the complexity of the social risks engendered by the energy transition. These issues must be settled collectively as the definition of climate risks prevention then calls for a specifically collective treatment.

In fact, the relevant literature underlines that bottom-up and top-down approaches remain in tension[43], implying inefficacious coordination between parties that entails that new «risk can arise […] from the uncertainty in the implementation, effectiveness or outcome of climate policy»[44].

As previously mentioned, the misalignment between experts, laypeople, and policymakers can frequently take place in eco-social work[45], but it is also recurrent in other collective risk-management processes[46]. Thus, the literature suggests that this link between risk-knowledge corpus and decision-making in real-world contexts seems indirect and circular. Institutions and laypeople's judgments on risks (risk assessment, risk imposition, and risk prevention) are often fragmented, and the outcomes of their interactions are unpredictable. The "shared evaluation" of risks at stake seems strongly intricate[47]. Notwithstanding these apparent challenges, IPCC reports[48] and others in the literature[49] continue to stress the importance of bottom-up social processes in the picture.

[42] S. Haslanger, *Resisting Reality: Social Construction and Social Critique*, Oxford University Press, New York 2012.

[43] M. Villa, *Crisi ecologica e nuovi rischi sociali*, cit.; *Cambiare o traccheggiare?*, cit.

[44] IPCC, *Climate Change 2023: Synthesis Report (Full Volume)*, cit., p. 128.

[45] R. Cucca *et al.*, *Towards a Sustainable Welfare System? The Challenges and Scenarios of Eco-social Transitions*, in «Social Policies» 10 (2023) n. 1, pp. 3-26.

[46] P.A. Ebert, I.N. Durbach, *xpert and Lay Judgements of Danger and Recklessness in Adventure Sports*, in «Journal of Risk Research» 26 (2023) n. 2, pp. 133-146.

[47] D. Thorstad, *General-Purpose Institutional Decision-Making Heuristics: The Case of Decision-Making under Deep Uncertainty*, in «The British Journal for the Philosophy of Science» August 2022.

[48] IPCC, *Summary for Policymakers, Climate Change 2021* in IPCC, *The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge (UK)-New York 2021, pp. 3-32; IPCC, *Climate Change 2023: Synthesis Report (Full Volume)*, cit.

[49] See R. Cucca *et al.*, *art. cit.*; E. Matutini (ed.), *op. cit.*; M. Villa, *Crisi ecologica e nuovi rischi sociali*, cit.

4. *A Side Note on Risk and Uncertainty*

The IPCC documents stress that preventing climate risks and new social risks starts from the consideration that there are both certain and uncertain risks. However, this issue seems to be at odds with the risk/uncertainty distinction.

According to Roser[50], the contrast between risk and uncertainty is debatable for practical purposes. Starting from the premise that «the question whether we have probabilities is completely separate from the question how we ought to make use of them»[51], Roser underlines that, in everyday discourse as well as in applied and theoretical contexts, «there is no universally accepted distinction between risk and uncertainty based on whether we have probabilities or not»[52]. Moreover, he argues for action-guiding principles that yield justified decisions and claims that «low epistemic credentials are better than non-credentials», because «using more evidence is usually better than using less evidence»[53]. To sum up, he claims that «risk-uncertainty distinction is irrelevant because both high- and low-credentials probabilities should enter our decision-making»[54]. Hence «we always have subjective probabilities and epistemic probabilities»[55], and they should be used for guiding actions in tackling climate change.

An in-depth exploration of Roser's argument is out of the scope of the paper. However, two points can be underlined according to his theses. First, the distinction between risk and uncertainty has been understood and applied in several ways, and its implications for decision-making demand further investigation. Second, in coping with salient challenges, such as climate change, the point is to apply the best available probabilistic estimations we have, either epistemic or subjective. The last issue concerns "to whom" probability estimations are available, or who is the "we" tasked to manage the risk knowledge corpus and the decisions to be made.

