Philosophy and Energy Transitions: Ethical Reflections on Overlooked Human and Non-Human Beings

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“Vai, vai che in fondo al tunnel la vedrai
la strada che conduce dritto fino al mare
vai, vai che nulla è invano e tu lo sai
quello che costa darsi senza rinunciare”.

[Pippo Pollina, A mani basse]

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Zusammenfassung

Die aktuelle Energiewende hin zu kohlenstoffarmen Gesellschaften umfassen mehr als nur einen technologischen Übergang von fossilen Brennstoffen zu erneuerbaren Energiequellen. Sie verfolgen auch weitergehende Ziele wie Gerechtigkeit, Fairness, Verantwortung, Nachhaltigkeit und ethische Integrität. Dieses Streben spiegelt ein wachsendes Bewusstsein für die sozialen und kulturellen Dimensionen von Energiesystemen wider, wirft jedoch zugleich Fragen nach der praktischen Bedeutung dieser Begriffe auf.

Diese Fragen wurden von Forscher und Forscherinnen im aufkommenden Feld der *energy ethics* untersucht. Die Forschung in der Energieethik umfasst ein breites Spektrum, das von der Untersuchung moralischer Verantwortlichkeiten zur Reduktion des Energieverbrauchs in energieintensiven Gesellschaften bis hin zur Bewertung der Verteilung von Risiken und Nutzen von Energietechnologien reicht. In diesem Feld positioniert sich die vorliegende Dissertation, indem sie untersucht, wie ethisches Argumentieren zur Energiepolitik beitragen kann. Im Mittelpunkt stehen ethische Fragen, die Akteure betreffen, die zwar in der Literatur anerkannt sind, in politischen Rahmenbedingungen der Energiewende jedoch marginalisiert bleiben. Dazu gehören Gruppen, die unverhältnismäßige Lasten tragen, wie arme Haushalte, die sich effizientere Technologien nicht leisten können, sowie nicht-menschliche Arten, wie Fledermäuse, die durch Windkraftanlagen beeinträchtigt werden.

Diese Dissertation verfolgt zwei Hauptziele: Erstens soll aufgezeigt werden, wie ethische Untersuchung durch die Klärung normativer Konzepte und die kritische Betrachtung der in dominanten Narrativen und Rahmenbedingungen enthaltenen Annahmen zur Energiediskurs beitragen kann. Zweitens soll der Dialog innerhalb der Philosophie und zwischen den Disziplinen gefördert werden, um zu untersuchen, wie ethische Perspektiven das Verständnis der Herausforderungen und Chancen zukünftiger Energiesysteme vertiefen können.

Nach der Einführung analysiert Kapitel zwei sprachliche Muster in EU-Politikdokumenten, die eine Tendenz erkennen lassen, Energie primär als Ware für den menschlichen Gebrauch zu konzeptualisieren. Diese kulturelle Rahmung prägt

politische und wirtschaftliche Narrative. Aufbauend auf einer öko-feministischen Analyse dieser Energiekonzeption argumentiert das Kapitel, dass die ausschließliche Sichtweise von Energie als menschliche Ressource Dualismen wie „Mensch–Natur“ verstärkt. Zugleich zeigt es, dass diese begrenzte Konzeption bestimmte Menschengruppen und Teile der nicht-menschlichen Natur marginalisiert, indem sie diese in den Hintergrund rückt, instrumentalisiert oder ausschließt. Dadurch werden ökologische Degradationsprozesse verstärkt und der Horizont von Nachhaltigkeitsdebatten eingeengt. Das Kapitel schließt mit einem Appell an Wissenschaft und Politik, Energienarrative neu zu denken, um hierarchische Strukturen und unterdrückende Dynamiken gegenüber Menschen und Natur zu hinterfragen.

Kapitel drei untersucht die ethischen Verantwortlichkeiten von Akteuren im Energiesektor gegenüber nicht-menschlichen Tieren, mit besonderem Fokus auf die Auswirkungen von Windkraftanlagen auf Fledermäuse. Diese Analyse wird im Kontext des politischen Rahmens der Europäischen Union verortet, der alle Fledermausarten durch Naturschutzrichtlinien schützt, gleichzeitig jedoch Ausnahmeregelungen zulässt, die diesen Schutz unterminieren. Diese Spannung verdeutlicht das „Green-Green-Dilemma“: die Schwierigkeit, den Ausbau erneuerbarer Energien mit dem Schutz der Biodiversität in Einklang zu bringen. Das Kapitel argumentiert, dass Fledermäuse marginalisiert werden, wenn sie in Risikoabschätzungen als von menschlich veränderten Umwelten getrennt betrachtet werden, eine Perspektive, die wechselseitige Abhängigkeiten zwischen Arten ausblendet. Aufbauend auf der politischen Theorie von Donaldson und Kymlicka führt das Kapitel das Konzept des „spillover harm“ ein, um die moralische Verantwortung von Akteuren gegenüber empfindungsfähigen nicht-menschlichen Lebewesen in anthropogenen Lebensräumen zu betonen. Es wird dargelegt, dass technologische Lösungen allein nicht ausreichen; wirksame Maßnahmen erfordern ethisches Engagement und die Anerkennung von Koexistenz. Die effektive Durchsetzung und Umsetzung technologischer Maßnahmen hängt von einer starken Motivation ab, die ihrerseits tief durch soziale Werte, Emotionen und moralische Überlegungen geprägt ist. Das Kapitel endet mit einem Plädoyer für eine stärkere

philosophische Beteiligung an Debatten über die Energiewende. Dadurch trägt es zum übergeordneten Ziel der Dissertation bei, moralisches Denken in die Planung und Politik von Energieinfrastrukturen zu integrieren.

Abschließend widmet sich Kapitel vier der Situation armer Menschen in den Prozessen der Energiewende, mit Fokus auf Italien und unter Einbeziehung des weiteren europäischen Rahmens. Obwohl EU-Rechtlinien die Energiewende als Mittel zur Bekämpfung von Energiearmut darstellen, können sie bestehende Ungleichheiten zugleich verschärfen. Um diese Spannung zu erfassen, führt das Kapitel das Konzept der „effectiveness gap" ein, das die Diskrepanz zwischen politischen Zielsetzungen, deren Umsetzung und den tatsächlichen Ergebnissen in der Bekämpfung von Energiearmut beschreibt. Auf der Grundlage empirischer Forschung, die während eines Praktikums bei RSE S.p.A. durchgeführt wurde, nutzt die Analyse den Befähigungsansatz, um zu adressieren, wie italienische Energiepolitiken Energiearmut berücksichtigen. Dieser Ansatz verdeutlicht, dass die bloße Verfügbarkeit von Ressourcen keine besseren Lebensbedingungen garantiert; Ergebnisse hängen von „Umsetzungsfoktoren" wie Gesundheit, Geschlecht, Infrastruktur und Politikgestaltung ab, die die Fähigkeit der Menschen prägen, von Reformen zu profitieren. Die Ergebnisse zeigen, dass die derzeitigen italienischen *policies* diese Faktoren unzureichend berücksichtigen, wodurch das Risiko besteht, dass energiearme Bevölkerungsgruppen von öffentlichen Förderprogrammen ausgeschlossen und in der Energiewende marginalisiert werden.

Durch die Verbindung empirischer Daten mit normativ-ethischer Analyse deckt das Kapitel strukturelle Ungerechtigkeiten in politischen Rahmenbedingungen auf und fordert inklusivere Energiepolitiken, die die Handlungsfähigkeit armer Menschen stärken. Damit trägt es zum übergeordneten Ziel der Dissertation bei, die ethischen Dimensionen gegenwärtiger Energiepolitik kritisch zu beleuchten.

Summary

Current energy transitions toward low-carbon societies involve more than a technological shift from fossil fuels to renewable sources. They also pursue broader goals of justice, fairness, responsibility, sustainability, and ethical integrity. While this ambition reflects growing awareness of the social and cultural dimensions of energy systems, it also raises questions about what these terms mean in practice.

Scholars within the emerging field of energy ethics have explored these questions. Research in energy ethics spans a wide spectrum, from examining moral responsibilities to reduce consumption in energy-intensive societies to evaluating how risks and benefits of energy technologies are distributed. Positioned within this field, this dissertation investigates how ethical reasoning can contribute to energy policymaking. It focuses on ethical issues affecting subjects who, despite being recognized in the literature, remain at the margins of energy transition policy frameworks. These include groups that bear disproportionate burdens, such as poor households unable to afford more efficient technologies, and non-human species, like bats, that are adversely impacted by wind energy turbines.

This dissertation pursues two main research objectives. First, it seeks to show how ethical inquiry can contribute to energy policymaking by clarifying normative concepts and critically examining the assumptions embedded in prevailing narratives and frameworks. Second, it aims to foster dialogue, within philosophy and across disciplines, on how ethical perspectives can enhance understanding of the challenges and opportunities shaping future energy systems.

Following the introduction, Chapter Two identifies linguistic patterns in European Union policy documents that reveal a tendency to conceptualize energy primarily as a commodity for human use. This cultural framing shapes political and economic narratives. Drawing on an ecofeminist analysis of this conception of energy, the chapter argues that viewing energy solely as a human resource reinforces dualisms such as “human–nature.” Also, it shows that this limited conceptualization of energy marginalizes certain human groups and parts of non-human nature, rendering them backgrounded, instrumentalized, or excluded. As a result, it perpetuates ecological

degradation and narrows the scope of sustainability debates. The chapter concludes by encouraging scholars and policymakers to reconsider energy narratives in ways that challenge hierarchical structures and oppressive dynamics toward both humans and nature.

Chapter Three investigates the ethical responsibilities of energy stakeholders toward non-human animals, focusing on the impact of wind energy infrastructures on bats. It situates this analysis within the European Union's policy framework, which simultaneously protects all bat species under conservation directives and permits derogations that undermine these protections. This tension exemplifies the broader "green-green dilemma": the difficulty of aligning renewable energy expansion with biodiversity conservation. The chapter argues that bats are marginalized when treated as separate from human-altered environments in risk assessments, a framing that obscures interspecies interdependencies. Drawing on Donaldson and Kymlicka's political theory, it introduces the concept of "spillover harm" to emphasize stakeholders' moral responsibilities toward sentient non-human agents inhabiting anthropogenic landscapes. It contends that technological solutions alone are insufficient; effective mitigation requires ethical commitment and recognition of coexistence. The effective enforcement and implementation of technological challenges depend on strong motivation, which is deeply shaped by social values, emotions, and moral considerations. The chapter concludes by calling for greater philosophical engagement in energy transition debates, thereby advancing the thesis's overarching aim of integrating moral reasoning into energy infrastructure planning and policies.

Finally, Chapter Four examines the position of poor individuals in energy transition processes, focusing on Italy while situating the analysis within broader European Union strategies. Although European Union policies present the energy transition as a means to alleviate energy poverty, they may simultaneously exacerbate existing inequalities. To capture this tension, the chapter introduces the concept of an "effectiveness gap" to describe the divergence between policy objectives, implementation practices, and actual outcomes in addressing energy poverty. Drawing on empirical research conducted during an internship at RSE S.p.A., the analysis

employs the capability approach to assess how Italian energy transition policies address energy poverty. This perspective highlights that outcomes depend on "conversion factors" such as health, gender, infrastructure, and policy design, which shape individuals' capability to benefit from energy reforms. The findings indicate that current Italian policies inadequately address these factors, risking the exclusion of energy-poor populations from public incentive schemes and limiting their participation in the transition. By integrating empirical data with normative ethical analysis, the chapter exposes structural injustices embedded in policy frameworks and calls for more inclusive energy policies that strengthen the agency of poor individuals.

List of Included Articles

Parts of this dissertation have been either published in or submitted to peer-reviewed journals:

- **Calidori,** N., Frigo, G. & Hillerbrand, R. "Just" energy? An ecofeminist analysis and critique of a predominant conception of energy. (2024) Energy Sustainability & Society, 14, 65. https://doi.org/10.1186/s13705-024-00495-8. (**Chapter Two**).

- **Calidori,** N., Of Bats and Wind Energy: Spillover Harm and Moral Responsibility in the Anthropocene. (2025) Ethics & the Environment, *Under review* (**Chapter Three**).

- **Calidori,** N., Galbiati, I., Frigo, G., & De Vidovich, L. (2025). Not enough (yet): A capabilities assessment of the implementation of energy poverty policies in Italy. Energy Research & Social Science, 120, 103879.https://doi.org/10.1016/j.erss.2024.103879. (**Chapter Four**).

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Chapter One

Introduction

1.1. From Technological Shifts to Ethical Projects

In *Energy Transitions: History, Requirements, Prospects*, Smil (2010, vii) defines energy transitions as "change[s] in the composition (structure) of primary energy supply". These transitions are rarely swift; they unfold gradually over decades, reshaping economies, societies, and technologies in the process. Some energy transitions occur at the local level, while others ripple across the globe, influencing every aspect of daily life. History offers numerous examples: the move from biomass fuels like wood to coal during the 18th and 19th centuries, or the rise of oil as the primary energy source in the early to mid-20th century, to the development of nuclear power plants starting in the mid 1950s.

On the surface, today's shift toward lower-carbon energy sources may appear to be just one more chapter in the long history of energy transitions. This historical continuity has led some scholars to use past transitions as a lens for understanding the present (Fouquet 2010; Fouquet and Pearson 2012). Yet, today's energy transitions also reveal characteristics that set them apart. While each transition reflects more than a change in energy sources, signaling a deeper transformation in how societies function, the current ones are the first in which a widespread awareness of the environmental and societal consequences of energy systems is actively shaping how the transition unfolds (Miller 2014). Unlike earlier transitions, which were largely uncoordinated and driven by economic forces or technological discoveries, the current shift is increasingly policy-led and value-laden. As García-García et al. note, "the present transition is a complex policy-led process with time goals" (2020, 1). The motivations behind today's efforts also reflect a conscious desire to reduce humans' ecological footprint, making environmental and climate concerns central to energy planning. Although some still view current shifts as a purely technological evolution,

a growing body of literature frames it as a socio-technical and "socio-cultural" transformations (Schuster et al. 2023, 12), ones that blend innovation with political intent and cultural change (Pfister et al. 2017).

Perhaps most strikingly, current transitions carries a strong moral dimension, as researchers increasingly advocate for justice, equity, and ethics to be treated as foundational elements in its design and implementation (Babatunde et al. 2024). *Energy ethics* reflects this shift. Defined by Wood et al. (Wood et al. 2024, 4) as "the systematic philosophical study of the moral dimensions of energy related matters", energy ethics evaluates energy systems and aims to prescribe ethically preferable courses of actions (see, *infra*, 1.1.1).

Each article in this cumulative dissertation is situated within this field, underscoring the importance of exploring the moral dimensions of energy transitions. Accordingly, this introduction begins by contextualizing energy ethics. The remainder of this section provides an overview of contributions to the field, focusing in particular on philosophical reflections (1.1.1.), and identifies some of the challenges involved in applying ethical analysis to energy issues (1.1.2.). Section 1.2 situates energy ethics within the broader philosophical landscape (1.2.1.), examining its intersections with adjacent research fields (1.2.2.), and confronting it with energy justice (1.2.3.), another prominent research area concerned with the moral dimension of energy transitions. Finally, Section 1.3 presents this doctoral project in detail: its context, overarching research question (1.3.1.), significance, objectives, and contributions (1.3.2.). It concludes with summaries of the three constituent articles (1.3.3.) and the thematic thread that unifies them (1.3.4.).

1.1.1. The Rise of Energy Ethics

Since the 1970s, in the English speaking academic world, scholars have approached energy not only from a technological and engineering perspective, but also through social, environmental, and ethical lenses (Frigo 2018a). This interdisciplinary shift has engaged researchers from fields such as anthropology, history, sociology, and

philosophy. Over the past decade, many ethics-related contributions to energy issues have been grouped under the umbrella of "energy ethics".

Energy ethics lacks a coherent disciplinary framework; instead, it has emerged as a field through the independent contributions of scholars from diverse disciplines engaging with the ethical dimensions of energy (Frigo and Hillerbrand 2021). For example, Smith and High (2017), adopting an anthropological perspective, emphasize the importance of understanding how people themselves evaluate the moral dimensions of energy systems, highlighting everyday ethical sensibilities as central to such analyses. They define energy ethics as the study of how individuals and communities judge ways, in which energy enables or threatens the kinds of lives and futures they consider good or valuable. Rather than drawing on theories, their proposal begins from the ground up, focusing on how people experience and reflect on energy in their daily lives.

Energy ethics studies include concerns about the moral responsibility to reduce energy consumption in *energivorous* societies (Dernbach and Brown 2008; Illich 2013a), the tensions between present-day energy policies and the well-being of future generations (Wenz 1983), or the assessment and distribution of risks associated with energy technologies (Rossert 2018). Miller (2014), for example, offers a contribution to energy ethics by framing energy transitions as opportunities to confront and correct existing injustices. He argues that ethical reflection must be embedded in the design, planning, and operation of new systems, proposing criteria to evaluate the ethical dimensions of transitions. Offering a conceptual frame, Mitcham and Rolston (2013) distinguish between Type I and Type II energy ethics. Type I assumes a linear correlation between energy availability and human flourishing, whereas Type II questions this assumption, foregrounding issues of justice, equity, and sustainability.

Philosophers, too, have contributed to this growing field, addressing ethical questions. Frigo and Hillerbrand (2021) distinguish between *descriptive* approaches of energy ethics, which map existing moral views concerning energy issues, and *normative* approaches, which refer to philosophical analyses of energy-related systems, policies, and actions to propose morally justified decisions.

One key area of philosophical engagement in energy ethics concerns the concept of well-being. This notion has long been central to philosophy, from classical reflections on *eudaimonia* (e.g. those of Democritus and Epicurus) to contemporary philosophical debates. Within energy ethics, the central question becomes how energy systems shape or constrain human well-being. Geerts (2018), for example, criticizes dominant energy transition discourses (categorized as either boundless consumerist or eco-frugalist) for their shared preoccupation with scarcity. Geerts introduces the concept of "qualitative abundance" as an alternative framing, encouraging a shift from merely replacing finite resources with sustainable ones to reimagining energy practices that enhance well-being. Similarly, Illich (2013a) offers a radical critique of high-energy modernity. He challenges the prevailing assumption that more energy (also clean energy) automatically equates to greater social equity and well-being. Instead, he argues that this belief constitutes a political fallacy, as it neglects the structural dependencies and inequalities embedded in energy-intensive lifestyles. Hillerbrand and Goldammer (2018) further argue that the connection between energy and well-being is often underexplored in sustainability discourses, which tend to rely on aggregate indicators. Drawing on Nussbaum's capability approach, they propose the notion of *energy capabilities* (i.e. "substantive freedoms that are predominately at stake during changes in the energy system", p. 9), as a framework for ethically assessing energy systems. Their perspective highlights how energy technologies affect not only health, autonomy, and participation, but also emotional and environmental well-being, thus linking energy transitions directly to the conditions for human flourishing. Similarly, in Frigo et al. (2021), the authors develop a capability-based foundation for a human right to access essential energy services (e.g. Electricity, nutrition, and cooking fuel), arguing that these are necessary preconditions for realizing fundamental human capabilities and achieving a human good life.

Contributions to energy ethics emerge from diverse disciplinary backgrounds and engage with a broad array of issues, reflecting the complexity of energy systems. But how is ethics itself understood within this landscape? The following section addresses this question.

1.1.2. Unpacking Ethics in Energy Ethics

Beyond meta-ethics, ethical inquiry is generally divided into normative ethics and applied ethics. Applied ethics deals with specific and concrete situations, aiming to determine what actions are morally right or wrong, permissible or obligatory, in particular contexts (De Caro et al. 2021, IX–X). To date, normative contributions to energy ethics have been relatively limited. Instead, most authors have focused on applied ethical questions related to energy practices and technologies, seeking to evaluate concrete energy-related decisions, projects, and policies. In this respect, some (though not all) works in energy ethics can be situated within the realm of applied ethics. Bethem et al. (2020), for example, interpret energy ethics as a branch of applied ethics focused on guiding real-world energy decisions through structured ethical reasoning. They propose a set of principles drawing from virtue ethics, deontology, consequentialism, and Indigenous ethical systems (Lakota and Navajo). These principles should aim at guiding decision-makers in assessing the ethical merit of specific energy projects.

The rise of applied ethics in the 20th century was marked by a growing interest in whether normative ethical theories could address "real ethical problems" (Singer, 1986, 3) and "particular cases" (Toulmin, 1982, 749). Yet applying ethics to energy practices and technologies is not straightforward. The energy sector involves a wide array of actors and systems, making it difficult to identify the subjects of ethical concern.

Unlike medical ethics (Beauchamp and Childress 2001), for example, where the primary actors (e.g. doctors and patients) are relatively easy to delineate, energy ethics faces greater complexity[1]. In regard to the multiple actors involved, Miller (2014, 2) argues that ethical analysis in energy transitions must operate across macro-, meso-, and micro-scales, i.e. global responsibilities (e.g. who is responsible for the burdens and costs of climate change and mitigation measures?), systemic injustices (e.g. engineers and designers' responsibilities), and individual behaviors respectively. This multi-scalar complexity presents challenges for translating ethical reflections into

[1] I would like to thank the PhilETAS research group for the many discussions on this very specific comparison.

practical action, carrying the risk that ethical reasoning becomes a procedural formality, a "check-box" exercise, particularly when competing justice claims are in play (Laes et al. 2023; Baasch 2023).

Moreover, ethical insights do not easily translate into policy or individual behavior through the mere presentation of rational models or prescriptive frameworks. As Wood et al. (2024, 7) note, "scholars cannot provide policy-makers and decision-makers with a simple manual to deal with energy [...] dilemmas." This observation underscores the enduring complexity of integrating ethical considerations into energy transition processes and the limits of theoretical solutions in the face of real-world dilemmas.

In this regard, Galvin (2019) offers an important corrective. He argues that effective ethical engagement must "connect with people's already developed moral character", noting that individuals "do not learn to be moral beings by intellectually grasping the logic of a rational moral edifice, nor are they morally gripped by logically flawless ethical reflections on facts that seem remote from the moral meaning of their lives" (2019, 183). Instead, when it comes to energy issues, Galvin emphasizes the need to engage politicians, business leaders, and citizens by appealing to their existing moral *sensitivities* and commitments. Galvin criticizes the idea of moral claims (e.g. rules, statements, imperatives) as existing in "some reified metaphysical realm" (p. 178), found through reasoning and translated into real-world practice. He argues that moral beliefs emerge within communities through shared practices and discourse; individuals develop moral sensibilities and behaviors as they grow, learn to relate to others, and become meaningful, functioning members of society. As such, moral commitments as deeply embedded in human *affect* (e.g. our feelings, wants, and preferences) which are constitutive of the meaning of human life itself.

Grounded in energy ethics, this specific work proposes ways, in which ethical reflections, attentive to existing *moral sensitivities* and commitments, can help promote more inclusive and respectful energy transitions. Particularly, this work focuses on some subjects (e.g. dislocated people due to the construction of hydropower plants, energy poor people, and some airborne species), whose interests, needs, and well-being, are not completely safeguarded in energy transition policies

(see, *infra*, 1.3.1.). The three chapters (Chapters Two, Three, and Four) comprising this dissertation draw on distinct ethical perspectives, yet all converge in challenging the primacy of abstract rationalism in ethics. They emphasize the *affective dimensions* in the formulation of moral claims, stressing the relevance of care, interdependence, emotion, individual sensitivity, and empathy.

This affective dimension is showing to be helpful to better understand power dynamics in energy practices (Longhurst and Hargreaves 2019; Groves et al. 2021), and lay the groundwork for a shift in how energy is culturally understood (see Chapter Two), how (predominantly techno-fix) narratives around energy transitions are constructed, and how energy is ultimately consumed and distributed.

1.2. Situating Energy Ethics

1.2.1. The Case for Energy Ethics

The relative novelty of energy ethics raises some questions: where does energy ethics situate itself within the broader landscape of philosophy? What are its connections with other philosophical domains? Moreover, why should philosophy concern itself with energy-related issues at all? Before advancing further, I will address these preliminary inquiries.

