



TIPPING+ Working Documents Series

Tipping dynamics, psychosocial patterns, and lock-in mechanisms in Sulcis coal and carbon-intensive region, Italy

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The TIPPING+ project

TIPPING+ provides an empirical in-depth social science understanding of fundamental changes in sociodemographic, geographical, psychological, cultural, political, and economic patterns which give rise to Social-Ecological Tipping Points (SETPs), both positive and negative in relation to socio-energy regional systems. Such empirical and theoretical insights will shed new light on the interdependencies between changes in regional socio-cultural structures and the technological, regulatory and investment-related requirements for embracing (or failing to embrace) low-carbon, clean-energy and competitive development pathways in selected coal and carbon intensive case study regions (CCIRs). The overall goal is to understand why and under which conditions a given social-ecological regional system heavily dependent on coal and carbon-intensive activities may flip into a low-carbon, clean energy development trajectory – or on the contrary may fall into an opposite trajectory with all its negative implications. Towards this goal, main focus of TIPPING+ is the participatory co-production of knowledge on the driving forces and deliberate tipping interventions leading to the emergence of positive tipping points toward clean energy transitions in European CCIRs

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Abstract

Phase-out processes are highly susceptible to path dependency and multiple lock-in mechanisms, especially in coal and carbon-intensive regions. Such vulnerable regions must navigate a destabilization-reconfiguration pathway where phase-out and innovations interact and mutually shape each other. Moreover, coal and carbon-intensive industries can be deeply sedimented in the cultural, socio-political, and socio-economic fabric making it difficult to identify emerging windows of opportunity and pursue a different development pathway. These aspects require understanding how and when investments and policy interventions may break out or reinforce lock-in mechanisms and exacerbate or alleviate social injustice and resistance toward sustainable innovations.

In this document, we explore how social-psychological factors can intervene in tipping dynamics, limiting the awareness and exploitation of windows of opportunity, and actively reinforcing lock-in and path dependency ultimately undermining decarbonization policies and a just transition.

We draw on the most emblematic coal and carbon-intensive region in Italy (Sulcis, Sardinia) as a case study to illustrate such dynamics. Sulcis is historically known for its mining and metallurgic industry which deeply influenced its territorial, socio-economic, and infrastructural development. Nowadays, the region is interested by coal phase-out and industrial decline while being extremely vulnerable due to the scarce diversification in the energy and economic sectors, and heavily interested by environmental degradation. We observed that despite consistent political and financial interventions (e.g., Piano Sulcis), the region is experiencing difficulties in envisioning and planning an alternative sustainable development pathway.

This research aims to understand how place-based meanings, memories, and identities have weakened the disruptive effect of destabilizing events or deliberate interventions, legitimating coal and carbon-intensive industry and delegitimizing a sustainable transformation. With this rationale, we used a mixed-method approach consisting of narrative interviews with key stakeholders (N=26), newspaper articles published between 2011 and 2021 (N=965) and two workshops with stakeholders.

Our findings reveal that industrial decline represented a transitional rupture followed by inadequate adjustment and recovery due to the positive feedback loop between lock-in mechanisms (psychosocial, political, infrastructural, and socio-economic) constraining the corridor of the possible and the windows of opportunity for reconfiguration. At a psychosocial level, the diffused industrial myth and identity based on coal and carbon-intensive industries allowed to preserve the continuity in sense of place during periods of change and uncertainty. However, it constituted a trap that made thinking and taking a new trajectory extremely difficult, interacting with other lock-in mechanisms, and reinforcing path dependency and carbon lock-in. On the other hand, however, sense of place is characterized by memories of socio-economic and ecological exploitation, that contribute to the co-construction of idealized spaces and normative imaginaries of transformation in contrast with low-carbon transition promoted by the government and incumbent actors. We conclude by discussing the implications of socio-psychological lock-in and the role of policy and social interventions and pathways to break lock-in mechanisms and promote a just transition.

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1 A conceptual overview of Sustainability Transitions

Global environmental change has created a great impetus for social research to understand how to promote, support and orient sustainability transitions and transformations, conceived as the passage from a state or system that is unsustainable to another qualitatively different and sustainable.

According to Loorbach, Frantzeskaki and Avelino (2017), the intellectual roots of transition research can be traced back to the 1990s' in 1) innovation research, grounded on science and technology studies, innovation policy, and evolutionary economics; 2) environmental studies and sustainability science, grounded in environmental policy, environmental assessment, and sustainability governance.

These two intellectual roots developed into the so-called socio-technical and socio-ecological perspectives, which involve different angles to look at transitions, that is the entrance points - e.g., the equilibrium of natural capital and ecosystem services for the socio-ecological perspective, or the deployment and diffusion of technological innovations for the socio-technical perspective. As stressed by Saviano, Barile and colleagues (2018; 2019), socio-ecological approaches imply adopting a dominant environmental perspective and focusing on humans-nature coupled systems (i.e., the environment-society relationship), while socio-technical approaches imply a dominant economic (management and engineering) perspective focusing on humans-technology coupled systems (i.e., technology-society relationship).

Despite these differences, the key notion of transition and transformation research is that systemic and societal change can be located in the dominant and stable configuration of a given system - i.e., a socio-ecological or socio-technical regime (Rip & Kemp, 1998), and that transitions and transformations occur from one stability pattern to another. At the core of both approaches to change is thus the relationship between stability and change, which is reflected in the struggle between the deeply sedimented systems and locked-in patterns of production and consumption (e.g., centralized energy systems, coal-fired energy generation) that create path-dependent trajectories (Kohler et al., 2019), and innovations, new visions and practices on the other side (e.g., renewable energy technologies, energy saving or sustainable use of natural resources). In any case, even pathways of transformation are constrained by a corridor of the possible (Stark, 1992).

Path dependency is a process in which the next steps of change are determined by previous ones. Path-dependent patterns are characterized by "self-reinforcing positive feedback" (Krasner, 1998, p.83) that are formed through historical development and that constrain, reproduce and in the worst scenarios lock-in current socio-technical systems¹.

Related themes can be found in the socio-ecological perspective, which stresses the systems transformative and adaptive capacity. Also in this case, self-reinforcing social and ecological feedback can create lock-ins that make taking new trajectories and moving to alternative states extremely difficult (Olsson, Galaz & Boonstra, 2014). In this regard, some authors coined the concepts of socio-ecological traps or addiction for indicating maladaptation or bad resilience (Marschke & Berkes, 2006; Bailey et al., 2010; Holling et al., 2002), i.e., the

¹ The socio-technical adjective is used to explain that systems of supply of goods and services to society (e.g., water, energy, transport) result from the interaction of actors, institutions, material artifacts and knowledge (Geels, 2004; Markard, 2011) and that the transitions of these systems include the change in social practices and institutions over technological change (Markard, Raven & Truffer, 2012).

system's high resilience to disturbance and perturbation to the point that an unsustainable trajectory is maintained suppressing innovations and finally maintaining a maladaptive state of the system. On the other hand, ideally, a transformative cycle of capacity-solution should bring the system to develop veritable transformative pathways aimed at elaborating new and sustainable visions.

In light of path dependency and lock-in effects, transitions are made possible by critical moments where the quality of resilience/vulnerability suddenly changes (i.e., transitional ruptures or regime shifts). This happens when pathways are suddenly elevated/lowered toward stronger or weaker levels of resilience breaking path dependency (see Figure 1).

Positive transitional ruptures are highly dependent on the right timing of the right ideas and are possible if there is enough momentum for change and this change is supported. In this regard, as pointed out by Wilson (2014, 2015) many communities are stuck in specific pathways because of structural problems that are linked to different mechanisms of lock-in (e.g., political and infrastructural lock-ins, geographical constraints, adherence to conservative norms and conventions).

As regards the emergence of new paths, recent reviews (Loorbach, Frantzeskaki & Avelino, 2017; Geels, 2019; Kohler et al., 2019) identify a set of useful concepts to understand and explain how transitions unfold:

- Nonlinearity of change, as transitions are disruptive changes that evolve through shocks rather than gradually. The notion of disruptive change is present in both sustainability science as tipping points and innovation sciences with disruptive innovations.
- Multi-level, multi-actor, and multi-scale dynamics: transitions result from the interaction between multiple levels (e.g., regimes, niches, landscape), scales of governance (global, supranational, national, local), and societal actors (civil society, governments, science, business). Therefore, they involve complex and nested feedback dynamics among these elements.
- Co-evolution: transitions are the product of interactions between transformations. Co-evolution implies that change in, for example, the technology domain interacts with changes in policies, institutions, and biophysical environments. This requires looking at how multiple domains shape each other.
- Emergence: transitions are the outcomes of multiple actions and changes leading to new systems in ways that are impossible or extremely difficult to predict or plan. Transitions can be coordinated or navigated by creating orientations, guiding values, or space for experimentation and learning that allow new solutions or organizational schemes to emerge and stabilize.
- Problem framing: how problems and solutions are framed influence the societal support and consensus for investments, policies, technologies, use of natural resources etc. Developing shared discourse is key for transitions.
- Envisioning, selection, experimentation, and learning: Transitions are a matter of innovations, which in turn are processes of experimentation and learning by doing that instigate change. Developing effective strategies or policies for innovation means including different values, beliefs, and practices to explore radical innovation and pathways and develop alternative goals and agendas for transformation.

In light of this gaze, energy transitions can be conceived as the passage from one basin of attraction (e.g. fossil fuel-based energy system) to another (renewable energy system) facilitated by disruptive events and interventions conceptualized as tipping elements (see Figure 1).

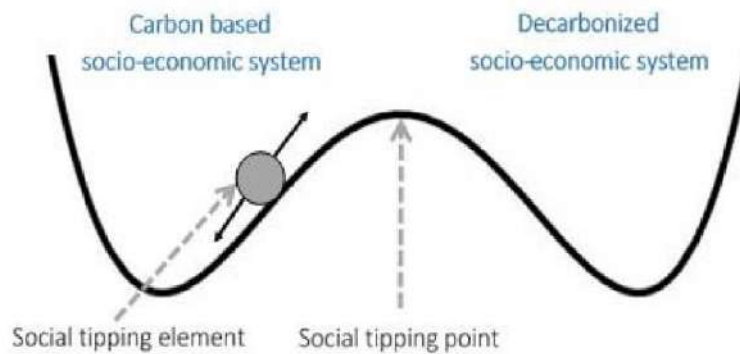


Figure 1. Conceptualization of system transformation via tipping dynamics from one basin of attraction to another

This passage often requires a transition in the social contexts (e.g. the experimentation of radical technological innovations, as well as strategies aimed at regime disruption/destabilization) which contribute to breaking lock-in mechanisms and sustain the capacity and stability of the new socio-ecological systems (Loorbach, Frantzeskaki, & Avelino, 2017; Seto et al., 2016; Buschman & Oels, 2018).

From a psycho-social perspective, we further suggest that a number of processes and factors are relevant to understand these dynamics. From cognitive biases and heuristics to community processes such as social memory, cultural resistance, or psychological conservatism. Taken together, these psychological mechanisms contribute to making certain pathways unimaginable and impossible to implement, or on the contrary to foster the capacity to respond to new problems and opportunities in new and unprecedented ways.

In this sense, the model we started developing (D2.1) connects in a multi-level and systemic perspective a number of processes already examined in the literature. Rather than considering them as separate entities, however, we suggested that system stability and change should be examined as emergent properties, guided by principles of self-organization. In this sense, stability is achieved when the system is capable of dealing with disturbances, i.e., when processes of awareness, appraisal and coping allow individuals and groups to perceive the phenomenological coherence, stability and regularity of observed or lived experiences.

1.1 Socio-psychological patterns and key factors considered in the case study

In the Literature Review from Environmental and Social Psychology and Anthropology (Deliverable 2.1, see also Biddau, Brondi & Cottone, 2022; Rizzoli, Norton & Sarrica, 2021) we examined a number of socio-psychological factors mediating the experience of tipping events (event awareness and appraisal) and related coping (coping appraisal and response) operating at the individual (e.g. risk perception, knowledge), community (collective identity, justice perception sense of place), and societal level (values, norms, imaginaries) of functioning. According to psychology, tipping points can be understood as the point at which people begin to perceive noise as a signal (O'Brien & Klein 2017). This broad definition leaves open many possibilities as regards the forms of change, being incremental or non-linear. Tipping points can be psychologically understood as the moments in which psychosocial patterns change due to cumulative effects or as disruptive events in the socio-material world (cf. Centola et al., 2018; Hermwille, 2016). In the classic studies of social influences, for example, the change could be produced by a divergent message which is coherently and consistently sent by a minority, or by a member of the majority which suddenly changes position.

Moreover, experimental research showed asymmetries between individual expectations about the amount of increment that is needed to reach a tipping point and the actual moment at which they are experienced by individuals (O'Brien, 2020).