In this vein, recalling the above example, the identification of the first plural "we" person is ambiguous, since there are many "we" with conflicting epistemic backgrounds and narratives. And therefore, given that risks are the product of hazard, exposure, and vulnerability, it can be stressed that

[50] D. Roser, *art. cit.*
[51] *Ivi*, p. 1389.
[52] *Ivi*, p. 1390.
[53] *Ivi*, p. 1404.
[54] *Ivi*, p. 1400.
[55] *Ivi*, p. 1406.

vulnerability evaluations are strongly subject-relative. This contrast entails that different actors could attribute varying salience[56] to different risks, due to diverging ethical and epistemic assessments. For instance, the locals in the Tuscany region could tend to pay more attention to cultural and psychological losses than private firms do.

In brief, two final points can be emphasized regarding the risk/uncertainty distinction.

To overcome these ambiguities two insights can be fruitful. Recently, the literature on risk has paid much more attention to the notion of "collective responsibility" [57], and this tendency can help highlight that most actors involved in the energy transition are collective ones. Thus, a comprehensive point can be outlined. Since no single actor can be held solely responsible for locally preventing climate and social risks, it is fair to suggest that only by developing some (new) forms of collective agency[58] and responsibility we can pave the way for effectively coping with climate-change-related challenges, as the debate about the accountability of plural subjects in the face of moral challenges posed by global warming indicates[59].

Considering these issues, some further research is in order. From the lens of collective agency, how can we account for decision-making under deep uncertainty? More specifically, can we better understand risk communication[60] between experts and laypeople, and the demanded iteration of decision-making under deep uncertainty[61]?

5. *Collective Responsibility and Interlocked Risks*

The question of how to account for collective responsibility has undergone a lively debate that has focused primarily on understanding whether

[56] F. Hindriks, F. Guala, *The Functions of Institutions: Etiology and Teleology*, in «Synthese» 3 (2019) n. 1, pp. 1-17.

[57] A. Placani, S. Broadhead, *Risk and Responsibility in Context*, Taylor & Francis, Abingdon (UK)-New York 2023.

[58] See N. de Haan, *Collective Moral Agency and Self-induced Moral Incapacity*, in «Philosophical Explorations» 26 (2023) n. 1, pp. 1-22.

[59] See S. Collins, *Corporations' Duties in a Changing Climate*, in J. Moss, L. Umbers (eds.), *Climate Justice and Non-State Actors*, Routledge, Abingdon (UK)-New York 2020, pp. 84-100.

[60] P.A. Ebert, I.N. Durbach, *art. cit.*, L. Zanetti, D. Chiffi, L. Petrini, *Epistemic and Non-epistemic Values in Earthquake Engineering*, in «Science and Engineering Ethics» 29 (2023) n. 3, pp. 18 (1-16).

[61] C. Helgeson, *art. cit.*

and how it is possible to speak of the moral agency of plural actors. That is, whether collections of people, groups, or institutions can develop joint intentions to act on their own and be held morally responsible for specific harms they may cause[62]. As it can be noted, the difference among the various positions revolves around the issue of ontological reducibility of collective agents[63].

Therefore, the topic has gained increasing traction also from the point of view of applied philosophical investigation[64]. A specific issue that is attracting rising consideration in this sense is that of forward-looking collective responsibility[65], understood as the power and accountability on the part of collective agents to implement a desired future reality. For instance, this issue asks for clarification on whether a collective subject, and which one, can be held responsible for building an environment in which climate and social risks will be significantly reduced, both at the foot of Mount Amiata and globally. Relatedly, the starting case immediately opens with a theoretical problem: a well-defined, singular collective subject that can cope with all the challenges posed by climate and new social risks does not (yet) exist. In other words, the current composition of the situation involves a bundle of heterogeneous collective subjects with different powers, risk assessments, preferences, and values. Therefore, the lack of coordination and cooperation shows that the preconditions of comprehensive collective agency as proposed by many social ontologists, such as group reasoning[66] and group ethos[67], are absent.

