Special Issue
The Socio-Technical Imaginaries of Energy Transitions and Environmental Justice

FUORI LUOGO

Journal of Sociology of Territory, Tourism, Technology



Guest Editors

Federica Viganò
Monica Musolino
Elisabetta Bucolo

Editor in Chief: Fabio Corbisiero
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Giada F.P. Coleandro, Matteo Lupoli[1]

Gas, Technology, and Power: Sociotechnical Imaginaries of Energy Transitions in a Fossil City[2]

Introduction

Fossil fuel infrastructures are widespread across the planet. While their development has generated wealth for some, in others it has exacerbated disparities and caused significant environmental damage, including as a primary driver of climate change (IPCC, 2023). For this reason, such infrastructure can be understood as "negative commons" (Monnin 2021): physical entities that, despite being widely acknowledged as socially and environmentally harmful, cannot be simply or abruptly eliminated (*ibid.*). Within energy transition, such infrastructures are often seen as reinforcing carbon lock-in mechanisms, whereby fossil fuels legacies become difficult or costly to change, thus constraining investment in renewable energy (Seto *et al.*, 2016). Carbon lock-in is sustained also through the deployment of discursive strategies (Simoens *et al.*, 2022) as illustrated by the re-articulation of natural gas within energy transition debates. Initially promoted as a cleaner alternative to coal and oil, natural gas gained traction as a "bridge fuel" towards renewable energies (von Hirschhausen *et al.*, 2021); more recently it has been reframed as a fundamental to decarbonization strategies, particularly in the European context (Szabo, 2021a). This contribution examines the narratives that seek to preserve the role of natural gas within the transition through the lens of sociotechnical imaginaries (STi). Originally conceptualized at the national level (Jasanoff & Kim, 2009; 2013), the concept has progressively expanded to encompass various collectives operating at multiple scales. As Jasanoff later elaborated, sociotechnical imaginaries refer to «collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology» (Jasanoff, 2015, p. 4). Accordingly, imaginaries may emerge from a diverse range of actors, including local communities, expert groups, and international organizations (Kuchler & Stigson, 2024). They are also inherently contested, mobilized both by dominant actors and by social groups striving to envision alternative futures (Delina, 2018). Nevertheless, mainstream visions tend to prevail, overshadowing alternative perspectives, such as energy demand reduction and degrowth in the discussion on just transitions (Royston *et al.,* 2018).

To investigate how dominant imaginaries can be reproduced or challenged in specific contexts, this contribution examines the case of Ravenna in the Emilia-Romagna Region, chosen for its strategic importance in the Italian energy landscape. Historically, this port city has been a key player in the national fossil fuel economy, particularly in natural gas production and management (Ramondetti, 2023). Recently, Ravenna has expanded its role by developing a Carbon Capture and Storage (CCS) facility and a liquefied natural gas (LNG) terminal supported by two major Italian energy companies, Eni and SNAM. Although these initiatives are framed as transitional, they have enhanced Ravenna's position within the fossil energy system, effectively transforming it into «the largest energy production and storage hub in northern Italy» (*ibid*, p. 70). Through

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2 Although the paper is the result of joint design and elaboration, the specific contributions can be defined as follows: Giada F.P. Coleandro is responsible for section 1, 2 and 5. She has worked under the funding of the European Social Fund Plus Project code ESF2_f3_0005 (CUP: B56F24000100001). Research projects on strategic topics for South Tyrolean economy. Matteo Lupoli is responsible for sections 3, 4 and 6 and conducted the research and data collection within the framework of the project Just Transition in the Factory. Workers' Mobilizations and Participatory Innovation in Emerging Italian Experiences, funded by the Italian Ministry of University and Research (MUR, PRIN 2022S2Y4PC, CUP J53D23011640006)
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this case study, this paper explores how local development trajectories, historical legacies, and territorial specificities, such as the productive fabric, contribute to shaping sociotechnical imaginaries (Hudlet-Vazquez *et al.*, 2023). Specifically, it examines the social and technical dimensions that underpin the dominant future-oriented visions of energy, alongside the efforts to articulate alternative imaginaries. Moreover, the aim is to demonstrate the performative power of such imaginaries in sustaining fossil fuel dominance by legitimizing and financing the development and implementation of technological solutions that ultimately reinforce the existing energy system (Rudek, 2022).

1. Carbon Futures: Sociotechnical Imaginaries at Work

STis have been extensively employed in social sciences research to identify societal visions of energy transitions (Mutter, 2019; Jasanoff & Simmet, 2021; Carvalho *et al.* 2022). From this perspective, energy futures are not understood as being determined solely by technological considerations since similar technology may generate different social, political and economic outcomes (Longhurst & Chilvers, 2019). In this regard, imaginaries are «imbued with implicit understandings of what is good or desirable in the social world writ large - for instance, how science and technology can meet public needs and who even are the relevant publics» (Jasanoff & Kim, 2009, p.122-123, *op.cit*). Their characterization as "institutionally stabilized" further suggest their capacity to become ingrained within dominant institutions and cultural frameworks, particularly insofar as they are sustained and enacted by actors in positions of power (Jasanoff, 2015, *op.cit*). Therefore, these visions play a crucial part in shaping problem framings and defining the boundaries of what can be considered thinkable or possible (*ibid.*).