Following this reasoning, in the review, we assumed that tipping points can be understood from the outside (etic perspective), as a transformation in contents and processes that is visible in enacted behaviours, or from the inside (emic perspective) as phenomenological changes in interpretations, representations and practices that define the relationship between people and their reality. An etic perspective suggests that visible behavioural outcomes (such as significant changes in energy demand) can signal a change in psychosocial patterns. On the other hand, an emic approach suggests that a transformation in consciousness is necessary to identify a tipping point from a subjective point of view.

Useful in this sense is the distinction between environmental *significant behaviours*, which are the core of 'intent-oriented approaches' and consciously aimed at reducing environmental impact, and *relevant behaviours*, which are at the core of 'impact-oriented approaches', and which can be observed and evaluated from the outside without requiring consciousness.

Connecting these insights with the transition perspective outlined above, we assume that positive socio-ecological tipping points result from the interplay and alignment of observed socio-physical and perceived or phenomenological tipping points (see Table 1).

Transformation	Phenomenological (perceived)	
	No	Yes
Socio-physical (observed)	Yes	Adoption of relevant pro-environmental behaviours + Lack of environmental awareness and concern (e.g., switch to renewable energy or increase in energy efficiency due to regulation/financial incentives)
	No	Socio-political, cognitive, and behavioural resistance to the adoption and diffusion of low-carbon energy technologies (e.g., public support for carbon-intensive policies and business-as-usual production and consumption patterns)

Table 1. Combining emic and etic perspectives for identifying and analyzing tipping points in the energy transition

The alignment between observed and perceived can be examined at several levels, from cognitive dissonance to value-beliefs-norm models.

In this study, we adopted the social representations theory (SRT, Moscovici, 1976) and the Argumentative discourse analysis (ADA) of Hajer (1995) grounding our examination in a societal psychology perspective (Himmelweit and Gaskell, 1990) to get closer to a systemic and multi-level vision. This approach combines macro-level and micro-level analyses (Lopes & Gaskell, 2015), and connects individual levels of explanations with the analysis of the relational and societal dynamics (Bauer & Gaskell, 1999; Castro, 2006; Howarth, 2006; 2013). Moreover, the societal perspective stresses that change should be considered within its own social and historical context, critically engaging with the politics of change and with societal actors involved, revealing the

multiplicity of factors and perspectives at stake in supporting or resisting change (Howarth et al., 2013). Examining the expression, negotiation, and contestation of multiple perspectives in context and their related power differentials, societal psychology tries to establish what interests and perspectives are marginalised or dominant and examine social and psychological factors maintaining the status quo or seeking societal change (Cornish & Gillespie, 2009; Jovchelovitch, 2007).

SRT assumes that thinking and meaning-making processes are not individual attributes but rather the product of the interaction between individuals and their social and cultural environment (see also Haste, 2012; Cole, 1996, for related visions in social and cultural psychology). Thus, the approach focuses the attention away from isolated individuals to the social side of human functioning, being attentive to and considering the broader environment where psychological processes take shape to explain change and stability (Reicher & Haslam, 2013). As Howarth and colleagues (2013, p. 368) argued, “[c]ontexts are therefore very complex: they are made up of physical aspects; they are social, containing social norms and knowledge systems; they are historical in that they contain already-constructed representations and discourses; they are dynamic and open to change; and they are ideological, imposing certain constructions over others as well as allowing resistance and controversy”.

In the social representation perspective, knowledge is considered the outcome of self-other interaction, sensitive to pre-existent knowledge, experienced relations, and power differential (Bauer & Gaskell, 1999; Markova, 2003; Howarth, 2006; Jovchelovitch, 2007; Batel & Devine-Wright, 2015). Creating or destabilizing legitimacy around existing or emerging policies and technologies is a crucial part of transition processes (Turnheim & Geels, 2012). Moreover, behaviours are not considered as the outcomes of basic and ideal processes (e.g. individual attitudes and norms), but as the expression of representations. In this sense behaviours embed meanings, and their permanence or transformations conveys denotative and connotative facets of the issue at stake.

Finally, SRT presupposes that representations and discourse conveyed by the diverse parts of a dispute are not equally valid. Some representations may be hegemonic in a culture (Moscovici, 1988), reified, objectified as facts and deeply sedimented - for example, they can be embedded in legislation and policies (Elcheroth et al., 2011; Castro, 2012), in education programmes (Howarth, 2006). Hegemonic representations are shared by all members of a society and allow very few degrees of freedom. They can be conceived as deep-rooted values and assumptions or meta-discourses (Fairclough, 2012), i.e. overarching dominant and widely accepted constructs of meaning in society (Foucault, 1972), such as “neoliberalism”, “globalization”, “transition”, “sustainable development”. Other representations can be emancipated, reflecting a heterogenous social environment where different communities exposed to new information constitute their versions of the world that are compatible with hegemonic representations. Finally, others can be polemic, constituting the view endorsed by specific (and often minority) groups during controversy and expressing rivalry and incongruity between representations (Wagner, 1995).

When coupled with the Argumentative discourse analysis (ADA) of Hajer (1995), social representations theory can thus be used for illuminating the discursive and representational processes through which problems and solutions are intersubjectively constructed, and common understandings are produced and can transform (Dryzek, 2005; Späth, 2012). Both ADA and SRT are interested in how certain meanings (social representations or storylines) are cultivated, negotiated, and conveyed within and by subgroups (social milieus² or discourse

² Social representations are elaborated, circulated and received within social milieus, i.e., group contexts in which

coalitions), which come together because of an (assumed) shared worldview and common conceptualization and interests about a given object. Discourse structuration and institutionalization of ADA, namely how a given conceptualization becomes widely shared, dominant, and powerful/influential, have a parallel in SRT's concepts of hegemonic, emancipated and polemic representations.

According to the discursive perspective, change is the result of the interplay of discourse coalitions and discourse agency of actors that exceed the boundaries of existing discourses supporting continuity (lock-in) for leaping into new ones promoting transition and undermining lock-in (Bouschman & Ockwell, 2018). Nevertheless, as stressed by Simoens, Fuenfschilling, and Leipold (2022), lock-in can be reproduced through three discursive dynamics:

- 1) unchallenged values and assumptions of meta-discourse. Institutionalized discourse is aligned with the values and assumptions of meta-discourses, therefore alternative voices are excluded, confrontation with alternative ideas is avoided, and underlying values and assumptions are not challenged.
- 2) incumbents with a strong discursive agency that reproduce the institutionalized discourse and resist transformative impulses (cf. discursive regime resistance in Geels, 2014).
- 3) narrative co-optation, which implies that the marginal narrative aligns too closely with the dominant one to persuade incumbents ending to lose its transformative power (cf. with Smith and Raven, 2012 who defined radical and marginal alternatives as fit-and-conform and stretch-and-transform narratives).

Therefore, to break discursive lock-in, scholars assume a few pathways of change. These can occur after a tipping event alters the values and assumptions of the meta-discourse and opens a window of opportunity for alternative discourses to gain legitimacy and dominance (e.g., Fukushima, cf. Buschmann & Oels, 2019), or, otherwise, via deliberate tipping interventions that unveil and challenge the underpinning of meta-discourses and open-up discursive space for alternative narratives making them appealing to incumbents and destabilizing the institutionalized discourse.

This is why social actors perceiving an affinity of interests and opinions may create coalitions and act in networks to develop and convey particular discourses and promote a particular way of thinking and acting about environmental challenges, articulating their storylines and narratives in public and political-institutional arenas (e.g. media, newspapers, political debates) aiming to influence interpretations of the audience and get support or dedicated resources (Scrase & Ockwell, 2010; Sarrica et al., 2014; Sarrica et al., 2018). In this regard, as stressed by Simoens, Fuenfschilling, and Leipold (2022) overtime a discourse can become sanctioned (Williams 2020) or institutionalized (Hajer 1995), and the dominance of socio-technical regimes must be continuously reproduced through dominant discourses that constitute and justify technologies, institutions and practices. This stresses the relevance of sense-making in legitimizing or delegitimizing certain transition pathways (Bouschman & Ockwell, 2018; Simoens, Fuenfschilling, & Leipold, 2022).

In line with the societal psychology, social representations and discursive perspectives outlined above, in this case study we focused our attention on a few key cultural and psychosocial factors that gradually emerged as the most relevant in understanding system stability (i.e., adaptation, lock-in, path dependency, and legitimacy),

localized systems of meaning are produced and used by members to make sense of their social world and their position within the world. Groups draw upon familiar images and metaphors based on their historical, cultural and educational status. Once a social representation is formed it is embodied in individual cognition, habitual behaviour, informal and/or formal communication.

and its capacity to transform or to absorb external pressures and internal impulses for transformation. The same factors and their relationship are crucial in understanding what kind of tipping interventions are necessary to break lock-in and support change. The assumption is that behavioural changes observed from an etic or emic perspective, i.e., relevant and/or significant behaviours, would be a manifestation of underlying transformations of meanings. In this sense, behavioural tipping points could emerge either in an apparent situation of stability and thus serve as further triggers for the transformation of meaning systems, or as the evidence of an ongoing transformation of the underlying systems of shared meanings that provide stability to our everyday reality and practices.

Relying on social representations theory and discursive perspectives, and open to the suggestions coming from the field, we examined in particular meaning-making processes regarding:

- the sense of place (i.e., the set of place meanings, attachments, identities, and imaginaries) and
- technological, political-legal, and social innovations (i.e. the social, policy and technical components of transition).

The aim was to enlighten the interplay of socio-ecological transformations and socio-technical transition and examine their dynamics.

We briefly describe the main psychosocial factors considered in the following paragraphs.

1.1.1 Sense of place

Resilience scholars agree that the resilience of a community is largely based on human connectedness to place (Folke et al., 2003; Barthel et al., 2010a, 2010b; Tidball et al., 2010). From a socio-psychological perspective, the people-place relationship is based upon meanings that people assign to material environments which are linked with collective processes of belonging, identification, and memory (Bonaiuto, Breakwell & Cano, 1996; Dixon & Durrheim, 2000). Indeed, complex histories must be considered as a starting point for understanding learning, decision-making, and adjustment trajectories (Folke et al., 2003). Memory can affect group-based appraisals and dynamics, and change and innovations are influenced by previous knowledge and experience. Thus, problematizing these elements opens new ways to understand the success and failure of innovations and transformations (Biddau, Brondi, Cottone, 2022). As stressed by Wilson (2015), the memory of a system – namely the memory linked with individuals as life histories and stakeholder groups as acquired memory - affects the community's adaptive capacity to disturbances. Social memory can both raise resilience and increase vulnerability at the local community level, influencing its coping, adaptation, and transformation (Adger, 2000). Through experiences with the biophysical environment, people develop subjective meanings and bonds that predict specific types of behaviour, and that have a role in the development of identities (Harner, 2001) and in promoting or hindering agency and adaptive capacity (Brown & Westaway, 2011, Biddau, D’Oria & Brondi, 2023).

On this matter, the sense of place – intended as the meanings and attachments to a setting held by individuals and groups (Tuan, 1977) – can be regarded as a promising research area for two reasons: its ontology interconnects the social and natural world; and it is both an outcome and a driver of socio-ecological processes (Masterson et al., 2017).

In coal regions, the sense of place can reflect a deep cultural relationship with coal (i.e. coal-based community identity, place dependence and attachment, collective memory) that can contribute to path dependency, constraining and shaping future transformative pathways for the region (see also Alexandra, 2017).

In this regard, we examine how the sense of place and related collective memories about coal and carbon-

intensive industrial developments play a role in coping with and understanding current transformations (i.e. the coal phase-out and clean energy transition).

1.1.2 Representations and perception of justice

Justice is a key driver for sustainability transformations and a crucial component of public support and political legitimacy. Indeed, forms and experiences of distributional (how the decisions reflect the recognition of concerns and opinions of diverse publics fairly distributing costs and benefits), procedural (if and how individuals are involved, treated, and represented in the decision-making) and recognition injustice intersect during the transformation of energy systems (McCauley et al., 2013).

In this regard, scholars apply justice concepts to energy transition (cf. Walker, 2009; Sovacool et al., 2016; Jenkins et al., 2016) to recognize how injustices emerge, which groups are affected and/or ignored, and what processes exist to make evident, reduce and remediate to such injustices. In so doing, they examined: a) how environmental costs and benefits of the energy system transformation are distributed not only between individuals and social groups but also geographically (between territories) and temporally (e.g. intergenerational justice); b) how equity and fairness of procedures – i.e., the access to information, transparency, legitimacy, access, inclusivity and representativeness of different interests at stake – have a role in energy decision-making and the final outcome (e.g., Lund, 2014); c) “the processes of disrespect, insult and degradation that devalue some people and some place identities in comparison to others” (Walker, 2009, p. 615), that is, how (lack of) recognition of social groups and places determine procedural and distributional injustices (cf. Yenneti, Day & Golubchikov, 2016).