Nonetheless, according to Hindriks[68], the situation can be understood as a case where singular actors (in a broad sense) should join forces to cope with a challenging problem and avoid some potential shared threat. Since social and environmental harms cannot be prevented by a single player, as one single agent alone cannot possibly control the complex interactions of global and lo-

[62] M. Smiley, *op. cit.*, par. 1.

[63] S. Bazargan-Forward, D. Tollefsen, *The Routledge Handbook of Collective Responsibility*, Routledge, New York-London 2020, pp. 1-2; D.P. Schweikard, H.B. Schmid, *Collective Intentionality*, in E.N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy*, Metaphysics Research Lab, Stanford University Fall 2021, par. 4.2, https://plato.stanford.edu/archives/fall2021/entries/collective-intentionality/

[64] S. Collins, *Collective Responsibility Gaps*, in «Journal of Business Ethics» 154 (2019) n. 4, pp. 943-954, p. 946.

[65] M. Smiley, *op. cit.*, par. 7.

[66] C. List, P. Pettit, *Group Agency: The Possibility, Design, and Status of Corporate Agents*, Oxford University Press, Oxford 2011.

[67] R. Tuomela, *op. cit*.

[68] F. Hindriks, *The Duty to Join Forces: When Individuals Lack Control*, in «The Monist» 102 (2019) n. 2, pp. 204-220.

cal factors, combining different efforts into forms of shared collective agency can counter potential hazards. Therefore, singular actors have «a duty to join forces: to approach others, convince them to contribute, and subsequently make a coordinated effort to prevent [eventual] harm»[69]. However, an issue emerges: how can random individual actors join forces and build a new collective subject capable of preventing climate and social risks? To put it simply, who in the geothermal plant case has an obligation to mobilize others and to help people join their forces to prevent risks for everyone? More specifically, regarding the epistemic issues in managing risks and uncertainty in complex cases, this line of thought investigates if any specific collective epistemic responsibility can be identified. Nevertheless, whether any epistemic collectives[70] do actually exist is a topic that needs to be clarified.

During the past few decades, there has been a growing interest in understanding whether groups can be identified as epistemic agents in a non-derivative sense, over and above individual members. This field of research, broadly defined as collective epistemology[71], can give relevant insights into the present issue. If joining forces to prevent climate and social risks may be a workable direction to go, the issue concerning what role risk experts[72] should play together in fostering the demanded cooperation and coordination should be addressed as well. Thus, can expert communities be held responsible for their risk communication? *Prima facie*, this problem seems quite challenging. However, recent contributions on the epistemology of seismic hazards[73] can shed some light on this. Some come to the rather counterintuitive implication that an aggregative procedure of different epistemic risk assessments can point to a «no one's model»[74] problem. All in

[69] *Ivi*, p. 204.

[70] According to Tollefsen, epistemic collective agents can be understood as «groups [that] have a rational point of view and are subject to the norms of rationality» (D. Tollefsen, *Collective Epistemic Agency*, in «Southwest Philosophy Review» 20 (2004) n. 1, pp. 55-66, pp. 62-63).

[71] See D. Tollefsen, *art. cit.*; H.B. Schmid *et al.* (eds.), *Collective Epistemology*, de Gruyter, Berlin-Boston (MA) 2011; J. Lackey, *The Epistemology of Groups*, Oxford University Press, Oxford 2021; P. Pettit, *Five Elements of Group Agency*, in «Inquiry» May (2023), pp. 1-21.

[72] M. Baghramian, C. Martini, *Questioning Experts and Expertise*, Taylor & Francis, Abingdon (UK)-New York 2022; F. Pongiglione, C. Martini, *Climate Change and Culpable Ignorance: The Case of Pseudoscience*, in «Social Epistemology» 36 (2022) n. 4, pp. 425-435.

[73] L. Zanetti, D. Chiffi, L. Petrini, *Epistemic and Non-epistemic Values in Earthquake Engineering*, cit.; L. Zanetti, D. Chiffi, L. Petrini, *Philosophical aspects of probabilistic seismic hazard analysis (PSHA): a critical review*, in «Natural Hazards» 117 (2023), pp. 1193-1212.