Given that many energy ethics publications refer back to well-established philosophical traditions, a first, legitimate objection to the existence of energy ethics as a distinct research field concerns its necessity: [1] why do we need a specific domain called "energy ethics" at all? In this section, I shall attempt to respond to this question. A second, perhaps more challenging, objection points to the apparent indistinguishability between energy ethics and energy-related research within the social sciences: [2] what, if anything, marks energy ethics as distinct from other ethics-related investigations concerning energy issues (e.g. energy justice studies)? This latter issue will be explored in sections 1.2.3, and 1.3.2.

To respond to the first question, it is helpful to reflect on the meaning attributed to the term "energy ethics". In the context of this work, the label "energy

ethics" refers to ethical discussions, and, more broadly, philosophical inquiries, focused on energy-related issues. Energy ethics studies recognize that the development, design, and deployment of energy technologies, as well as decisions spanning from energy generation to consumption, are laden with ethical implications (e.g., equity in access to energy-efficient appliances, responsibility in individual lifestyle choices, and social justice concerns due to the displacement of communities caused by hydropower dams). The use of this label (i.e. energy ethics) underscores the necessity of considering energy beyond (though not necessarily in isolation from) the domains of science and engineering.

As discussed earlier (see 1.1.2.), research areas of applied ethics typically base on normative theories to frame, analyze, and evaluate real-world contexts. For instance, animal ethics raises questions such as how non-human animals should be treated and what moral obligations arise from those considerations. Normative theories (e.g. utilitarianism, deontology) have shaped responses to practical issues like animal testing or industrial farming, ranging from welfarist approaches (e.g. Singer 2002) to right-based ones (Cochrane 2012; Regan 1983; Garner 2013). In a similar way, many energy ethics contributions rely on normative theories to explore specific energy issues. The emergence of energy ethics, as a distinct research area, signals a shift in philosophical attention, one that brings into focus aspects of human life (those concerning energy practices) that had long been present but remained relatively underexplored within ethical discourse (Steigleder and Heeger 2024).

Energy has always played a central role in shaping human life and social organization (long before it was formally conceptualized or theorized), but has rarely been treated as a primary object of philosophical concern. The growing field of energy ethics thus emerges as a response to this oversight. It reflects the need for a dedicated philosophical engagement with energy, practices and technologies concerning energy, especially as they are entangled with questions of justice, sustainability, and the future of human and non-human life.

In the following, I outline some energy ethics' connections with adjacent areas of philosophical inquiry. This should provide a clearer view of its philosophical relevance.

1.2.2. Connections with the Broader Philosophical Panorama

The development of energy ethics does not render it isolated from broader philosophical discourses. On the contrary, because energy practices are embedded in nearly every aspect of human life, energy ethics exposes the cross-sectional character of many contemporary ethical challenges. It engages in dialogue with key areas of philosophical inquiry, including ethics of technology, engineering ethics, environmental and climate change ethics, as well as with political and moral philosophy. This dialogue is enriching. Ethical reflections on energy transitions offer philosophers new opportunities to test, refine, and expand theoretical frameworks, thereby advancing multiple strands of philosophical research. In the following section, I illustrate how energy ethics intersects with and contributes to broader ethical debates, highlighting its relevance across multiple areas of contemporary philosophy:

i) Over the past several decades, ethics of technology has extended from general reflections on technology to more targeted analyses of specific technologies (e.g. artificial intelligence, biotechnology, and nanotechnology), as well as distinct stages in their development (Franssen et al. 2009). This move has led to a significant expansion in the range and complexity of ethical questions, and it has emphasized the importance of grounding ethical reflection in empirical realities. Within this panorama, recurrent themes have emerged, including responsibility (e.g. the responsibility of engineers and developers, or the notion of individual and collective responsibility) (Braunack-Mayer et al. 2012), risk (e.g. radiological risks) (Taebi and Kloosterman 2008; Hillerbrand and Roeser 2016), and design (e.g. involving sustainability, inclusivity, and care as criteria) (Hillerbrand and Goldammer 2018). These themes also figure prominently in energy ethics. Debates over responsibility, for example, surface in discussions of who is accountable for energy-related greenhouse gas emissions, whether producers, consumers, or policymakers. Similarly, ethical considerations of risk are central to discussions about nuclear energy, battery storage, and other energy technologies with uncertain long-term effects. Design

questions appear in conflicts over wind farms that endanger bird and bat populations or disrupt local ecosystems and communities. Building on design concerns, for instance, Geerts (2012) explores the disjunction between individuals' experiences of energy use and the broader socio-technical systems that mediate it. Geerts argues that this "experiential gap" inhibits individuals from developing ethical relationships with energy consumption, and emphasizes the importance of "self practices" in becoming ethical subjects. By advocating for technologies that reduce this gap (e.g., localized, off-grid systems), Geerts underscores the role of technological design in fostering ethical engagement (for more details, see Chapter Four).

Overlapping concerns highlight the mutual influence between energy ethics and the ethics of technology, particularly when examining the complex sociotechnical systems required for the generation, transport, distribution, and consumption of energy. Ethical questions arise around solar farms displacing agricultural land, pipelines intersecting with indigenous territories, unequal access to energy infrastructure, and the use of smart home technologies that track individual consumption patterns. In this context, energy ethics can make a distinctive contribution to the ethics of technology by offering a lens that is not limited to specific devices or sectors. Energy ethics foregrounds *energy* as a shared and foundational element that cuts across technological systems, revealing patterns of power, justice, and responsibility that recur across different domains.

ii) Turning to the entanglements between energy ethics and other philosophical research fields, such as environmental ethics, Illich's work offers a critical entry point. Illich (2013b) interrogates the notion of *energy* as a historically loaded term, simultaneously a scientific concept and a socio-cultural construct[2]. He traces the emergence of this dual character in the 19th century, where the concept of energy came to represent the exploitation of a passive natural world, what he metaphorically refers to as a "womb" or "matrix." Conceptions of nature, particularly in Western societies, are informed by a specific, well-established understanding of energy as a

[2] The essay is based on the opening talk to a seminar on the "The Basic Option within any Future Low-Energy Society" held at El Colegio de México, México, July 1983.

commodity and a resource for human use (see Chapter Two). The study of how humans conceive of and relate to nature constitutes a central focus of environmental ethics. Accordingly, an analysis of the role and mediation of conceptions of energy within human–nature relationships compels ethicists concerned with energy-related issues to engage with the insights of environmental ethics. Frigo (2018), for instance, argues that energy ethics must be rethought through the lens of environmental ethics, particularly ecocentric environmental philosophy, to address the deep moral challenges of current energy transitions. He criticizes the dominant anthropocentric and techno-scientific approaches to energy policy, and instead advocates for a normative energy ethic grounded in ecological principles (e.g. ecocentrism, intergenerational responsibility, and the acceptance of ecological limits). Conversely, environmental ethicists may find it highly fruitful to investigate the role of energy, for example, in processes of natural exploitation (Chapter Three further illustrates how research in energy ethics and environmental ethics can intertwine to the mutual benefit of both fields). Moreover, animal ethics in recent decades has expanded its scope to examine human interactions with other sentient non-human animals, based on the recognition that we share and cohabit the same environments. The expansion of globalized energy systems raises questions regarding their impact on other species, making dialogue with animal ethics a necessary step for energy ethicists. On the other hand, animal ethicists may broaden their inquiries by exploring the new forms of interspecies interaction driven by energy systems.

iii) Climate change ethics also maintains a direct connection to ethical reflections on energy. The energy sector, encompassing both the generation, distribution, and consumption of energy, is widely recognized as the most significant contributor to environmental pollution[3]. Moreover, energy transitions are considered essential for addressing the challenges posed by climate change, particularly the need to reduce

[3]See:
https://www.iea.org/reports/multiple-benefits-of-energy-efficiency-2019/air quality?utm_source=chatgpt.com;
https://www.eea.europa.eu/publications/air-quality-in-europe-2022/sources-and-emissions-of-air?utm_source=chatgpt.com

carbon dioxide (CO_2) concentrations in the atmosphere. Research in climate change ethics and energy ethics thus goes hand in hand. Recently, Steigleder and Heeger (2024) have argued for a shift toward *climate-related energy ethics*, which focuses on the normative challenges of achieving viable, and just energy transitions. They contend that current climate ethics overestimates the knowledge of how to decarbonize global energy systems. Instead, ethics must engage more concretely with energy technology, economic, and geopolitical realities. Questions such as: Who should bear the greater cost of climate disruptions? Who should be burdened? Should individuals or states receive compensation for their losses, and if so, through what mechanisms? - are central to the field of climate ethics. A deeper understanding of the specific ethical challenges that energy-related activities present could significantly enrich these inquiries. For example, when climate ethicists consider who should bear the greater cost of climate disruptions, insights from energy ethics can highlight how decarbonization policies may deepen existing global inequities. Energy ethics draws attention to how transitions away from fossil fuels can disproportionately affect low-income populations who already suffer from energy poverty. In many cases, these communities contribute the least to climate change yet are asked to shoulder the burdens of transitions, such as higher energy prices, job losses in carbon-intensive sectors, or the displacement effects of new infrastructure like large-scale solar farms or bioenergy projects. Integrating this energy ethics perspective could push climate ethics to consider the lived realities of energy vulnerability, infrastructural injustice, and the socio-political contexts in which mitigation and adaptation efforts unfold.

iv) On another level, when considering energy transitions that aim to be just, the fundamental philosophical question of what constitutes justice inevitably arises. Drawing on well-established traditions such as utilitarianism, Rawlsian theory, and the capability approach to address this question in energy ethics is often taken as a given. What deserves emphasis is that energy-related issues do not merely apply these traditions; they also contribute to their further development and the broader discourse in political philosophy. Since energy concerns have increasingly been recognized as matters of ethical inquiry, they raise critical questions: What exactly must be

distributed to achieve a just society? A specific amount of a resource? Equal or equitable access to it? The services derived from the resource? Or the opportunities generated by those services? Furthermore, new questions of rights have emerged, with scholars debating whether there exists a right to energy and, if so, how it should be defined and justified (Walker 2015). Given the profound impact of energy, particularly in the form of electricity, on human lives, well-being, and geopolitical relations, it seems only natural that political philosophy would engage with these concerns. Moreover, given the pervasive role of energy in human life, an analysis of what energy represents for individuals and societies can also make important contributions to moral philosophy. Many of the so-called "longitudinal collective action environmental problems" (Sandler 2009), that is, problems arising from the cumulative, often unintended and unforeseeable effects of countless seemingly insignificant decisions made by individuals unknown and distant from one another, are closely connected to patterns of energy consumption. Individual choices regarding energy thus present a rich field of inquiry for various moral theories. From the perspective of moral philosophy, research into energy-related issues offers valuable insights into how moral claims can be rendered capable of motivating individuals to alter their behavior, as well as into how moral sensitivity evolves and expands in response to complex, collective challenges.

v) Finally, although the present work does not focus on metaphysics, early academic discussions on the concept of "energy" within nineteenth-century scientific circles were deeply intertwined with questions central to this discipline (e.g. debates about the nature of causality, the reality of invisible forces, and the ontological status of energy itself.)[4]. At the time, scholars were engaged in foundational ontological debates about the nature of energy: Is it a substance, a property, or merely a conceptual tool? Is it real, and if so, in what sense? (see Lopes Coelho 2009). For instance, in response to a query from the Department of Philosophy of Göttingen, physicist Max

[4] The term *energy* first appeared in a scientific context in 1807, when Thomas Young used it to refer to the quantity mv^2 (Smil 2017). For a more detailed account of the term's usage and evolving meanings in 19th-century scientific discourse, see Lopes Coelho (2009, 973).

Planck (1887) addressed these questions by reflecting on the concept of energy (*Energiebegriff*). He characterized it as a quasi-material notion, a reserve of effects determined by the current state of a material system. While acknowledging that this view might eventually be replaced, he argued that, for the time being, it remained the most intuitive and empirically productive framework for scientific inquiry (see Planck 1887, 105). The debate has continued throughout the 20th century[5], and in 2000, Mario Bunge (2000, 461), both physicist and philosopher, affirms "the general concept of energy is so general, that it belongs in metaphysics (ontology)". These examples illustrate that energy, far from being a concept confined to empirical science, has consistently demanded philosophical scrutiny.

1.2.3. Confronting Energy Ethics with Energy Justice

Energy ethics is not the only field concerned with ethical dimensions of energy. In the context of social sciences, the new and interdisciplinary research field of energy justice emerged since the 2010s. Advocates of this approach aim to fill the pervasive "moral vacuum" (Sovacool et al. 2016) in which energy issues are often addressed at both individual and policymaking levels, thus proposing two main definitions of energy justice. The first is a tenets-based definition, which frames energy justice as a tool for exploring and understanding key dimensions of justice: distributive justice (e.g. a just allocation of burdens and benefits associated with energy infrastructures), procedural justice (e.g. justice of decision-making processes), and recognition justice (the need to address issues of disrespect, stigmatization, and exclusion) (see McCauley et al. 2013; Jenkins et al. 2018, 67–68). In some formulations, additional dimensions such as restorative, participative, and cosmopolitan justice are also included (Heffron and McCauley 2017; Heffron 2022).

The second is a principled approach, which views energy justice as a normative system aimed at ensuring a more equitable distribution of the benefits and costs of

[5] Richard Feynman famously remarked in his *Lectures on Physics* that "it is important to realize that in physics today, we have no knowledge of what energy is" (Feynman, 1963, lecture 4, section 4-1), highlighting the persistent conceptual opacity surrounding the notion even within the scientific community:
https://www.feynmanlectures.caltech.edu/I_04.html.

energy services and promoting more representative and impartial decision-making processes. To operationalize this framework, Sovacool et al. (2016) propose eight guiding principles (i.e. availability, affordability, due process, transparency, accountability, sustainability, intra-generational equity, inter-generational equity, and responsibility). Energy justice aspires to guide ethically informed decision-making in the energy sector (Jenkins et al. 2017), with the broader goal, as Jones et al. (2015, 147) emphasize, of "persuad[ing] energy analysts, business leaders, politicians, utility managers, and energy consumers to consider or reconsider the ethical dimensions of our current energy system". Energy justice has significantly advanced the call for embedding ethical discourse into energy transition debates, but it has also drawn criticism (see Dunlap and Tornel 2023). Wood et al. (2024), for example, argue that the framework's tenets lack descriptive precision and normative guidance, leaving key concepts open to multiple, often conflicting interpretations. In addition, Tornel (2022) contends that energy justice remains rooted in Western epistemologies and universalized notions of justice, which risk reproducing colonial power structures. From a decolonial perspective, the author suggests that justice must be grounded in place-based knowledge and the lived experiences of communities, especially in the Global South.

Returning to question [2] discussed in 1.2.1., energy justice differs from energy ethics in several respects. First, energy ethics does not present a unified framework; instead, it encompasses a plurality of ethical reflections stemming from diverse disciplinary and philosophical traditions. Second, energy ethics is not exclusively concerned with justice. Justice is only one among many ethical questions addressed, alongside issues such as well-being, autonomy, and sustainability. Finally, energy ethics is often more critical of dominant energy narratives. While its proponents see energy justice as capable of contributing to mainstream policy discourse partly due to its lack of an "anti-establishment past" (Jenkins et al. 2016, 180; see also Heffron et al. 2015, 120), many contributions in energy ethics aim to interrogate prevailing assumptions and envision alternative energy futures.

1.3. This Work

1.3.1. Left Behind in Energy Transitions

One pivotal concern that emerges in the ethical debates surrounding energy transitions is the marginalization of those who are often "left behind" in the language of the European Union (European Commission 2019). Throughout this dissertation, I will refer to these subjects interchangeably as *marginalized* or *overlooked*, not to imply they are absent from existing literature, but to emphasize that the ethical implications of renewable energy transitions on them remain under-theorized. These are the communities, individuals, and species who, while not disregarded, are frequently sidelined in shaping policy or transition pathways.

Historically, energy transitions have frequently unfolded at the expense of specific segments of society and nature. The shift from coal to oil in the 20th century, for instance, led to the decline of coal mining communities, causing economic hardship and job losses for many workers. Moreover, the expansion of oil extraction has resulted in significant environmental degradation and displacement of indigenous communities.

Contemporary energy transitions seem to be replicating these patterns, as current moral claims for a just transition argue for, and are deeply entwined with, the interests of particular marginalized groups. Indeed, the ethical demand for a "just transition" are sometimes traced to the experiences of workers in the United States during the 1970s, who protested the closure of industries following the implementation of new environmental regulations (García-García et al. 2020; Gambhir et al. 2018; Morena et al. 2020; Wang and Lo 2021). These shutdowns resulted in significant job losses, prompting calls for a fairer approach to managing the social impacts of ecological policies. During this period, Tony Mazzocchi of the Oil, Chemical and Atomic Workers International Union (OCAW) proposed the concept of a "just transition", advocating for government-funded wage support, retraining programs, and job relocation assistance for affected workers.

Displaced workers are not the only group at risk of being overlooked during energy transitions; nor are they the sole individuals affected by these processes.

Ethical reflection on the broader range of marginalized stakeholders is increasingly gaining traction. Within energy justice, for example, the question of *who* is affected, impacted, or held responsible is often framed through the lens of justice as recognition (van Uffelen 2022). Indigenous communities in Argentina, for instance, have faced barriers to expressing their views on the development of lithium mining projects (Escosteguy et al. 2022). Similarly, workers - many of them children - in the cobalt-mining sector of the Democratic Republic of Congo suffer from severe exploitation. Other groups, such as those experiencing energy poverty, are left behind, unable to access the benefits of energy transition policies (see Chapter Four). Moreover, non-human beings, including airborne species harmed by wind turbines, are often sacrificed in the name of public interest (see Chapter Three).

In many cases, research on recognition stops at the acknowledgment that certain groups are excluded from or adversely affected by energy transitions. Ethical inquiry into the situation of overlooked subjects often struggles to find its distinctive way of contributing to the debate. Moreover, as noted by some scholars (e.g. see Gram-Hanssen 2024), ethical reflections concerning justice within energy transitions are mostly human-centered, focusing on human interests and well-being (see Jones et al. 2015; Sovacool et al. 2016). In energy social sciences, this persistent silence regarding the ethical implications of energy technologies on sentient non-human beings is becoming increasingly difficult to ignore. Recent influential contributions have acknowledged the necessity of incorporating non-anthropocentric ethical perspectives into the broader discourse on energy transitions. Nevertheless, the question of how this integration may occur in energy transition studies, or, to put it differently, how ethical reflections on non-human beings may contribute to the field, remains largely unresolved. As Sovacool et al. (2017, 682) put it, "[s]o far, animal-centered, life-centered, and ecosystem-centered justice theories have tended to advance themselves in separate fields - can those [...] be integrated?".

In sum, energy transitions and energy-related issues inevitably raise profound ethical concerns, including questions of justice, human rights, equity, inter- and intra-generational responsibilities, and animal welfare. Within this landscape, a growing body of literature has begun to highlight how certain groups, both human and non-

human, bear a disproportionate share of the burdens associated with these transitions. These are not invisible actors; they are present in policy discussions and academic research. Yet, they often stay in the background, insufficiently recognized, or excluded from the benefits of energy transition policies. By focusing on some of them, this work aims to show how ethical inquiry could contribute to informing energy transition policymaking. To do so, it poses the following overarching research question: How can philosophy provide deeper ethical reflection on human and non-human beings who have received limited attention in energy transition policymaking? The strategy employed to address the overarching research question led to the development of three distinct articles, each constituting a separate contribution to the field of energy ethics and exploring a specific sub-question.

1.3.2. Significance, Contribution, and Aims of the Dissertation

In section 1.2.1, I introduced a second critical question concerning the field of energy ethics, namely, what distinguishes it from branches of the social sciences involved in the study of energy-related issues. This question presents a considerable challenge, and in many ways, the present dissertation can be seen as an effort to address it. Reformulating the overarching research question presented above (see section 1.3.1), the inquiry here centers on how ethics can offer a distinct and meaningful contribution to energy policymaking. What specific insights or normative frameworks does it provide, especially when considering often-overlooked human and non-human actors involved in energy transitions? Contemporary research in energy ethics is deeply interdisciplinary, often involving productive collaborations with technical disciplines such as engineering, as well as with the social sciences, including sociology and economics. This interdisciplinarity is valuable, as it creates spaces at the intersections of diverse fields that can foster innovation and novel perspectives. However, such collaborations can also present certain challenges for philosophical engagement. First, they may lead philosophers to engage with questions that, while important, are primarily empirical or technical in nature and not central to philosophical inquiry. Second, the conclusions reached in some studies often reiterate normative

commitments that, while widely shared, remain relatively unexamined (e.g., the call for a just energy transition, fair procedures, and equitable distribution of costs and benefits). Third, there is at times a tendency to instrumentalize ethical reasoning by seeking direct applications or guiding principles that can immediately inform the decisions of energy stakeholders (Wood et al. 2024).

Far from attempting to offer an exhaustive response to these challenges, this dissertation seeks instead to explore *how* some ethical reflection can meaningfully engage with energy-related issues and work within interdisciplinary collaborations. The motivation for this work arises from a perceived need for deeper philosophical involvement in the discourse surrounding energy transitions, both to contribute with distinctive insights and to foster critical reflection within the field of energy ethics itself. This dissertation, therefore, serves a dual purpose. First, it calls for a more sustained engagement of philosophers with the complex ethical dimensions of energy systems and policies. Philosophical analysis has much to offer, both in clarifying normative concepts such as justice, responsibility, or sustainability, and in interrogating the assumptions that underpin current narratives and frameworks. Second, it invites those already working within energy ethics, regardless of disciplinary background, to reflect critically on the aims, methods, and boundaries of the field. By doing so, the intention is to encourage a more self-reflective approach to ethical inquiry in the context of energy transitions. In sum, this dissertation aims to demonstrate the value of ethics in contributing to energy policymaking and to open a space for dialogue, both within philosophy and across disciplines, on how ethical thought can better understand the challenges and possibilities of our energy futures.

The three articles that comprise this dissertation are both conceptual and normative in nature. They each respond, in distinct yet interconnected ways, to the broader aims outlined above, that is, to explore how ethics can meaningfully engage with energy-related issues and policies and contribute to a more reflective and critically grounded energy ethics.

1.3.3. Overview of Single Articles

In *"'Just' energy? An ecofeminist analysis and critique of a predominant conception of energy"*, the underpinning hypothesis (substantiated by an analysis of EU energy-related policy communications) is that, at least in the Western context, there is a characteristic socio-economic understanding of energy as a resource and commodity for human needs and the development of human societies. This cultural understanding of energy extends beyond the scientific definition, embedding itself in political and economic narratives. The article's guiding research question is: *does this conception of energy as a commodity and resource affect the relation between humans and nature? And if so, how?* To respond this question, the article adopts an ecofeminist lens. Specifically, it draws on the works of Val Plumwood, and Greta Gaard. Plumwood (1993) argues that Western thought has historically structured the human–nature relationship through dualistic frameworks that cast nature, and by extension, certain groups of people, as passive, non-agentic, and subordinate. She reveals how the category of "nature" has been politically constructed as a field of multiple exclusions, enabling domination not only of the non-human world but also of marginalized human groups. This dualism underpins the environmental crisis by portraying nature as inert, empty of meaning, and available for exploitation. Building on Plumwood's reflection, Gaard (2001) examines how energy and water infrastructures reflect and reproduce systems of environmental sexism, racism, and classism. She criticizes the linear model of energy extraction, which assumes infinite exploitation of both natural and human resources, and advocates for ecofeminist alternatives rooted in reciprocity, ecological democracy, and a reimagined relationship with energy and power based on care and sustainability. In Chapter Two, the analysis argues that the view of energy as a commodity and resource for human needs reinforces entrenched hierarchical dualisms, particularly the human–nature one, and contributes to backgrounding, excluding, incorporating, and instrumentalizing some parts of nonhuman nature as well as some human groups. In doing so, it exacerbates existing environmental injustices and ecological degradation**.** The article advocates for a more critical and inclusive discourse around energy, encouraging scholars and policymakers to move toward less oppressive and more ecologically

attuned approaches. Its contribution to the overarching research question (see section 1.3.1.) lies in offering a philosophical analysis of energy as a mediating force in the construction of the human–nature relationship. While this interpretive lens could be enriched by political or sociological insights, its philosophical distinctiveness lies in revealing how a specific way of thinking about energy underpins broader patterns of exclusion and domination affecting both human and non-human beings.