The present study aligns with the conceptual framework for analysing STi developed by Sovacool and Hess (2017). This approach proposes the analysis of three fundamental dimensions: materiality, meaning and morality (*ibid.*). The examination of materiality involves the investigation of technologies as a means to constrain or enable action. Meaning, in turn, concerns the diverse reactions and interpretations that technologies can elicit among different social groups, as well as the way in which these meanings are articulated and negotiated within the public sphere. Finally, morality refers to the evaluative judgements through which technologies are justified or contested, drawing attention to the normative arguments made to sustain or criticize them (*ibid.*).

Taken together, these dimensions provide an analytical lens for investigating how imaginaries are translated into energy decision-making by shaping which technologies are considered feasible, how their role within the transition is defined, and on what normative grounds they are legitimized. One example of this translation process can be found in the National Energy and Climate plans mandated by the European Union, which institutionalize particular visions of the transition and guide the allocation and justification of financial resources toward the development and commercialization of specific technologies (Gatto *et al.,* 2024). In addition, scholars have emphasized that imaginaries are not just projections toward the future but are also deeply influenced by past conditions, often building upon pre-existing «uneven landscapes co-produced by modern biopolitical technologies such as racism, imperialism, and colonialism» (Hudlet-Vazquez *et al.*, 2023, p.34 *op. cit*).

In the European context, sociotechnical imaginaries of natural gas are undergoing significant reconfiguration, driven by evolving policy frameworks, heightened energy security concerns, and the pursuit of decarbonization objectives. Existing gas infrastructure, alongside the economic and political power of incumbent fossil fuel actors, actively shapes energy futures by sustaining dominant sociotechnical imaginaries aligned with fossil fuel dependence (Wilson *et al.,* 2017). This is evidenced by the concept of "carbonscape", which offers a theoretical lens to comprehend the complex, interwoven network that underpins the operation of fossil fuel systems within specific geographical regions (Haarstad & Wanvik, 2017). Specifically, carbonscapes

> «are the spaces created by material expressions of carbon-based energy systems and the institutional and cultural practices attached to them. [....] shaped at the intersection of infrastructures, technologies, the built environment and various social, cultural and political regimes that govern them» (*ibid*, p. 443).

These material and symbolic spaces not only sustain existing energy structures but also advance visions of economic growth that depend on the continued consumption of fossil fuels, thereby shaping technological development in ways that reinforce the status quo (*ibid.*). From an analytical perspective, carbonscapes highlight how sociotechnical imaginaries become spatially embedded within specific territorial contexts. Müller and Sareen (2024) apply this concept to the case of Stavanger, a Norwegian city whose trajectory has long been intertwined with the oil and gas business. They show how incumbent actors are pursuing net-zero targets while simultaneously preserving, and even expanding, the fossil fuel industry through the development and implementation of technologies that extend the lifespan of fossil fuel infrastructure (*ibid.*). At the same time, this Norwegian city seeks to position itself in the energy transition discourse by participating in European and international initiatives on climate neutrality, while continuing to support the operations of the oil field, showing how even the leadership in the transition may accommodate, rather than displace, ongoing fossil fuel activities (*ibid.*). By repurposing existing infrastructure and mobilizing region-specific resources and technical expertise, such places uphold transition pathways that opt for adaptability rather than rupture. These operations may end up reinforcing the influence of the incumbent actors, who strategically nurture sociotechnical imaginaries in which they rebrand themselves as "transition actors", thereby legitimizing the extension of the current system and delaying a substantive shift toward fully sustainable arrangements (Egler & Barbieri, 2024). From this perspective, the concept of carbonscape helps to clarify how energy transition pathways are reworked within specific territories shaped by materialities and values rooted in particular historical and geographical conditions (Smith & Tidwell, 2016). The next section provides a brief overview of how different visions of gas and its related technologies have changed over time, showing shifts in material arrangements, meanings, and moral justifications.

1.1 Evolving Narratives of Natural Gas

> «Today's meetings highlight our joint efforts to improve energy security and support the shift to cleaner energy in Southeastern Europe. I'm happy to see many partners' interest in expanding gas supplies through the Southern Gas Corridor in the coming years and creating new trade routes for renewable energy». (Dan Jørgensen, European Commissioner for Energy and Housing).[3]

This statement was delivered by Dan Jørgensen, the European Commissioner for Energy and Housing, following a meeting with the Minister of Energy of the Republic of Azerbaijan in April 2025. The discussions focused on the advancement of the Southern Gas Corridor, a strategic infrastructure project designed to deliver Azerbaijani natural gas to the European market via the well-known Trans Adriatic Pipeline (TAP) in Southern Italy (Firat, 2023). Jørgensen's declaration illustrates a well-established tendency to intertwine the expansion of gas infrastructure and supply with discourses centered on clean and renewable energy. As previously observed, increasing investment in natural gas development exemplifies the phenomenon of infrastructural lock-in, as long-lived physical infrastructure impedes adaptability and transformation, primarily due to the economic implications of abandoning such investments and the necessity to address the fate of existing physical infrastructure (Seto *et al.,* 2016, *op.cit*). In the case of natural gas, it is noteworthy that the phenomenon of carbon lock-in has been shaped not only by material infrastructure, but also by the different meanings and moral justification concerning its role within the energy system. In the development of the contemporary European energy system, natural gas