[74] «Respect to the final hazard estimate, neither the individual proponent nor the integrator seem to have ownership of the final result» (L. Zanetti, D. Chiffi, L. Petrini, *Philosophical Aspects of Probabilistic Seismic Hazar*, cit., p. 1209).

all, this discussion, applied to the problem at hand, seems to suggest that focusing on "how" scientific communities decide what to communicate to laypeople can have a significant impact in improving the experts' sense of accountability of risk communication. (However, the question of how non-experts themselves can be involved remains open.)

A clever way to tackle such questions is to draw from the current research on individual and collective agency. The first insight relates to the idea that collective agency is "layered"[75] and dynamic[76]. Some investigations on the different "segments" and "strata" of human action embedded in social techniques (such as games) highlight that to achieve a complex goal (such as striving to play, e.g., enjoying playing a specific sport or game) demands intermediate coordinated actions and flexible sequences of sub-actions on the part of all the members (segments and strata). At the same time, it is necessary that players "submerge themselves" in each sub-action by zooming in on a specific task and, when required, zooming out to monitor whether the overall end of the game remains in focus. This intuition can show how risk assessment, risk-taking, and risk imposition can be framed as discrete levels of joint actions: only with reiterated joint zooming out and monitoring of the overall goals and strategies different actors[77] can build collective decisions about climate and social risk prevention.

Such steps indicate that building a collective perspective[78] on risk prevention requires subsequent stages of reflection, similar to discussions on we-reasoning[79] or group reasoning elsewhere[80]. All of this commands two more points concerning decision-making and acting together to prevent new social risks. The first point is about "how" risk communication and decision-making practices are structured. In fact, drawing on the geothermal plant case, assessing which methods are used for helping people with divergent understandings and perceived vulnerabilities to decide together about risk prevention appears to be crucial[81]. More explicitly, climate and social sci-

[75] C.T. Nguyen, *Games: Agency as Art*, Oxford University Press, New York 2020; L. Ferrero, *Games and the fluidity of layered agency*, in «Journal of the Philosophy of Sport» 48 (2021) n. 3, pp. 344-355.

[76] G. Thonhauser, M. Weichold, *Approaching Collectivity Collectively: A Multi-Disciplinary Account of Collective Action*, in «Frontiers in Psychology» 12 (2021) n. 740664, pp. 1-15.

[77] Joint zooming out can be roughly defined as a joint action that aims at building a shared understanding of the overall joint agency regarding a shared goal.

[78] G. Thonhauser, M. Weichold, *art. cit.*

[79] R. Tuomela, *op. cit.*

[80] P. Pettit, *art. cit.*

[81] As suggested by recent investigations on expertise, «trust being more a matter of com-

ence experts seem to have specific duties to avoid epistemic harms[82], such as a wrong estimation of the likelihood and vulnerability of salient future scenarios. As the case suggests, joining the epistemic forces of experts and laypeople to prevent climate hazards is not an easy task. Therefore, peculiar collective responsibilities of social experts (and practitioners) to structure decision-making under deep uncertainty seem to exist. Supporting different actors to mobilize themselves and join forces requires a specific social methodology[83] that can mobilize subjects with different epistemic risk understanding and build new collective agents.

To sum up, avoiding epistemic harms related to risk prevention may require collective epistemic duties on the part of experts to join their forces to help people mobilize, by responsibly structuring risk communication and decision-making under deep uncertainty. In addition, this collective framing of decision-making suggests we take into account the issue of collective learning. For instance, Helgeson[84] underlines that coping with embedded uncertainties requires iterative decision-making cycles; hence, inquiring how local collective agents learn together[85] could play a relevant role in developing a comprehensive view of preventing new social risks and navigating uncertain environments, as suggested by Doan[86] and generally by research on common pool resource management[87]. Therefore, a second future direction to explore