While there is no doubt about the valence of such a normative approach for understanding and governing current transitions, we should add that communities with histories of disadvantage or powerlessness can be more vulnerable, less resilient, and unable to cope effectively with transformations. Furthermore, memories of environmental injustice can constitute a frame of reference to make sense of transformations (Biddau, Brondi, & Cottone, 2022).

All these elements stress that an intergenerational approach to justice, considering the interplay of injustices in development pathways across time, is highly relevant for understanding how people make sense of and respond to current transitions.

In this regard, recent developments in justice literature are extremely relevant for the study of coal regions in transition. First of all, the restorative justice concept introduces the idea and obligation that a just transition needs to identify and respond to those damages that already occurred. This implies repairing it and restoring the dignity and well-being of those involved before embarking on a new transition, and that any injustice should be rectified and be part of preventive and forward-looking action (Heffron & McCauley, 2017). Moreover, the capability approach to justice introduces the idea that externalities from energy system transformations or environmental change can affect multiple dimensions of well-being and human flourishing. Thus, a capability approach to sustainability elucidates the interconnection between human well-being, the natural environment, and socio-technical systems (Hillerbrand, 2015), including how environmental changes and transition processes expand or limit the capabilities of individuals, households, and communities (Tarekegne, 2020; Joodoin, 2021; Chipango, 2021).

It is clearly possible to intersect the different dimensions of justice with the emic or ethic perspectives outlined above. This puts once again at the forefront the relationship between the structural and the cognitive aspects, that is the structural components of violence and the consciousness and agency of the actors. From this point of view, it is possible to establish promising links with conflict theories and to reflect on energy injustice in terms

of oppression, characterized by a lack of awareness or so-called false consciousness, or in terms of social transformation, where the actors confront with structural forms of injustice (Galtung, 2009).

All these normative considerations are of relevance for the case study as many coal regions (including this case study) are interested in the EU just transition mechanism and fund. In this regard, we aimed to elucidate how structural and representational forms of justice and injustice from previous development pathways influence the understanding of the current state and the visions of transition.

1.1.3 Socio-technical and spatial Imaginaries

Elaborating shared visions about transformations is recognized as a critical ingredient to orient strategies and policies to support such changes by providing clear pathways that are feasible and viable (see e.g., Buschman & Oels, 2018).

In this regard, scholars often inquire about socio-technical imaginaries (Jasanoff & Kim, 2009) because they inform visions of desired futures in which sociotechnical assemblages (encompassing ongoing interactions among human and non-human actors) play a key role. Sociotechnical imaginaries are “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). Imagined futures can help justify new investments in science and technology and serve both as the ends of policy and as instruments of legitimation (Kuchler & Bridge, 2018). These ideas about the future, or “sociotechnical imaginaries,” do not just describe desirable futures but also delimit attainable ones. Different studies have explored socio-technical imaginaries but have mainly focused on how technical experts and political systems envisage them rather than engaging citizens or stakeholders.

A particularity about coal regions is that energy transition involves a profound territorial transformation that goes well beyond technological substitution (e.g., from coal-fired power plants to renewable energy). Indeed, many of these regions historically based their economic development and community identity around coal-based practices (e.g., extraction, transformation, transport) and places (mines, industrial clusters located close to coal-based facilities). The transformation of such places and practices brings risks about losses of jobs and consequently economic well-being and may involve feelings of dispossession, disrupting place histories and memories captured in the sites (Duffy & Whyte, 2017) and the related psychosocial dimensions such as place attachment, identity, and values.

Therefore, socio-technical imaginaries are deeply entrenched with spatial imaginaries as the way people perceive, conceive and live space can lead to normative imaginaries and actions about territorial transformations based on low-carbon energy (Aiken, 2018). Socio-technical imaginaries involve forms of space and place as part of the desirable vision of the future, as much as spatial imaginaries involve ideas about technology as part of the understanding of positive socio-spatial relations (Chateau, Devine-Wright & Wills, 2021). Watkins (2015) distinguished between three types of spatial imaginaries: place imaginaries, which define a particular and unique space with related ideas about its characteristics (e.g., New Orleans as the birthland of jazz); idealized space, providing idealized representations of places that share general characteristics (e.g. the mine as a peaceful and silent place); and spatial transformation imaginaries, involving representations of processes by which spaces and places change (e.g., “airbnbization” as a form of intense touristification and gentrification).

Chateau et al. (2021) stressed that these imaginaries have a key role in shaping and legitimizing socio-technical change in three ways: energy transition imaginaries can support or disrupt the place imaginaries by embedding socio-technical pathways that act in continuity or discontinuity with the past of a place toward a more desirable

future (i.e., reversing the conditions of a stigmatized space, or reinforcing and reproducing its positive characteristics); idealized space can shape siting or planning decisions about renewable energy technologies (e.g., the recreational and economic value of the sea constraining the deployment of offshore wind turbines); and spatial transformation imaginaries shape the sense-making and acceptance of socio-technical change by connecting past experiences (e.g., past intensive exploitation of place for industrial and urban development affects the symbolic coping of energy development).

In this regard, we explored the interplay of socio-technical and socio-spatial imaginaries of transition, regarding how energy can be generated and consumed, i.e. how, when, and where can different types of renewable energy infrastructures be considered acceptable, and how the places, existing infrastructure, and ecological environments can be used or re-deployed to create new activities and revitalize the local economy in line with place-based meanings, interests and values.

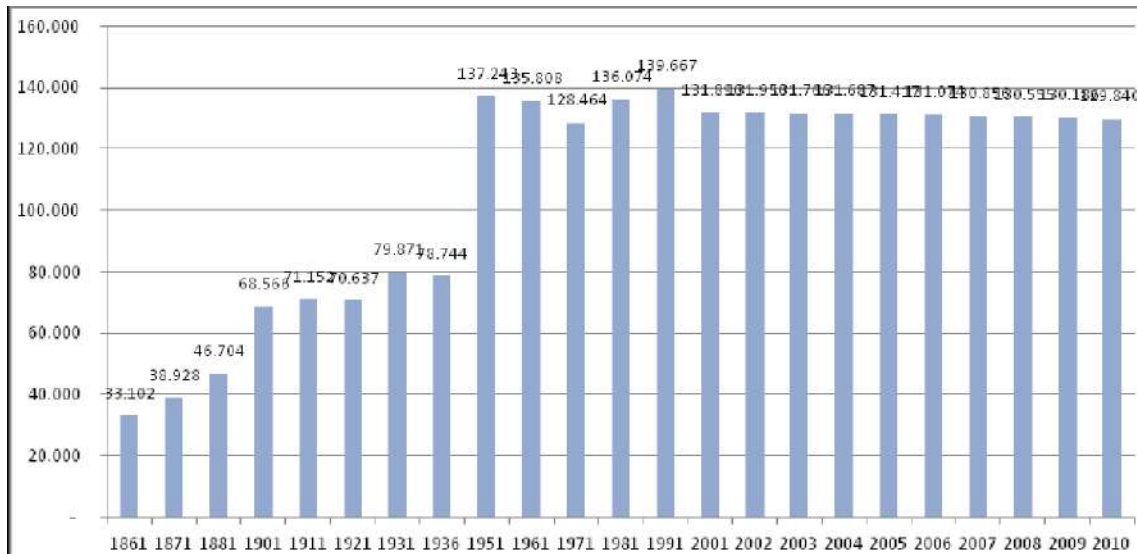


Figure 3. The resident population in the province of Carbonia-Iglesias from 1861 to 2010 (Source: Provincial Strategic Plan, 2011)

Therefore, the Sulcis region represents an exemplary case of a coal-functional region³. Its rationale for development was based on the production and distribution flows of coal, namely extraction, transport, commerce, and use. The decline and reconversion of the mining industry (coal, plumb, zinc) started in the '50s via the post-war 'Piano di Rinascita' (Rebirth Plan, L. n.588 11th June 1962), which aimed at financing the industrialization of Sardinia and leading to the development of industrial specialized clusters and supply chains for the energy-metalliferous industry. In the Sulcis area, the industrial pole of Portovesme was developed on the coast (Portoscuso) and characterized by large and energy-intensive metal industries (e.g. ALCOA, EURALLUMINA, PORTOVESME srl), a coal-fired powerplant owned by ENEL (Centrale Elettrica Grazia Deledda, 590 MW), the industrial port, and waste fills to serve industry needs (see Figures 4 and 5).

All these distinctive features make the Sulcis region a prototypical example of a coal and carbon-intensive area. Energy production and distribution were designed and developed according to the availability of coal and the presence of logistic infrastructures (e.g., port) for its transport (Sulcis coal is highly impure and needs to be mixed for energy generation) and that of metals (import of raw materials and export of processed ones).

³ The functional region is the most applied concept in the sustainability transitions literature. It is based on social and ecological flows or functional links across a geographic area. This region type can be seen as nodes of population groups connected with functional links such as flow of persons, economy, markets, transport, communication, among others. It is a behavior-based activity area. For example, the region consuming electricity from a coal-fired power plant or the region in which workers at a coal mine live and work are functional regions. Functional regions may cross administrative (even national) boundaries (Gillespie 2014).

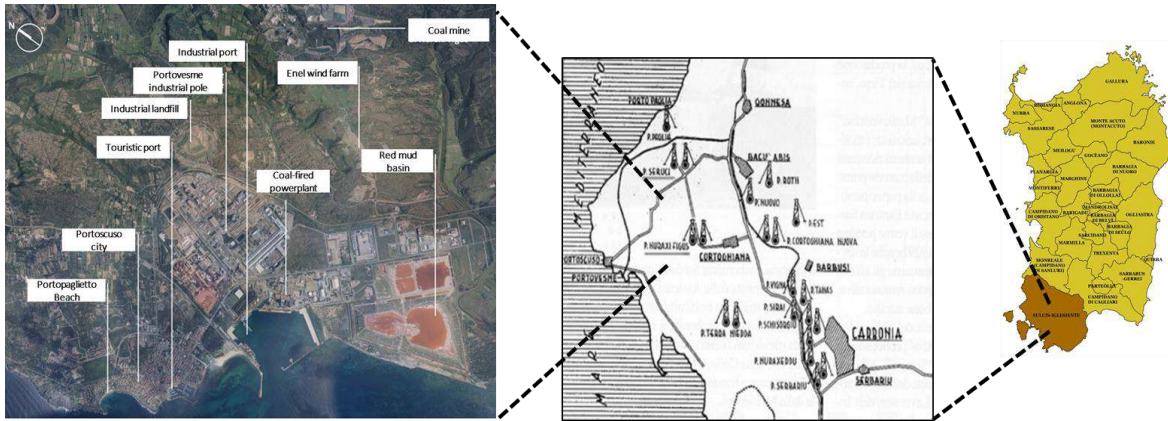


Figure 4. Zooming in the coal and carbon-intensive territory. From right to left: 1. Sulcis-Iglesiente territory; 2. Sulcis coal basin (mines and transport infrastructure); 3. Portovesme industrial cluster (industries and related transport, energy, and waste infrastructures)



Figure 5. The emblematic places of the coal and carbon-intensive territory: the coal mine close to a wind farm (top left), the industrial area of Portoscuso (top right), the port of Portoscuso with the ENEL coal-fired powerplant and the wind farm in the background

Therefore, logistic efficiency in transport and the availability of energy at affordable prices were crucial elements for industrial sustainability and territorial development, making the region economically exposed to cyclical fluctuations in raw materials. The coal and carbon-intensive region thus coincides with the territory affected by the mining and industrial activities (functional region), which is inside a complex area of crisis by the national government (formal region, province of Carbonia-Iglesias, see figure 6).



Figure 6. Area of Complex crisis (Source: Invitalia, 2018)

As documented in several policy reports, while the Portovesme industrial district located in Portoscuso can be conceived as the epicenter of the industrial crisis of Sulcis-Iglesiente, its effects comprise the broader functional region. We decided to focus on this area as it is more exposed to decarbonization policies and related impacts.

Considering that coal and carbon-intensive features are distinctive aspects of the region in terms of the local economy, identity, and memory, we hypothesize that the functional region can coincide with the perceptual one based on shared collective experiences and memories about the coal and carbon-intensive industry.

Formally, at the administrative level, the role of the province has been inconsistent throughout the years, due to the elimination and changes of provinces in the Italian administrative system (see figure 7 showing the differences in the administrative-geographical compositions in the last 15 years). For this reason, we decided to adopt a multi-scale perspective considering the interaction of National, Regional, and Provincial policies for the Sulcis region.