3 https://energy.ec.europa.eu/news/press-statement-european-commissioner-energy-and-housing-and-minister-energy-republic-azerbaijan-2025-04-04_en (last access 15/05/2025).

initially played a relatively minor role until the 1960s, when the North Sea was discovered to be a significant source of gas deposits (von Hirschhausen *et al.,* 2021). This status persisted until the energy crises of the 1970s, a period during which the term "bridge fuel," along with the broader concept of "transition," began to gain traction. These terms did not initially signify a shift toward renewable energy but rather served to justify the increased use of alternative fossil fuels, such as coal and gas, in response to surging oil prices (Bonneuil & Fressoz, 2016; Delborne *et al.,* 2020).
This evolving narrative is particularly relevant when assessing the European Union's climate strategies, from the Kyoto Protocol era to the present, especially given the changing role of gas in the energy mix (Szabo, 2022). Even though until the 1980s natural gas played a relatively minor role (Mendelevitch *et al.,* 2021), during the 1990s its consumption significantly increased, establishing natural gas as a competitor to coal and oil (von Hirschhausen *et al.*, 2021, *op.cit*). A turning point occurred in the first decade of the 2000s when natural gas began to be promoted as a cleaner option compared to coal and oil and came to be recognized as a useful bridge towards a renewable energy system (*ibid.*). The acknowledgement of natural gas as the "least" emitting fossil fuel has grown into «an element of discourse that actors in the structural setting of fossil capitalism have welcomed, adopted, and reified to legitimize its heightened uptake» (Szabo, 2021b, p.70). Within this "bridge" framework, natural gas was expected to play a temporary role, gradually declining as renewable technologies matured and became capable of sustaining the energy system independently (Brauers, 2022).
European policy documents have often reflected the assumption that natural gas infrastructure would continue to operate within a defined time frame before being phased out in favor of renewables, however some critical perspectives suggest that this vision implicitly serves to prolong the use of existing facilities, thereby maximizing returns on investments and minimizing the risk of stranded assets (Malm & Carton 2024). As the projected timelines for gas phase-out approach, policymakers and energy incumbents appear increasingly inclined to extend the infrastructure's operational lifespan (Kemfert *et al.,* 2022), suggesting that even proponents of the "bridge fuel" narrative may have underestimated, or left ambiguous, how long this provisional role was supposed to last (Delborne *et al.,* 2020). This extension has, in turn, contributed to the rebranding of natural gas as a contributor to decarbonization efforts. In this regard, Szabo (2021) has analyzed a range of documents and studies published by the European Union and affiliated think tanks which sought to assign a strategic role to natural gas and its associated infrastructure in the energy transition. This discursive shift from the "bridge" narrative to the "decarbonization fuel" one has been enabled by rhetorically framing "gas" to include other decarbonized forms in which carbon emissions are somehow avoided or mitigated (*ibid*.). Therefore, despite the different characteristics, roles, and long-term impact of natural gas and decarbonized gases, they are sometimes subsumed under a single vision, with significant implications for the actual capacity to achieve climate neutrality (*ibid*.).
Moreover, the decarbonization narrative increasingly links natural gas with the deployment of different mitigation technologies, such as the Carbon Capture and Storage (CCS), a technology designed to capture carbon dioxide produced during industrial processes and store it underground (Haszeldine, 2009). CCS has been implemented in various industrial sites globally, particularly in hard-to abate sectors reliant on gas or coal-fired power generation, although its efficacy and efficiency remain to be fully demonstrated (Faber *et al.,* 2025). Nevertheless, it has already attracted substantial governmental funding, and its mitigation potential has been emphasized in several climate models, including those published by international organizations such as the IPCC, albeit under the scenario where greenhouse emissions will continue rather than be reduced by changing production systems (Malm & Carton 2024). In this regard, Hougaard and Christiansen (2025) in their analysis of the sociotechnical imaginaries associated with the introduction of CCS in Sweden, employ the notion of a CCS-dependent climate future to describe «a future imaginary where current lifestyles and production patterns are maintained and economic incumbents remain, enabled by the promise of CCS» (Hougaard & Christiansen,

2025, p.1). Undoubtedly, the entrenchment of climate imaginaries favorable to the status quo does not occur in a sociopolitical vacuum. Unforeseen global disruptions have previously been shown to catalyze shifts in energy priorities, thus exposing both the fragility and adaptability of dominant sociotechnical narratives. Against this backdrop, scholars adopting the sociotechnical imaginaries perspective have attempted to highlight the role of policy choices and statements in shaping public perception on the function and impact of emerging technologies (Lefstad *et al.,* 2024). Since these imaginaries can either enhance or diminish the perceived reliability and desirability of a given technology, this underscores the critical need for both social research and political engagement to challenge the idea that proposed technological solutions are always inevitable. These considerations will be further explored through the empirical data collected in the city of Ravenna.