munication and emotional connection, and only to some extent secondarily a matter of credentials and certifications» (C. Martini *et al.*, *Knowledge Brokers in Crisis: Public Communication of Science During the COVID-19 Pandemic*, in «Social Epistemology» 36 (2022) n. 5, pp. 656-669, p. 666). See also S. Roeser, *Risk Communication, Public Engagement, and Climate Change: A Role for Emotions*, in «Risk Analysis» 32 (2012) n. 6, pp. 1033-1040; S. Roeser, *Risk, Technology, and Moral Emotions*, Routledge, New York 2017; F. Pongiglione, *Trust, Experts, and the Potential Side Effects of Critical Thinking*, in «Teoria. Rivista di Filosofia» 42 (2022) n. 2, pp. 163-174.

[82] «Epistemic harm: a harm affecting the epistemic status of a subject, group of subjects, or epistemically important social system» (W. Fleisher, D. Šešelja, *art. cit*, p. 8).

[83] M. Villa, *Cambiare o traccheggiare?*, cit.

[84] C. Helgeson, *art. cit*.

[85] A «theory of collective learning describes how the capacity to mentally represent objects, events, and minds as targets of firstperson plural attention facilitates cognitive collaboration in groups» (G. Shteynberg *et al.*, *Shared Worlds and Shared Minds: A Theory of Collective Learning and a Psychology of Common Knowledge*, in «Psychological Review» 127 (2020) n. 5, pp. 918-931, p. 926).

[86] M.D. Doan, *Collective Inaction and Collective Epistemic Agency*, in S. Bazargan-Forward, D. Tollefsen (eds.), *The Routledge Handbook of Collective Responsibility* Routledge, New York-London 2020, pp. 202-215.

[87] E. Ostrom, *Governing the Commons: The evolution of Institutions for Collective Action*, Cambridge University Press, Cambridge (UK) 1990; E. Ostrom, *A Polycentric Approach for Coping with Climate Change*, The World Bank, Washington (DC) 2009.

can be understanding how the notion of collective learning might improve the current debate on decision-making under deep uncertainty.

In conclusion, an account of collectively preventing climate-related risks demands focus on at least two areas of inquiry. One primary issue calls to investigate not only the ontology and epistemology of risks at stake but also how collective epistemic and policy decision-making processes unfold through different instances of risk evaluation, and what are the related collective responsibilities of experts, scholars, and scientific institutions. In addition to this, any comprehensive account should consider the procedural and dynamic evolution of collective agency, and how preventing (future) social risks demands collective learning by many plural subjects about the future collective affordances that can be made available by present choices.

6. *Interdisciplinarity and Collective Agency*

As a final point, some implications of this approach regarding the demand for interdisciplinary research on climate risks[88] can be outlined. Although inquiring risks and wicked problems demands interdisciplinarity, this tendency, as social risks communication shows[89], might increase laypeople's disorientation – and hesitancy to commit.

Nevertheless, investigating the role of experts through the lens of collective epistemic obligations[90] might reframe potential epistemic harms in many puzzling cases. First, inquiring about experts' duty to join forces to improve risk communication in decision-making under deep uncertainty might help avoid epistemic harms related to local climate risks, such as the "paralyzing effects" of some communication strategies. Second, experts can also help research communities to listen to stakeholders' values and their understanding of vulnerabilities, which is crucial for reframing shared problems that are at the center of interdisciplinary and transdisciplinary inquiry[91].

[88] M. MacLeod, M. Nagatsu, *What does Interdisciplinarity look like in Practice: Mapping Interdisciplinarity and its Limits in the Environmental Sciences*, in «Studies in History and Philosophy of Science» 67 (2018), pp. 74-84; J. Persson *et al.*, *art. cit*.

[89] See the notion of "linguistic uncertainty" in P. Döll, P. Romero-Lankao, *How to Embrace Uncertainty in Participatory Climate Change Risk Management-A Roadmap*, in «Earth's Future» 5 (2017) n. 1, pp. 18-36.