The third chapter, titled *"Of Bats and Wind Energy: Spillover Harm and Moral Responsibility in the Anthropocene,"* examines the ethical dimensions of renewable energy development in relation to non-human life. Focusing primarily on European Union policies, the article highlights the increasing recognition among energy stakeholders, those involved in the design, construction, and evaluation of energy systems, of a "green-green dilemma": the challenge of reconciling renewable energy expansion with biodiversity conservation. Wind energy development, for instance, can unintentionally harm non-human animals such as bats through habitat disruption, collisions with turbines, and barotrauma. This article contends that technological solutions alone are insufficient to resolve such conflicts. Instead, the successful implementation and enforcement of mitigation strategies require moral motivation. The central research question addressed is: *Why should energy stakeholders put effort into realizing energy generation systems that account for the well-being of non-human animals such as bats?* Many of the non-human animals affected by projects such as wind farms cannot be neatly categorized as either domesticated or wild, as they often inhabit liminal spaces where human and non-human lives intersect. In such cases, neither a strict non-interventionist ethic (as might be applied to distant wilderness conservation), nor a maximalist duty of intervening (which would imply suspending any project that risks animal harm), offers a feasible moral approach. To navigate this complexity, I mostly draw on Donaldson and Kymlicka (2014), which offers a framework for understanding interspecies interaction through the lens of political theory, highlighting the role of animal agency and the inevitability of coexistence within shared environments. Building on the concept of "spillover harm" (Donaldson and Kymlicka 2014), the article argues that energy stakeholders have a moral responsibility toward sentient non-human agents, which

share increasingly overlapping habitats with humans, particularly in the Anthropocene, where human activities deeply reshape ecosystems and blur the boundaries between human and non-human worlds. This chapter contributes to the overarching research question of the thesis by emphasizing how ethical reasoning can motivate energy stakeholders to account for non-human beings in energy infrastructure planning. Rather than prescribing specific moral obligations, the article seeks to foster ethical reflection: urging stakeholders to consider the ethical dimensions of their decisions, and calling upon philosophers to engage more actively in the discourse surrounding energy transitions.

Finally, Chapter Four, titled *"Not Enough (Yet): A Capabilities Assessment of the Implementation of Energy Poverty Policies in Italy"*, focuses on energy-poor individuals as often-overlooked subjects in energy transition processes. The article draws on empirical insights gained during an internship at RSE S.p.A., a Milan-based research company specializing in energy systems[6]. The analysis introduces the notion of an "effectiveness gap" to describe the divergence between the policy goals of alleviating energy poverty, the actual implementation of those policies, and their limited outcomes to date. Framed by the capability approach, the article evaluates the extent to which current Italian energy transition policies effectively address energy poverty. The capability approach shifts the focus from abstract ideals to the real-life conditions that constrain or enable individuals' well-being (Sen 2009; Nussbaum 2000; 2006) (a detailed overview of the theoretical framework of the capability approach is provided, see Chapter Four). This theory focuses its attention to how structural, environmental, and personal factors influence the conversion of resources into meaningful outcomes. From a capabilitarian perspective, well-being is not determined solely by the availability of resources, but also by individuals' ability to convert those resources into meaningful functionings, achievements of being and doing. These abilities are shaped by a variety of "conversion factors," both internal (e.g., health, age, gender) and external (e.g., infrastructure, policy design, socioeconomic conditions). The article addresses two specific research questions: *Are*

[6] https://www.rse-web.it/en/.

current energy transition policies in Italy addressing the issue of energy poverty? and, if this is not the case, can such energy transition policies be deemed unjust? The analysis shows that Italian energy transition policies insufficiently account for the conversion factors affecting energy-poor populations, thereby risking their exclusion from public incentive schemes and limiting their ability to benefit from the transition. By responding these questions, this work contributes to the overarching research inquiry by demonstrating how normative ethical analysis can reveal structural injustices embedded in policy design. Co-authored also with a social scientist and an engineer, this interdisciplinary work highlights the distinct role of philosophy in interpreting empirical data and formulating normative conclusions. It ultimately calls for the development of more inclusive energy policies that promote the agency, dignity, and freedom of choice of energy-poor individuals.

1.3.4. Bringing Different Theories Together

This dissertation brings together environmental philosophy, animal ethics, and the capability approach to explore energy-related issues. As outlined earlier (see 1.3.2), the aim is to demonstrate the relevance of ethical reflections in shaping energy policy. Rather than adhering to a single theory, this work adopts a pluralistic perspective.

While the articles of this dissertation do not explicitly develop a shared theoretical core, a thematic thread becomes apparent when they are viewed in relation to one another. Each engages, in different ways, with ethical approaches that challenge the dominance of abstract rationalism and highlight the significance of emotion, care, and embodied experience. This underlying concern is not foregrounded in the individual chapters, but can be drawn out here as a point of convergence across otherwise distinct frameworks.

Sen and Nussbaum's capability approach departs from moral rationalism by recognizing emotions as essential to ethical reasoning. Nussbaum describes emotions such as compassion and indignation as "upheavals of thought" (2001), integral to rational processes and justice. Sen similarly rejects "transcendental institutionalism" (2009) in favor of grounding justice in real experiences of injustice, emphasizing that

emotions are not irrational impulses but vital components of ethical reflection: "Reason and emotion play complementary roles in human reflection" (2009, 39). Ecofeminist thinkers, such as Plumwood (1993), Gaard (2001), and Kheel (1985), critique Western philosophy's privileging of reason over emotion, relationality, and care. Ecofeminist ethics centers these dimensions, highlighting the moral significance of interdependence, vulnerability, and affective responsiveness toward both human and non-human others. Finally, animal ethics also underscores the ethical importance of affect, through the concept of sentience. Bentham's famous provocation "The question is not, Can they *reason*? nor, Can they *talk*? but, Can they suffer?" (Bentham 1988, 311, I ed. 1789) shifts moral consideration from rational capacity to sentience. Contemporary animal ethicists build on this insight, arguing that empathy and emotional attunement are central to ethical agency. These perspectives reject detached abstraction in favor of moral responsiveness grounded in feeling and connection.

The emphasis on the *affective dimension* of ethics is particularly important in the context of energy, technology, and climate change. Roeser (2012), for instance, argues that emotions play a crucial role in understanding and motivating responses to climate change. She challenges the common assumption that emotions are irrational, instead presenting them as vital sources of ethical insight and practical judgment. Emotions, such as compassion, fear, and indignation, can illuminate the moral dimensions of climate risks and serve as powerful motivators for behavioral change. By engaging people's emotions (rather than relying solely on statistical information) risk communication can foster a deeper moral awareness and drive public engagement toward more sustainable actions (see also Roeser and Pesch 2016; Steinert and Roeser 2020).

Rationally driven theories of a "just energy transition" often fall short when they lack grounding in real-world experience and fail to engage emotional awareness and moral imagination. Ethical change - at individual, corporate, or governmental levels - requires not just rational argument but the ability to resonate with what people feel. Ecofeminsim, animal ethics, and the capability approach exemplify ethical theories that integrate in their considerations an affective dimension.

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Chapter Two

"Just" Energy? An Ecofeminist Analysis & Critique of a Predominant Conception of Energy

Abstract

Background This theoretical paper offers an ecofeminist analysis and critique of a specific conception of energy. The hypothesis is that, at least in the Western context, there is a characteristic socio-economic understanding of energy as a resource and commodity for human needs and the development of human societies. This conception corresponds to a cultural understanding that is both different from and broader than the scientific notion of energy. Such a conception has become part of several narratives, including energy policy. Our research question is: *does this conception of energy as a commodity and resource affect the relation between humans and nature? And if so, how?*

Results Drawing on the work of Val Plumwood, and Greta Gaard, we argue that conceiving of energy as a resource and commodity for human needs and the socio-economic development of human societies reinforces and mediates the hierarchical and oppressive dualism "human-

nature", thus contributing to backgrounding, excluding, incorporating, and instrumentalizing some parts of nonhuman nature as well as some human groups.
Conclusions The idea of energy as a commodity shapes public debates and policies, worsening existing environmental issues. This dominant perspective affects how people respond to environmental challenges and crises, both individually and collectively. This article aims to encourage more critical and open discussions about energy. It suggests that researchers and policymakers adopt more radical and less oppressive approaches in their academic work, benefiting both the human and non-human world.

Keywords: energy; conception of energy; ecofeminism; energy justice; environmental ethics; energy ethics

2.1. Background

Many countries are today transitioning their energy systems from fossil-based sources to more sustainable and less resource-intensive alternatives. Energy transitions constitute massive and complex transformations of socio-technical systems. Energy social sciences, energy humanities, and energy ethics have developed as the main fields that address the societal, cultural, economic, and political dimensions of energy transitions. A few approaches that have emerged within energy justice literature have become the primary means of tackling these dimensions, especially regarding issues of injustice, poverty, and related policies and governance. In an attempt to better connect those fields with that of environmental ethics, this article offers an ecofeminist analysis and critique of a specific conception of energy. The term "energy" is central in many current research areas and debates, ranging from physics to socio-political issues such as energy justice (Walker and Day 2012; McCauley et al. 2013; Bombaerts et al. 2020), energy ethics (Bethem et al. 2020; Frigo and Hillerbrand 2021; Hillerbrand and Goldammer 2018b; Sovacool 2013), and energy democracy (Becker and Naumann 2017; Burke and Stephens 2017; van Veelen and van der Horst 2018; Stephens 2019; Sorman, Turhan, and Rosas-Casals 2020). From a scientific standpoint, textbooks typically define energy as "[t]he potential or capacity of a body or system to do work […] by virtue of its motion, position, chemical structure, etc., frequently regarded as a quantifiable attribute or property which can be

acquired, transferred, and expended"[7]. This scientific conception of energy has long been studied by historians of science and technology (e.g., Lopes Coelho 2009), feminist political ecology scholars (e.g., Daggett 2019), physicists (e.g., Coopersmith 2015), and cultural critics (Illich 2013). However, as scholars have pointed out, besides this understanding of energy, the conception encompasses "multiple meanings in both its every day and more technical uses" (Illich 2013, 3). In this article, we maintain that this way of conceiving of energy is "just" one among others, although it is predominant for (good) techno-scientific and engineering reasons[8]. In other words, beyond the scientific understanding of energy, there are also additional "meanings of energy", and different usages of the term are currently at play in various domains and discourses (i.e., economics, sociology, anthropology, environmental and climate ethics). These "multiple meanings" are often only indirectly connected to the scientific conception of energy and do not coincide with it (Rupp 2013; Illich 2013).[9] In these other cases, we are dealing with conceptions or understandings that are value-laden according to the specific socio-economic context in which they occur, and sometimes contain normative elements. For example, in discourses as diverse as poverty studies (Bartiaux 2021; Bouzarovski, Thomson, and Cornelis 2021), economics (Goldemberg and Johansson, Thomas B. 1995; Ayres and Warr 2009), or public policy (Goldthau 2013; Araújo 2017), the term energy seems to signify different things, such as a means to alleviate suffering and improve well-being (i.e., energy services), a commodity, or the processes of conversion, distribution, and use of resources for human benefit, respectively. In principle, these alternative "meanings of energy" can be discovered and studied within specific debates (e.g., just energy transition, energy poverty, energy justice energy policy, energy geopolitics). So far, however, these multi-faceted meanings have rarely been addressed as a specific object

[7] https://www.oed.com/dictionary/energy_n?tab=meaning_and_use#5622769.

[8] The term "just" in the title is purposefully ambivalent as it can mean "only" but also "right". In general, however, we mostly intend the former, while the latter is intended to be provocative.

[9] Whilst a concept refers to a general idea or understanding of something, a conception indicates the way in which something is perceived or the ability to form or understand mental concepts and abstractions. Here, we avoid using the term (energy) "concept" but use (energy) "conception", or "understanding" essentially as synonyms in the sense of conceptions of energy that are, for the most part, unconscious and tacit. For a more analytic discussion of the concept-conception distinction, see, e.g., (Ezcurdia 1998) or (Swift 2013, 33–44).

of research. Even scholarship in energy social sciences tends to tacitly assume some of these understandings when energy-related expressions are used without questioning or problematizing them. For example, in EU energy policy documents (for more info see 2.5.), the term energy is used in various ways and in association with many other terms as part of specific linguistic expressions (e.g., "energy transitions", "energy poverty", "energy systems", "energy justice", "energy technologies", "renewable energy", "energy sources" and so forth). In these policy documents, energy is primarily viewed as *a resource and commodity for human use and benefit*[10]. Some expressions stress an economic orientation and refer to energy as something that humans require, pay for, produce, generate, convert, obtain from natural resources, use and consume, manage, and save, and eventually dispose of. Simultaneously, policy documents usually assume that the environment primarily matters insofar as it supports fundamental human needs and interests, thus reinforcing instrumental attitudes and visions towards nature as it relates to energy provision. This is well summarized in sentences such as: "what is good for the planet is good for people and the economy" (European Commission 2021a, 2), or "If we help delicate land and ocean ecosystems recover, they can provide for life on the planet and fulfill their role in the fight against climate change" (Tornel 2022).

Our hypothesis is that there exists, at least in the Western context, a characteristic socio-economic understanding of energy as a resource and commodity for meeting human needs and the socio-economic development of human societies. This conception of energy as a commodity and resource for human beings has recently begun to be addressed by scholars. For instance, moving from political ecology, Tornel (2022) explores the capitalistic and fetishized conception of energy implied in energy justice studies, defining energy as "a tool for subjugation and domination" (2022, 15). Cederlöf (2021) acknowledges that even in political ecology, energy is considered "an object for human appropriation" (p. 70) and as a "resource" (ivi, p. 71). From his perspective, this conception leads "to contentious extractive

[10] Conceptualizing energy as a (re)source represents a precondition for conceptualizing it as a commodity. In other terms, while most, if not all, human groups conceptualize energy as the former, only some human groups understand energy also as the latter.

geographies and unequal distributive outcomes" (ivi, 81). From a Marxist and historical standpoint, Pirani (2021) analyzes the commodification process, which has brought "many people – including, but not only, politicians and economists – [to] refer to 'energy' as something that is being, or even must be, bought and sold" (p. 1). Moreover, he illustrates the categorization of energy carriers and resources (e.g., wood, coal, and other fuels) as commodities. In this regard, as Urry proposes, energy could be considered the "precondition of all commodities" (Urry 2014, 3, quoting Schumacher).

Finally, the conception of energy as a commodity for humans has been questioned also from marginalized worldviews, thus contributing to a sharper decolonial awareness in energy social studies (Tornel 2022; Sovacool et al. 2023; Dunlap and Tornel 2023). For example, the members of the social movement Luz y Fuerza del Pueblo working in Chiapas, Mexico, reject "any conception of electricity as a 'commodity', 'good' or 'service' that is subject to market laws" (Cao and Frigo 2021) and support a conception of energy as a right connected to Madre Tierra.

Remarkably, in all these and other studies concerning the conception of energy as a commodity, there is always a reference to the corresponding understanding of nature. This may depend on the fact that - in the words of human geographer Calvert - energy is "the primary mediator in the human-environment relationship" (Calvert 2016, 106). Bearing this in mind, in this article we focus on the "energy-nature relation" to signify the relation between energy and nature as they are primarily conceptualized by humans, at least in the Western context[11].

This relationship between energy and nature is particularly relevant today, as the effects of the energy sector on the environment become increasingly apparent[12]. The energy sector is a major contributor to environmental degradation, including air

[11] In energy studies, some authors have already investigated the "energy-society relation" (Mitcham and Rolston 2013; Shove and Walker 2014). When referring to the Western world, it is important to note that terms such as "Western", "non-Western", "Global South", "Global North", "developing" and "developed" can be problematic and subject to debate. In this context, the term "Western" is used to describe the cultural, economic, and socio-political contexts of Europe, North America, and parts of Australasia, which have been heavily influenced by a predominantly capitalist and neoliberal worldview.

[12] https://www.iea.org/topics/climate-change.

pollution, greenhouse gas emissions, and habitat destruction. To create more sustainable societies, reforming the energy system is essential. However, this reform must go beyond mere technological advancements. We believe that true reform starts with a deeper engagement in understanding terms such as "sustainability" and "energy". This understanding can illuminate the shortcomings of current strategies and help set and achieve ambitious ecological goals. For example, fossil fuels, which still dominate the global energy mix, are a leading source of carbon emissions, contributing significantly to climate change and health issues. Transitioning to renewable energy sources like wind, solar, and hydroelectric power is crucial, but also requires a cultural and systemic shift in how we perceive and use energy.

We offer a partial and theoretical answer to the following broad question: *Does the conception of energy as a commodity and resource affect the relation between humans and nature? And if so, how?* People "learn" to conceptualize energy as a resource and commodity for humans through education and socialization. For instance, nature figures necessarily as an energy (re)source when it provides fuels or nutrients. Of course, we do not deny that humans rely on nature and the energy sources that come from it, or that humans need to use these resources in order to survive and thrive. Rather, a prevalent understanding of energy as a resource and commodity for humans contributes also to worsening socio-ecological problems.

We suggest that the way policy makers and practitioners conceptualize and talk about energy reinforces dualisms which are taken up as theoretical assumptions within policy documents.

To understand if and in which terms the conception of energy outlined above affects the relation between humans and nature, we rely on the specific ecofeminist contributions of Greta Gaard and Val Plumwood.

Since the 1970s, environmental ethicists have considered the topic of energy (McShane 2009) by addressing issues such as pollution derived from energy conversion, distribution, and waste, moral obligations and responsibilities towards future generations, non-human beings, and ecosystems. However, *explicit* engagements with the *conception* of energy have not been very common (i.e., it seems that only a few titles contain the term "energy", e.g., (Frigo 2018)). We suggest that a

philosophical analysis of conceptions of energy could be useful to unveil additional theoretical assumptions connected to, for example, Western, patriarchal, and gendered dimensions that have been underexplored in energy social science research (Sovacool et al. 2023). Ecofeminists have long integrated gendered perspectives with environmental issues, advocating for ecological sustainability beyond economic globalization. As far as the energy sector is concerned, Brownhill and Turner, for instance, use an ecofeminist lens to examine the role of women in community resistance against oil companies in Nigeria, responsible for the exploitation of indigenous people, including women, and the environmental degradation of the country (2009). While various perspectives could be used to reflect on these issues, we intentionally focus on ecofeminism to hypothesize that by conceptualizing energy as a commodity, some parts of nature (humans and nonhumans, living and nonliving beings and entities) become commodified for human aims and benefits. Recent research has highlighted the benefits of ecofeminist analysis in energy social studies, particularly regarding the intersectional dimensions of many energy-related issues (Sovacool et al. 2023; Brownhill and Turner 2009). For example, Sovacool et al. (2023) suggest incorporating ecofeminist perspectives into energy social science scholarship. However, there is a risk that incorporating critical voices such as ecofeminism into the mainstream discourse of a particular domain may perpetuate a colonizing logic of oppression in which the oppressed subjects, their voices and claims, are swallowed up in the discourse they aim to criticize (Plumwood 1993)[13]. Therefore, we argue that ecofeminist approaches should not be included an afterthought into an existing framework such as energy justice. On the contrary, ecofeminist analysis and critique should become an additional framing for discussion of energy discourses. The main reasons we believe that ecofeminism appears

[13] Similarly, Dunlap and Tornel (2023) criticize Sovacool et al.'s article (2023) affirming that it "still reads as if it is trying to integrate these critical or rebellious positionalities into the dominate framework of modernist energy development (2023, 3). It is also striking to note that Dunlap and Tornel denounce that "[f]rom a liberal governance perspective, feminism, Indigenism and anti-racism [...] are not simply condemned anymore, but can be managed, inserted into a system of political utility, extractive development and regulated for the 'greater good' of economic growth and development " (2023, 4).

particularly suitable for addressing the conception of energy and its socio-ecological implications lie in its longstanding, 1) analysis of hierarchical value dualisms such as human-nature (see section 2.2), and 2) critique of seemingly neutral conceptions that shape narratives about the past, present, and future (Barca 2020). Regarding energy as a resource and commodity, we argue that narrow, economically driven understandings of energy predominantly inform techno-fix solutions and narratives for addressing socio-ecological crises. These narratives may disregard the perspectives and interests of many marginalized human and non-human beings, thus worsening socio-ecological crises (Brownhill and Turner 2009). The problem with the commodification of energy is that in practice it means the commodification of nature, or the reification of the non-human world. The premise of this study is that there is a need for more critical lenses (such as ecofeminism) within the existing energy social science and humanities studies and energy research, broadly constructed.

Situated at the crossroads between environmental and energy ethics, this article aims to provide a missing link (Groves et al. 2021) between the conceptual tools offered by ecofeminist authors like Gaard and Plumwood and a particular conception of energy that seems to affect the human-nature relation. In doing so, the article aims to deepen the relationship between environmental philosophy and energy social studies.

The article is developed as follows: in section 2.2, first the ecofeminist theoretical background is presented and connected with energy issues. Second, the specific theoretical contributions of Gaard and Plumwood are used to address the research question. Following these accounts, we argue that backgrounding, instrumentalism, incorporation, and hyper-separation (Plumwood 1993) of nonhuman nature as well as some human groups work through the understanding of energy as a distinct and indispensable product, resource, or commodity for human needs and socio-economic development. For instance, by placing emphasis on energy as a substance, or as a commodity to trade and consume, parts of nonhuman and human nature are confined to the background, thus making them ready to be instrumental zed. In section 2.3 we draw our conclusions.

2.2. Towards an Ecofeminist Perspective in Energy Studies

2.2.1. Ecofeminist Theoretical Background

In this section, we introduce the perspective of ecofeminism, an important area of scholarship that has emerged within environmental philosophy since the 1970s (Buckingham 2004) and has also functioned as an "activist and research movement" (Lauwers 2016). We present some of the characteristic themes explored by ecofeminists and briefly address the connections to energy research. This serves as an overview to discuss how Greta Gaard's and Val Plumwood's ecofeminist analyses of the hierarchical dualistic logics behind the human-nature relation help address the conception of energy as a resource and commodity.

Ecofeminism includes various perspectives and schools of thought, so it is better to refer to "ecofeminist approaches" (Buckingham 2004, 147) instead of assuming a uniform set of ideas common to a supposed unified ecofeminist view. The term "ecofeminisms" (Di Chiro 2021) acknowledges the diversity and richness of perspectives. Scholars in this field have discussed how ecological issues should be viewed through a gendered lens and have specifically focused on the relationship between women and nature. Some ecofeminists have privileged analysis based on socio-constructivist and materialist approaches, arguing that the oppression of women and nature is linked to the roles and activities typically performed by women in certain societies and economies, such as nurturing and caring (Mellor 2006)[14]. During the 1990s, some ecofeminist scholars moved from examining the links among oppressed groups to tackling the underlying reasons for structural oppression (Gaard 2011, 31–32). In this article, we draw from these developments and consider this theoretical shift as the cornerstone of our approach.

[14] Some early ecofeminists focused their efforts on supposed feminine/biological qualities and attitudes of women, which would make them inherently closer to nature. This conceptual movement - rooted in the desire to positively evaluate what had been traditionally devalued in Western society - has been strongly criticized and charged with essentialism especially by some feminist philosophers (Biehl 1991), who claimed it relegated women to the natural sphere, thus reaffirming what most feminists were condemning. Along with the essentialist critique, others have been developed, such as those of biologism and "utopianism" (e.g., Sargisson 2001).