2. Methodology

In order to make operational the sociotechnical imaginaries framework the analysis mobilizes three dimensions presented in the theoretical sections – materiality, meaning and morality – in relation to Ravenna's carbonscape. First, materiality is assessed by considering how existing and proposed gas-related infrastructure, such as offshore facilities, pipelines and depleted gas fields identified as potential storage sites, are understood to enable or constrain different transition actions. Meaning refers to how these gas infrastructures and technologies are framed and interpreted by different actors in the city, while morality is examined looking at the justifications that sustain these in. In addition, we retraced the development of the oil and gas industry through a review of secondary literature, analyzing how its historical establishment contributed to shaping Ravenna's energy future (Chateau *et al*., 2021). Building on this, the research adopted already established approaches drawn from the literature on sociotechnical imaginaries (Rudek, 2022, *op.cit*), notably in-depth semi-structured interviews and content analysis of official reports, corporate strategy documents, and local media coverage. Specifically, between 2024 and 2025, 30 interviews were conducted with key actors across three main groups: labor representatives from the oil and gas sector, members of civil society, and political representatives. For the labor perspective, interviews included representatives of the two main trade unions in the energy branch, affiliated with the national confederations CGIL and CISL, as well as current and former industrial workers. Interviews were also carried out with members of civil society, particularly activists from environmental movements and organizations, including *Coordinamento Per il Clima Fuori dal Fossile - Ravenna, End Fossil, Energia per l'Italia,* and the national Ngo *A Sud*. Finally, the study included interviews with different political figures, such as the former mayor of Ravenna, a former president of the Emilia-Romagna region, and a former provincial administrator who played a role in the development of local energy policies. It is important to note that despite repeated efforts, it was not possible to secure interviews with representatives from the oil and gas industry. Alternatively, the study drew on publicly available industry documents, including *Eni for 2023 - Sustainability Performance Report* and *Capital Market Update 2025,* which includes the *Strategic Plan 2025-2028*. In addition, articles from local newspapers and documents published by the Municipality of Ravenna were analyzed. Finally, participant observation was conducted at public events related to the CCS project in Ravenna, organized by different organizations.

3. Ravenna: What Visions for a Fossil City?

In Ravenna, the legacy of natural gas has produced a physical landscape of pipelines and offshore platforms and a durable sociotechnical imaginary that links fossil energy, and gas in particular, to modernization, prosperity, and territorial identity. Rooted in the post-war "methane era", this

imaginary continues to shape how decarbonization is conceptualized, debated, and implemented at the local level, as well as how new fossil fuel infrastructures are developed This section traces the evolution of this imaginary from its origins in the 1950s to contemporary transition narratives and, in order to analytically unpack the sociotechnical imaginary of gas in Ravenna, the section adopts the three dimensions outlined in the methodological framework.

3.1 Ravenna and the "Methan Era": Origins of a Fossil Imaginary

Located on the southeastern coast of the Po Valley – a large alluvial plain – the city of Ravenna lies in an area historically affected by subsidence phenomena (Teatini *et al.,* 2005) and it is also characterized by some of the highest levels of air pollution in Europe, a condition largely attributed to the concentration of energy-intensive industries in the area (De Angelis, 2020). Ravenna's local energy trajectory began in 1952, with the discovery of the first onshore well and the subsequent expansion of hydrocarbon exploration under the direction of Enrico Mattei. Although the initial focus was on oil, it soon became evident that the local subsoil was rich in methane. Italy thus became the first European country to adopt methane on a large scale mainly due to Mattei's initiative who, after assuming leadership of SNAM (Società NAzionale Metanodootti - National Me-thane Pipeline Company), launched the project to «methanize Northern Italy» (Accorini, 2007, p.191). With Eni's establishment in 1953 to coordinate state oil and gas agencies, a future-oriented energy vision was institutionalized, linking gas and industrial growth in a sociotechnical imaginary of progress, energy autonomy, and collective wellbeing. The long-term impact of this vision is still visible today: natural gas continues to occupy a central place in the Italian energy mix, suggesting that the original project of methanization was not only successfully implemented but continues to shape the nation's energy trajectory.
The discovery of large methane reserves and the subsequent infrastructural development helped to position the city as a laboratory of industrial modernity. The benefits were not only material: local workers gained stable employment, the urban fabric was reshaped through Eni-led architectural and social planning, and environmental concerns were overshadowed by the promise of prosperity. During this period, gas came to represent more than a mere source of energy; it emerged as a symbol of progress. The city of Ravenna was portrayed by the company as «an open-air laboratory, on land and at sea, capable of offering experiences and producing knowledge. An important and expansive workspace that has fundamentally contributed to shaping our corporate culture» (Nardi, 2022, p.9) as stated in a volume to celebrate seventy years of Eni's presence in the region. Environmental impacts were systematically overshadowed by a firm-led narrative that mobilized media and public institutions to craft a positive image of the industry (Pizzirani, 2022). The state ownership actively legitimized its role, cementing the perception of the company as both a vehicle for redistribution and a bulwark against international monopolies (Saitta & Pellizzoni, 2009). This alignment between technical advancement and institutional legitimacy enabled the deployment of infrastructures that gave material and aesthetic form to a fossil imaginary, while systematically downplaying environmental concerns.