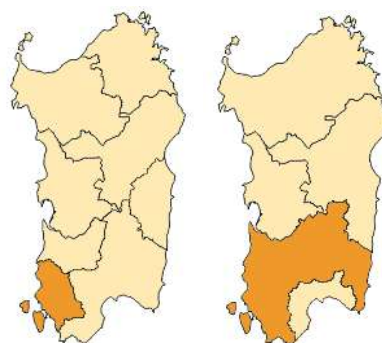


Figure 7. Administrative province of Carbonia-Iglesias/Sulcis-Iglesiente (2005-2016; 2021-today) and of South Sardinia (2017-2021)

2.2 The societal problem

During the last decades, due to energy prices and the global crisis of 2008, which also affected the non-ferrous metal industry, the area experienced a severe industrial decline with consequent job losses. This coincides with a long-lasting crisis at a socio-economic and environmental level. Indeed, regarding the environmental crisis, the area is a National Interest Site (Ministerial Decree 12th March 2003) due to the widespread presence of dismissed mining areas, industrial districts, and waste fills (see Figure 8).

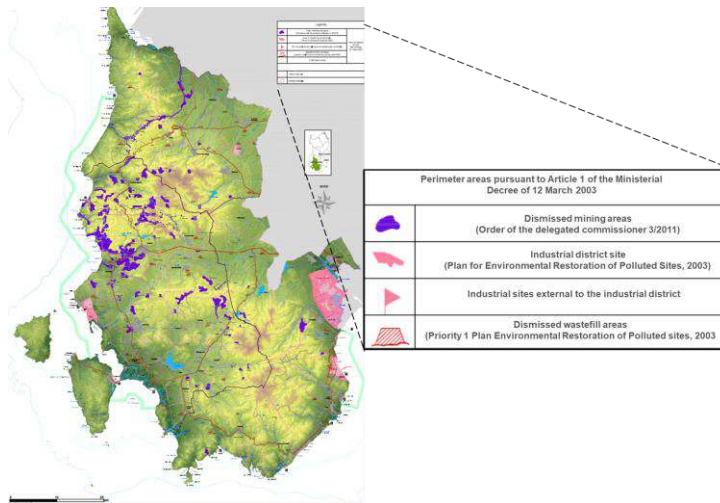


Figure 8. Map of the National Interest Site of Sulcis-Iglesiente and localization of mining, waste, and industrial sites (Source: Strategic Provincial Plan, 2011)

Environmental assessment reports show that large areas are highly polluted by industrial activity (mining and metal transformation) which concerns air quality and soil and water ground contamination, with risks of the introduction of heavy metals in the food chain (Russo et al., 2021). For this reason, they are subject to multiple remediation projects though different areas are inevitably compromised. Thus, every attempt for conversion and recovery of the area for productive purposes is impossible without remediating. From a demographic and socio-economic perspective, the region suffered from a long-time job loss, high rates of unemployment, migration, school drops, and a decrease in the resident population, especially for young generations (Provincial Strategic Plan, 2011; Monitoring Report Sulcis Plan, 2019).

From 2005 to 2016, the resident population decreased from almost 132.000 to around 126.000, and in 2019 (see Figure 9) it reached 124.000 residents (Eurostat, 2019).



Figure 9. Trends of the resident population in Carbonia-Iglesias province from 2005 to 2016 (Source: ISTAT). Note that in 2019 the total of residents decreased to 124.329 (Source: Eurostat)

This demographic trend is accompanied by the ageing of the population due to the negative natality-mortality ratio and outward migration of the younger generation (see figure 10 and Table 2). As shown in Figure 10, the average age in the population rises from an average of 42.9 years to 47.7 years in the period 2006-2017.

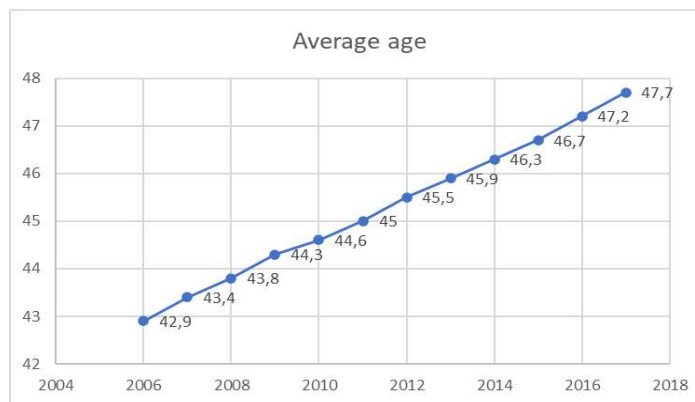


Figure 10. The average age of the resident population (2006-2017). Source: ISTAT data, our elaboration

Table 2 shows that in 11 years the age index increased by 61.7% and that in 2017 there were 246,9 elderly people for every 100 young people. In the same period, the old-age dependency index increased by 25,7% - showing that in 2017 there were 53.2 not working individuals for every 100 individuals that were working - and the active population turnover index has more than doubled showing that the population of working-age is very old.

Year	Age Index	Old-age dependency index	Active population turnover index	Structure index of the active population	Birth rate	Mortality index
2006	152,3	42,3	99,9	108,1	6,5	8,8
2007	161,1	42,5	105,5	111,4	6,6	9,1
2008	169,4	43	114,1	114,8	6,4	8,8
2009	176,8	43,4	126,4	117,5	6,8	9,5
2010	180,8	43,7	142,5	121,5	6,9	9,4
2011	186,3	44,4	157	125,4	6,8	9,6
2012	193,3	45,6	171,6	129,1	6,6	10,1
2013	201,1	46,9	185,7	133,4	6,1	10,1
2014	209,9	48,5	196,8	137,6	5,7	9,9
2015	220,9	50	201,9	142,4	5,9	10,6
2016	233,9	51,5	201,9	146,2	5,6	10,1
2017	246,9	53,2	207,9	151,2	-	-

Table 2. Main demographic indexes⁴ for the Province of Carbonia-Iglesias (2006-2017). Source: ISTAT

⁴ Age index represents the degree of aging of a population. It is the percentage ratio between the number of

Sulcis region has been considered for many years the poorest region in Europe. From data from 2016, compared to the preindustrial crisis 3500 jobs have been lost, of which 65% come from industries (Monitoring Report Sulcis Plan, 2019). From 2008, the Carbonia-Iglesias province registered the most significant decline in employment in percentage terms (-14.8%) and a constant increase in layoffs compared to the rest of the region (Regional Observatory of the Labor Market of the Regional Employment Agency of Sardinia region, 2016). Data on hiring trends in the province show that this significant decline is due to the industrial crisis (see Figure 11). Moreover, it shows a gender imbalance for new contracts, positive for women, and negative for men (see Table 3).



Figure 11. Hiring trend in the Province of Carbonia-Iglesias from 2009 to 2015. Source: Regional work agency

Year	Male	Female	Total
2009	-527	687	160
2010	-232	515	283
2011	38	536	574
2012	-580	691	111
2013	-295	228	-67
2014	-970	117	-853
2015	-40	337	297

Table 3. Gender balance in new contracts. Source: Regional work agency

This can be explained by the economic trend and the employment balance per sector (see figure 12) which shows a negative occupational trend for certain sectors that are mostly male prerogative (agriculture,

over-65s and the number of young people up to 14 years of age. Old-age dependency index represents the social and economic load of the non-active population (0-14 years and 65 years and over) on the active one (15-64 years). Active population turnover index represents the percentage ratio between the population group that is about to retire (60-64 years) and that which is about to enter in the work age (15-19 years). Indicator is less than 100 when active population is younger. Structure index of the active population represents the degree of aging of the working-age population. It is the percentage ratio between the oldest part of the population of working age (40-64 years) and the youngest (15-39 years).

manufacturing, and extractive industry with a loss of around 1500 workers in 2013-2014), and a positive occupational trend for sectors prerogative of female workers, such as education⁵, which increased of 572 workers in the same period.

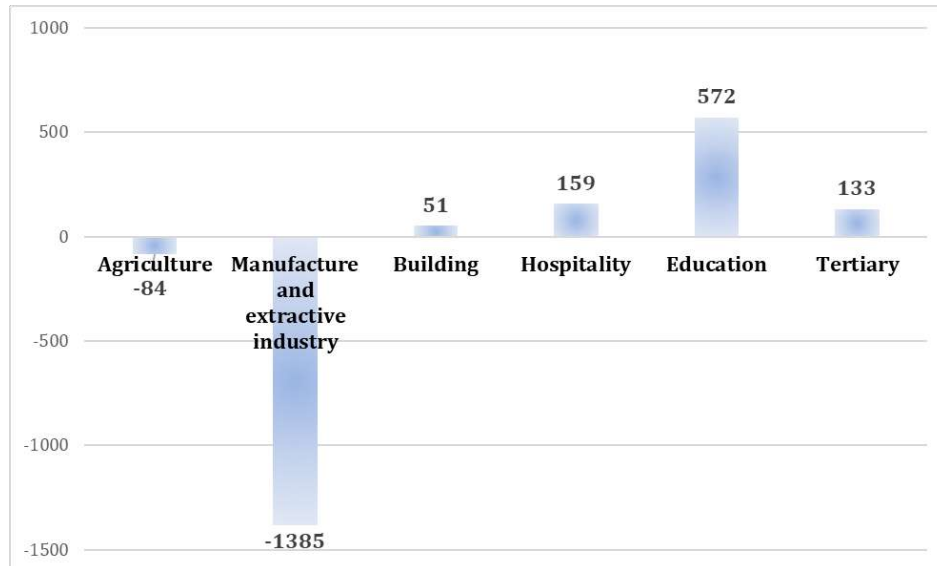


Figure 12. Employment trend per economic sector (2014-2015). Source: data from Regional Work Agency, our elaboration

Beyond the impact of de-industrialization, decarbonization policies can make the region more vulnerable, exacerbate the social crisis, or on the contrary, can trigger positive transformations. The last coal mine, owned by the regional company Carbosulcis, ended its activity in 2018 and the site is currently subject to multiple reconversion projects: creating an energy hub for energy production and storage (CCSU projects, PV and storage facilities), developing a waste facility, and using the site for R&D activities in the fields of experimental physics and natural science. On the other hand, the coal-fired power plant is expected to phase out by 2025, affecting industries and overall energy security. The possibility of its re-conversion for natural gas or biomasses has been set aside, while the methanization of the island still represents a controversial and harshly debated project. Previously, the national energy strategy opted to connect the island through a pipeline. This scenario was highly contested by environmental NGOs emphasizing the risk of locking-in infrastructurally and economically the region. Nowadays, the most probable option is the development of coastal deposits of natural gas accompanied by regasification plants.

In the last few decades, the region has been the beneficiary and subject of multiple investments and plans for relaunching the economy and tackling the socio-economic crisis. First, through an agreement between the National and Regional Governments for a territorial development strategy: the 'Sulcis Plan' (2012, 1.243 million euros). The plan was based on 71 projects divided into 6 programs: enterprise, fiscality and safeguard of productive-economic texture (41%) school (0,7%), technological research (6,7%), infrastructures (28%), environmental restoration and remediation (24%).

Industrial Reconversion and requalification are accompanied by investments for the recovery of affected areas,

⁵ According to the OECD study "Gender imbalances in the teaching profession" (2017), in Italy the 83% of teaching staff is represented by women.

conversion of dismissed industrial areas, training of human capital, and promotion of energy efficiency and infrastructural development. However, the situation remains characterized by delays in these transformative projects (e.g., environmental remediation), uncertainties about energy provision and security (phase-out of coal-fired power, lack of natural gas) and consequently industrial future due to energy price and availability.

Nowadays, due to decarbonization and phase-out policies, the region of Sulcis is also interested in the Just Transition Mechanism and is listed as eligible for the Just Transition Fund. Indeed, the national government indicated Sulcis Iglesiente as a recipient considering the high dependence on mining and carbon-intensive industries, to mitigate socio-economic impacts induced by the transition.

2.3 The research problem

The risk of reinforcing lock-in and the intrinsic difficulties of breaking path dependency triggering systemic transformations present socio-political and socio-psychological challenges and consequences that so far have been underestimated – e.g., coal-fired generation and mining activities that are deeply sedimented in the community cultural, socio-political, and socio-economic fabric (Biddau, Brondi & Cottone, 2022; Duffy & Whyte, 2017).

In this regard, the Sulcis region historically based its economic and territorial development and community identity around industrial practices and places. Thus, the transformation of such places, practices, and sources of income not only brings risks about losses of jobs and decreased economic well-being but may also involve feelings of dispossession and disruptive change in how the community perceives and projects itself due to place attachment, identity, ideologies, and values among others.

The history of the region stresses that despite huge investments and plans the area seems stuck. The region seems involved in struggles over the old and the new (cf. Johnstone and Hielscher, 2017), suffering path dependency and social and economic vulnerability characterized by de-industrialization, lack of innovation and economic diversification, negative migration dynamics and occupational trends.