[90] A. Schwenkenbecher, *How We Fail to Know: Group-Based Ignorance and Collective Epistemic Obligations*, in «Political Studies» 70 (2022) n. 4, pp. 901-918.

[91] S. Efstathiou, Z. Mirmalek, *Interdisciplinarity in Action*, in N. Cartwright, E. Montuschi (eds.), *Philosophy of Social Science: A New Introduction*, Oxford University Press, Oxford 2014, pp. 233-248; J. Mittelstrass, *On Transdisciplinarity*, in «Trames» 15 (2011) n. 4, pp. 329-338.

From the standpoint of collective agency, experts might act as a two-way interface between laypeople and scholars in identifying which research problems should be tackled. Moreover, they could uptake the task to listen to laypeople's suggestions and concerns and thus foster a collective epistemic (sense of) agency; nonetheless, listening and deciding collectively, as suggested by research on "knowledge co-production" with indigenous people for instance[92], demand the conceptualization and design of new social processes that involve laypeople, experts, scholars, and decision-makers.

7. *Conclusions*

The investigative path I have sketched is not a conclusive analysis of the different issues at stake in theoretically understanding the interlocking of climate and social risks. On the contrary, my objective is to highlight how interdisciplinary research can substantially help improve the current debate on risk, uncertainty, and climate change.

To conclude, a brief overview of some tentative upshots of the analysis can be summarized. The different notions of ecological, climate, and social risks are related to each other through the conceit of vulnerability. This entails that identifying who, and why, should become more vulnerable due to an energy transition policy can become a highly debatable matter. This hint can help enlarge the current philosophical investigation on risk to inquire the issue of sharing moral and epistemic salience of vulnerability related to different risks. Moreover, recognizing the collective structure of climate challenges can suggest that epistemic failures inherent in risk-prevention demand an enhanced comprehension of the collective assessment of hazards, exposure, and vulnerability, as a joint effort of building collective agencies.

Therefore, it can be suggested that a duty to mobilize other people to join their forces to cope with climate change in local energy transition projects does exist, and it entails a specific role for scholars and experts to join their forces to avoid epistemic harms. The specific consequences of these harms are that unaccounted risks could impact on laypeople and, at the same time, that could lead astray in defining research problems within research com-

[92] N. Latulippe, N. Klenk, *Making Room and Moving over: Knowledge Co-production, Indigenous Knowledge Sovereignty and the Politics of Global Environmental Change Decision-making*, in «Current Opinion in Environmental Sustainability», 42 (2020), pp. 7-14.

munities. This duty can also be understood as an obligation to promote collective learning of plural subjects involved in energy transitions as a sort of "risk co-knowledge" building.

Finally, the discussed case is one of the many controversial examples of energy transition where social, technological, economic and ecological factors tend to conflict with each other[93]. Nonetheless, the research trajectory I have drafted shows the opportunity to improve the interdisciplinary dialogue between social sciences, climate sciences, and philosophical investigation on risk and collective agency, in order to better examine "how" decision-making under deep uncertainty and risk communication are structured to overcome the hazards of collective paralysis and powerlessness.

Abstract

Interweaving hazards in environmental crises can be framed as a wicked problem as well as an opportunity for the interdisciplinary contribution of philosophical analysis on risk. Due to nonlinear mechanisms and contextual variations, this shows the importance of inquiring about contrasting assessments of vulnerability and the demand for comprehensive collective actions in coping with climate risks. The article examines how to address overlapping ecological and social risks, focusing on decision-making in the context of local energy transition projects through the lens of collective epistemic responsibility. By analyzing disciplinary accounts and exploring the links between assessment and decision-making further research directions for collective risk prevention strategies will be outlined, and some implications for interdisciplinary investigation on risk and expertise will be sketched.

Keywords: climate risk; collective agency; deep uncertainty; social risk; vulnerability.

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[93] F.W. Geels, *et al., The Socio-Technical Dynamics of Low-Carbon Transitions*, in «Joule» 1 (2017) n. 3, pp. 463-479.