3.2 Between transition and resistance: labor, legitimacy and the fossil question

As the 21st century began, increasing international calls for emission reductions contributed to a partial loss of legitimacy for natural gas. Yet in Italy, and particularly in Ravenna, this shift has not diminished its central role in energy strategies. As the city's former mayor stated, these developments began to influence national policy orientations, suggesting an emerging shift in the country's stance on domestic energy production:

> «Starting in the early 2000s, the country's attitude changed completely. From 'methane gives you a hand', with a child in the photo, methane became public enemy number one. Everything associated

with methane began to be viewed very negatively by public opinion, and all governments, from 2001 to 2020, adopted at least one measure that either restricted or reduced domestic production». [Int. former mayor]

The evolving discourse around ecological transition has foregrounded the inherent tensions between the imperatives of environmental sustainability and the socio-economic need to safeguard employment in conventional energy sectors. This conflict became particularly evident during the 2016 referendum, when Italian citizens were asked to vote on the repeal of legislation allowing the extension of offshore hydrocarbon extraction concessions. On that occasion, Ravenna emerged as a strategic site of political confrontation, where workers' voices entered the national conversation (Ierace, 2016). However, the referendum failed to reach the required quorum, and Ravenna became the site of celebrations for the victorious "No" alliance, which were attended by the country's Prime Minister at the time. These conflicts reveal how moral evaluations of the energy transition are closely tied to material conditions. More specifically, they are primarily articulated through short-term narratives aimed at managing social conflict and political consensus in moments of uncertainty, rather than through explicit engagements with long-term transition imaginaries. For workers and local institutions, existing gas infrastructures are mobilized as concrete justifications for claims about protecting employment and maintaining territorial stability. In contrast, environmental critiques mobilize alternative moral frameworks centered on climate responsibility and intergenerational justice, often clashing with locally embedded perceptions of necessity and feasibility. The transition thus emerges not as a purely technical process, but as a moral negotiation shaped by infrastructural dependency.
While several testimonies suggested that the fossil industry in Ravenna was undergoing a period of crisis and profound uncertainty, the outcome of the referendum revealed a more complex reality and that a radical transition away from fossil fuels was far from imminent. As several scholars have emphasized, international institutional guidelines and proclamations frequently overlook the material embeddedness of energy systems (Lai *et al.*, 2025), resulting in a weak anchoring of the transition at the local scale, where global ambitions often lack the material and institutional support required for effective implementation (Jordhus-Lier *et al.,* 2024). Ravenna's case demonstrates how decarbonization, rather than being an automatic implementation of global frameworks, becomes a contested negotiation with place-specific industrial legacies and sociotechnical path dependencies. In the subsequent years, despite European climate policies increasingly promoting renewable energy development, the regional economic fabric remained deeply tied to natural gas extraction. Following Russia's 2022 invasion of Ukraine and the European Union decision to halt gas imports from the Kremlin, the Italian government faced an unforeseen energy shortage and surging prices (Prontera, 2024). In response, it opted to reinvest in fossil fuel infrastructure by expanding LNG imports and committing to the deployment of floating regasification units in strategic ports. These measures, presented as part of a broader national energy security strategy, have provoked sustained local opposition and political debate (Prontera & Lizzi, 2023). Once again, Ravenna emerged as a focal point, having been designated as the site for both a CCS facility and a new regasification terminal.

3.3 CCS: Fossil legitimacy in the Name of Transition

Building on the analysis presented above, this section examines how the sociotechnical imaginary of natural gas has been both reinforced and rearticulated within contemporary energy transition discourses. Central to this process is the strategic role played by Eni, whose industrial planning and narrative production have profoundly shaped the trajectory of Ravenna's development. However, this stabilization has also relied on the active support of national and local institutions, which have provided the legal, political, and territorial frameworks necessary for the implementation of fossil facilities. In this regard, the Italian government has explicitly endorsed

carbon capture and storage (CCS) technologies as a strategic pillar of the long-term energy transition. In its National Energy and Climate Plan, CCS is assigned a key role in the 2050 transition vision, particularly with regard to so-called "hard-to-abate" industrial sectors (MASE, 2024). Media representations of this technology are analytically significant in this context, as they contribute to shaping public understanding of CCS. A local outlet presented the Ravenna CCS project reporting that is "realized exclusively for environmental purposes to contribute to the decarbonization of industrial sectors"[4], whereas national media emphasized Italy's technological leadership, portraying the project's launch as "a kick-off that places our country at the forefront"[5], positioning Ravenna as a symbol of national innovation. Environmental activists, however, have criticized such coverage, arguing that media reporting is "largely insufficient, incompetent, or scarcely impartial, and actively contributes to the spread of misleading narratives". These media narratives resonate with institutional framings that position CCS as a legitimate and necessary element of the national energy transition. The embeddedness of this vision is evident in the ways current infrastructures and institutional discourse continue to reinforce the centrality of gas, despite increasing pressures to decarbonize. In 2021, during a city council meeting approving a cooperation agreement between the Municipality of Ravenna and Eni, the mayor underscored the value of this relationship, stating:

> «In the wake of a long-standing collaboration that dates back to the first agreement in 1993, we are renewing our commitment with Eni, recognizing that sustainable development, capable of integrating economic growth with respect for ecological and environmental balances, is possible. Natural gas is recognized as a vital energy source in this transition process». [Int. former mayor].

From the perspective of the energy companies and the local institution, the transition is framed as compatible with, and dependent upon, the continuity of existing business models. This perspective is part of a broader strategy to leverage its existing expertise in traditional energy sectors while gradually expanding into new low-carbon businesses. As this statement by the Chief Financial Officer affirms:

> «We are convinced that the energy transition can only be realized if it generates the basis for new and profitable business models. This is precisely what we are doing through our technological expertise and the integration of traditional and transition-related businesses» (Eni, 2023, p. 32-3)].