Transformative change means also restructuring a different and alternative identity and vision for the territory, destabilization and reconfiguration of previous schemes, structures, and psychosocial patterns, and aligning socio-technical innovations and phase-out policies with the socio-cultural environment.

2.4 Aims and research questions

In this regard, we aim to understand the role that sense of place, shared perception of the various typologies of justice, and vision and imaginaries play in fostering path dependency and lock-in. We hypothesize that these factors could contribute to explaining the failure in creating the conditions for destabilization following potential tipping events (e.g., industrial, and occupational decline, coal phase-out decision) and tipping interventions (e.g., Piano Sulcis). On the contrary, carbon-lock-in and path dependency can be broken through tipping interventions aligned with imaginaries for system transformations.

From a psychosocial perspective (Biddau, Brondi & Cottone, 2022) we attempt to explore these issues by trying to answer the following research questions:

- I. How does sense of place (including attachment, meanings, coal-based memory and identity) affect the

psychosocial agency and imagination of desired futures?

- II. What are the social representations and shared discourses about energy and sustainable energy transition at play in the area? Which kind of representations/discourses are these (e.g., hegemonic, polemic)? How do these contents reflect power interests and how do different actors compete in defining viable and legitimate futures?
- III. How do interventions and representations contribute to justice/injustice dynamics, and how do they contribute to stabilizing or tipping the system (i.e., legitimating, or de-legitimizing transition)?
- IV. Is the region psychologically locked-in? and what are the structural (economic, political, geographical) and psychosocial patterns that sustain path dependency constraining alternative imaginaries and the corridor of possibility?

3 Methods

3.1 Research design and data collection

To map and examine representations, discourses, and visions, addressing the socio-cultural and socio-political dynamics of the transition pathway, we triangulated qualitative and quali-quantitative techniques and different corpora of textual data.

In the research design, we partially followed Hajer's methodological guidelines (2006) for argumentative discourse analysis and adopted a multi-scale approach (see Sarrica et al., 2018).

At first, we conducted desk research, i.e., a survey of public documents to make a first chronology of events, and identify and map actors and positions in the field. This included a review of grey literature that was used to identify and understand the main discourses about the energy transition.

In particular, we examined:

1. Policy and planning documents from different scales of governance (e.g. 'The Sardinian Environmental and Energy Plan', 'National Energy Strategy', the 'Sulcis Plan' and related monitoring reports, and the 'Strategic Provincial Plan')
2. Assessment reports, studies, or advocacy briefs developed by different groups (e.g., 'Dossier of Sulcis-Iglesiente's Crisis'; 'Sardinia Island Zero CO₂ – phase-out 2025: decarbonization proposals for Sardinia'; 'Socio-economic assessment of renewable energy scenario for Sardinia').

Moreover, we carried out a longitudinal analysis of newspaper articles published between January 2011 and February 2021 in national (Ansa), regional (La Nuova Sardegna and Unione Sarda), and local newspapers (La provincial del Sulcis-Iglesiente). Through newspapers' online database, we collected all the articles comprising the keywords 'energy' and 'Sulcis' (search query: "Sulcis AND energ*") published from January 1st of 2011 to February 28th of 2021. After initial screening assessing the pertinence of the articles (i.e., the energy issue is relevant and not only mentioned) the final corpus consisted of 965 selected articles distributed in a non-homogenous way across time and newspapers (see Table 4).

YEAR	ANSA	LA NUOVA SARDEGNA	LA PROVINCIA DEL SULCIS-IGLESIENTE	UNIONE SARDA	TOTAL
2011	1	59	0	10	70
2012	16	150	0	29	195
2013	4	42	12	13	71
2014	4	47	29	13	93
2015	24	66	46	5	141
2016	23	36	19	2	80
2017	11	32	34	3	80
2018	4	13	30	2	49
2019	19	27	58	5	109
2020	12	26	19	6	63
2021	2	5	0	7	14
TOTAL	120	503	247	95	965

Table 4. Distribution of newspaper articles analyzed

The analysis of press and public documents was initially used for structuring initial concepts, ideas and categorizations, looking for the employment of storylines, metaphors, consensual and conflicting discourses and getting a preliminary understanding of discursive dynamics and significant (tipping) events.

Then, we conducted interviews with key informants (n=4) chosen because having an overview of the field from different positions (i.e., a journalist, a historian, a policymaker, and a representative of an environmental NGO).

Afterwards, from December 2020 to October 2021, we conducted 26 narrative interviews with key regional stakeholders and informants (N=27) representing heterogeneous perspectives and interest groups (see Table 5).

These comprise political representatives and public officers (n=8) operating at different scales (municipality, province, region), experts from different scientific fields (n=4), such as energy planning, mining, environmental health or social research - workers from industry and trade unions' representatives (n=5), journalists (n=2), representatives of environmental NGOs or local movements (n=6), and firms operating in the environmental and energy field (n=2).

ID	Type of organization	Sector	Role	Date	Length
1	Regional Environmental NGO	Environmentalism	Scientific representative	21/12/2020	00:29:03
2	Regional newspaper	Journalism	Journalist (Sulcis reporter)	24/03/2021	00:54:28
3	Youth political organization	Local politics	Local representative	11/05/2021	01:12:54
4	Youth political organization	Local politics	Local representative	04/06/2021	01:15:59
5	Municipality	Local politics	Municipality Councilor	01/09/2021	01:31:44
6	Municipality	Local politics	Municipality Councilor	23/04/2021	00:30:17
7	Regional Environmental NGO	Environmentalism	President	25/06/2021	01:37:28
8	Local environmentalist association	Environmentalism	Local representative	22/06/2021	00:50:05
9	Local environmentalist association	Environmental activism	Local representative	23/06/2021	00:49:05
10	Network of local movements	Environmental activism	Coordinator	27/07/2021	01:38:52
11	Coal industry	Industry	Worker and trade unionist	18/06/2021	00:30:27
12	University	Science	Sociologist	27/05/2021	00:43:25
13	Environmental health organization	Science	Representative (Medical Doctor)	29/09/2021	01:18:21
14	Regional political authority	Regional politics	Public office manager	30/09/2011	02:02:15
15	Mining institution	Industry	President	04/10/2021	01:13:25
16	Metal company	Industry	Former worker	05/10/2021	00:51:10
17	Energy R&D center	Science	Research manager	08/10/2021	01:15:42
18	Local trade union	Union	Representative	14/10/2021	01:18:53
19	Metal company	Industry	Worker (x2)	13/10/2021	01:29:06
20	Local environmental association	Environmentalism	Representative	14/10/2021	01:29:14
21	Regional radio and press	Journalism	Journalist and blogger	18/10/2021	01:10:56
22	Municipality	Local politics	Municipality Mayor	21/10/2021	01:11:44
23	Provincial political authority	Provincial politics	Province representative	24/10/2021	02:06:22
24	Regional Authority	Science	Energy planner	26/10/2021	01:23:23
25	Coal industry	Industry	Manager	02/11/2021	01:01:27
26	Regional council	Regional politics	Regional Councilor	03/11/2021	01:07:45

Table 5. Stakeholders interviewed

Due to covid-19 pandemic, most interviews were conducted virtually with Zoom platform. Participants signed a consent form, and all the interviews were video/audio recorded and subsequently verbatim transcribed. The interview protocol contained questions aimed at eliciting narratives about the territorial trajectory across time and incorporating four aspects and related socio-psychological variables (see Figure 13):

1. The sense of place, intended as the set of meanings, attachments, and identities related to the place.
2. The perception of environmental risk/degradation and justice

3. Collective memory about territorial development pathways including energy transition (their problems, the most salient moments)
4. Imaginaries and aspirations for transition.

Narrative interview protocol

Introduction

- ✓ Introduction to the Tipping plus project and the researcher(s) conducting the interview
- ✓ Description about the rationales of the interview and the interviewee selection
- ✓ Description about return of results and use of scientific knowledge
- ✓ Reading and signing of consent form

Questions
1) First of all, could you briefly tell us more about yourself? Where were you born and raised? What do you do? Your family?
2) If you had to tell us and describe the Sulcis territory, how would you do it? What are the elements, places, or even moments and events that characterize the soul of the territory (identity and tradition) in positive and negative?
3) Could you tell us more about the Sulcis context regarding the energy and environmental issue? What about pollution, the use of natural resources, the development of renewables and sustainable economies?
4) In your opinion, what are the most salient moments in the past and recent history of Sulcis that have characterized its development and the current situation? The industrial past (mining, industrial pole), the industrial crisis, the sulcis plan and the more recent energy transition (just transition)
5) Regarding the development of renewable energy in the area, how energy transition unfolded in this area? Do you remember projects or episodes that have sparked conflict or discussion within the community? Could you tell us more about it?
6) In your opinion, what have been the critical issues encountered so far for the sustainable development of Sulcis?
7) How do you imagine Sulcis in 30 years? What will have changed and how? What, if you have to think negative / positive about current transition?

Figure 13. Interview protocol - in bold the open and generative questions followed by follow-up probing questions

3.2 Analytical procedure

As a first step, textual corpora were submitted to preliminary forms of content analysis.

In the case of newspaper articles, texts were prepared using the software TalTac 2 (Bolasco, Baiocchi & Morrone, 2000) to identify multi-words (e.g., "energy transition", "renewable energy") and perform lemmatization, i.e., grouping the inflected forms of words and reducing them to the word's lemma so they can be analysed as a single item.

Then, texts were analyzed using the software IRaMuTeQ (Ratinaud, 2014). We calculated descriptive statistics and the frequency distribution of words and finally, we analyze them through the Descending Hierarchical Classification or Reinert method (Reinert, 1983), which consists in classifying words in lexical worlds (topics of words that refer to a class of meaning), i.e. the topics. Lexical worlds (or topics) are the visible traces (lexical) of the latent dimensions that underlie the discourse, called *topoi* (places of thought) (Reinert, 1998). The texts that

compose the corpus are defined Initial Context Units (ICU). The first step allows dividing the corpus into smaller portions, which are the Elementary Context Units (ECU). Lexical worlds are individuated through co-occurrences of words as they appear in portions of a text (ECU).

Put simply, the Reinert method is a clustering method based on lexical/vocabulary distribution (occurrences and co-occurrences of words within a unit of context) and assumes that words used in similar contexts are associated with lexical worlds. The final objective is to create topics based on similarities and differences in vocabulary distribution (Reinert, 2000). In social research, lexical worlds often refer to frames (Goffman, 1974) or social representations (Moscovici, 1961/76).

Regarding interviews, these have been verbatim transcribed and analyzed through thematic discourse analysis (Taylor & Ussher, 2001). In line with social representations theory and argumentative discourse analysis, at the first step, we used thematic coding (Braun & Clarke, 2006) as a method for data reduction, systematization and interpretation capturing both explicit and implicit meanings. After coding, we organized our data through themes and analyzed discursively the coded portions of text to capture shared, consensual or conflicting discourses representing underlying systems of meaning (Taylor & Ussher, 2001), and the function they serve (i.e., sustaining a particular version of reality, accuse, justify, making evident contrasts).

Therefore, the research examined the inter-textuality of discourses, namely the interaction of discourse with elements of other discourses from which it emerges and interacts (Fairclough, 1992) – e.g., polemic representations are developed and conveyed in opposition to hegemonic or emancipated representations. In this way, the research connects meanings in their context of use, considering the positions criticized or against which given versions of reality are created, acknowledging the counter-position in the analysis (Billig, 1987).

4. Lexicometric analysis of national, regional and local newspapers

The characteristics of the final corpus⁶ confirm the suitability of lexicometric techniques for data analysis (see Figure 14). The articles were analysed at first using the Reinert method (Reinert, 1983), to identify the lexical universes, or topics conveyed in the press. These macro themes were then interpreted and labelled based on the set of representative words for each theme and performing text mining to better interpret the themes and the related key terms and discourses.

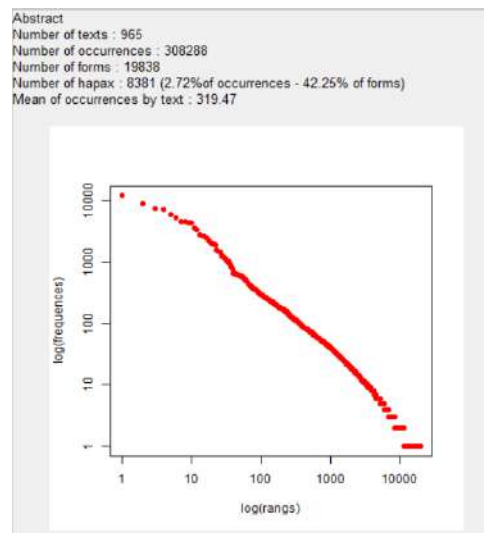


Figure 14. Lexicometric features of the corpus of newspaper articles

4.1 Peaks and tipping events in press coverage

The temporal overview of articles (see Figure 15) reveals peaks that coincide with tipping events mainly about industrial decline, such as (a) the industrial crisis (crisis of Alcoa, closure of Portovesme industrial plant) and the territorial and industrial recovery plan of 2012 (launch of Sulcis plan); (b) the worker protests and strikes of 2015 pertaining the decision to close and dismiss the coal mine and the difficult reopening of several industries in the Portovesme industrial topic; (c) the acquisition of Alcoa from Sider Alloys, the difficulties to restart activity due to energy prices, and worker protests of 2019.