2.2.2. Ecofeminist Themes Intersecting Energy Issues

Ecofeminist thought considers non-human nature as a feminist issue and investigates the interconnections between gender, nature, race, species, and class intended as intersectional dimensions. The core premise of ecofeminism is that "how we treat nature and how we treat each other are inseparably linked" (Gaard 2001, 158). In the context of energy consumption, focusing on intersectionality allows for a comprehensive understanding of the experiences of marginalized groups, whose various forms of oppression intersect both theoretically and practically (Di Chiro 2021). This perspective can be applied to explore energy injustices, such as those related to the use of cook stoves in the Global South, which are particularly detrimental to the environment, and also to women's health due to their social roles (Moniruzzaman and Day 2020). Ecofeminism could contribute significantly to energy social studies by highlighting the marginalization of women's care practices and roles (Warren 1990; Merchant 2003; Mellor 2006). This marginalization is often reflected in energy consumption patterns and related problems. Research indicates a gendered aspect of energy poverty, as women are mostly responsible for household chores, and are more exposed to energy poverty (Sánchez-Guevara Sánchez, Sanz Fernández, and Núñez Peiró 2020; J. S. Clancy, Skutsch, and Batchelor 2002; J. Clancy et al. 2020; Oviedo-Toral, François, and Poganietz 2021)[15]. Furthermore, ecofeminism can contribute to the examination of power dynamics and how they can exclude, subjugate, or empower individuals (Gaard 2001) in the energy sector. Energy is a form of power that can create dependencies (Groves et al. 2021) and hierarchies on a wide range of levels (e.g., geopolitical level). Ecofeminism has long examined power dynamics and social structures as well as understanding how different forms of oppression are linked. The analysis of power relationships seems an essential step in addressing social and environmental issues. The centrality of such an analysis seems

[15] Ecofeminism has contributed also to the development of care ethics (Cross 2018; MacGregor 2004). Although care ethics still represents a minority voice in energy social sciences, in the last few years there have been a few attempts to contribute in this direction (Groves et al. 2021, e.g. Wågström and Michael 2023; Gram-Hanssen, Christensen, and Madsen 2022).

to be demonstrated considering that some energy research scholars have started to explore content and attitudes that resemble ecofeminist themes. For example, there is a growing literature stressing the importance of (network of) relationships and hierarchies within socio-technical energy systems (e.g., Tornel 2022; Boyer 2011; Urry 2014), and some studies, for instance, Damgaard et al. (2022) challenge individualistic frameworks associated with energy choices and responsibilities, moving towards "[r]elational understandings of energy systems and a language of interconnectedness" (2022, 8).

Another valuable contribution of ecofeminism to energy studies is its critique of technological optimism. The energy transition is today considered the most feasible way to address environmental issues, shifting from old to new energy resources. This shift emphasizes new energy technologies and infrastructure, while behavioral changes and social practices affecting energy consumption remain secondary (Shove and Wilhite 1999). However, the general belief that this process is just a technological one is today extensively criticized (Schuster et al. 2023; Carley and Konisky 2020). On an ecofeminist account, environmental problems cannot be simply resolved by modernizing existing polluting technologies. The criticism is that overoptimistic narratives about (energy) technological progress fail to recognize how ecological problems are deeply rooted in Western ways of conceptualizing relations and subjects[16]. Promoting (energy) technological solutions as if they were the *only* reliable solutions - that is embracing technological determinism - may deny and marginalize alternative trajectories or solutions.

Finally, ecofeminism addresses the core issue of this article (e.g., the understanding of energy and its implications for the relationship between humans and nature) by examining the "value dualisms" (Warren 1990) typical of Western thought, such as the nature-human dualism[17]. A "value dualism" is a dualism that historically formed

[16] For example, the optimistic outlook on technological innovation put forth by eco-modernists (see, e.g., Asafu-Adjaye et al. 2015) seems shortsighted when considered through an ecofeminist lens (Barca 2020).

[17] In ecofeminist terms, nature is a concept that includes entities and beings that are often undervalued. Interestingly, to this category belong not only non-human beings but also marginalized human groups, stressing that the term "humanity" should be used to denote only those human beings in positions of power rather than the entire human species (Plumwood, 1993, Barca 2020).

part of the foundation of how Western culture views the world (Plumwood 1993; Gaard 2001)[18]. These dualisms are not merely paired opposites but hierarchical, with one term valued over the other. Ecofeminism argues that hierarchical value dualisms result in the oppression and domination of the subjugated term (e.g., male-female).

By challenging these dualisms, ecofeminism offers a critical framework for understanding and addressing the interconnected oppressions affecting both humans and nature.

In the following, we focus on the human-nature relation and explore the application of Gaard's and Plumwood's analyses to the conception of energy as outlined in section 2.1.

2.2.3. The "Energy – Nature" Relation through an Ecofeminist Lens: Applying Gaard's and Plumwood's Critiques

Reiterating our research question, *does the conception of energy as commodity and resource affect the relation between humans and nature? If so, how?* We now provide a response to by focusing on the specific ecofeminist contributions of Greta Gaard and Val Plumwood.

Among ecofeminist scholars, Greta Gaard explores the connections between the treatment of women, nature, indigenous people, and water by chasing the distribution processes of energy in North America. In her article *Women, Water, Energy* (2001), she identifies a series of tendencies among energy companies' conduct. Examples of these trends are: siting their power plants in rural areas, depleting water reservoirs, polluting the environment, harming local people's health, and then supplying energy to wealthy urban populations (Gaard 2001). Through the adoption of Val Plumwood's (1993) critique (see below), Gaard shows many overlapping and veiled associations (or linking postulates, in Plumwood's terms, 1993) among the condition and consideration of water, women, indigenous people, and some socio-economic social

[18] The relationship between humans and nature is at the core of any environmental ethic. Moreover, the separation of humans from the rest of nature has been interrogated by many scholars adopting different conceptual lenses, including Bruno Latour (2018), Jason Moore (2016b), and Philippe De Scola (2021).

groups. Gaard considers the energy system as emblematic of realizing how environmental sexism, environmental racism, and environmental classism take place as interwoven phenomena. She identifies a "linear model" through which the relation between energy and nature is displayed in the conversion and distribution of energy, and writes:

"[A]s inhabitants of Western culture we are conditioned to think about water [...] and about power. Our conception of power and energy, as well as our relationship to water, is based on a linear model that is now showing itself to be not only inaccurate but life-threatening. This linear model is based on the assumption that energy can be continuously extracted from nature - from water, from poor people, from people of color, from women [...]. In the linear model of power production, energy is extracted, distributed, consumed, and in the process, wastes are produced" (Gaard 2001, 167).

This linear model relies on a "conception of power and energy" as well as on a specific "assumption" concerning energy. We note that the conception of energy Gaard criticizes is similar to the conception of energy as a commodity and resource for humans highlighted in the "Background" section of this article and largely used in engineering and economic practices: a commodity that is crucial in mediating the human-nature relation. Drawing on Plumwood's critical lens, Gaard tracks the root of current environmental problems to the extractivist and nature-subordinating linear model operating in Western thought. On top of this aspect, we stress how the very conception of energy as a commodity contributes to reinforcing and reproducing continuously the mindset of the linear model. We underline that this peculiar and not-neutral conception of energy influences Western narratives and may contribute to worsening or exacerbating the ecological crises. Among ecofeminists, Val Plumwood's (1993) critique is emblematic of such potential. According to her analysis, the multiple forms of oppression experienced by different human groups (e.g., women, some indigenous groups, marginalized people, etc.) and other parts of nonhuman nature (e.g., nonhuman animals) are interlocked under the same oppressive conceptual structure. Plumwood describes this structure based on a logic of dualisms

that are hierarchically ordered. In her explanation of how hierarchical dualisms work (cfr. Section 2.2.2), Plumwood introduces the components of the "logical structure of dualism" (Plumwood 1993, 47) that make it possible to devalue one of the two terms of any dualistic relation:

1) Backgrounding (denial of dependence and/or existence)
2) Radical exclusion (hyperseparation)
3) Incorporation (relational definition)
4) Instrumentalism (objectification).
5) Homogenization

One of the key pairs she proposes is the so-called "human-nature" dualism (see above)[19]. According to Plumwood, this dualism informs and shapes Western thought in a way that contributes to backgrounding nature, denying human dependency on it, and hyper-separating it from humans. Nature is defined by its relation to humans who are then able to instrumentalize and homogenize it.

We propose that the conception of energy as a commodity and resource for humans implies and reinforces the "logical structure of dualism", thus denoting a certain energy-nature relation. Conceptualizing energy as a commodity backgrounds the subjects who are directly and indirectly affected in the process of energy conversion, distribution, and consumption. In the background of these processes, there are people working in cobalt mines; there are dislocated villages for the extraction of lithium (Escosteguy et al. 2022); there are heavily impacted biotic and a-biotic components of ecosystems. When energy is conceptualized merely as a resource and commodity for humans, a third element is introduced between "human" and "nature" in the form of a (material) substance of its own[20]. Paradoxically, energy as a commodity contributes also to the incorporation (relational definition) of nature into the sphere of humanity (as a sort of possession) because some parts of nature become

[19] "I argue that Western culture has treated the human-nature relation as a dualism and that this explains many of the problematic features of the West's treatment of nature which underlie the environmental crisis, especially the Western construction of human identity as 'outside' nature" (Plumwood 1993, 3).
[20] (Cfr. on the substantiation of energy, Lopes Coelho 2009; Adams 2004; Cederlöf 2021).

predominantly depicted through the energy needs of humans.[21] Wind, water, sunbeams, plants, and lands became primary energy sources, forms of fuel with some qualities, which make sense only if associated with the conception of energy (renewable, clean sources, etc.) Finally, as a "corollary" (Plumwood 1993, 52) of these three characteristics of dualisms (backgrounding, hyper-separation, and incorporation) there is the instrumentalization of nature. This applies to the commodified parts of nature that are necessary to obtain energy (i.e., plants, animals, ecosystems) as well as those that are not commodified yet (i.e., human beings who are in different ways and extents involved in energy extraction and similar processes). Both, nevertheless, are taken for granted in meeting the stupendous growing energy demand (Birol 2022). Conceiving energy as a resource and commodity for humans reinforces and reproduces the human-nature dualism, along with a hierarchy of values. From an ecofeminist point of view, in this hierarchical and oppressive structure (or "linear model", in the words of Greta Gaard), narrow anthropocentric assumptions which reduce nature primarily to a resource thrive, thus contributing to the exploitation of and domination over nature and the exacerbation of existing environmental issues. The key critical contribution of the ecofeminist analysis consists in showing that both other-than-humans *and* some humans are backgrounded, instrumentalized (Plumwood 1993) for the sake of energy extraction and provision, and disregarded. In this way, the ecofeminist critique assumes that some human groups are more responsible than others for causing environmental harms (Di Chiro 2017). Meanwhile, it highlights that some other human groups are threatened in a way similar to non-human beings and entities, thus stressing that dualistic logics and structures oppress some humans too and that humans, overall, should be understood as being part of nature.

Addressing the research question above by relying on an ecofeminist account, we believe that a narrow socio-economic conception of energy as a resource and commodity for humans does indeed affect the human-nature relation, and it does so

[21] "The definition of the other in relation to the self as a lack or absence is a special case of incorporation, defining the other only in relation to the self, or the self's needs and desires". (Plumwood 1993, 52).

by reinforcing the "logical structure of dualisms". The predominance of this energy conception shapes public narratives, discussions, and academic discourses about energy. We suggest that this view, along with its assumptions about nature, limits alternative narratives and pathways for current and future energy transitions. Accordingly, this dominant energy perspective influences how people envision their individual and collective responses to the various environmental challenges and crises.

2.3. Conclusions

This theoretical article focuses on conceptions of energy. We suggested that energy is not one single neutral term transcending socio-cultural and economic contexts, but it is used with different meanings and through various expressions and this usage of the term affects how we view the world and us as human beings in it. In section 2.1, we focused on a conception of energy primarily seen through the prism of economics and markets: something to commodify and monetize; something that humans must necessarily pay for, extract, generate through conversions, manage, use, and conserve before eventually disposing of it.

Adopting an ecofeminist analysis and critique, this article argues that the conception of energy as a resource and commodity for humans may affect the human-nature relation. According to this understanding, energy would be a resource or a product that originates primarily outside of the human sphere, something that humans exploit, extract, transform, consume, use, manage, regulate and, in any case, rely on. The problem with this way of conceptualizing energy is not that energy can be used as a resource for human needs. The issue is that when this understanding of energy as a resource or commodity is the only or predominant one, it contributes to excluding some other parts of nature (human and nonhuman) that are directly or indirectly affected (i.e., natural entities and beings). What is crucial is that such a conception of energy becomes part of and predominant within the narratives created by various actors and institutions that deal with energy and environmental issues (see 2.5. for example EU energy policies). These narratives may in turn influence and shape

different (public) debates (e.g., geopolitical discussions, energy research in social sciences) and have practical implications in terms of public policy, practices, and actions (e.g., justification of energy projects, energy poverty measures). Hence, such a conception of energy may contribute to worsening existing environmental issues.

We drew from Gaard's and Plumwood's analyses of the "logical structure" of hierarchical dualisms and indicate that when energy is conceptualized as and therefore assumed to be a resource and commodity for humans, there is a risk of reinforcing narratives in which parts of nature and some humans are neglected, backgrounded, separated from what we perceive as (more) valuable, dependent in their very definition on human needs (incorporation), and instrumentalized.

This ecofeminist analysis and critique may help energy humanities and social science scholars to acknowledge and highlight gender, race, indigenous, and species inequalities, and the power imbalances embedded in and constitutive of socio-economic and political energy transitions. But is it possible to move beyond a conception of energy as a resource and commodity for humans? What would that entail theoretically and practically? Addressing these questions could be the next step of this research. The aim of this article is not to offer an alternative ecofeminist conception of energy but rather an invitation to consider an ecofeminist analysis and critique as a helpful approach in framing public narratives and discussion about energy as well as academic discussions, discourses, and research in a more radical, critical, open, and less oppressive manner. Although more research is needed to craft energy narratives, we agree with Mitcham and Rolston when they conclude: "Are there not other perspectives from history to art, poetry, psychology, and religion that could further de-constrain and enrich the way people think about energy?" (2013, 318). The idea we have presented in this article is that a well-affirmed energy conception affects narratives within policies and beyond. To the end, we recommend working on the power of alternatives and marginalized narratives to help question and deconstruct long-standing theoretical assumptions, which may have tremendous practical implications.

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2.5. Appendix 1

2.5.1. Methods and Data Selection Procedure

As mentioned in the article, we assume that there are other conceptions of energy at play in different domains that are not identical to the scientific one, even though they may be indirectly connected to it. In the article, we focused on the conceptualization of energy as "a resource and commodity for humans". In this appendix, we are interested in identifying whether there are linguistic instances in EU policy documents that correspond to the "tendency to conceptualize energy as a generic resource**"** (Shove and Walker 2014, 45) and as a commodity for human beings.

In order to investigate this hypothesis and provide evidence for the theoretical claims that follow in the upcoming sections, we turn to the specific yet influential domain of energy policy produced by EU political bodies. To exemplify this, we conducted a discourse and content analysis of 11 EU documents that have been published in

English since the Paris Agreement (2015) (See Table 1). We searched for linguistic expressions, coded them according to both inductive and deductive categories and then interpreted the results.

We decided to focus on the European level energy policy discourse primarily because - as the analysis repeatedly revealed - the EU claims to play a leading role in the energy transition, welcoming the fact that its own direction in energy policy matters "has now been followed by other countries all over the world" (European Commission 2019a, 3). The selected documents are primarily EU communications[22] that provide the latest strategies and pathways to achieve the objectives of the Paris Agreement. Moreover, all these documents discuss energy-related issues and emphasize the importance of transitioning to cleaner and renewable energy sources. Each communication presents different aspects of energy transitions within the European context: from those explaining the EU's energy transition strategies in general (i.e., the 13 legislative proposals that make up the "Fit for 55" package (European Commission 2021a) or the European Green New Deal (European Commission 2019c) to those responding to particular energy transition challenges (e.g., the transition in the financial and industrial sector or the issue of raw materials), to those framing the energy transition in a specific historical moment (e.g., specific measures during the pandemic, 2020, or the REPowerEU Plan, 2022, in the aftermath of Russia's invasion of Ukraine).

We used Atlas.ti to analyze the 11 documents. We searched the most salient occurrences of the word "energy" within various expressions and combinations (e.g., "energy efficiency", "energy poverty", "renewable energy", "sustainable energy"). However, we did not code certain occurrences when they were irrelevant (e.g. when the term "energy" was coupled with "policy" in the expression "energy policy") or when it occurred repeatedly in the same passage with an identical meaning. We created 25 different codes for the most salient and frequent energy-related linguistic

[22] An EU Communication evaluates, clarifies, and interprets policies, provides frameworks for interpretation, notifies of concrete measures, and initiates policy debates without creating new policies or directly affecting member states.
Cfr: https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vh7dptp45uyn.

expressions present in these documents (see fig. 1). The majority of these codes were created *a priori* based on our previous knowledge and intuition, others emerged from in-depth reading of the documents (i.e., they are the result of additional meanings we did not anticipate but found while analyzing the texts). Some codes were clustered together when occurrences and expressions seemed to refer to the same essential meaning. For instance, we clustered expressions such as "energy bills", "energy costs", and "energy markets" under the label "energy business/management/money/commodity". Our selection does not aim to be exhaustive but rather to illustrate how a certain conception of energy might be present and influence certain narratives and discourses and consequent decision-making and actions.

2.5.2. Interpretation of the Discourse and Content Analysis

Mapping the results of the analysis, we suggest that at least in the EU energy policy documents considered, energy is primarily viewed as a resource and commodity for human use and benefit. Although the scientific definition of energy as "the ability to do work" does not seem to play a central role in these documents, in a few instances the term energy is used in the technical sense of physics or engineering. However, the centrality of "energy efficiency" seems mostly to relate directly to the EU's promotion of the "energy efficiency first principle". Another significant finding is that many expressions contain the term "energy" either in the form of an adjective combined with a noun (e.g., energy resource) or in association with another noun (e.g., energy poverty). Sometimes they denote things (e.g., renewable energy, energy sources, energy costs, energy technologies), other times they refer to processes or activities (e.g., energy transitions, energy extraction, production, distribution, and consumption, waste), or even contexts (e.g., expressions such as "energy sector", "energy field", and "energy industry"). However, when we try to spell out what energy really means in these cases, we fall back on the various conceptions of energy that are assumed in the background, which seem to not correspond only to the scientific notion of energy. Therefore, one may ask: what is the "energy sector"? What do we mean by "energy

sources"? What is actually included under "sustainable energy? Moreover, the predominant narrative frames the energy transitions mostly as an economic affair (e.g., "clean and fair energy transition [...] creates growth and jobs in a modern economy", see (European Commission 2019a, 1). Numerous sentences suggest that the transition to "cleaner and smarter energy" is meant to benefit humans in different ways: "cleaner and smarter energy will mean improved health, a better quality of life and will allow citizens to take their own decisions regarding their energy use"; or "The clean energy transition must benefit everyone - no citizen, no region should be left behind" (European Commission 2019a, 6). A major assumption and implicit goal is that the European energy transitions will rely on alternative "cleaner and smarter energy" sources and technologies. This would ensure that European economic growth could continue increasingly decoupled from ecological impacts, hence separated from a stringent dependency on nature. Interestingly, the idea that economic growth based on advanced technological developments can be brought about decoupled from an increasing human ecological footprint constitutes the basis of the ecomodernist narrative (Asafu-Adjaye et al. 2015).

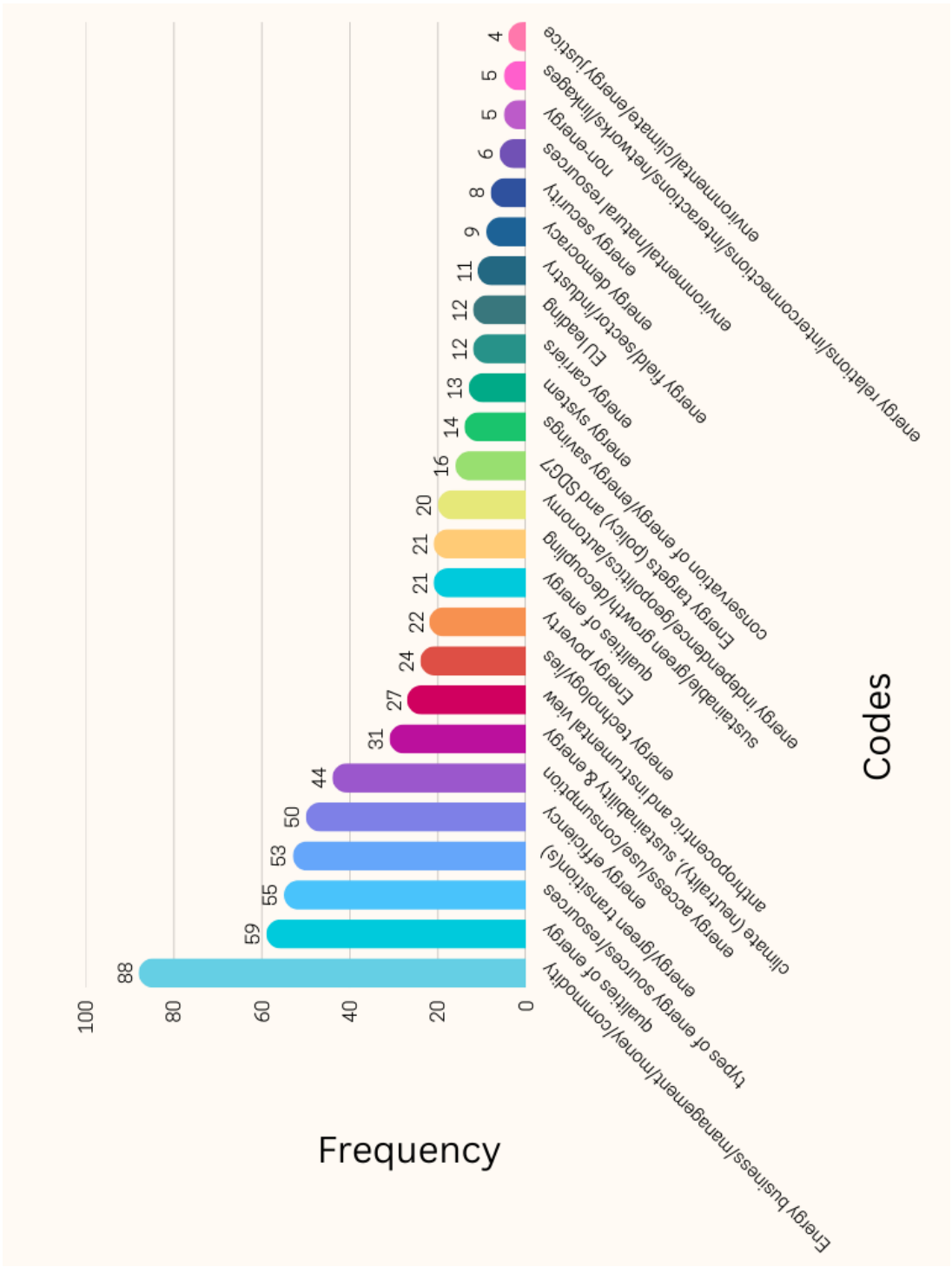

Figure 1. The 25 codes created through a discourse and content analysis

#	Year of Publication	Author (s)	Code	Title of the Communication
1	2018	European Commission	COM(2018) 97 final	Action Plan: Financing Sustainable Growth
2	2018	European Commission	COM(2018) 773 final	A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive, and climate-neutral economy
3	2019	European Commission	Rulebook Publications Office of the European Union	Clean Energy For All Europeans Package
4	2019	European Commission	COM(2019) 640 final	The European Green Deal
5	2020	European Commission	COM(2020) 102 final	A New Industrial Strategy for Europe
6	2020	European Commission	COM(2020) 299 final	Powering a climate-neutral economy: An EU Strategy for Energy System Integration
7	2020	European Commission	COM(2020) 456 final	Europe's moment: Repair and Prepare for the Next Generation
8	2020	European Commission	COM(2020) 474 final	Critical Raw Materials Resilience: Charting a Path

				towards greater Security and Sustainability
9	2020	European Commission	COM(2020) 562 final	Stepping up Europe's 2030 climate ambition. Investing in a climate-neutral future for the benefit of our people
10	2021	European Commission	COM(2021) 550 final	'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality
11	2022	European Commission	COM(2022) 230 final	REPowerEU Plan

Table 1. EU policy documents

Epilogue to Chapter Two

This Chapter has suggested that creating more sustainable societies requires not only reforming the energy system but also moving beyond a narrow focus on technological progress (see above 2.1.). While the expansion of renewable energy sources such as wind, solar, and hydroelectric power seem to be fundamental in at least European Union energy transition policies, their adoption *should* be accompanied by broader cultural and systemic shifts in how energy is understood. On an ecofeminist account, environmental problems cannot be addressed solely by modernizing polluting technologies. Overly optimistic narratives about technological progress often obscure the fact that ecological crises are rooted in Western modes of conceptualizing relations and subjects. Treating technological innovation as the primary or exclusive solution risks marginalizing alternative pathways and reinforcing a limited view of energy transitions (see above 2.2.2.). This perspective is reinforced by the dominant conceptualization of energy as a commodity for human needs, which frames both public and academic discussions while constraining alternative conceptualizations. The issue is not the use of energy as a resource *per se*, but rather the backgrounding, the hyper-separation, and instrumentalization of other human and non-human subjects when this conception of energy becomes the only prevailing view.