This strategic vision is reflected in the development of the largest CCS facility in Europe (Gerebizza & Pastorelli, 2024). Developed by Eni and SNAM, it is designed to sequester CO_2 at the point of emission from industrial facilities, transport it through a network of pipelines, and store it permanently beneath the Adriatic seabed in depleted gas fields. It offers a particularly revealing site to observe the interplay between materiality, meaning, and morality within the local sociotechnical imaginary. Promoted as a cutting-edge solution for reducing industrial emissions, it is described in the Eni 2025–2028 strategic plan as a «key catalyst for the energy transition» (Eni, 2025, p.11).

While initially facing institutional resistance and remaining excluded from the National Recovery and Resilience Plan, the CCS project regained momentum through a strategic reframing. In 2024, the initiative was scaled up and incorporated into the "Callisto Mediterranean CO_2 Network" a newly proposed cross-border industrial corridor, linking Ravenna with industrial clusters in southern France. This reconfiguration not only expanded the project's scope but also reframed its strategic relevance within a Mediterranean decarbonization agenda. As a result, the

4 https://www.ravennaedintorni.it/economia/2024/09/03/ravenna-ccs-primo-progetto-cattura-e-stoccaggio-co2/ (last access 13/02/2026).

5 https://www.corriere.it/economia/aziende/24_settembre_04/eni-e-snam-parte-il-progetto-di-cattura-dell-anidride-carbonica-cosi-viene-imprigionata-nel-sottosuolo-26d386e1-84b5-4e90-a9d4-3cb77b235xlk.shtml (last access 12/02/2026).

initiative was included among the European Commission Projects of Common Interest, a status that granted access to public financing instruments and facilitated approval processes, positioning CCS as a key mitigation technology. While this upscaling is crucial for political recognition and access to European funding instruments, the question of scale has implications for how CCS is regulated, publicly framed, and materially embedded in the territory. The Ravenna CCS facility is formally classified as a pilot project, with limited volumes of CO_2 injection (about 25,000 tons of CO_2 per year) into a depleted offshore gas field, and a regulatory framework allowing experimental storage activities below a defined threshold without a full Environmental Impact Assessment. By contrast, the planned industrial phase aims to store up to 4 million tons of CO_2 annually by 2030, requiring extensive new onshore and offshore infrastructures, including dedicated CO_2 pipelines crossing multiple regions and connecting industrial clusters beyond Ravenna[6]**.** Although this future phase will require more comprehensive authorization procedures and environmental assessments, narratives emphasizing technological feasibility and strategic necessity normalize its impact and blur the distinction between a small-scale experiment and large-scale, long-term commitments (Gerebizza & Pastorelli, 2024). This framing helps stabilize the sociotechnical imaginary of CCS in Ravenna, as the low risks and regulatory flexibility of the pilot phase are implicitly projected onto the industrial future, portraying CCS as a controllable rather than uncertain infrastructural solution. However, according to a detailed report by the Italian association Recommon, CCS remains up to this point a costly and largely unproven technology, with a track of underperforming projects that raises doubt about its viability as a reliable climate solution (Gerebizza & Pastorelli, 2024). In this regard, environmental groups contend that the project primarily serves to extend the lifespan of fossil-based industries. As one activist from the committee *Fuori dal Fossile* argued, «they promote CCS to say that gas has zero impact, but it is a tool for maintaining the status quo» [Int. Fuori dal Fossile]. This perspective highlights how CCS can serve to reinforce a carbon lock-in that is not only material and technological, but also deeply ideological (Harris & McCarthy, 2023). This distrust is not limited to grassroots organizations as also the former president of the Emilia-Romagna region has warned about the risk of so-called "false solutions" in the energy transition:

> «This issue of CCS does not favor the transition because it implies that certain industries, large energy consumers like chemical production, must inevitably seek alternatives to renewables. And that, to me, is highly questionable. [..] The problem is not only the climate deniers; it is also those who, directly or indirectly, slow down the process, preventing us from pursuing a credible path» [Int. Former President of the Region].

Competing interpretations of CCS sustain this divergence: to leverage existing infrastructures for climate goals, or as a mechanism that perpetuates fossil dependency (Swennenhuis *et al.*, 2020). In the Ravenna case, this ambivalence is reflected in how CCS is embedded within pre-existing material arrangements, while simultaneously raising concerns over its capacity to delay far reaching structural transformations. Eni's economic interests, particularly in relation to the management and decommissioning of offshore gas extraction platforms have a clear role in this debate. As a local journalist and expert on coastal and maritime issues observed: «off the coast of Ravenna, there are hundreds of abandoned wells, depleted of gas. For the company, their closure would entail significant costs. Costs that CCS helps mitigate» [Int. Journalist]. This economic rationale further fuels skepticism about whether the project is primarily driven by environmental concerns or corporate convenience. At the same time, it confirms the presence of a sociotechnical imaginary in which physical infrastructures, such as offshore platforms, do not simply reflect energy choices, but actively shape the trajectory and perceived feasibility of the energy transition itself (Hendriks *et al.,* 2025).
Conversely, workers tend to support the CCS project precisely because it may represent a po-

6 https://ravennaccs.com/it-IT/progetto (last access 10/02/2026).