⁶ 308.288 occurrences (i.e., total words), 19.388 forms (i.e., distinct words), 8.381 hapax (i.e., forms with frequency 1, which accounts for the 2,72% of occurrences and 42,25% of forms

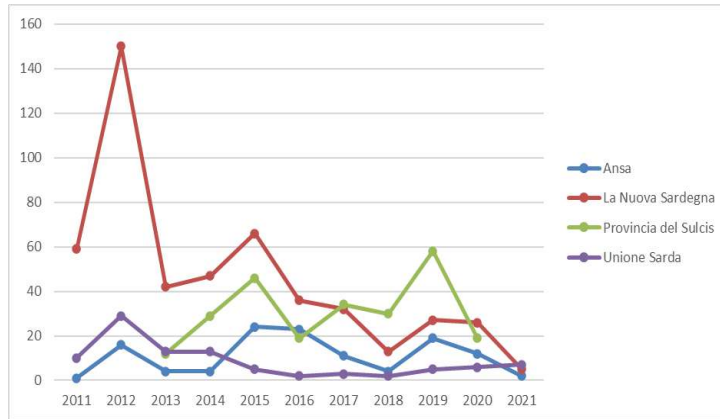


Figure 15. Temporal overview and peaks of newspapers articles across the years

A preliminary analysis of the high-frequency words confirms this finding and shows that the industrial crisis of Portovesme and the coal decline occupy most of the media debate. Indeed, beyond the keywords used in the query (energy=1241, Sulcis=1039) and those related to the geographical location (Sardegna=1531; region=830) the most frequent words (e.g., Portovesme=644; Alcoa=606; coal=509; workers=449; industry=423) pertain to these themes.

4.2 Topic detection

The Descending Hierarchical Classification (Reinert, 1983) identified 5 topics divided into two main branches (see Figure 16).

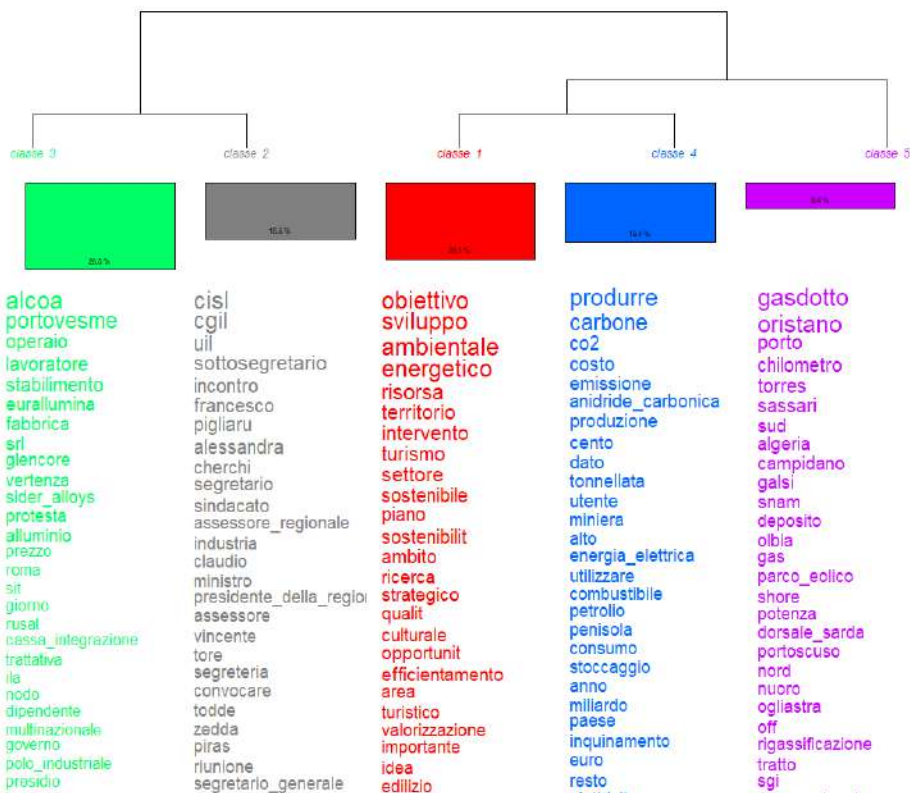


Figure 16. Clusters/Topics identified in the press with the Reinert Method and their most representative words

Topic 3 (green, 28.5%) and 2 (grey, 18.5%) belong to the same branch (de-industrialization or industrial decline), referring respectively to "*industrial crisis*" and "*resolution of the industrial crisis*".

Indeed, the most representative words in topic 3 identify the main industries (e.g., Alcoa, Eurallumina, Fabbrica|factory, Glencore, Sider Alloys, Stabilimento|plant) locations (Portovesme), or actors affected by the industrial crisis (e.g., operaio|workman, lavoratore|worker), the related socio-economic consequences (e.g., cassa integrazione|layoffs, chiusura|closure, acquisizione|acquisition, riavvio|restart), workers' actions of protest and union fights (e.g., protesta|protest, vertenza|dispute, sit in, mobilitazione|mobilization, assemblea|assembly).

On the other hand, the most representative words of topic 2 refer to crisis management and resolution in terms of involved actors (e.g., the unions: cisl, cgil, uil; regional political representatives: Cherchi, Pigliaru, assessore regionale|regional councillor; national ones: Todde, ministro|ministry) and related institutional activities (e.g., riunione|meeting, tavolo|decision table, vertice|summit, confront|confrontation).

It is worth remembering that the dataset is all related to energy. Thus, this finding highlights that energy discourse is imbued by the industrial issue, which covers 47% of the total text segments classified (3418 text segments over 7269). This reflects how energy supply and costs are discussed as key factors in the overall discourse on industrial crisis and decline.

Topic 1 (red, 25.13%) refers to the semantic universe of "*plans and strategies for sustainability transition*". It comprises words referring to political goals (e.g. sviluppo|development, sostenibilità|sustainability, efficientamento|efficiency, valorizzazione|valorization, tutela|safeguard), action domains (e.g., ambientale|environmental, energetico|energy, culturale|cultural, ricerca|research, turismo|tourism, innovazione|innovation) and premises for sustainability transition (e.g., risorse|resource, territorio|territory).

Topic 4 (blue, 19.42%) refers to the semantic universe of "*materiality of energy generation*". The most representative words describe the material premises (e.g., carbone|coal, costo|cost, miniera|mine, combustibile|fuel, petrolio|oil) and outcomes (e.g., co2, emission|emission, consume|consumption, inquinamento|pollution) of energy generation and words quantifying these elements (cento|hundred, tonnellata|tonne, anno|year, miliardo|billion).

Finally, topic 5 (purple, 8.42%) refers to the semantic universe that concerns the "*territoriality and infrastructures of energy generation and socio-technical change*". The majority of representative words refer to geographical locations interested by energy infrastructure spanning across the entire island (i.e., Oristano, Porto Torres, Campidano, Sassari, Portoscuso, Nuoro, Ogliastra), or energy supply regions (Algeria) accompanied by words referring to the main energy projects that attracted media attention (e.g., gasdotto|pipeline, galsi, deposito|deposit, dorsale sarda|domestic pipeline, rigassificazione|regasification, parco eolico|wind farm). It should be noted that almost the entirety of the words referring to projects for energy production describe gas infrastructures and the struggle between heavier and lighter forms of methanization for Sardinia (gas pipeline versus gas deposits with regasification plants). This highlights how the media discourse reflects the coal-to-gas transition advocated in political decisions and that renewables seem relegated to a marginal and niche role, at least in the media discourse.

Looking at the relationship between these topics on a factorial plan (see Figure 17), the five discourses seem positioned and can be interpreted along two main dimensions. The X-axis opposes discourses about transition and deindustrialization, while the Y-axis opposes discourses about politics and policy (plans, strategies, governance struggles, etc.) and discourses about their local implementation in terms of projects, territories, and

actors involved.

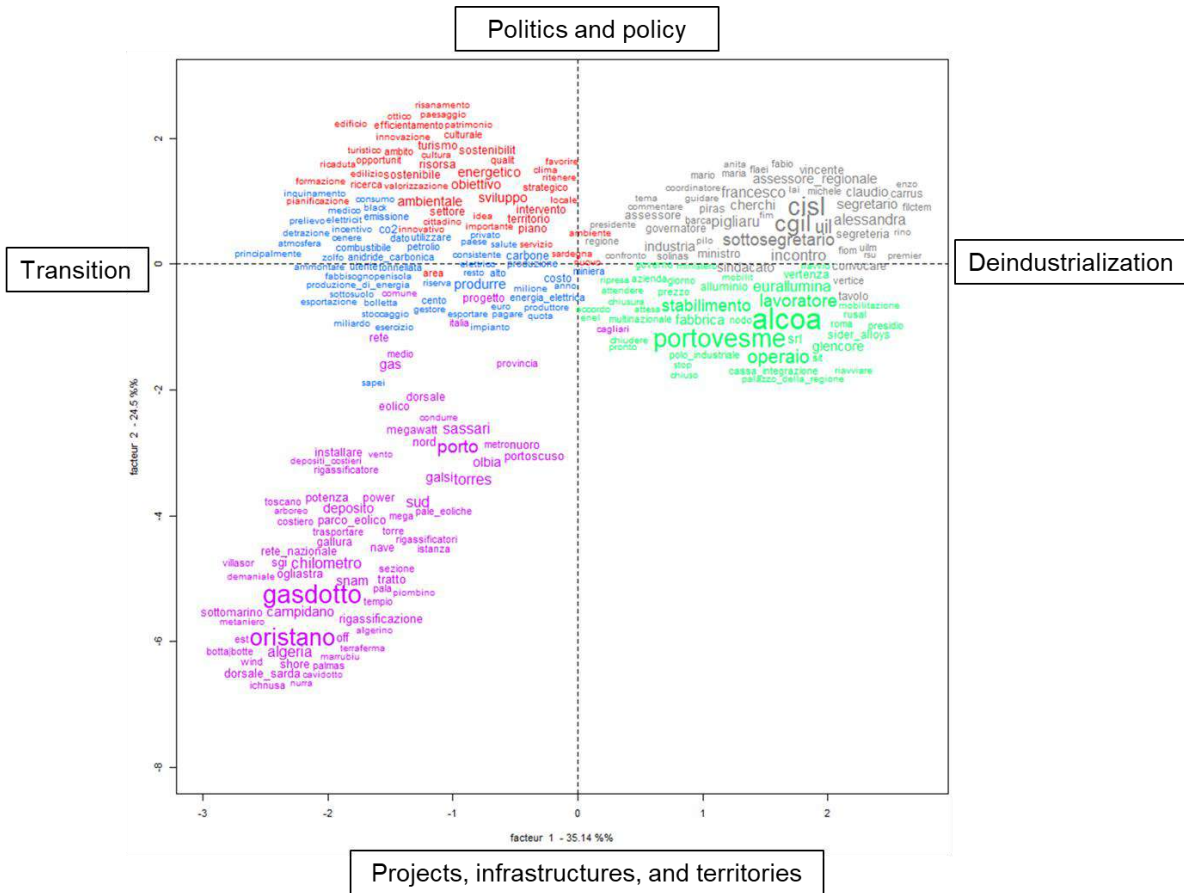


Figure 17. Factorial visualization of clusters/Topics identified in the press

4.3 Similarity analysis and text mining

To further understand the discourse embedded in the topics about energy transition, we performed similarity analysis⁷ for each topic (excluding topics 2 and 3) and used text mining techniques for exploring and interpreting the central elements (words) of the graph areas by examining the words’ context of use (concordances). Similarity analysis shows graphical representations of the co-occurrences among the main lemmas for each topic/discourse (see e.g., Figure 18 for topic 1).

⁷ Similarity analysis is based on the theory of graphs and aims at identifying words cooccurrences and provide information on the proximity and relations between them (size of forms is proportional to the frequency, size of the links to the cooccurrence) graphically representing them through a maximum tree (Ratinaud & Marchand, 2012).