Chapter Two was intentionally conceptual, which may render it somewhat abstract and distant from real-world contexts. Chapter Three addresses this potential limitation by offering a concrete illustration of these dynamics (i.e. backgrounding, hyperseparation) through the example of wind energy. While wind power is considered central in the Net Zero Emissions by 2050 Scenario[23], its deployment raises ecological concerns, particularly for airborne species. Despite technological and policy measures designed to mitigate risks, conflicts remain between economic priorities and the preservation of ecosystems and biodiversity. These tensions often reflect the backgrounding and hyper-separation of non-human individuals within dominant energy discourses. Bats, for instance, are backgrounded when policies fail

[23] https://www.iea.org/energy-system/renewables/wind.

to ensure their protection or when limited weight is given to the impact on their well-being in risk assessments. At the same time, they are hyper-separated from humanized environments when interspecies interconnections are disregarded. Yet contact zones where humans and other species interact have never been wider.

Building on the open question raised earlier about whether energy can be conceived in ways other than as a resource or commodity (see above 2.3.), Chapter Three suggests that energy transitions create opportunities to move in this direction. It argues for a transformative approach to energy transitions that integrates ethical considerations for the agency and well-being of sentient non-human animals at every stage (from planning and construction to operation and evaluation).

While Chapter Two questions prevailing assumptions concerning a cultural conceptualization of energy, Chapter Three encourages envisioning alternative energy futures. This latter chapter, however, does not offer prescriptive solutions, recognizing that ethical insights do not easily translate into policy or individual behavior through the mere presentation of rational models or normative frameworks. Framed by the overarching research question of the dissertation (see section 1.3.1.), it provides an example of how ethical reflection can intersect with debates on energy transition policies. The aim is to foster more inclusive and respectful energy practices among stakeholders whose sensibilities are ready to be morally engaged (see also 1.1.2.), particularly towards subjects who, while not entirely disregarded, are often sidelined in the shaping of policy and transition pathways.

Chapter Three is currently under review for the journal "Ethics & the Environment" as **Calidori, N.** (2025), *Of Bats and Wind Energy: Spillover Harm and Moral Responsibility in the Anthropocene.*

Chapter Three

Of Bats and Wind Energy: Spillover Harm and Moral Responsibility in the Anthropocene

Abstract:

Balancing renewable energy development with biodiversity conservation presents a pressing "green-green dilemma", especially in wind energy, where efforts to reduce carbon emissions often harm non-human animals like bats through habitat disruption, collisions with turbines, and barotrauma. This article assumes that technical solutions alone are insufficient to address green-green conflicts, and that the effective enforcement and implementation of mitigation measures require strong motivation, which is deeply influenced by moral considerations. Drawing on the concept of "spillover harm" (Donaldson and Kymlicka 2014), we contend that energy stakeholders should account for sentient non-human agents coexisting in expanding human-animal contact zones, where infrastructure inadvertently causes harm for which humans bear moral responsibility. This accountability grows urgent in the Anthropocene, characterized by profound human ecosystem influence and eroding boundaries between human and non-human habitats. This article does not prescribe specific moral actions, but aims to stimulate ethical inquiry: encouraging energy stakeholders to scrutinize their decisions' ethical dimensions, and inviting ethicists to engage more actively with energy challenges.

Key words: Green-Green Dilemma, Bats, energy transitions, Environmental ethics, Animal Ethics, Anthropocene, Spillover harm

3.1. Introduction

Addressing the environmental consequences of fossil fuel reliance has become an urgent global priority. Fossil fuels impact negatively on the environment in terms of air pollution, environmental disruptions (e.g. oil drilling), and greenhouse gas emissions (GHGs). Global carbon dioxide emissions are a major driver of climate change, posing a serious threat to biodiversity and human health around the world. In response, many nations are turning to renewable energy, but these projects, while essential, are not without environmental consequences, particularly for biodiversity.

Policymakers and energy stakeholders are aware of the ongoing tension between the need to curb CO2 emissions by adopting less polluting energy systems and the commitment to halt biodiversity loss (Voigt, Straka, and Fritze 2019; Fritze et al. 2019). This conflict is known under the label of "green-green dilemma". Studies have shown that hydroelectric plants - classified as renewable energy by the International Energy Agency (IEA) - reduce fish biodiversity, including migratory species, IUCN-listed threatened species, and ecological indicator species (Sor et al. 2023; Wu et al. 2019). These dams have also been linked to declines in terrestrial species, such as fruit bats (Estefano Dineli Bobrowiec, Clarissa Nobre, and Da Cunha Tavares 2021). Similarly, improperly sited ground-mounted solar panels have been found to negatively affect biodiversity (Tinsley et al. 2023), and the cultivation of biofuel crops can drive deforestation, leading to habitat destruction for countless non-human species (Tudge, Purvis, and De Palma 2021).

Wind energy is viewed as a crucial tool in mitigating global warming[24]. However, its deployment poses a significant threat to wildlife, particularly bats like the common noctule (*Nyctalus noctula*), which inhabit or migrate through areas where on-shore wind energy facilities are concentrated in Europe[25]. The conflict between the implementation of wind farms and the impact on bats is a significant example of "green-green dilemma" within the European Union, since all bat species are legally

[24] According to the Global Wind Energy Council, the total wind energy installations in 2023 reached 117 GW, marking a 50% increase compared to 2022.

[25] This article focuses on onshore wind farms. However, research on the impacts of offshore wind farms on biodiversity and ecosystem services is growing (Vaissière et al. 2014; Watson et al. 2024).

protected under the Habitat Directive (92/32/CEE, Annex II and IV)[26]. Also, various strategies have been already proposed to address this issue. For instance, the guidelines outlined by Rodrigues et al. (Rodrigues and UNEP 2014) include avoidance, mitigation, and compensation measures for each phase of wind farm development that could impact bats, from site selection to construction and operation. These strategies may involve actions like shutting down turbines at night during critical times of the year or curtailing turbine activity at specific times based on an algorithm that predicts the risk of bat fatalities. Despite proposed strategies, the dilemma persists, highlighting the difficulty of balancing renewable energy with biodiversity conservation in the EU. The lack of integration between EU directives on ecosystem conservation and renewable energy leads to legal gaps and ambiguous interpretations (see section 3.2). In some cases, individual energy companies determine the need for mitigation measures, often with insufficient transparency (Fritze et al. 2019).

This article examines the ethical dimensions of the green-green dilemma - a conflict between competing, often incommensurable values that defy straightforward comparison. These tensions manifest in clashes between economic priorities, the intrinsic worth of sentient beings, and the preservation of ecosystems and biodiversity. Ethics can contribute to the debate by deepening our understanding of the frameworks through which we analyze green-green dilemmas, while also encouraging the consideration of alternative frameworks that could enrich the discussion and inspire new narratives. Loder (2009), for instance, exploring the ethical foundation of the conflict between renewable energy infrastructures (such as wind power facilities in Vermont) and wildlife conservation (e.g. the disruption of bear habitats), argues that most of the time they are results-driven, and particularly utilitarian in nature, proposing instead alternative ethical frameworks (e.g., deontology, virtue ethics, and ecofeminism) that could lead to more justified decisions and foster a more reflective, deliberative process. These ethical discussions, far from replacing technical and legal

[26] Furthermore, Most EU countries are bound by the UN Convention on Migratory Species, which includes bats under its protection (UNEP/EUROBATS, Bonn 1979, London 1981).

measures, can play a complementary role by strengthening the motivation of energy stakeholders to address the issue seriously and with more determination (e.g. by developing more coherent policies, demanding greater transparency, and more consistently implementing technical mitigation measures).

This article addresses the research question: Why should energy stakeholders put effort into realizing energy generation systems that account for the well-being of non-human animals such as bats? By "energy stakeholders", we refer to all parties involved in the design, construction, and evaluation of energy generation systems, like, for example, wind farms. To address this question, we follow two lines of thought: 1) we explore the specific harm caused to individual bats, i.e., spillover harm of wind turbines, and 2) we reframe energy transitions within the context of the Anthropocene. We argue that energy stakeholders should consider the well-being and suffering of bats and other sentient non-human agents, because wind turbines and similar infrastructure can cause spillover harm – defined as unintended adverse consequences for non-human animals arising from human-built systems – for which humans bear responsibility. This consideration becomes especially urgent in the Anthropocene, a period defined by humanity's profound and far-reaching impact on the planet, increased human-animal interactions, and the blurring of boundaries between wild and human-dominated spaces. In such a context, a transformative approach in energy transitions is needed: one that reimagines how energy generation projects are designed, implemented, and evaluated, with ethical consideration for the well-being and agency of sentient non-human animals integrated at every stage.

This work is directed at both energy stakeholders and ethicists. Our goal is not to present definitive moral prescriptions for stakeholder conduct, but rather to stimulate ethical inquiry. We encourage energy stakeholders to more deeply consider the ethical dimensions of their decisions, and we invite ethicists to engage more actively with energy-related challenges. Reflecting on spillover harms and humanity's role in the Anthropocene can prompt a more thorough assessment of wind farms' impact on animals like bats - and inspire meaningful action.

A limitation of this article is its focus solely on sentient animals, excluding living beings not conventionally considered sentient (e.g., plants) or non-living entities.

The article is organized as follows: in section 3.2 we present the "green-green dilemma" raised by the construction and operation of wind farms; section 3.3 examines the kind of harm (i.e. spillover harm) that wind turbines can cause to sentient non-human animals. Section 3.4 reframe current energy transitions within the narrative of the Anthropocene. Section 3.5 outlines future research directions, and section 3.6 concludes the discussion.

3.2. A Green-Green Dilemma

Gliding through the twilight sky, the common noctule is one of Europe's biggest bats. Cloaked in a rich, reddish-brown fur, it boasts a muscular body measuring between 8 and 10 cm, with a wing spanning up to 40 cm. By day, it hides away in the hollows of trees or the nooks of old buildings, waiting for dusk. As night falls, it takes to the open skies, darting over forests, rivers, and city parks, chasing down moths and large insects at astonishing speeds of up to 60 km/h. Widespread throughout Europe, the common noctule is a great traveler, embarking on migrations of over 1,600 km to find the perfect seasonal home[27]. The common noctule is one of the most frequently recorded bat species at wind energy sites in Europe (Arnett et al. 2016).

The construction of wind farms often requires clearing forests, which disrupts the habitats of foraging species. Growing research underscores that wind turbines can lead to the displacement of birds, bats, and terrestrial mammals (Tolvanen et al. 2023; Scholz, Klein, and Voigt 2025). Studies show that bat acoustic activity near wind turbines is lower, suggesting that bats avoid these areas, making the surrounding habitat unsuitable for foraging (Ellerbrok et al. 2022; Millon et al. 2018). Additionally, the spinning blades pose a significant threat to airborne species due to the risk of collisions (Ellerbrok et al. 2022; Zimmerling and Francis 2016; Guest et al. 2022). Significant fatalities of bats have been documented, with wind turbines being

[27] https://www.bfn.de/artenportraits/nyctalus-noctula.

identified as a major anthropogenic factor contributing to mass bat mortality (Zimmerling and Francis 2016)[28]. Bat fatalities pose serious concerns for population-level effects, as bats are long-lived, have very low reproductive rates, and experience slow population growth. The available data suggest that several bat species may even be attracted to wind energy facilities. Some of them mistake turbines for roosting sites, while others are attracted to the insects that gather around the turbines, which they feed on (Arnett et al. 2016; Guest et al. 2022; Horn, Arnett, and Kunz 2008; Jameson and Willis 2014). Finally, even when they avoid physical collisions, they could suffer from barotrauma due to sudden pressure changes (Millon et al. 2018).

At the EU policy level, this dilemma is particularly evident in the challenges of reconciling policies aimed at safeguarding European habitats and wildlife (Habitat Directive 1992 and Birds Directive 2009) with those designed to promote the shift toward renewable energy (Revised Renewable Energy Directive 2023). Dulluri and Rat (2019) suggest that the conflicts between the goals of nature conservation and those of energy directives arises from both the scientific uncertainty surrounding the environmental impact of renewable energy projects and the derogation clauses within the EU biodiversity policy framework. The derogation clauses within the biodiversity framework provide a legal basis for Member States to bypass certain protection measures outlined in the Habitats and Birds Directives, in cases where public health, safety, or the protection of flora and fauna is at stake. These clauses, found in Articles 6(4), 16 of the Habitats Directive, and Article 9 of the Birds Directive, allow for derogations if no alternative solutions exist. These clauses have been increasingly used to approve renewable energy projects in protected areas such as those belonging to the Natura 2000 network[29]. Lukas (2016) examines the legal framework for species protection assessments in Germany, highlighting the lack of clear guidelines,

[28] Estimations of fatalities vary enormously. If we consider, for instance, the German situation only (one of the better documented in Europe), estimation vary from 1-2 fatalities per wind power plant per year in some regions (Arnett et al. 2016), to 24.5 fatalities per wind power plant per year in Brandenburg (Fritze et al. 2019).

[29] The Natura 2000 is the largest coordinated network of protected areas in the world, established by the European Union in 1992 under the Birds and Habitats Directives. The network covers over 18% of the EU's land area and approximately 9% of its marine territory. See: https://www.eea.europa.eu/en/analysis/indicators/natura-2000-sites-designated-under.

particularly under §44 Abs. 1 BNatSchG[30]. While all bat species are legally protected in Germany by national legislation (§7 BNatSchG), the German law does not specify how to conduct species inventories or assess risks to protected bats (and birds) species, leaving planning authorities to rely on expert discretion (Lukas 2016). When impact assessments predict significant harm to bats, mitigation measures, commonly scheduled turbine shutdowns during peak activity and adaptive monitoring, are required for approval. Fritze et al. (2019) find that too few wind turbines (less than 25%) implement these measures, likely resulting in high bat mortality, and that no comprehensive data exist on actual mitigation efforts.

A key takeaway from these studies is the need to strengthen existing regulations at both the EU and national levels to more effectively integrate biodiversity protection into the expansion of renewable energy. Additionally, the adoption and implementation of technological mitigation measures remain insufficient, despite their potential to reduce biodiversity loss. Expanding the use of these technologies could significantly enhance conservation efforts while supporting the transition to renewable energy. However, putting these changes into practice is more complex than it may seem. Beyond the technical challenges, their effective enforcement and implementation depend on strong motivation, which is deeply shaped by social values, emotions, and moral considerations. Straka et al. (2020) explore, for instance, stakeholders' values, beliefs, and emotions related to wind energy, conservation, and bats. The study highlights the need to recognize these emotional and cognitive differences among stakeholders (e.g., energy sector, consultant, NGO employees) as a crucial step toward building trust and fostering cooperation in decision-making processes. According to the study, trust among different stakeholders is low, with wind energy representatives placing more trust in politicians than conservationists. Recognizing these dynamics is essential for bridging gaps in stakeholder engagement.

[30] The BNatSchG (Bundesnaturschutzgesetz) is Germany's Federal Nature Conservation Act, which provides the legal framework for nature conservation and landscape management across the country. See: https://www.gesetze-im-internet.de/bnatschg_2009/BNatSchG.pdf.

Similarly, moral questions could foster reflection and dialogue among diverse energy stakeholders involved in the design, construction and evaluation phases of energy generation systems, encouraging closer collaboration. These discussions can also bring attention to overlooked subjects, such as bats, which are often marginalized in energy debates. In the long run, such reflections may help strengthen the motivation to consider non-human animals from the very outset of energy transition projects and policy-making, thus taking meaningful action accordingly (for the relevance of ethical considerations in the protection of species, see also Voigt and Kingston 2016, 6).

Therefore, in what follows, we examine the moral dimension of harm caused by wind energy infrastructure, and then we consider the deepening interactions between human and non-human species in the Anthropocene.

3.3. Spillover Harm

3.3.1. It Affects Sentient Animals

The concept of harm is widely debated in philosophy (Pellegrino 2018; Nefsky 2019; Broome 2021), particularly in an era where more traditional definitions of harm seem insufficient to account for the negative consequences of cumulative, seemingly insignificant individual actions and decisions (Sandler 2009)[31]. For the purposes of this article, harm will be broadly defined as the suffering an individual experiences when their well-being is significantly diminished (Regan 1983, 94), whether due to physical injury or various forms of deprivation (e.g., habitat loss). Within this framework, we specifically restrict the concept of harm to sentient beings – those capable of experiencing suffering and species-specific well-being – while acknowledging that

[31] For example, taking a flight from Rome to Berlin may contribute to harm, affecting both present and future human and non-human beings on the other side of the planet, such as those living on Kiribati Island. In this case, a conventional definition of harm such as "damage or injury that is caused by a person or an event" (Oxford dictionary) may fall short, as the causal links between the action (an individual's flight) and its effect (increased CO2 emissions contributing to global warming and consequent rising sea levels that threaten low-lying islands like Kiribati) are highly complex, despite their existence. Additionally, identifying the specific agents responsible for harm and the individuals or communities affected further complicates the ethical analysis.

harm can also extend beyond sentient beings (for further discussion, see Nolt 2011). Also, we set aside the ecological harm that can be caused to the ecosystem as a whole, when biodiversity decreases. Regarding bats, many studies have already shown their unique "ecosystem services" (Kunz et al. 2011), and economic value. Instead, we focus on a moral concept of harm that extends beyond human interests.

When a bat flies near a wind turbine, there is a risk of harm, through a) direct collision with the turbine, leading to, for instance, a mutilation, b) barotrauma from sudden air pressure changes, or c) due to disruptions to its habitat, negatively affecting its activities (see section 3.2). In all these cases, the well-being of a sentient being (i.e. a bat) is compromised. Additionally, death can also be considered a form of harm, as it constitutes a deprivation of well-being (Regan 1983). Donaldson and Kymlicka (2014) define this kind of harm (i.e. the harm caused to non-human animals by human infrastructures) as *"spillover harm"*. Spillover harm to non-human animals has only recently gained attention in ethics.

In animal ethics, mostly (for good and historical reasons), the literature deals with the suffering of (i) domesticated animals (e.g. pets, factory-farmed animals), (ii) animals exploited for human interests (e.g. circus animals, laboratory animals), and (iii) those free-living in the wild which could be directly harmed by humans (e.g. fishing, hunting), or harmed by natural causes (e.g. natural disasters, predation). For (i), and (ii), influential ethical traditions (see Regan 1983; Singer 2002; Korsgaard 2018; Bentham 1948, 1st ed. 1789) argue that the (experience of) suffering and well-being of sentient beings matter morally, be they humans or non-humans. As a result, humans have ethical obligations toward them, including the duty to avoid causing suffering (or at the very least, to minimize it), as well as the responsibility to care for them when they are ill or in need of assistance, especially in cases of dependency relations. For (iii), although the premise remain equal (i.e. suffering and well-being of sentient beings matter morally), until recently, the dominating position was the "laissez-affaire intuition" (Palmer 2011) according to which, while we should refrain from directly harming wild animals, we have no moral obligation to intervene or assist them when they face challenges such as predation or natural disasters. We should "let them be" (Regan 1983, 357), that is, we should refrain from interfering with them

whenever possible and allow them to exist undisturbed. This perspective has come under critique. Some authors argue that there are compelling moral reasons for humans to assist wild animals in need (Faria 2023; Palmer 2021), while others contend that common objections to direct intervention in the wild fail upon closer examination (Sözmen 2013). This debate often hinges on the idea that sentient beings deserve help if we are capable of providing it, regardless of our relationship to them, or if we (do not) cause the harm.

Spillover harms challenge the "laissez-faire intuition". If we are to truly avoid disturbing wild animals, many human infrastructures, such as drilling platforms, highways, and large-scale agricultural projects, would need to be reconsidered or avoided altogether. Yet, this perspective also highlights a gap in discussions of direct intervention: while proponents advocate for assisting wild animals affected by natural causes, further debate is needed to clarify the obligations we have (e.g., restoration, feeding, shelter, or non-interference duties) toward non-human animals unintentionally harmed by human activities. In the specific case of wind farms, a pivotal starting point for this discussion would be determining whether humans bear moral responsibility for the harm caused to animals like bats.

We agree with Nolt (2011, 705) that moral responsibility for harming others arises when four conditions are met: 1) we cause or can prevent the harm; 2) we acknowledge its moral significance; 3) we can anticipate it with some reliability; and 4) we have the ability to act in ways that are less harmful or more beneficial.

Condition 1 is fulfilled in the case of spillover harm caused by wind turbines affecting animals like bats. While this harm differs from direct and intentional violence inflicted by humans on non-human animals and is largely unintended, it remains human-induced. Thus, the first condition can be considered satisfied. Condition 2, requiring acknowledgment of the moral significance of harm, is also met because the harm impacts sentient beings, causing suffering and diminishing species-specific wellbeing. As mentioned above, the capacity to experience suffering forms the basis of moral obligations toward non-human animals, whether they are included in categories (i), (ii), or (iii). Also, although we cannot predict with certainty whether a specific wind turbine blade will collide with individual bats or determine exact fatality numbers, we can

reasonably anticipate times of day (e.g., nocturnal hours) and periods of the year when bats are most likely to migrate through a given area. This satisfies Condition 3. Finally, Condition 4 is met, as discussed in sections 1 and 2, where mitigation measures to reduce harm are outlined and shown to be feasible.

The fulfillment of these conditions leads us to conclude that humans bear moral responsibility for spillover harms associated with wind turbines. Returning to the research question of the chapter (i.e. Why should energy stakeholders put effort into realizing energy generation systems that account for the well-being of non-human animals such as bats?), this responsibility should prompt those involved in wind energy generation to consider the well-being of sentient non-human animals throughout the design, implementation, and evaluation of wind farms. Acknowledging moral responsibility may further motivate stakeholders to prevent or mitigate the unintended consequences of wind energy infrastructure on animals like bats.

3.3.2. It Affects Co-existing Active Agents

Another line of ethical reflection drawn from animal ethics may also offer valuable insight. Spillover harms of wind turbines are experienced by animals that are neither domesticated, exploited for human purposes, nor directly harmed by human actions or natural disasters. Rather, it affects animals inhabiting "the contact zone" (Palmer 2011), and defined as "liminal" (Donaldson and Kymlicka 2014), or as "semi-wild" (Swart 2005) in the literature, meaning that they live in human-altered environments without being domesticated: they live "in between" (Swart 2021) areas that are undeniably humanized and those where humans may have interests but not necessarily reside. As the contact zone continues to expand, spillover harms increasingly affect wild animals as well, gradually blurring the distinction between semi-wild and wild species (for the concept of wildness, see Palmer 2016), as well as the traditional boundaries between the wild and human worlds, emphasizing the interconnectedness of human-animal relationships and interactions (Swart 2016). Wind farms provide a clear example of this phenomenon. Depending on their location, wind turbines can impact the well-being of liminal species that thrive in human-altered landscapes as well as that of traditionally wild animals such as bears (Loder 2009) and certain bat

species that primarily inhabit caves, forests, or other natural ecosystems with minimal human interaction. Spillover harms of wind turbines result from the co-habitation and co-existence of humans with different species. Donaldson and Kymlicka (2014) propose addressing challenges arising from interactions with both liminal and wild animals through two different political ideas. They suggest viewing liminal animals as denizens, akin to immigrants in a country who possess basic rights but not full political participation, such as voting. Similarly, liminal animals might have a fundamental right not to be harmed or killed, yet there might be no obligation to feed or shelter them. As far as wild animals are concerned, they propose recognizing them as members of autonomous sovereign communities, whose relationships with human societies should be governed by principles of international justice.