tential pathway to preserve high-skilled employment in a region historically dependent on hydrocarbon industries (Normann & Tellmann, 2021). This seems to be the case with the workers employed in the fossil sector in Ravenna, where both the existing and prospected material are discursively mobilized to articulate claims about future employment: «the possibility of having a future in CO_2 storage could mean continuing to work» [Int. CGIL FILCTEM]. Yet workers' support is not only grounded in material concerns but also shaped by a mythical past in which Eni was seen as a provider of security and prosperity. This narrative continues to shape employees' understanding of the company's role in the present. As one interviewee recalled:

> «Of course, Eni had a major positive impact here, right? It gave the city a whole new economic leg to stand on. Before that, we mostly relied on beach tourism and cultural heritage. The industrial sector became the third leg of the economy, and it gave us an incredible boost. I mean, with all due respect to people working in tourism... but here, our per capita income is extremely high» [Int. CISL FEMCA].

The connection to Eni's historical presence is not only remembered but actively ritualized through everyday practices and symbolic sites embedded in the urban landscape. These practices contribute to the construction of a shared moral memory in which specific historical figures (most notably Enrico Mattei) are elevated to iconic status and invoked as moral exemplars of progress and industrial foresight (Hobi, 2025). As a consequence, the workers' personal biographies are intertwined with the company's history, rooting industrial development in a familiar narrative of general prosperity. This connection became visible through specific places that today form part of the city's industrial heritage as one interviewee described during a walk through what was once the ANIC village, originally built to house the families of workers employed in the nearby chemical complex:

> «You see that church over there? That's where we commemorate the dead, including the anniversary of Mattei's death every year. That sculpture [representing Mattei] outside? My colleagues made it, one of them was a sculptor» [Int. CISL FEMCA #2].

This excerpt illustrates how commemoration practices can contribute to the moralization of industrial history, with corporate figures potentially serving as enduring reference points through which present and future energy choices are interpreted. In Ravenna, such memories help reinforce the perception of Eni not merely as an employer, but as a foundational institution closely interwoven with the shared local identity. The city is thus suspended between past and future, as the fossil fuel imaginary resists fading by being readapted and reinvented, thereby maintaining its legitimacy under changing meanings and moral justifications framed within the broader discourse of "Transition". Corporate documents celebrate this logic, casting natural gas not as a relic of the past but as «the ideal bridge solution to quickly replace fossil sources with a higher carbon footprint and support the transition to a renewable-based energy system» (Eni, 2023, p. 39, *op. cit*). The bridge has become a destination. The process at play is not a transition away from fossil fuels per se, but a transition within the fossil regime itself (Jordhus-Lier *et al.,* 2024), wherein continuity is reframed as innovation and infrastructural persistence is rebranded as pragmatic realism. In this way, the project does not challenge the role of gas in the energy matrix; instead, it reinforces and extends it. CCS becomes the key device through which a model of industrial development rooted in natural gas is maintained and legitimized, not despite, but because of its alignment with the rhetoric of transition.

3.4 Contesting the Gas Transition and Reclaiming Ravenna's Energy Future from Below

However, the dominant discourse that frames natural gas as both an environmentally sustainable and secure energy source, enabled by technological innovation and system integration,

faces significant challenges. Environmental groups and critical scholars challenge the assumption that gas can serve as a meaningful transition fuel, especially considering current alternatives. «Forty years ago, a transition based on natural gas might have made sense [...] but today, given the technological advancements and the economic viability of renewables, proposing gas as a transition strategy is simply a scam» argues a member of *Fuori dal Fossile*. Similarly, a representative of *A Sud* notes that

> «gas is not new, Eni's history began with gas extraction in the Po Valley over seventy years ago. It's misleading to present it now as a novel or sustainable resource. Even if it is slightly cleaner than coal or oil during production, recent studies suggest that, across its full life cycle, gas may be even more climate-damaging than coal [...] The comparison should be made with the least impactful energies, not the most polluting ones» [Int. A Sud Association].

Environmental groups contest the portrayal of gas as a transitional resource and promote an alternative vision of energy futures, that calls into question the deep entanglement of local politics and economy with extractive systems. The critique has been also extended to the ways Eni is embedded in the local social context, strengthening its legitimacy and presence well beyond the industrial sphere. The company contributes to Ravenna's civic life by sponsoring major cultural events, most notably the *Ravenna Festival*[7], but also allocating five million euros to support post-flood reconstruction efforts in 2023[8]. Eni also plays a strategic role in academic formation through research partnerships and career pathways, raising concerns about the company's influence on knowledge production and on the autonomy of political decision-making. Finally, local groups complain about the lack of transparency and democratic participation in processes surrounding new energy infrastructures. Challenging the frame of the CCS hub as a technical and inevitable solution, rather than as a political and contestable one, activists argue that this narrative serves to preempt dissent and foreclose alternatives. In doing so, these groups do not merely oppose specific infrastructures but actively seek to re-signify energy technologies and re-interpret the transition debate. By challenging dominant framings of inevitability and technical necessity, they attempt to destabilize the existing sociotechnical imaginary and to open up space for alternative interpretations of what a just and feasible energy future for Ravenna might entail.