The ALCOA dispute encompasses several problems: the purely industrial problem, and the **energy** one, which is, however, closely linked [ID 650, 2019, Nuova Sardegna]

Due to these reasons, coal (and coal-fired powerplants) is legitimized across time by discourses that justify its use by adopting appropriate technologies for limiting environmental harm, such as carbon capture and storage (CCS), and re-presenting it as a "clean source" (clean coal) or the "most suitable source" due to the intermittency of renewables and related issues with the transmission grid (overcapacity).

with the CCS also fossil fuels can continue to be used on a large scale [...] researchers are finalizing a complete, impartial, and independent Report on the Italian energy situation with particular attention to the role that coal can play in the future **energy** mix if treated with appropriate technologies [ID 758, 2014, Provincia Sulcis]

the growth of renewables, therefore clean but intermittent **energy** has an impact on the level of operation of the electricity grids. Also in this scenario, coal plays a leading role because it represents the most suitable resource to guarantee the necessary energy coverage when the production of renewables decreases or ceases [ID 835, 2017, Provincia Sulcis]

Despite the decision in 2014 to conclude the mining activity and close the coal mine by 2018, discourses on coal reveal a consistent attempt for its legitimization across time. This is accomplished through discourses justifying its use for responding to industrial needs and preserving the stability of the power system and representing coal and carbon-intensive industry as part of the tradition, culture, heritage, identity, or vocation of Sulcis, as well as its economic crutches for stability.

The essentiality regime⁸ [of the powerplant] would make it possible to safeguard employment levels, protect the heritage of technical-**industrial** culture and tradition, and guarantee the safety and stability of the electricity system. Suffice it to say that it was thanks to the presence of the Sulcis, Ottana and Fiume Santo power plants that, in February 2015, the black-out was avoided in Sardinia [ID 455, 2015, Nuova Sardegna]

for now, it is only an idea that however testifies to the great desire of the territory not to abandon the **industrial** culture that characterized it in the past and still characterizes it, but to focus on a new role in the field of scientific research in the field of new energy technologies [ID 855, 2017 Provincia Sulcis]

The reactions flooded in the aftermath of the interview in which the entrepreneur proposed for the Sulcis to focus on tourism and abandon the **industrial** model. All reactions to the same sign, from miners to trade unionists, from parliamentarians to public administrators: considerations sent back to the sender. Suggestions are perceived as a foreign body to the territory. [...] in short: tourism and industries "can coexist". [318, 2013, Unione Sarda]

On the other hand, in face of transition and deindustrialization, the territory is represented as dispossessed, lacking the agency and ownership for taking control and responsibility over development pathways and the necessary resources. This representation of the local population is linked with discourses that represent deindustrialization and transition as mainly guided by external pressures and forces, which respectively jeopardize the economic future of families and leave little economic benefit locally. For this reason, sustainability transition strategies are demanded to promote the re-appropriation by local communities of local resources for territorial development (i.e., food sovereignty, place management, energy self-sufficiency). The following extracts reflect our claims.

in this way, the future of thousands of families is jeopardized in **a territory** heavily affected by the economic and social crisis [ID 103, 2012, Nuova Sardegna]

⁸ Legal term indicating the essentiality of powerplants for the safety of the power system

Despite a high [energy] production, the [positive] implications for the **territory** are very low. For this reason, it is necessary to increase consumption. In particular, as regards renewable sources, we have already identified 11 districts within which we will have energy self-sufficiency [ID 528, 2016, Nuova Sardegna]

it is necessary to oppose a virtuous quality policy aimed at food sovereignty functional to the needs of those who live in the **territories** a policy that favours the re-appropriation by local communities of the management of places [ID 761, 2015, Provincia Sulcis]

The key terms that mirror discourses on territorial and economic development refer to “development”, “valorization/enhancement”, and “resources”. Discourses that include these terms are not limited and merely subjected to economic considerations but embody the development of agency and ownership during transformations. In this regard, the key elements for development that are often discussed refer to the economic sectors and supply chains of tourism, agri-food, energy, or waste management, and key local assets such as dismissed industrial areas, polluted sites, and the heritage of natural landscape and mining industrial archaeology. The extracts supporting these claims are presented below.

The competition [“99 ideas for sustainable development of Sulcis”, part of Sulcis Plan] concerns various themes, articulated in several needs-objectives including the **valorization** of the local production system, in particular tourism, agri-food supply chain, craftsmanship, the **development** of new productive sectors regarding new technologies and sustainable energy production, the recovery and enhancement of places, and the usability of waterways marine corridors also through infrastructural investments, the **development** of services to increase the sustainable usability of the environmental and mining cultural heritage [ID 271, 2013, Nuova Sardegna]

The sea is the **resource** that for us means the future, and without this future, the situation becomes truly sad. This wind farm does not provide economic benefits for us [ID 964, 2020, Provincia Sulcis]

The Sulcis territory represents an example to discuss the solutions that the market currently offers to solve the problems of polluted soils not only for their reclamation but also for their **valorization** for agricultural purposes [ID 898, 2019, Provincia Sulcis]

We must therefore think of concrete answers and give support to those who want to safeguard the productive fabric by identifying new **development** prospects with particular attention to the supply chains of agri-food, environmental restoration, and tourism including the relaunch of the geo-mining park [903, 2019, Provincia Sulcis]

main source of energy security, a local asset that compared to uranium and nuclear power (rejected in 2011 by a national referendum) is portrayed as potentially clean and safe.

we all are now aware that nuclear energy has its limits, while it is recognized by technicians and experts that the kWh produced with **coal** has a lower price than other energy sources [ID 35, 2011, Nuova Sardegna]

today the **coal** of Sulcis must be the Sardinian answer to nuclear power, our uranium in the subsoil of Nuraxi Figus[mine]. It is not dangerous with modern technologies; it does not pollute as you can eliminate co2. It will never be used to produce atomic bombs or cause alarms for radioactive pollution [ID 23, 2011, Unione Sarda]

Beyond this representation of coal as a risk-free panacea for energy security, to justify new investments in the declining sector, coal is also represented as a means of innovation and local development that respects and enhances the existing skills in the area based on historical mining development and tradition.

the funding of this kind of [R&D] initiative is more than justified. It is not just about reviving an old coal mine, but developing in the Sulcis an Italian technology hub of pan-European interest in clean **coal** [ID 246, 2012, Unione Sarda]

we must use all the mining expertise remaining in our region after the **coal** extraction phase to forge technological partnerships with countries such as China and the United States that are focusing a lot on coal, especially in terms of clean energy for the future [399, 2015, Ansa]

Over the years, policies and investments aimed at supporting coal or the coal-to-gas transition are legitimated by discourses that stress the condition of the island's infrastructural diversity compared to the rest of the country. This implies negative socio-economic impacts for industry (especially energy-intensive ones) and families in terms of energy costs, industry operational functioning, and jobs. Therefore, following the decision to phase out the coal-fired thermoelectric by 2025, a low-carbon transition is often portrayed as impossible without undertaking a coal-to-gas transition, namely using gas as a transitional material to support the deployment and diffusion of renewables.

as there are still no alternative energy sources such as methane, said the councilor of industry, Sardinia pays a total **cost** between businesses and families that is excessive compared to the costs of the rest of the peninsula [ID 742, 2014, Provincia Sulcis]

The construction of a cogeneration plant for electricity and steam, using imported coal sold mainly to Eurallumina can favour the reopening of the Sulcis plant by reducing **costs**. A decisive turning point with the involvement of 357 workers. [ID 757, 2014, Provincia Sulcis]

As for the government's proposal to focus on the power line, the regional councillor replies: "It is an infrastructure necessary to guarantee the energy stability of the entire country, but it is not equivalent to the arrival of methane in Sardinia. They are two distinct things. We need methane to face the energy transition and reach the 2050 target with energy produced from renewable sources ". [The undersecretary of the ministry for economic development] "The pipeline must justify the **costs** [..] it is an infrastructure that justifies its cost only if it is demonstrated that from the point of view of utility, it is essential". [ID 625, 2019, Ansa]

As the latter extract shows, the debate over the need to develop gas infrastructures never left the agenda, intensifying over the years between the different solutions proposed by regional and national governments and often opposed by local populations - i.e., the methane pipeline, gas coastal deposits and regasification plants, or powerlines. On this matter, the graph area about energy provision refers to terms such as "power generation" "electricity" and "renewable energy sources". Discourses on these elements always refer to the "colonial relationship" of the region with the country, which is represented symbolically by the submarine powerline that connects the island and the mainland. Regardless of the newspaper, regional power generation is represented as to the benefit of the country and the disadvantage of the region: a form of energy colonialism that preserves national energy security but not regional ones.

regarding Sardinia and manufacturing activities, if we want them to have a future, we must be able to rely on thermal energy that guarantees continuity of supply and protects us from possible connection problems with the peninsula. In fact, now Sardinia **produces more energy** than it consumes. [384, 2014, Unione Sarda]

we consume less but produce more than we need. The energy produced cannot be stored and is exported to the peninsula, for the benefit of who? Certainly not ours. Sardinians do not buy electricity at a "Sardinian price". **Electricity** produced in excess and mainly from coal could be very cheap, but by law, we must buy it at a single national price [287, 2013, Nuova Sardegna]

Sardinia exports about 33% of the electricity produced. **Power generation** from renewable energy sources accounts for 36% of the total electricity consumption. [ID 859, 2018, Provincia Sulcis]

As the extracts show, newspapers' discourse stresses the paradox of having a high energy production from local sources (coal and renewables), a high percentage of energy export, and little benefit from this production in terms of energy costs or stability of power supply (e.g., storage and grid).

In this regard, renewables are represented across time in an ambivalent way that emphasizes on one side the shared representation of exploitation of local resources from industry actors and political compliance. Different events and projects of rapid and uncontrolled diffusion of renewables due to generous national subsidies, and the lack of timely regulation (especially in the period 2005-2012), characterize these discourses portraying Sardinia as a colony subject to industrial and national interests.

"**Renewables** are not all the same. It is not enough to launch commercials on the green economy without regulating their use [unionist]" [...] block of projects on thermodynamic solar energy, an unrestrained diffusion (+ 400% in two years) of photovoltaic systems, especially in the countryside (with subtraction of fertile land from agriculture), but also in an uncontrolled way in cities, without creating smart grids capable of contributing to the equilibrium of the system, and then " a continuous stop and go on wind power" [ID 294, 2013, Nuova Sardegna]

"We have been dragging the energy problem for decades - concludes the Deputy Mayor of Portoscuso - . But offshore wind cannot be the solution at all. While in this period of neglect of coal, the solution could be transient with gas. Alternative energies make sense if, in addition to providing energy, they do not increase the costs of energy itself, on the territory, on the community. Therefore, the development of energy from **renewable sources** is welcome, but it must be born in the area, with a whole series of infrastructures that should start from the construction of the plants up to installation and maintenance. In this project we see everything coming down from above and snatching the resources that this can entail." [ID 964, 2020, Provincia Sulcis]

These extracts underline that the experience with renewable energy deployment is characterized by intensive and uncontrolled exploitation or even impairment of local resources. Lack of regulation or scarce attention to policies orienting renewable energy deployment in favour of the local economy and communities are at the heart of a shared representation of renewables exclusively as a "territorial cost". The energy transition is therefore conceived as an external force. The development of large-scale renewable energy projects is not accompanied by the creation of economic opportunities locally or the re-distribution of benefits.

4.3.3 Topic 5: Territoriality and infrastructures of energy generation and socio-technical change

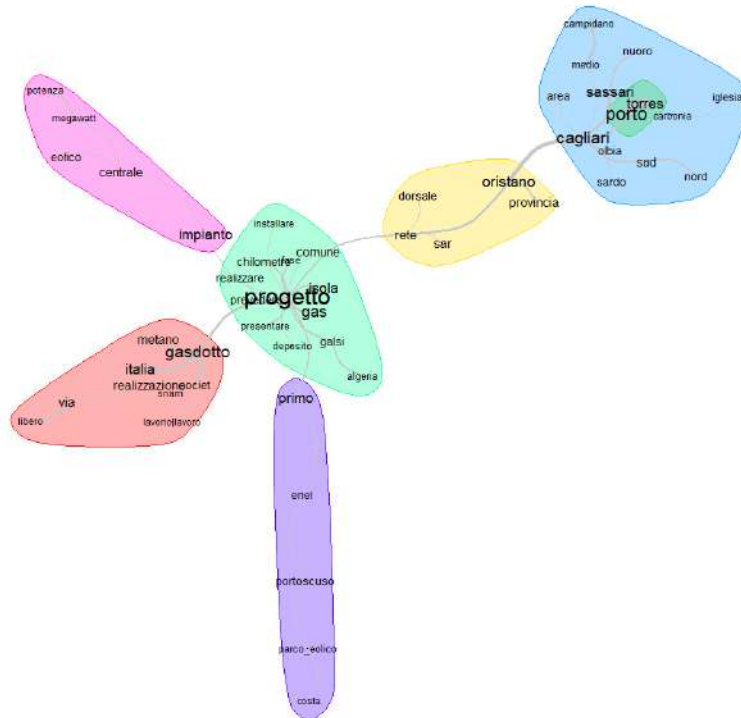


Figure 20. Topic 5 Territoriality and Technologies of Decarbonization

It is worth noting that despite this topic refers to places and infrastructures for energy production and socio-technical change (see Figure 20), it mostly refers to the coal-to-gas transition. Indeed, the central area of the maximum tree includes the key term “project” accompanied by terms such as gas, deposit, GALSI (an acronym for Gas pipeline Algeria-Sardinia-Italy), or municipality.