This political turn (see also Nussbaum 2022) is crucial in animal ethics. It contributes to advance research by shifting the focus from viewing animals as passive victims to recognizing them as agents whose capacity to act (beyond being free from suffering) should be considered in moral discourse (for animal agency, see Donaldson and Kymlicka 2016). Animal's agency refers to the ability to act in accordance with its innate drives, desires, or species-specific volition (see also Meijer and Bovenkerk 2021)[32]. Ethical reflections that position sentient animals like bats as "active agents with whom we need to negotiate our common lifeworld" (Bovenkerk and Keulartz 2021, 33:4) can also drive energy stakeholders to systematically integrate their well-being into wind farm design, construction, and evaluation.

3.4. Reframing Energy Transitions in the Anthropocene

A growing awareness of our shared existence with other species, coupled with a more refined sensitivity, in animal ethics, toward the agency of non-human animals, underscores the need to account for interspecies relationships. This is all the more

[32] The agency of sentient non-animals is also shaped by external factors as well as relationships with other beings. This has led some authors to question whether wild animal communities can truly be considered autonomous. Swart (2021, 487), for instance, view instead wild and liminal animals "as nodes in a dynamic, heterogeneous, coercive, socio-ecological network of dependency relationships between abiotic and biotic factors", stressing the necessary interdependency between species (particularly with the humans) as well as non-living components of nature.

critical in the context of current energy transitions. Historically, all energy transitions and systems have had significant environmental (Smil 2010, 12) and wildlife impact (e.g. underwater noise from drilling operations). Yet, in the past, environmental considerations in energy infrastructure planning have often been overlooked or entirely ignored. On the contrary, today, the conservation and inclusion of non-human nature play a fundamental role in shaping the energy transition, arguably for the first time, making them key drivers of change. Incorporating non-human animals such as bats into considerations for energy generation through wind farms is essential, as it shapes the energy transitions defining the Anthropocene.

3.4.1. Anthropocene, Energy Transitions, and some Critiques

The term *Anthropocene* is used to refer to the geological epoch in which the biogeochemical cycles of the Earth are primarily influenced by human activity. Originally coined in the 1980s by ecologist Eugene Stoermer, the term gained widespread recognition when Nobel laureate Paul Crutzen proclaimed that humanity had officially entered a new geological era[33]. According to Crutzen, there was sufficient evidence to recognize the epochal transition from the Holocene to a new phase in Earth's history, shaped in many different ways by human influence (Crutzen 2002). While the term has not been officially incorporated into the geological time scale, its adoption has gained significant traction in recent years, reflecting the growing recognition of humanity's transformative impact on the planet.

Energy transitions play a pivotal role in the Anthropocene narrative for two key reasons. First, as Steffen et al. (2011) argue, the onset of this epoch can be traced back to the Industrial Revolution, marked by the intensified consumption of fossil fuels. This trend accelerated significantly during the "Great Acceleration" (McNeill and Engelke 2014) in the latter half of the 20th century, a period characterized by rapid and unprecedented energy consumption in Western societies. Second, *renewable* and *sustainable* energy transitions are now regarded as critical tools to counteract the trajectory set in motion by the Industrial Revolution.

[33] At the 2000 International Geosphere-Biosphere Programme (IGBP) conference.

However, critiques of the Anthropocene challenge both its framing and implications. The concept has been criticized for presenting an abstract and disembodied view of humanity, the *Anthropos* of the Anthropocene, devoid of gender, social status, or ethnicity. This universalized perspective obscures Western historical and economic responsibilities for the current environmental crisis, as well as the hierarchies, power dynamics, and inequalities that underpin it (Alaimo 2017; Barca 2020; Di Chiro 2017; Grusin 2017; Hartley 2016; Moore 2016)[34]. Regarding energy transitions toward more sustainable societies, critiques arise when these shifts are framed as purely technological solutions. The "mainstream narrative" (Barca 2020) of the Anthropocene often suggests that humanity can address environmental crises primarily through technological advancements, sidelining deeper structural changes and social considerations.

3.4.2. Anthropocene, Energy Transitions, and Potentialities

While critiques of the Anthropocene highlight its limitations and biases, the concept also offers opportunities for rethinking humanity's role in the world, challenging assumptions, and reflecting on our relationships with non-human nature, rapidly transforming due to human-induced changes. In the Anthropocene, environmental crises expose the interconnections between human actions and the rest of nature, making our response to these crises one of the defining challenges of our time.

One potential strength of the Anthropocene lies in highlighting the delicate balance within and between ecosystems, as well as to draw attention to individual beings that are often overlooked when nature is viewed primarily as a resource for human use (Calidori, Frigo, and Hillerbrand 2024). A crucial step in avoiding this oversight is recognizing that, although the term does not capture them, the Anthropocene is inhabited by many non-human animals, which can be seen "not only

[34] In recent decades, there has been a proliferation of alternative terms, considered by their proponents to be more accurate to describe the present this epoch and the aspect that most distinctly characterizes it: the *Plantationocene* (Haraway et al. 2016; Tsing 2021), the *Plasticene* (Tiller et al. 2019), the *Chthulucene* (Haraway 2016), the *Wasteocene* (Armiero 2021), just to name a few.

as victims of our treatment, but also as actors in their own right" (Bovenkerk and Keulartz 2021, 3). This recognition invites a shift in how we understand and narrate energy transitions: rather than viewing them as purely technological advancements, they can become opportunities to rethink and reconfigure human-non-human relationships.

Returning once again to the research question posed by this article, the Anthropocene perspective provides a compelling rationale. As humanity confronts its profound impact on the planet, there is a growing need to acknowledge that we inhabit a shared world with a multitude of species, including sentient non-human agents. In the Anthropocene, the awareness of the growing interactions between human and non-human driven by the blurring of traditional boundaries between the wild and human worlds, call for a transformative approach to how energy stakeholders regulate, design and implement projects such as wind farms. Accounting for non-human animals in the design and regulation of energy generation can challenge the perception of sustainable energy transitions as purely technological shifts involving only humans (see section 3.4.1.). To put it differently, the moral attention to sentient animal, such as bats, in energy generation systems and regulations, is a form of what Haraway calls "response-ability" (Haraway 2016), that is the ability to cultivate the capacity to pay attention, to stay with complexity, and to be accountable in relationships — whether with other humans, nonhuman animals, or entire ecosystems. This response-ability can contribute to a subtle yet significant shift in the Anthropocene from energy transition seen as a purely technological change into a deeper socio-environmental-technical transformation.

3.5. Outlook

In the Anthropocene, some non-human species adapt to human activities and even thrive in altered environments. For example, the American crocodile (*Crocodylus acutus*) has seen significant population growth in Florida, particularly around the Turkey Point Nuclear Power Plant. The facility's cooling canals, initially designed for

reactor temperature control, inadvertently created an ideal habitat with stable water levels, nesting sites on berms, and freshwater ponds for hatchlings[35]. Conversely, for other non-human animals like bats, the Anthropocene is posing numerous challenges. Voigt and Kinston (2016) argue that bats are particularly affected in the Anthropocene because "they often go unnoticed by their human neighbors" (p. 4) as they are nocturnal animals. In energy transition projects, bats continue to be neglected stakeholders also because energy transitions are mostly anthropocentric, focusing almost exclusively on human interests and wellbeing. Chapter Two analyzes the cultural understanding of energy as a resource and commodity for humans, and how this understanding can contribute to background parts of (human and non-human) nature, instrumentalize it, incorporate it in human interests (e.g. nature as energy resource), and, in some cases, hyper-separate it from humans. The impact of wind energy turbines on bats exemplifies both backgrounding and hyper-separation. Bats are backgrounded when their presence at construction sites is overlooked in risk assessments or when policies fail to adequately protect them. At the same time, they are thought as hyper-separated from humanized environments when their exclusion stems from the belief that they exist far from human influence, independently of our actions. This perspective ignores the deep interconnections between species and the reality that, in the Anthropocene, the contact zones where humans and other species interact have never been wider. The authors wonder whether it is "possible to move beyond a conception of energy as a resource and commodity for humans" (p. 7). Reimagining energy beyond its cultural framing as merely a resource and commodity for humans is not something that can happen overnight. However, ongoing energy transitions present an opportunity to take meaningful steps in this direction, when, for example, different energy stakeholders closely collaborate to consider the impact on non-human species often overlooked in energy generation processes (e.g., in the design and construction of wind turbines). Furthermore, while not a definitive solution, framing the green-green dilemma

[35]Today, Turkey Point hosts approximately 25% of the U.S. crocodile population, contributing to the species' recovery from endangered to threatened status by 2007 https://indiandefencereview.com/american-crocodiles-thriving-nuclear-plant/.

illustrated by the case of bats affected by wind turbines within the broader context of the Anthropocene could also generate new narratives that move beyond the opposition between renewable energy sources and biodiversity conservation concerns on which rely the green-green dilemma, and offer deeper insights into the underlying value conflicts at play. This, however, warrants further research.

3.6. Conclusion

This article explored why energy stakeholders should make a concerted effort to design, implement, and evaluate energy generation systems that account for the well-being of non-human animals, such as bats. The article addresses the research question (see section 3.1), examining the specific harm caused to individual bats, i.e., spillover harm of wind turbines, and 2) reframing energy transitions within the context of the Anthropocene. We contended that energy stakeholders ought to take the well-being and suffering of sentient non-human animals like bats seriously, as infrastructure like wind turbines can unintentionally inflict harm for which human agents are morally accountable. This ethical responsibility is particularly pressing in the Anthropocene, an era marked by humanity's deep and widespread influence on the Earth's ecosystems, the growing entanglement of human and non-human lives, and the erosion of traditional divisions between wild nature and human-managed environments. Within this context, a fundamental shift in the way energy transitions are conceived is necessary, one that envisions the planning, construction, and evaluation of energy infrastructure through an ethical lens, ensuring that the well-being and agency of sentient non-human animals are considered at every step of the process. Finally, in the Outlook, we considered the broader implications of these ideas for future energy policy and research. As energy systems evolve, there is a critical opportunity to move beyond viewing energy solely as a resource for humans. Ultimately, this article does not claim to offer final moral prescriptions. Rather, it aims to open a space for ethical inquiry that can deepen motivation, enhance cooperation, and guide more just and responsible energy transitions—ones that recognize and respect the well-being and agency of the non-human animals with whom we share this

planet. “We must learn to co-exist” (Donaldson and Kymlicka 2016, 232) is the challenge posed by the spillover harms of wind turbines in an era where the contact zone between humans and non-human animals continues to expand. These harms affect sentient, active non-human *agents* that co-exist with us, highlighting the need to rethink how humans share space with other species. As the boundaries between liminal and wild animals blur and interdependencies between species deepen, considering and addressing the environmental impact of wind energy on sentient beings becomes not merely a technical or ecological issue, but also an exercise in reimagining coexistence.

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Epilogue to Chapter Three

Chapter Three examined the European Union policy landscape at the intersection of climate change mitigation, renewable energy (particularly wind power), and biodiversity conservation, with a focus on bat species. The analysis highlighted a "green–green dilemma": the European Union seeks simultaneously to expand wind energy, to reduce CO_2 emissions, and to safeguard biodiversity. While a range of

avoidance, mitigation, and compensation measures has been proposed (e.g. turbine curtailment during high-risk periods), the dilemma persists. A lack of integration between European Union conservation and energy directives hampers effective policy implementation, resulting in limited progress. The chapter suggests that technological and legal measures are necessary, but insufficient on their own.

Situated within the field of energy ethics, Chapter Three emphasized the importance of also considering the moral dimensions of energy transitions. Ethical reflection can complement regulatory and technical approaches by clarifying normative commitments, fostering stakeholder responsibility, and enhancing the coherence of energy and conservation policies. As noted in Chapter One, however, ethical insights rarely translate directly into policy or behaviour through prescriptive models alone. Accordingly, in Chapter Three no prescriptions are offered; rather, ethical reasoning is presented as a means to question established practices, technologies, and policy rationales. The chapter proposes that ethical engagement, attentive to existing moral sensibilities and commitments, can support more inclusive and respectful energy transitions.

Chapters Two and Three together have shown how philosophical reflection can productively engage with energy-related issues, from an analysis of a cultural conceptualization of energy to questions of ethical responsibility for airborne species affected by wind power. This approach stems from a recognition of the need for deeper philosophical involvement in energy transition debates, especially concerning subjects (e.g., dislocated people due to the construction of hydropower, some airborne species) whose interests, needs, and well-being are not completely safeguarded in energy transition policies. The aim is to both contribute distinctive philosophical insights and to strengthen critical reflection within energy ethics. Building on this foundation, the following chapter turns to another dimension of the transition: its social implications.

Chapter Four examines the intersection between climate change, European Union energy transition policies, and energy poverty with particular attention to Italy. Despite the European Union's recognition that current renovation rates are inadequate

and that energy-poor households are the hardest to reach[36], policies often fail to benefit those most in need. The mismatch, termed the "effectiveness gap" in Chapter Four, emerges between the intention to address energy poverty through energy transition policies, the practical implementation of these plans, and their unsatisfactory results thus far. Adopting the Capability Approach as an analytical lens, the chapter shows how inadequate attention to structural barriers, such as economic constraints, limits the capacity of poor households to access incentives. An aspect of the Capability Approach's theory is that wellbeing and human development depend not only on available resources but also on "conversion factors" that determine how resources can be transformed into valued functionings (see section 4.2.1.). These factors may be internal (e.g. health, skills, age) or external (e.g. income, institutional support, environmental conditions). In light of this, we argue that energy transition policies should not only improve efficiency but also enhance people's capabilities and agency, enabling them to make meaningful choices about their energy use.

All chapters of this dissertation address problems at the intersection of climate change mitigation policies, energy transitions as a pathway to reducing CO_2 emissions, and their implications for specific subjects (e.g., bats and energy-poor users, respectively). Whether these overlooked subjects are non-human species or energy-poor households, ethical reflection offers a complementary perspective for engaging with questions of well-being and agency that extend beyond the reach of technological or legal measures. Chapter Four will show how normative ethical analysis can reveal structural injustices embedded in policy design. Co-authored also with a social scientist and an engineer, this interdisciplinary work highlights the distinct role of philosophy in interpreting empirical data and formulating normative conclusions.

[36] Directive (EU) 2023/1791 of the European Parliament and of the Council on Energy Efficiency and Amending Regulation (EU) 2023/955 (Recast) p. 15.
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023L1791

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Chapter Four

Not Enough (Yet):

A Capabilities Assessment of the Implementation of Energy Poverty Policies in Italy

Abstract
Energy-poor individuals face greater difficulty in accessing the benefits of energy transition policies. This conceptual article employs *a priori* analytical categories based on the Capability Approach to assess the effectiveness of energy transition policies in addressing energy poverty in the context of Italian energy transition efforts. We use the expression "effectiveness gap" to describe the discrepancy between the intention to address energy poverty through energy transition policies, the practical implementation of these plans, and their unsatisfactory results thus far. From a capabilitarian standpoint, a person's wellbeing depends on "conversion factors". Conversion factors determine to what degree people are able to transform resources into the achievement of beings and doings (i.e. functionings). Some conversion factors are internal to a person (e.g. physical condition, gender, age); others are external such as environmental and socio-economic factors (e.g. public policies). In Italy, energy transition policies do not fully consider conversion factors of energy-poor people potentially leading to their exclusion from public incentives. We argue that Italian energy transition policies could be deemed unjust as they disregard energy-poor people's socio-economic conditions, thus failing to enable some of their functionings. We recommend developing policies that enhance energy-poor people's agency, dignity, and freedom of choice by actually allowing them to access public incentives. The main novel contribution of this article is using the Capability Approach to provide a normative perspective on energy poverty in Italy. The article aims to contribute to scholarly and policy debates as well as policy-making concerning the challenges of solving energy poverty.

Key words: energy poverty; just energy transition; Capability Approach; policy assessment; Italy; conversion factors

4.1. Introduction

The increase in anthropogenic greenhouse gases (GHG) emissions and other human-induced environmental disruptions pose a significant threat to the safety of all species,

requiring concrete and urgent political action worldwide[37]. Energy transition policies are crucial to mitigate and adapt to climate and environmental changes (IPCC 2023). Energy-vulnerable people are among the most affected by climate crises because of the challenges they may face, not only in adapting to environmental changes (e.g., summer temperature spikes and winter dips, see Jessel, Sawyer, and Hernández 2019), but also suffering greater burdens from energy transition processes (e.g., increasing energy costs and rental bills, see Bardazzi et al. 2024; Jessel, Sawyer, and Hernández 2019; Berti et al. 2023; Vurro et al. 2022; Belaïd 2022). In this article, we use both "energy-poor households" and "energy-poor people" to emphasize individuals' condition, which can be overlooked when focusing solely on households (Rajagopalan 2021). We also use "energy vulnerability" and "energy poverty" interchangeably[38]. Recent contributions to the literature have demonstrated how energy-poor people are often less capable of benefiting from the opportunities provided by energy efficiency incentives (Karpinska and Śmiech 2021; Banerjee and Schuitema 2022; Bardazzi and Pazienza 2023; Lowans et al. 2023).

The threads linking energy poverty, climate change, and energy transitions become more crucial in the context of a *just* energy transition, where there is a growing ambition to promote sustainable global energy systems that are equitable, accessible, and affordable, as in Sustainable Development Goal (SDG) 7 identified by Agenda 2030 of the United Nations. This goal entails ambitious transition projects, with a particular emphasis on ensuring that more vulnerable citizens and consumers are not left behind (European Commission 2019b). Moreover, SDG 13 stresses the need to "take urgent action to combat climate change and its impacts". This often means preventing and mitigating the social injustices that may arise when transitioning to new, environmentally sustainable energy systems to meet climate targets (Carley and Konisky 2020; Banerjee and Schuitema 2022). However, it remains uncertain whether the resulting policies are delivering what they intended to achieve.

[37] The latest IPCC report (2023, 42) states that in 2011-2020 human-induced GHG emissions *unequivocally* provoked an increase in the surface temperature of 1.1°C above the 1850–1900 level. https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf.

[38] The two terms are often used in the literature to indicate distinct sets of conditions (Rajagopalan 2021) and other terms may be in use (e.g. energy precariousness; energy insecurity).

To assess whether energy transition policies are helping to address the problem of energy poverty, this article focuses on the Italian context and considers the situation of those whose wellbeing is often negatively affected in multiple aspects as a result of energy poverty (Bartiaux, Day, and Lahaye 2021). In doing so, the article addresses an "effectiveness gap", identified as the mismatch between the intention to address energy poverty through energy transition policies, the practical implementation of these plans, and their unsatisfactory results thus far.

The focus on Italy is due to its diverse geography and varying socioeconomic conditions, which make this country an interesting context for studying energy poverty (see also Besagni and Borgarello 2019). According to a recent study by Campagnolo and De Cian (2022), Italy may experience increased energy poverty in the future due to the necessity for citizens to spend a larger proportion of income on electricity for cooling. Moreover, Italy recognizes energy poverty as a problem to be tackled within the energy transition, as suggested by the recently updated Italian National Energy and Climate Plan (NECP)[39] (2023). Furthermore, Italy falls within the group of Southern and Eastern European countries that still suffer energy poverty due to many entrenched factors such as years of recession, unaffordable energy, poor housing, including inadequate heating (Pye et al. 2016). Hence, a focus on Italy may provide additional insights into both the reasons for and the specificities of its energy poverty issues.

The specific research questions are: (1) Are current energy transition policies in Italy addressing the issue of energy poverty? and, (2) If this is not the case, can such energy transition policies be deemed unjust? To answer these questions, we adopt the Capability Approach (CA) and some of its operationalizations (Hillerbrand and Goldammer 2018a; Lee, Kim, and Byrne 2021) to assess some Italian energy transition policies, with the goal of providing a normative perspective on energy poverty in the country and to evaluate issues about justice.

[39] The National Energy and Climate Plan (NECP) is a comprehensive framework outlining Italy's strategies and measures to meet its energy and climate objectives for 2030. It aligns with the European Union's goals under the Paris Agreement and the European Green Deal.

From its first appearance in the late 1970s, the CA has enriched the debate on justice especially within liberal discourses. It focuses on human development and flourishing based on human dignity and freedom of choice while highlighting concrete inequalities and injustices (Sen 2010). One crucial knot of this theory is that individual wellbeing and human development depend not only on the resources available to a person. Rather, they mostly rely on "conversion factors" that help transform resources (e.g. money, good and services) into what a person aspires to be or to do (Sen 2010). Conversion factors determine in which degree a person is able to convert resources into what she desires to do or be (i.e. doings and beings, or functionings, see section 4.2.1). These "conversion factors" can be internal to a person (e.g. physical condition, mental health, age, language proficiency, skill and technical know-how, nutritional status, self-confidence, independence) as well as external, such as socio-economic and environmental factors "stemming from the society in which one lives, such as *public policies,* social norms, practices that unfairly discriminate, societal hierarchies, or power relations related to class, gender, race, or caste [...] climate, pollution, the likelihood of earthquakes, and the presence or absence of seas and oceans" (Robeyns 2017, 46)[40]. Internal and external conversion factors "influence how a person can convert the characteristics of the commodity into a functioning" (Robeyns 2005, 99). According to the CA, many injustices depend on the absence of actual possibilities for people to translate resources and goods into valuable achievements (Holland 2008b, 321).

Through the CA we suggest that the effectiveness gap in Italy may be caused by inadequate attention to the difficulties that may prevent energy-poor households from converting public resources allocated by the State into actual opportunities. Starting from the idea that capabilities represent a foundational "currency of justice" (Stumpf, Becker, and Baumgärtner 2016), we argue that energy transition policies aimed at combating energy poverty in Italy could be deemed unjust as they fail to take into account the socio-economic conditions that characterize energy-poor people (e.g. limited financial stability, which restricts their ability to make upfront payments, or

[40] Our emphasis.

their housing situation, which often involves rented apartments), thereby preventing them from converting resources into functionings. Finally, building on the operationalization of the CA developed by Lee et al (2021), we also make the normative claim that to be just, such energy transition policies should aim to *enhance* the agency of energy-poor people.

This article is a conceptual contribution that employs *a priori* analytical categories based on the CA as its theoretical basis. The aim is to assess specific and current Italian energy transition policies that aim to address energy poverty by using the CA as an evaluative lens. The CA has sometimes been challenged due to its struggle with measuring people's capabilities in practice. Here, we do not aim to assess capabilities but to assess policies from a capabilitarian standpoint. As highlighted by Crevani et al. (Crevani, Milchram, and Frigo, forthcoming), in energy research the CA has been used most prominently as (i) a conceptual tool; (ii) an energy planning tool; (iii) an impact evaluation tool. We are interested in the application of the CA according to this last option, as a tool to "assess the impacts of energy interventions on the sets of capabilities" (Crevani, Milchram, and Frigo, forthcoming,). We provide a content analysis of energy transition policies and assess them through the lens of CA. We also highlight the lack of data regarding the impact of energy transition policies on energy poverty in Italy, and this underlies our key call for improved data collection and better statistics.

The article is structured as follows: in section 4.2, we discuss the theoretical framework and clarify how the CA can help assess energy transition policies in Italy that aim to tackle the issue of energy poverty. Section 4.3 presents the effectiveness gap, offering an overview of Italian policies that emerged in the wave of the energy transition and are also expected to combat energy poverty. The overview shows the challenges of determining whether these policies reach energy-poor households. Section 4.4 analyses the Italian energy transition policies through the normative lens of the CA. Section 4.5 provides an outlook that encourages policymakers to design policies that empower energy-poor people and enhance energy-saving behaviors. Section 4.6 presents some concluding remarks.