4. Discussion

This paper examined how a sociotechnical imaginary that frames continued fossil fuel investments as compatible with the energy transition is articulated and sustained in the case of Ravenna. The analysis shows how this imaginary is stabilized through the alignment of infrastructures, meanings, and moral justifications within local development trajectories. By retracing Ravenna's historical trajectory from its post-war emergence in the "methane era" to its contemporary positioning as a hub for so-called transitional technologies, we show that rather than being dismantled, the city's fossil heritage is being repurposed in ways that uphold the promise of a low-carbon future.

In this context, the urban landscape does not merely represent the legacy of past decisions, but a *carbonscape* where sociotechnical imaginaries of natural gas are differently rearticulated over time. Fossil infrastructures are then materially maintained and defended, while their meanings are reconceived through discursive frames ranging from environmental responsibility to economic opportunity. Concurrently, moral justifications are shifting from past narratives of

7 https://www.ravennafestival.org/elenco_sponsor/ (last visited 10/05/2025)

8 https://www.ilrestodelcarlino.it/ravenna/cronaca/alluvione-paradosso-ravenna-donazioni-df898371 (consulted on 10/05/2025)

extractive growth underpinning the city's prosperity toward a more pragmatic attitude towards energy security and continuity of industrial activity. This situation enables incumbent actors to strategically position existing and future gas infrastructure as compatible with new climate imperatives. The historical presence of Eni, anchored in its deep institutional, economic, and cultural entanglement with the city (as sponsor of events, partner in education, and cornerstone of the local employment) has enabled the company to present itself simultaneously as the steward of the city economy and a key actor in the transition. Yet this centrality also constrains the discursive space within which energy futures can be imagined and debated. As our analysis shows, the fossil regime has not disappeared but has adapted, absorbing the language of sustainability while preserving the underlying logics of extraction and accumulation. Therefore, technologies such as CCS may serve not only to extend the lifespan of fossil infrastructures but also to symbolically reassure publics and policymakers that decarbonization can proceed without disruption, within a narrative of continuity under the guise of transformation.

Workers and trade unions largely converge with this position, from a distinct standpoint rooted in material and moral concerns about the safeguard of the local economy. For labor representatives, existing infrastructures and technical expertise are not only economic resources but also symbols of collective investment and social responsibility. CCS, in this sense, is interpreted as a pragmatic opportunity to preserve high-skilled jobs and to avoid abrupt disruptions in a region historically dependent on the oil and gas sector. This perspective does not necessarily deny environmental challenges but subordinates them to short and medium-term imperatives of employment protection and industrial continuity. This configuration, however, is not without contradictions. Environmental movements and critical segments of civil society articulate a fundamentally different interpretation. Rather than focusing on continuity, they problematize the framing of gas and CCS as inevitable transition technologies. From their perspective, projects such as the CCS hub are not neutral or purely technical solutions, but political choices that risk entrenching fossil dependency and deferring more transformative pathways. Their critique highlights how CCS concentrates decision-making power and defers structural change, challenging both the technocratic governance of energy infrastructures and the imaginaries that render fossil futures perpetually conceivable. Taken together, these positions reveal how the sociotechnical imaginary of gas in Ravenna is not monolithic but stabilized through the action of a dominant coalition.

Conclusions

The aim of this contribution was to explore how sociotechnical imaginaries of natural gas are constructed and stabilized in the context of the energy transition, by examining the case of Ravenna as a historically fossil-dependent city repositioning itself within contemporary decarbonization discourses. By adopting an analytical framework that combines materiality, meaning, and morality, the article has shown how energy infrastructures, discursive framings, and normative claims co-exists in shaping locally grounded visions of transition.

By focusing on Ravenna, this contribution has shed light on how the endurance of fossil imaginaries is rooted in place-specific histories that actively shape the boundaries of public debate. The city's long-standing entanglement with gas extraction and processing has generated a carbonscape in which infrastructures, skills, and institutional relationships continue to orient perceptions of what is feasible, desirable, and responsible in the present. This underscores the importance of approaching the energy transitions not solely through policy targets or technological scenarios, but also by examining their entanglement with visions of social order and collective aspirations, considering how these interactions shape imaginaries that are performed, contested, and stabilized on the ground.

Like any empirical research, this study faced some challenges. First, despite several attempts, it was not possible to conduct interviews with representatives of Eni and Snam. As a consequence, the reconstruction of their positions was primarily informed by documents and public declarations, which may not fully grasp their future visions. Secondly, while the analysis recognizes the relevance of the material dimensions and path dependent mechanism in shaping sociotechnical imaginaries, the empirical focus has been more oriented towards the analysis of discourses, with the aim of capturing different meanings and moral justifications attached to gas infrastructures and the CCS technology. This choice allowed for a detailed reconstruction of competing framings but inevitably limited the depth of engagement with the technical and operational aspects of infrastructures. Moreover, when the research was carried out the CCS project was in a preliminary stage. Future research should therefore investigate how the shift from the pilot phase to full industrial deployment might affect the sociotechnical imaginary by attaching new meanings and justifications to gas infrastructure in the context of intensified climate change.

Any credible pathway to decarbonization, therefore, should go beyond the proposal of different technologies to also cultivate new imaginaries anchored in alternative visions and desires for the future. This implies cultivating new imaginaries anchored in alternative visions of prosperity, work, and territorial development, capable of breaking with path-dependent trajectories that continuously legitimize fossil infrastructures under the banner of transition. Without such a political shift, the risk is that energy transitions remain confined within existing regimes, reproducing continuity and delay rather than enabling genuinely transformative change.

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