4.2. The Theoretical Framework

4.2.1. The Capability Approach

In the late 1970s, Sen elaborated for the first time the capability approach (e.g., Sen 1979), successively enhanced on the normative level by Nussbaum (2000; 2006). Although there are some differences in how Sen and Nussbaum defined capabilities, (Crocker 1995; Robeyns 2017), they are generally understood as a person's actual opportunities to do or be and should be distinguished from "functionings", (i.e. the actual states of "beings" and "doings" that a person has reasons to value and may achieve). As Groves formulated, capabilities "are [...] possibilities for achieving functionings" (Groves 2021, 2), and are not to be confused with goods that we can use. For example, being healthy is a "functioning", while the actual opportunity to be healthy is a capability. While Nussbaum set a list of central capabilities (Nussbaum 2000, 78–80)[41], for Sen collective decision processes determine the relevant capabilities (Sen 2009). Overall, the particularity of this theory of social justice is that rather than aiming to define what institutions should characterize a just and ideal society, the capability approach starts from concrete and realized forms of injustice, which seriously affects the wellbeing of individuals (Sen 2009; Robeyns and Fibieger Byskov 2023). Put differently, it focuses on what people can effectively be and do rather than the resources available to them. Sen motivates this shift by affirming that "[t]here are, in fact, various types of contingencies which result in variations in the conversion of income into the kinds of lives that people can lead" (Sen 2009, 255). Factors such as individual traits, circumstances, environmental surroundings, and social conditions influence individuals in actually converting resources into opportunities. This shift from inputs to outcomes (Melin, Day, and Jenkins 2021) does not deny the relevance of material empowerment (that could depend, for example, on energy). Rather, it implies considering external and internal factors when implementing policies to make the redistribution of resources equitable. In

[41] 1. Life. 2. Bodily Health. 3. Bodily Integrity. 4. Senses, Imagination, and Thought. 5. Emotions. 6. Practical Reason. 7. Affiliation. 8. Other Species. 9. Play. 10. Control over One's Environment. A. Political. B. Material.

capabilitarian terms, "justice means that each citizen is equally entitled to a set of basic capabilities" (Claassen 2016, 1279). In this article, we do not aim to specify the basic capabilities, but aim more generally at understanding justice in terms of substantial opportunities (capabilities) for citizens of a country to achieve "functionings", by considering those factors that could prevent them from realizing what they have reason to value. As Nussbaum states, her theory of justice is "partial" and yet is compatible with other theories of just distribution of resources (Nussbaum 2000, 12).

In this theoretical framework of justice, States should develop targeted policies that consider those socioeconomic, environmental, and physical contingencies that may limit people from doing and being what they value doing or being[42]. In Day's words, "[c]apabilities [...] are not just a matter for the individual to work on, but for society to consider, assess, and ideally to promote for its citizens, through its programs, *policies*, and ways of working" (Day 2017, 125)[43]. Day's emphasis on the political decisions and conditions for capabilities to be available to people and the role of policies (i.e. improving people's capability sets) directly relates to the concrete issue of energy poverty and the corresponding energy policies.

4.2.2. The Capability Approach and Energy Poverty

Starting with Boardman's publication on "fuel poverty" (Boardman 1991), definitions of energy poverty have proliferated in scientific and policy discussions. In the academic literature, an influential work by Bouzarovski and Petrova (2015) tries to resolve the dichotomy that has developed between "fuel poverty" (mainly concerning issues of energy affordability in the global North), and "energy poverty" (mainly addressing issues of energy access in the global South) (see Sy and Mokaddem 2022). They suggest defining energy poverty through an aspect common to the experience of both the global South and the global North: the "inability [of energy-poor households] to attain a socially and materially necessitated level of domestic energy services"

[42] In capabilitarian terms, Claassen says that: "Justice then is a matter of using public power to save citizens from private practices of oppression and coercion, so that they can function as autonomous choosers of their own lives" (Claassen 2016, 1294–95).
[43] Our emphasis.

(Bouzarovski and Petrova 2015, 31). This shift towards energy services (from energy *per se*) (see also Brand-Correa and Steinberger 2017) occurs today in energy policy documents as well (e.g., European Commission 2023a), and it is pivotal to understand the CA's role in conceiving energy poverty and how to better address it through policies. Considering capabilities as currency to measure an individual's wellbeing reminds us that people and households are interested in energy services only to the extent that they benefit human development. This idea is well reflected in the capabilitarian definition of energy poverty provided by Day et al. (2016, 259):

> "an inability to realize essential capabilities as a direct or indirect result of insufficient access to affordable, reliable and safe energy services, and taking into account available reasonable alternative means of realizing these capabilities".

To date, many studies confirm the positive correlation between the Human Development Index (HDI) and energy services (Arto et al. 2016; Frigo, Baumann, and Hillerbrand 2021; Tho Pesch et al. 2023). From a capabilitarian point of view, a constraint in basic energy services, when they enable human functionings (Lee, Kim, and Byrne 2021), limits people in their actual capabilities and, ultimately, in their freedom (Day, Walker, and Simcock 2016). As such, energy poverty and its multidimensional implications (e.g., on health, education, emotion, and play, see Bartiaux, Day, and Lahaye 2021; González-Pijuan et al. 2023) represent a hurdle to personal flourishing.

In the last decade, several studies of energy poverty cases adopted the CA (Groves 2021; Willand and Horne 2018; Bartiaux et al. 2019). For instance, Pellicer-Sifres et al. (2021) explore the relationship between energy poverty and wellbeing through Nussbaum's theory of central capabilities. Interviews in four European countries identified six central capabilities (Bodily Health; Emotions; Affiliation; Play; Practical Reason; Senses, Imagination, and Thought) that are directly impacted by energy poverty. The authors highlight the importance of addressing energy poverty as an injustice and suggest the need to adopt the CA in both research and policy.

Similarly, Middlemiss et al. (2019) delve into the social relations aspect of energy poverty, to examine how relationships with family, friends, and other individuals affect people's ability to deal with energy poverty. They argue that good social relations can enable access to energy services and *vice-versa*. The findings of this research emphasize the significance of considering the quality of social relations in addressing energy poverty and highlight the role of policy and practice in shaping these dynamics.

Highlighting that what matters is what we can achieve with energy services (i.e. basic capabilities), rather than the energy service *per se*, leads positive assessment of reasonable means to realize basic capabilities which are less dependent on energy (Day, Walker, and Simcock 2016). This feature is particularly relevant at a time of rapid climate and environmental changes that are largely driven by the energy sector.

4.2.3. The Capability Approach: Balancing Individual Freedom and Environmental Policies

The use of the CA to evaluate climate and environmental policies as well as their societal implications is quite recent (Hillerbrand 2018; Holland 2008a). Given the CA's strong emphasis on individual freedom, its adoption might appear inadequate for tackling urgent collective environmental problems (cfr. Bonvin, De Munck, and Zimmermann 2018; Robeyns 2017, 183ff for a discussion of the "critique of individualism" of the CA)[44]. Environmental and climate emergencies often necessitate robust governmental interventions, which could potentially conflict with what individuals have reason to value and seek to achieve. In the context of energy poverty, for example, it is conceivable that a person might be indifferent or even opposed to energy transition efforts. Additionally, the CA has traditionally been linked to a conception of the welfare state that relies on economic growth, a notion which is often criticized for being incompatible with sustainable future scenarios (Moore 2016a;

[44] All the more reason, if we consider that many environmental problems are longitudinal collective action problems (Sandler 2009), that is problems that depends on the aggregated sum of all unintended contributions of individuals who are unknown to each other.

Barca 2020). Addressing these criticisms, Bonvin and Laruffa (Bonvin and Laruffa 2022) have argued that it is possible to decouple the welfare state from economic growth within the CA's normative framework. Moreover, they contend that the emphasis on democracy within the CA helps to mitigate conflicts that might arise between individual choices and the implementation of strong climate mitigation policies. Also enriched by these different standpoints, the debate surrounding the social versus individual dimension of the CA is extensive (Evans 2002; Gore 1997; Stewart 2005), with many authors defending the strong social implications of the CA (Ibrahim 2006; Binder 2009).

In this article, we do not delve into that discussion. Instead, we consider the hypothetical situation of energy-poor individuals who, despite being willing to participate in the energy transition, can often be overlooked by policies that fail to account for their internal and external conversion factors (see below). This does not imply that all energy-poor people positively value energy transition policies. They may oppose these policies, which can also apply to those who do not require public assistance to invest in energy efficiency measures. What a person has reason to value (functioning) is ultimately a matter of individual choice, but among which capabilities (actual opportunities to be or to do) is not. These also depend on the society in which the individual lives. For Nussbaum, for instance, central capabilities should be considered "as a basis […] of a political overlapping consensus" (Nussbaum 2000, 14), while in Sen's approach, it is a democratic decision-making process that decides on which capabilities a society should focus (Sen 2009).

Climate change is scientifically proven, empirically experienced, and widely recognized as a problem that needs to be addressed urgently. Policymakers should promote democratic debates in society as well as the dissemination of information, which shapes individuals' opinions and enhances their agency (see section 4.2.4). Environmental and climate concerns are among the most serious challenges of our time. The capability to live more sustainably, and in a less damaged world, could well be among the most highly valued capabilities in a society.

Nevertheless, this article does not address these broader considerations. Instead, we limit our focus to assessing energy transition policies that may be deemed

unjust due to their failure to provide actual opportunities for a specific group in society (i.e. energy-poor people).

4.2.4. The Capability Approach, Energy Justice, and Energy Poverty Policies

Lacking energy services prevents people from enabling capabilities and achieving valuable functionings, affecting their freedom, actions, and wellbeing. What are policies expected to do then, from a CA perspective, to address energy poverty *justly*? In section 4.2.1, we made the normative claim that policies should improve a person's set of capabilities. In this section, we elaborate on this idea concerning energy poverty. In energy studies, the research field of "energy justice" recognizes the need to identify and address inequalities and injustices in the energy sector, expanding the debate beyond economic considerations (Miller, Iles, and Jones 2013; McCauley and Heffron 2018; Walker and Day 2012; Jenkins et al. 2016). The CA stands out as a prominent normative tool for understanding questions of energy justice. A recent special issue in the *Journal of Human Development and Capabilities* addressed these intersections (Melin, Day, and Jenkins 2021). Some contributions discuss energy poverty specifically (Rajagopalan 2021; Bartiaux, Day, and Lahaye 2021; Lee, Kim, and Byrne 2021). For instance, Lee et al. propose a "capabilitarian energy justice framework" to evaluate energy poverty policies in their attempt to achieve social justice. They distinguish energy poverty policies into "compensation-based" and "empowerment-focused" categories through the criterion of "human agency" (Lee, Kim, and Byrne 2021), that is, the capacity of a person to make decisions and act autonomously based on their values. Since "empowerment-focused" policies aim to "[expand] the agency of the less privileged by elevating their capacity to control decisions at personal and community levels" (Lee, Kim, and Byrne 2021, 300), they are more recommendable than compensation-based ones to counteract energy poverty[45]. From a CA point of view, just energy policies are expected to enhance the agency of energy-poor individuals. According to Lee et al. (2021), energy efficiency

[45] The concept of agency is extremely relevant in the CA literature. Various typologies of agency (individual, participational, and navigational) related to the CA can be found in Claassen (2016).

policies best exemplify the "empowerment-focused" typology of policies. Yet, energy-poor households often have difficulties implementing them due to high upfront costs (2021, 308). At the European Union (EU) level, the empowering role of energy transition policies for energy-poor households is widely recognized, and EU Directive 2023/1791 says that "Member States shall take appropriate measures to empower and protect people affected by energy poverty" (2023a art. 24). However, there seems to be a mismatch between the intention and the result of the implemented energy transition policies as far as energy poverty is concerned. Next, we present such an effectiveness gap regarding the Italian context.

4.3. The Effectiveness Gap in Italy

4.3.1. Impacts of Energy Transition Policies on Energy Poverty

Some scholars have begun to investigate the unintended socio-economic side effects of energy transition policies on energy-poor people (Carfora and Scandurra 2024; Koďousková et al. 2023). Focusing on Europe, for instance, Faiella et al. (2022) discuss the challenges of achieving a fair transition to net-zero emissions by 2050, emphasizing the risk of disproportionate burdens on vulnerable households. Similarly, Feenstra and Özerol (2021) warn about the unjust side effects of energy transition policies in the Netherlands, showing how transitioning from gas-based energy systems to "less carbon-intensive heating alternatives" puts energy-poor people at risk of being adversely affected or marginalized. Streimikiene and Kyriakopoulos (2023) argue that addressing energy poverty requires a carefully designed strategic plan for low-carbon energy transition. As stated by Belaïd (2022, 10), "climate policies must go hand-in-hand with inequality and energy poverty mitigation". On a more theoretical level, Wood and Roelich (2019) highlight that certain climate mitigation policies aiming at reducing fossil fuel burning could negatively impact energy-poor households that heavily rely on them. The interaction between energy poverty, climate change and the energy transition has also been addressed by the EU, where multiple transition policies have often failed to adequately address the issue of domestic energy deprivation (Bouzarovski and Tirado Herrero 2017). According to the EU, "current building

renovation rates are insufficient and buildings occupied by citizens on low incomes who are affected by energy poverty are the hardest to reach" (European Commission 2023a p. 15). It is often difficult to determine whether the policies implemented to combat energy poverty in a wider transition program effectively reach energy-poor households. This problem has become known in the literature as the "hard-to-reach" citizens' issue (Mundaca et al. 2023; Owen et al. 2023). In the following sections, after presenting EU and Italian energy transition strategies, we address what we identified as an effectiveness gap (see section 4.1) in Italy.

4.3.2. Energy Transition Targets and Energy Poverty: from the EU to Italy

The EU has recognized the impact of global warming on the environment, including the rise in extreme weather events and loss of biodiversity (European Commission 2018a), and has set long- and short-term targets to meet the Paris Agreement's goal of limiting global warming to well below 2°C above pre-industrial levels and pursuing efforts to limit the increase to 1.5°C (UN 2015 art. 2). The EU has defined a set of legislative packages (see Table 2) with a key objective to achieve climate neutrality across the EU by 2050. There is a binding target to reduce domestic GHG emissions by at least 55% compared to 1990 levels by 2030 (see European Commission 2021b; 2021c art. 4). To comply with these targets, ETS (Emission Trading System) sectors[46] are expected to reduce their GHG emissions by 61% compared to 2005 levels by 2030 (European Commission 2021b, 6). For non-ETS sectors[47], the revised Effort Sharing Regulation (European Commission 2023c) laid obligations on EU Member States to fulfil the EU's target of reducing its GHG emissions by 40% below 2005 levels by 2030. For the EU, transitioning to more efficient and greener energy sources is an essential component of achieving these targets (European Commission 2018b; 2020). Given that over 75% of the EU's GHG emissions result from energy production and consumption across all economic sectors (European Commission 2019d, 6), decarbonizing the energy system is pivotal.

[46]https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/scope-eu-emissions-trading-system_en#sectors--gases.
[47] See footnote 46 for all other not listed sectors.

These EU packages mark a significant milestone in the recognition of energy poverty. Some of the Directives include measures that specifically address energy poverty (see Table 2). For instance, the "Energy Efficiency Directive" establishes a common definition of energy poverty (European Commission 2019b, 9). Under the guiding principle "no-one should be left behind", some Directives propose measures to address energy poverty (see Table 2), encouraging citizens to take an active, conscious, and independent role in their energy decisions and consumption. The "fit for 55" package (European Commission 2021b) establishes a Social Climate Fund to support vulnerable households, recognizes energy efficiency as one of the most effective tools for tackling energy poverty, and requires Member States to renovate at least 3% of the total floor area of buildings owned by public bodies each year, with a focus on buildings serving vulnerable users and social housing. In sum, the EU recognizes that the energy transition can be both an opportunity to combat energy poverty and a potential factor in its exacerbation. (European Commission 2023a; 2023b).

Directive	Measures addressing EP	EU Framework
Energy Efficiency Directive (EU/2023/1791)	● Under the energy savings obligation, each EU country is responsible for achieving a share of its energy savings among vulnerable customers and those affected by energy poverty. ● Aims to empower energy-poor consumers by requiring EU countries to enhance awareness and provide information on energy efficiency. ● Emphasizes the creation of one-stop shops, technical and financial advice and consumer protection via out-of-court mechanisms for the settlement of disputes. ● Improved regulations to identify and remove barriers related to split incentives for energy efficiency renovations between tenants and owners or among multiple owners. ● Establishes that the revenues generated from the EU Emission Trading System in the buildings and transport sectors will be allocated to the Social Climate Fund, which, among other things, contributes to the fight against energy poverty.	EU Green Deal, Fit for 55 Package
Energy Performance in Buildings Directive (EU/2024/1275)	Defines actions at the national level to combat energy poverty through the improvement of the least energy-efficient buildings.	EU Green Deal, Fit for 55 Package
Governance Regulation (2018/1999)	Member States to include energy poverty reduction targets in their National Energy and Climate Plans (NECPs).	Directive adopted before the Clean Energy for All Europeans Package, but closely linked to it
Electricity Directive (2019/944)	Member States to provide a definition and criteria for measuring energy poverty.	Clean Energy for All Europeans Package

Table 2. European Directives addressing energy EU legislative framework.

Following the EU lead, Italy implemented a set of energy transition policies. In the NECP 2023 *(*Italian Ministry of the Environment and Energy Security 2023) the decarbonization process is mostly entrusted to the residential housing (e.g. civil buildings) and transportation sectors, both of which present considerable opportunities for improvement (2023). By the end of 2030, Italy shall reduce its GHG emissions from non-ETS sectors by at least 43.7 % in relation to 2005 (European

Commission 2023c). To achieve this target, Italy aims to reduce by at least 30% the GHG emissions (compared to 2021) in the building and transport sectors. However, according to the Italian NECP, the combination of all planned policies, in the civil and transport sectors, currently allows for an emissions reduction in the range of *only* 35% to 37% by 2030 (2023).

The decision to focus on these two sectors highlights the condition of energy-poor households since they are more sensitive to changes in the surrounding environment (e.g. public transport facilities, energy bills, rents). Indeed, energy poverty is extensively addressed in the latest NECP. In line with EU Directives and communications, the Italian government recognizes energy efficiency, and more generally the energy transition, as pivotal to combat energy poverty (2023, 291). But to what extent can energy-poor households actually benefit from energy transition policies in Italy?

4.3.3. Counteracting Energy Poverty through Energy Transition Policies in the Italian Context: an Overview

In Italy, several scholars have tried to characterize and quantify energy poverty (Miniaci, Scarpa, and Valbonesi 2014; Faiella and Lavecchia 2015; 2021; Faiella, Lavecchia, and Borgarello 2017). To date, there is no official national definition of this phenomenon. Yet, the topic is gradually gaining attention in official documents such as the *National Energy Strategy* (it., *Strategia Energia Nazionale*, SEN) (2017) or the NECP 2019 (Italian Ministry of the Economic Development 2019). Various Italian policies address energy poverty already: some directly, through specific national or local public interventions; others indirectly, as they are designed for different objectives but could be targeted for energy-poor users (see Fig.1).These policies follow two main approaches: 1) providing financial support to citizens through bonuses and subsidies to cope with higher energy prices and living costs (e.g. electricity and gas bonuses); 2) promoting energy and economic savings through efficient technologies and renewable energy sources (all other policies. See Appendix 2 for details). In the NECP, measures emerging in the wave of the energy transition

(e.g. supporting energy efficiency and the spread of renewable energy sources) are mentioned as capable of addressing energy poverty (2023, 290 ff).

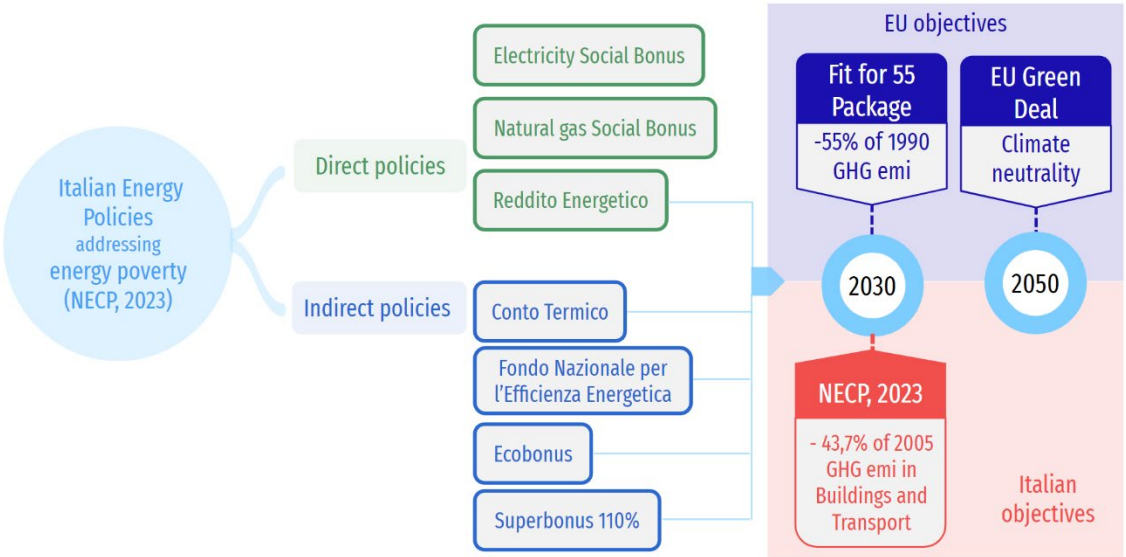

Figure 2. Schematic representation of Italian policies addressing energy poverty

At present, however, it is difficult to determine the effectiveness of most of these measures in addressing the issue of energy poverty. This is the case for the *"Fondo Nazionale Reddito Energetico"*[48]*:* which has been used only for a few isolated interventions, and never at the national level (Realini et al. 2022). Similarly, the shortage of data makes it difficult to evaluate the impact of another fund provided by the Italian government: the *"Fondo Nazionale Efficienza Energetica"*. According to the *National Agency for New Technologies, Energy, and Sustainable Economic Development* (ENEA), relatively few interventions are eligible for the incentives of this fund (ENEA 2023). In a previous report, ENEA reveals that of the twenty-six projects financed by the fund in 2021, only one is focused on building renovation by energy service companies (2022, 141), and it is not specified whether the sole project

[48] This and all further mentioned policies are described in table 3.

is aimed at social housing (i.e. whether it would benefit those who are more likely to be in energy poverty). Conversely, the capacity of *Renewable Energy Communities (RECs)* to tackle energy poverty is increasingly scrutinized. For instance, research insights from the CEES (Community Energy for Energy Solidarity) consortium question the ability of such initiatives to adequately address energy poverty and mitigate the impact of energy crises on households[49], as the success of citizen-led and community-owned energy projects depends on several variables, involving energy practices, ownership of a REC project, and institutional support from national and local governments (Hoicka et al. 2021). Finally, there is the case of the "Ecobonus" and the "Superbonus" which establish a tax relief scheme for improving the energy efficiency of existing house/building. In the past few years, these two policies gained momentum, encouraging research on their effects, including on energy-vulnerable households. The *International Energy Agency* (IEA 2023, 30, 69) points out that such incentives have regressive effects, benefiting homeowners and households with higher upfront spending capacity. The Italian Government Report on building tax incentives (Ufficio Parlamentare di Bilancio Italiano 2023) confirms that slightly more than 10% of the wealthiest taxpayers benefited from half of the total Ecobonus deductions provided by the State in 2023. Moreover, most low-income households live in rented homes (Faiella et al. 2019). Owners of rented properties are potentially eligible for the Ecobonus and Superbonus, but they might be discouraged from investing in energy efficiency due to high costs, and benefits that do not directly benefit them. Tenants, on the other hand, may find it unattractive to invest in energy improvements because of the short-term nature of rental agreements and the risk that any upgrades could lead to higher rents (Faiella et al. 2019).

By analyzing the territorial distribution of deductions, further confirmation of the regressivity of these measures can be found. As addressed in Martini (2023), for example, lower access to Ecobonus is observed in Southern Italian regions, where the incidence of energy poverty is higher. Governmental data from 2008 to 2019 confirm that, before the introduction of the Superbonus, more than 60% of deductions were

[49] https://www.energysolidarity.eu/.

used by taxpayers resident in the Northern regions (Ufficio Parlamentare di Bilancio Italiano 2023). The use of the Ecobonus and Superbonus through transfer credits helped economically weaker households to access investments, increasing the use of incentives in lower-income municipalities (2023). However, according to the IEA (2023, 78), few companies are interested in receiving a tax credit, as they would also need to advance costs while having to address their cash flow to cover operational costs. A credit transfer to financial institutions still requires an upfront financing capacity as reimbursements are made after the expenditure. In a study by RSE[50], Brugnetti et al. (2023) conducted a cost analysis of the two policies to assess whether they could have been affordable for energy-poor households. They calculated the average regional expenses, net of state incentives, falling on households using the Ecobonus or Superbonus in 2022 and compared it with the calculated 2022 "residual expenditure capacity" of households, net of minimal energy expenses and minimum car travel expenses for work. If the "residual expenditure capacity" falls below the relative poverty line, the household is classified as energy-poor[51]. According to the results, it is unlikely that in 2022 energy-poor households could afford an energy efficiency intervention under the Superbonus 110% scheme, considering that it would have meant using a significant fraction of its overall residual spending capacity. The analysis conducted on the Ecobonus leads to similar conclusions (Brugnetti et al. 2023).

4.4. The "Effectiveness Gap" through the Lens of the CA

In section 4.2, we defined justice in capabilitarian terms considering both the relevance of opportunities to achieve valuable "functionings" and the conversion factors that enable them. We also highlighted the role of policies in counteracting energy poverty, and more generally, to improve people's capabilities set and enhance

[50] RSE S.p.A. is an Italian company indirectly controlled by the Ministry of Economy and Finance through its sole shareholder GSE S.p.A (https://www.rse-web.it/).

[51] The relative poverty line is annually defined by ISTAT (Italian National Institute of Statistics) depending on the number of family members. The values for 2022 are available here: https://www.istat.it/it/files/2023/10/REPORT-POVERTA-2022.pdf.

their agency. Drawing on these elements, here we analyze the policy overview conducted in section 4.3.3.

Adopting the CA and focusing on conversion factors may help highlight that people in energy poverty conditions not only lack resources but also live in disadvantaged circumstances. The policies overview focuses on the economic factor, showing that the costs associated with additional but essential interventions to benefit from government efficiency initiatives, as well as the requirement to pay upfront for administrative expenses, can be prohibitive. Moreover, energy-poor individuals often live in rented homes where renovation expenses are rarely prioritized.

To revisit the research questions: (1) are current energy transition policies addressing the issue of energy poverty in Italy? And, if this is not the case, (2) can such energy transition policies be deemed unjust? From a CA standpoint based on the central roles of actual opportunities, the consideration of conversion factors, as well as the fundamental empowerment role of policies (see section 4.2), it seems that energy-poor people and households have been among the losers of the Italian energy transition so far. When energy transition policies in Italy do not directly consider the socio-economic conditions of energy-poor people (i.e. conversion factors), they limit vulnerable subjects in their opportunity to take control of their energy consumption. Moreover, they are left behind in a transition process that could help them out of energy poverty. In other words, such policies risk narrowing their capabilities, as failing to effectively address energy poverty leaves people in conditions that have been widely proven to limit even fundamental capabilities (see section 4.2.2). Therefore (at least within the Italian context), current energy transition policies that aim to alleviate energy poverty in Italy can be deemed unjust.

Through a CA lens an effectiveness gap is indeed observable and derives, at least partially, from a conceptualization of justice that pays inadequate attention to factors (e.g. economic factors) that impede energy-poor people from applying for energy transition incentives in Italy. The cost analysis conducted by Brugnetti et al. (2023) argues that in 2022 in all Italian regions, energy efficiency incentives - under the Superbonus and Ecobonus schemes - have been mainly used by privileged households with the means to afford such expenses. This is because energy efficiency

interventions incentivized by the Superbonus 110 % require non-deductible expenses (such as upfront costs for administrative costs), which are borne by private citizens. Similarly, the interventions incentivized by the Ecobonus assume an unavoidable share of non-deductible expenditure, since the deduction covers only a part of the total intervention cost[52]. These "other" expenses (i.e. those not covered by the incentives schemes) have rarely been found to be within the economic reach of households in energy poverty in 2022. This means that only households capable of paying beforehand for ancillary and non-deductible measures could carry most of the energy efficiency interventions.

Moreover, authors have also argued that the sole implementation of energy transition policies does not suffice in addressing and solving the energy poverty phenomenon (Bartiaux et al. 2019; Hunt et al. 2021; Sherriff, Butler, and Brown 2022). Similarly, through the theoretical lens of the CA, energy transition policies *per se* cannot be considered *empowerment-based* policies that reinforce and promote the agency of energy-poor individuals in energy issues. This is possible only when policies create actual opportunities for energy-poor households to take advantage of the energy transition. For energy policies to truly empower energy-poor people (and more generally all citizens), they need to not only provide resources in material terms but also offer support to develop the capacity for individuals to utilize these resources. This could happen, for instance, by developing more targeted energy transition policies to reach specific households such as rented ones (Papantonis et al. 2022). Integration of energy policies with broader social welfare and community development initiatives can create support networks that offer education, information, and training on energy management, enabling individuals to make informed decisions about their energy use. Community-based projects can also foster a sense of ownership and engagement, ensuring that energy-poor households can directly benefit from the energy transition. For example, some pilot initiatives in Italy (mostly

[52] The deduction rates used in the analysis proposed by Brugnetti et al. (2023) to calculate the net intervention costs, referred to the year 2022, are 50% for window frames replacement and 65% for condensing boilers installation (including thermoregulation systems).
(https://www.efficienzaenergetica.enea.it/images/detrazioni/Normativa/30-decreto_efficienza_energetica_2020_gu.pdf).

proposed by philanthropic organizations or associations helping vulnerable individuals) have introduced training programs to raise energy awareness alongside efficiency measures (such as replacing old appliances) aimed at the most disadvantaged users. These projects have received highly positive feedback and have great potential to be systematically integrated into political strategies to combat energy poverty[53]. For this purpose, policy design and energy rules need to change. Barroco Fontes Cunha et al. (2021) have noted that energy communities in Italy could represent a partial solution to combat energy poverty. However, new energy market regulations that promote their implementation, as well as other collective energy schemes, are needed. By establishing these connections (e.g. broader social welfare, energy policies and community development initiatives) and providing comprehensive support, energy transition policies can empower individuals and enhance their agency in energy-related matters.

Identifying a latent form of injustice is one thing; addressing it is another. This brings us to an important question: Do the conceptual tools of the CA possess practical utility for policymakers aiming to improve energy transition policies? Policy implications of CA assessments of energy-poverty related issues have already been successfully advanced in the literature (e.g., Day, Walker, and Simcock 2016). We recommend envisioning the objectives of energy transition policies more broadly when trying to combine them with the energy poverty problem. We suggest two key objectives for energy transition policies. First, they should aim at improving the capabilities set of energy-poor individuals. To do this, it could be helpful to think about energy transition policies as conversion factors that enable people to transform their resources into functionings. This perspective encourages consideration of the socioeconomic, environmental, and physical contingencies that energy-poor people might face when seeking to benefit from energy transition incentives (e.g. difficulties for upfront payments or living in rented or sublet housing). Second, we emphasize the need to enhance the agency of energy-poor individuals. This might involve creating conditions through welfare systems, information campaigns, education, and public

[53] https://bancodellenergia.it/progetti/.

discussions that enable individuals to make autonomous decisions about their energy consumption and similar issues. However, envisioning the empowerment of energy-poor households from a policy perspective risks adopting a top-down approach. We suggest that government-driven initiatives should be merged with bottom-up ones. Indeed, civil society often displays a richness of organizations and activism that policies can highlight, foster, and support, leading to a fruitful cross-fertilization to foster a sense of ownership and participation in the energy transition process.

4.5. Outlook

Energy poverty has not only a close relationship with energy transition policies in general but with *empowerment-based* policies specifically. In the context of climate change, enhancing people's agency through policies is crucial to promote energy-saving behaviors (Sapci and Considine 2014; Dernbach and Brown 2008; Ortiz, Kurvers, and Bluyssen 2017). Some studies have shown that both pro-environmental and environmentally unfriendly behaviors are influenced not only by psychological barriers (Gifford 2011) but also by contextual and structural factors such as technology and public incentives (Stern 1999, 465). According to Geerts (2012), technologies can play a fundamental role both in exacerbating or reducing the "experiential gap", that is, the divide between the experience that an individual has of electricity consumption and the effects of this consumption on the rest of the network and the environment. To this extent, political incentives towards modern and more efficient energy systems can contribute significantly to the spread and development of sustainable habits. This is not to say that technologies - e.g. off-grid microgeneration systems or solar panels - would be sufficient to promote a deeper collective environmental awareness. On the contrary, relying *only* on "cleaner" technologies can even lead to the opposite effect of consuming more energy due to the Jevons effect (Trincado, Sánchez-Bayón, and Vindel 2021) or moral licensing (Tiefenbeck 2013). However, if we consider the residential sector, we propose that energy transition policies (e.g. incentives for cleaner energy systems, renovation of buildings, information campaigns for alternative energy systems) have great potential

to shape new and more sustainable energy consumption habits (e.g. monitoring the amount of energy consumed through smart grids; using appliances during the day, when having solar panels). Energy policies can also enhance individual agency by encouraging critical and democratic examination of widely accepted energy practices, as energy consumption patterns depend on societal changes and the evolution of energy-related practices (Gantioler et al. 2023; Shove and Wilhite 1999). Engaging critically with the question "what do we need energy for?" (Shove and Wilhite 1999; see also for a similar question Geerts 2018) opens up the opportunity for policymakers and individuals to rethink energy consumption through a social understanding, rather than a merely economic one. Adopting the language of the CA could contribute to empowering energy-poor people to "realize, exercise and celebrate in action" (Crocker 1995, 163) more sustainable energy behaviors.

We identify three areas for improvement in energy transition policies in Italy and similar contexts: 1) addressing behavioral barriers to pro-environmental habits caused by energy deprivation (Streimikiene and Kyriakopoulos 2023), 2) considering personal, environmental, socio-economic conversion factors that influence the actual transformation of public incentives into sustainable energy technologies and systems, which could help individuals benefit from energy policies (e.g. retrofitting, tax breaks); and 3) promoting a democratic debate on energy practices within society. Developments in these directions would ensure that two key notions at the core of the capability approach - dignity and freedom of choice - will be safeguarded. In "*The Idea of Justice*", Sen introduces the term "sustainable freedom" (2009, 251) to emphasize the role of human agency and human freedom to engage in pro-environmental activities. This "sustainable freedom" today is not within the capability set of all individuals. Failing to extend this freedom to all "will lead to a society in which people might be willing, but are not able to reduce their energy consumption" (Geerts 2012, 12).

4.6. Conclusion

In light of the nexuses among energy poverty, climate change, and energy transitions, this article explored the effectiveness of energy transition policies in addressing the energy poverty phenomenon in Italy. We presented a policy overview (see section 4.3) which showed that despite the Italian government's intention to tackle energy poverty through specific energy transition measures, an effectiveness gap is observable in reaching energy-poor households. When data is available, the effectiveness gap appears pronounced. For instance, the "Ecobonus" and the "Superbonus" have not proved to be effective because energy-poor households could hardly access such public incentives. In section 4.4, we analyzed this "effectiveness gap" through the lens of the CA, starting from the idea that capabilities (the opportunities to achieve "functionings") are a fundamental currency of justice and that conversion factors play a direct role in achieving functionings. We suggested that the effectiveness gap in Italy may depend on inadequate attention to the difficulties of energy-poor households in converting public resources allocated by the State into actual opportunities. For this reason, the Italian transition policies considered in the article could be deemed unjust.

A key finding of the article is that there is an overall lack of data available to determine the concrete impact of energy transition policies on energy-poor households and people in Italy. This and the effectiveness gap characterizing the Italian situation speak of insufficient interest in the socio-economic context of energy-poor people, shedding light on the limited empowering effect of implemented energy transition policies. Our analysis and assessment through the CA are limited by the focus on energy transition policies affecting only the residential sector, which are sometimes very recent (see fig. 3). However, the rationale behind our approach can be generalized and applied to the evaluation of other policies that could promote energy services, including those related to recreational facilities, public sport facilities, and transportation, as well as their impact on the capability set of various social groups (not only energy-poor people).

Public policies should work to improve the capabilities of individuals and their well-being, considering their socio-economic and physical circumstances. To this aim, we advanced some policy recommendations in section 4.4. Building on the capabilitarian approach developed by Lee et al. (Lee, Kim, and Byrne 2021), we make the normative claim that such policies should aim to enhance energy-poor people's agency, reinforcing their capacity to make autonomous decisions when it comes to energy matters that affect them directly. We recommend developing policies that empower energy-poor people and enhance energy-saving behaviors, two crucial issues that require further research.

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4.8. Appendix 2

Direct policies		Social Bonuses (electricity and gas)	Established in 2005 (electricity bonus) and 2008 (natural gas bonus), they provide a reduction for electricity and natural gas supply expenses for domestic customers recognized as being in economic hardship. The main eligibility requirements for the bonuses are related to income and the number of household members. These bonuses are the main instruments to address energy poverty in Italy. According to the Italian Observatory on Energy Poverty (Faiella et al. 2019) as well as to the peer reviews of energy policies annually conducted by the International Energy Agency (IEA 2023) the structure of the two bonuses discourage energy saving attitudes, reseller changes or investments towards more efficient equipment, thus negatively affecting long-term actions on energy poverty households.
		Reddito Energetico	Grants allocated by the Italian government to incentivize energy efficiency by purchasing and installing renewable energy systems for economically disadvantaged households that are unable to afford these solutions. This initiative simultaneously addresses energy poverty and environmental protection. The establishment of the Fund was anticipated by resolution no. 7 of March 17, 2020, but the resources remained blocked for a long time until the official establishment of the fund in 2023 by the Italian decree of August 8, 2023.
Indirect Policies	Energy efficiency policies	Ecobonus and Superbonus 110%	They consist of tax incentives provided for energy efficiency improvements in buildings and/or residential technological equipment that account for a significant portion of household energy consumption. The Ecobonus was introduced in 2006 (DL 296/2006). It allows taxpayers to deduct a certain percentage of expenses incurred for energy requalification work on

			existing buildings from their individual income tax (Irpef) or corporate income tax (Ires). The value of the deduction rate varies depending on the type of dwelling being upgraded (single property unit or condominium) and the year in which the upgrade took place. The deduction applies to interventions aimed at reducing energy demand for heating, improving the thermal efficiency of the building, installing solar panels, and replacing winter climate control systems. The most relevant interventions eligible for the tax relief scheme are vertical walls, horizontal and inclined walls, window frames, solar heating systems, solar shadings, condensing boilers, heat pumps, biomass systems, building automation, installation of condensing boilers, and the replacement of windows frames. The Superbonus was introduced in 2020 (D.L. 34/2020 art. 119) as an enhancement of energy efficiency incentives. Like the Ecobonus, it is also offered as a tax deduction, with the difference that the deduction covers 110% of the expenses incurred from July 1, 2020, for the implementation of specific interventions aimed at energy efficiency and the structural strengthening or seismic risk reduction of buildings. In terms of efficiency improvements, it mainly incentivizes interventions on domestic energy plants and building envelopes. It also includes Ecobonus interventions on the 110% deduction, provided that they are carried out together with the previous mentioned interventions. Initially, the tax deduction for Ecobonus and Superbonus could be applied either as a direct deduction or through invoice discounting or tax credit transfer. However, the latter two methods of disbursement were abolished as of February 2023 (D.L. No. 11 of February 16, 2023).
	National Funds	Conto Termico	Fund that incentivizes interventions for energy efficiency in Public Administration and for the production of thermal energy from renewable sources. This measure could address the issue of energy poverty if public administrations undertake interventions on public residential buildings (social housing). It was introduced in 2012 (decree 28/12/2012) and recently updated in 2016 (decree 16.02.2016). This measure is also listed among those that could alleviate energy poverty in the NECP (Italian Ministry of the Environment and Energy Security 2023), but we did not consider in the article. This is because in 2023 the incentive quota for the public administration has been raised, introducing the possibility of combining the incentive with the National Recovery and Resilience Plan (Piano Nazionale di Ripresa e Resilienza, PNRR) funds. The consequences of this amendment (which might result in a greater possibility of reaching users in energy poverty) can be evaluated only in the years to come.

		Fondo Nazionale per l'Efficienza Energetica	This fund provides subsidized or state-guaranteed financing (by the Ministry of Economic Development and the Ministry of the Environment) for energy efficiency interventions carried out by businesses and public administration. Similar to the Conto Termico, it also includes interventions for improving energy efficiency in public residential buildings, which could align with efforts to combat energy poverty. It was established in 2014 by the decree of 4.07.2014 (art. 15) and revised in the 2022 Legge di Bilancio.

Table 3. Brief description of Italian policies addressing energy poverty.

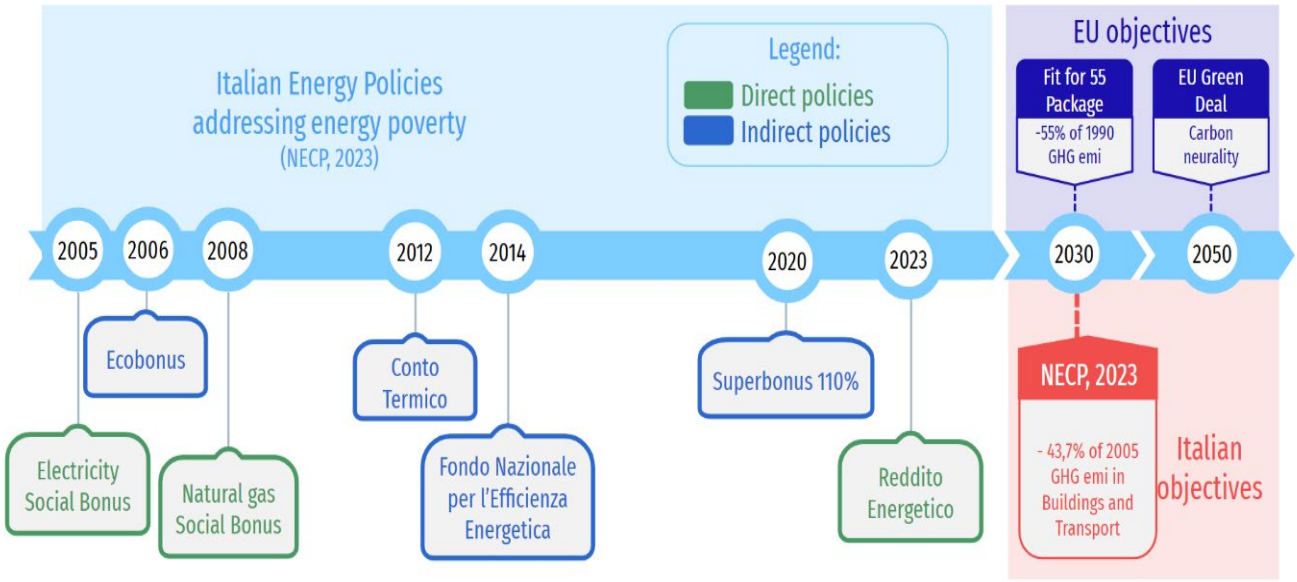

Figure 3. Timeline of Italian policies addressing energy poverty.

Conclusive Remarks

This dissertation has examined how ethical reflection can contribute to more inclusive energy transitions. It has focused on communities, individuals, and species referred to here as marginalized or overlooked, not because they are absent from scholarship. Rather, to emphasize that the ethical implications of renewable energy transitions on them remain under-theorized. These actors, while not disregarded, are frequently sidelined in shaping policy or transition pathways.

The overarching research question guiding this work has been: *How can philosophy provide deeper ethical reflection on human and non-human beings who have received limited attention in energy transition policymaking?* The three articles have addressed this question, serving as examples of how philosophical reflections based on distinct theoretical perspectives (ecofeminism, animal ethics, and the capability approach) can enrich policy debates on the energy transition. Specifically, Chapter Two has analyzed conceptions of energy, showing that framing energy primarily as a resource or commodity shapes human–nature relations, and contributes to limiting narratives that might become embedded in policy, discourses, and practices. This has raised the question of how alternative conceptions might be developed (see section 2.3.), both theoretically and practically. Future research could explore neglected perspectives, such as those from history, art, or religion, to challenge entrenched assumptions and reframe debates. Chapter Two has contributed to the overarching question by highlighting how philosophical inquiry into the meaning of energy can uncover

structural patterns of exclusion that shape both human and non-human lives, within and beyond policymaking. Chapter Three has extended the inquiry to the ethical responsibilities of energy stakeholders toward non-human animals, focusing on the harms caused by wind infrastructure to bats. By emphasizing the agency and well-being of non-human beings, it has argued for a shift in perspective that challenges their continued marginalization in energy debates. This also raises broader questions of coexistence in the Anthropocene, where the boundaries between human and non-human lives are increasingly blurred. Future inquiry could examine how narratives might move beyond the opposition between renewable energy and biodiversity protection, illuminating deeper value conflicts and possibilities for coexistence. The contribution of Chapter Three lies in showing how ethical reasoning can guide stakeholders to account for non-human beings without prescribing fixed obligations, and in urging philosophers to engage more actively with debates on energy transitions. Moving to the social dimension, Chapter Four has examined energy poverty in Italy. It has revealed gaps between policy goals and outcomes, pointing to structural barriers that limit households' ability to turn public resources into real opportunities. While the capability approach has offered a framework for addressing these shortcomings, further research is needed to extend the analysis beyond the residential sector and across different policy contexts. This chapter has contributed to the overarching research question by demonstrating how normative ethical analysis can uncover injustices embedded in policy design. Co-authored with a social scientist and an engineer, it also illustrates the value of interdisciplinary collaboration, with philosophy offering a distinctive role in interpreting empirical data and drawing normative conclusions.

Each article of this dissertation has engaged, in different ways, with ethical approaches that challenge the dominance of abstract rationalism and highlight the significance of emotion, care, and embodied experience (see section 1.3.4.). They have shown how ethical reflections, attentive to existing *moral sensitivities* and commitments, can help promote more inclusive and respectful energy transitions with a particular focus on some subjects (e.g. dislocated people due to the construction of

hydropower plants, energy poor people, and some airborne species), whose interests, needs, and well-being, are not completely safeguarded in energy transition policies.

The emergence of energy ethics as a distinct research area signals a shift in philosophical attention, one that brings into focus aspects of human life (i.e., energy practices) that had long been present but remained relatively underexplored within ethical discourse. The aim is not to prescribe fixed codes of conduct or specific actions. As noted in 1.1.2., scholars in this field emphasize that there can be no simple manual for policymakers or decision-makers when confronting energy dilemmas. Rather, the hope is to open discussions about energy issues and practices that might not ordinarily appear connected to the moral sphere, while remaining aware of the complexity of integrating ethical considerations into energy transition processes and the limits of theoretical solutions in the face of real-world dilemmas. Individuals inevitably act according to their own moral sensitivities. Ethics serves to stimulate and guide such reflections, encouraging a deeper engagement with the moral dimensions of energy transitions.

This dissertation, situated within the field of energy ethics, has pursued two objectives. On the one hand, it has sought to strengthen philosophical engagement with the ethical complexities of energy systems and policies. Philosophical inquiry can clarify key normative concepts (such as justice, responsibility, and sustainability), while also interrogating the assumptions that shape prevailing narratives and institutional frameworks. On the other hand, it has invited scholars already engaged in energy ethics, irrespective of their disciplinary orientation, to examine critically the aims, methods, and scope of the field itself. The broader intention has been to foster a more self-reflective mode of ethical inquiry in the context of energy transitions. Overall, the dissertation aims to highlight the relevance of ethics for energy policymaking and to create space for dialogue, within philosophy and across disciplines, on how ethical reflection can contribute to addressing the challenges and possibilities of future energy systems.

Beyond the specific limitations noted in each article, this dissertation is further constrained by its primary focus on European Union and Italian policy frameworks (Chapter Four). This emphasis is justified by the European Union's its aspiration to

global leadership in advancing energy transitions (see section 2.5.), yet a broader comparative perspective would enrich the analysis. Extending the inquiry to other contexts (e.g., the United States, where debates unfold amid strong political polarization, or Asia, where China currently leads in renewable energy deployment[54]) would allow for a better understanding of how ethical concerns are negotiated across diverse energy systems. A second limitation lies in the range of marginalized subjects considered. Many groups remain underexplored, and each category offers the potential to reshape both ethical reflection and practical narratives of energy transitions. Since narratives are not merely descriptive but actively shape which interests are acknowledged, which values are prioritized, and how policies are justified, greater attention to narrative construction represents a promising direction for future research aimed at developing a more inclusive and critically grounded energy ethics.

[54] https://www.theguardian.com/environment/2025/sep/07/china-fossil-fuel-us-climate-environment-energy
https://www.weforum.org/stories/2025/04/china-leads-renewable-energy-installations-what-learn/

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