The latter term links the central elements to the right areas (yellow and blue), which involve terms referring to the methane pipeline project (rete|grid, dorsale|backbone) and the main inland territories or cities affected and interested by energy projects (e.g. Oristano province; Olbia, Cagliari). This is exemplified in the extract below that describes the characteristics of the pipeline project emphasizing how it involves connecting Algeria and Italy passing through Sardinia - from south (Sulcis) to north (Olbia) - thus responding to national interest besides that of the regional energy security.

The [infrastructure] work is impressive and has a capacity of 8 billion cubic meters of gas per year. The **Algeria-Sardinia** stretch is 285 km long and will reach a maximum depth of 2,824 meters with a pipeline of 66 centimetres of diameter. A 272 km pipe will cross Sardinia from Porto Botte, in **Sulcis**, to **Olbia**, to then bring the gas to Tuscany, to Piombino, with another 280 km long pipeline that will reach a maximum depth of 878 meters. [ID 61, 2011, Nuova Sardegna]

Specific discourses about the pipeline are present also in the orange area on the left. In line with previous considerations, these discourses stress the need to diversify supply and reduce energy costs for industrial and household end users. The coal-to-gas transition is represented as unavoidable and not postponable, albeit fluctuating in indecision on the infrastructural strategy to be adopted, as the following extracts demonstrate.

the **gas pipeline** with Algeria will not be built but the region does not give up on methanisation which would lower the cost of the bill [339, 2014, Nuova Sardegna]

there are two options on the table: the construction of a Sardinian-Tuscan **gas pipeline** which would be the most convenient for all industrial and household end users or a regasifier that is certainly more expensive in all respects [ID 339, 2014 Nuova Sardegna]

Examining the purple areas, the one on the bottom is characterized by words such as wind farm, new, coast, ENEL, and Portoscuso, thus reflecting the development of on-shore and off-shore wind projects in Portoscuso, starting from the pioneer projects in 2011 by ENEL to the latest development proposals and controversies about the off-shore wind farm in 2020.

the ENEL green power engineering and construction manager immediately pointed out that this is the first phase of a project that represents an important intervention in the sector of electricity production with renewable sources. We are building the largest **wind farm** in Italy, in an area adjacent to an industrial cluster [ID 40, 2011, Nuova Sardegna]

On the other hand, the purple area on the top left is characterized by words such as plant, powerplant, wind, megawatt, and power. This area reflects discourses on energy production facilities, mostly large-scale, being fossil or renewables.

For the Region of Sardinia, the decarbonization scenario cannot be implemented without considering that investments are required for the construction of new electricity interconnection with the rest of Italy and a gas generation capacity, powered by regasification **plants** supplied by LNG deposits. According to the Region, the implementation of the coal abandonment scenario, as outlined by the Ministry of the Environment, in the absence of an adequate alternative to the current structures of thermoelectric energy supply, ensured by coal or other fossil sources other than methane, creates risk conditions capable of determining significant economic impacts for the Sardinians and Sardinia. [ID 897, 2019, Provincia Sulcis]

an electricity production **plant** consisting of 42 wind turbines, each with a total power of 504 megawatts, off the coast of Cala Domestica which, according to the association, represents a very innovative project that overcomes the problems of visibility of wind power by placing the towers away from the coast in deep waters [ID 696, 2020, Nuova Sardegna]

the group leader in the regional council takes sides against the construction of the mega photovoltaic **plant** in Gonnosfanadiga, the mega project of Flumini Mannu Ltd, which intends to build a 270-hectare mega plant in the countryside of Gonnosfanadiga [ID 830, 2017, Provincia Sulcis]

These extracts demonstrate that energy production is almost always discussed concerning large-scale facilities (regasification plants, large wind or solar farms) promoting a picture of energy transition and socio-technical change as a technological substitution that reproduces the centralized model of energy production and distribution typical of fossil fuel-based infrastructure. Indeed, these projects are presented as a feasible alternative to replace coal-fired power generation and thus enable coal phase-out and decarbonization limiting their negative economic impacts. Nevertheless, as reported in previous parts, a common trend in these “mega projects” is the recurrent opposition by citizens, local politics and regional environmentalist organizations.

Overall, the findings suggest that renewables remain marginal in the media discourse, a niche that finds multiple difficulties in scaling up due to the protracted regime stability (coal legitimacy) and transformation (coal-to-gas transition), and in its diffusion due to the proposed model of large-scale infrastructures that find harsh resistance locally.

5 Narrative interviews with stakeholders

5.1 Making sense of place and collective history: social representations of coal and carbon-intensive industrialization

5.1.1 The rise of the extractive industry: functional people-place relationships and social emancipation

When presenting the Sulcis territory, participants described it as a functional coal mining region showing how the sense of place is strongly related to mining places, natural resources and traditions and overall, how the mining industry affected its social, territorial, and economic development. Indeed, the history of the place is often described in parallel with the development of the mining sector, referring to the phases of mining development and decline as the phases of community development and decline.

***Sulcis, and its history, can be summed up in the rise and decline of the mining sector.** It was an industry of extraordinary proportions. Its deposits for a long time represented an important fraction of Italian and European supply. So, let's say that **the story can be retraced by following the trajectory of this industrial sector: there is an ascent, a peak and a decline** that takes place from the first half of the nineteenth century, up to the second half, up to 1960-70. (ID 23)*

In this regard, the development of the region as functional for coal production coincides with relevant psychological and socio-political consequences. According to some interviewees, this development has not been accompanied by appropriate recognition and valorization of place but rather based upon an extractivist view of the environment, lacking attachment and identification with place. This is exemplified in remembering the foundation of Carbonia (i.e., coal city), developed during fascism to become the Italian energy capital exploiting its coal reserves (see Figure 21).

***Sulcis is a story of disavowal, a pulverized territory,** one of the poorest areas in Europe. This is because there is a bad recognition, **people did not recognize themselves in the territory.** Carbonia was founded in a year bringing people from 73 different Italian provinces into a city designed to produce. Carbonia in 1938 was the Italian capital of energy, an example of rationalist architecture, and also **an example of a community that did not exist.** How do you design and build a community? Is it enough to design well a city? And the disavowal has led to choices that have deeply damaged the territory, the culture, tradition, work and knowledge of this territory. That is, **there is no place if there is not a population that cares about it.** The lack of recognition of the characteristics of the places brought senseless policies: the explantation of the vine, the introduction of an industrial model far from the culture, from the tradition of the place, from a lack of recognition of a mining culture that could evolve, in a culture of visiting, of recognizing the mine, to exploit it differently, to tell it differently, to innovate with the mine. (ID 5)*

The functional development features are recognized as the basis of compromised people-place relationships, a functional attachment to place (see Stokols & Shumaker, 1981) that conduced to policies and human activities detrimental to the place. This is explained by referring to the lack of relationship and attachment between people and the place, due to migration patterns bringing people from 73 Italian provinces into the workforce.



Figure 21. Historical photo of Carbonia that shows the interconnection of the city and the mine. Source: <https://www.museodelcarbone.it/>

Nevertheless, memories of the rise of the mining industry are also accompanied by narratives emphasizing its emancipatory potential in terms of economic well-being, as well as capacities, and ownership/agency of transformation processes.

Indeed, many narratives focus on the increasing emancipation and empowerment of the working class during the mining development:

The mining period is linked with the memory of the arrival of wages, because industrial work was still a wage job, and this was a bit of a mirage for those who lived the rhythms of the countryside. The miner receiving a salary although poor had money. The wage condition was mythical for the Sardinian popular classes because it made them less marginal. There have been several riots, strikes and even deaths to have a normal salary. That said, the condition of the miner was considered enviable by shepherds and farmers (ID 12)

I am proud to have been the son of a miner, and I am also grateful to Quintino Sella, who, in 1871, wanted to establish the Iglesias mining school with one goal, which was to change a situation, that is, the miners sweating under the ground to extract the minerals were all Sardinians, and the managers in the offices were all from outside. His goal was to make the miners' children also become managers. So, I, the son of a miner, in the meantime had become a manager. (ID 14)

As the excerpts demonstrate, while the establishment of the mining industry raised the economic well-being of individuals, the establishment of a mining school allowed local people, from generation to generation, to develop capacities and a sense of ownership of the community's socio-economic development. This is stressed by referring to the previous situation of the development pathways, where locals were relegated to marginal and low work roles in the regional economy and mining industry, while the top managers were all foreigners.

5.1.2 Carbon-intensive industries: environmental degradation, socio-economic compromise, and rupture of the place-identity link

However, interviewees reported that these feelings and the structural conditions for ownership and emancipation were lost in the passage between the two industrialization waves, i.e., the passage from mining

to the metal processing industry. The decline of the mining industry and the transition from mining to the metal industry, are recognized by almost all the interviewees as an 'imposed pathway', a 'not contextualized development' or an 'industrialization paradigm not fitting with the context'.

*Then a further phase, between the '60s and the '70s, is instead **an industrialization model that is not contextualized**. The **coal industry was accompanied by the context** because there was the largest coal field in Italy. The **Portovesme industry is not accompanied by the context, we are not aluminium extractors**, we buy it, we work it, and we build an aluminium supply chain but in a delocalized way .. from my point of view this activity was wrong, **it brought workplaces, yes, but the costs**, that is the jobs have almost all been lost, the environment today almost all damaged, and **these places have lost knowledge, skills, even the possibility of work linked to the context** (ID 5)*

*Therefore, at the time of the recovery plan (Piano di Rinascita), **Sulcis was also affected by the most polluting industry**, the energy-intensive and chemical one, with the promise of jobs. **Everything was bartered for a couple of industries, which employed a lot of people** and also gave significant salaries, **but that was the first form of corruption**. You convince yourself that this thing suits you and in reality, **is cutting off all perspectives** because in the meantime **you lose the territory, you lose above all your professionalism** because you no longer practice a profession, **you also lose knowledge, and you find yourself having whole communities that are completely dependent on these dynamics** (ID 10)*

*These **industrial models that have been imposed** are **unrelated to what is the vocation of the territories** (ID 13)*

As the excerpts show, the rise of the metalworking industry is represented by diverse stakeholders as a form of corruption of consciences through the promise of work and salaries, and as a development pathway imposed by the central state and disconnected from territorial traditions and vocation. Many interviewees made sense of this transition as a transitional rupture that compromised the materiality of places and the endogenous capacities of the community, forcing the community to leave traditional economic sectors and lose related knowledge and competencies. This passage and its consequences are well-described in the following excerpt.

*the **industry has opposed primary activities**. The **prices** of houses, land, and food, have **adapted to the salaries of the workers in the factory**, making the farmer's activity no longer liveable. There was this social upheaval, **a race to leave the land and run towards the industry**. Industry failed miserably after a few years, and we were left with polluted land and without jobs because we had learned to be more workers than farmers. (ID 7)*

This narrative stresses how industrialization forced people to leave previous economic sectors due to the costs of life, conducing to an industrial monoculture and the abandonment of primary activities compromising the agri-food sector with negative environmental and social effects (loss of identity, knowledge, and tradition).

On the side of the environmental costs, indeed, many interviewees reported a very critical situation denoting a diffused awareness of environmental degradation and health impacts due to coal and carbon-intensive industries.

*the **mining activities were terrible**, there was **no prevention or control system**. Think of the **landfills that continue to pollute**, when there is wind the red dust [bauxite] goes everywhere (ID 4)*

***they stuffed everything into a small piece of land**: the lead, zinc, arsenic, cadmium, aluminium factory, power plants and other very heavy processes (ID 8)*

***Sulcis is an ecological bomb**. The epidemiological investigations over the years have never been reassuring. In January 2012, the Health Authority of Carbonia informed the population, based on data acquired by the Higher Institute of Health and the Ministry of the Environment, of the need for the **fruit and vegetables produced locally to be differentiated from imported ones**, and that **local products were not given to children up to three years of age**. **This is due to environmental pollution issues**, which is disturbing, isn't it? **a very high incidence of cognitive deficits in a sample of children from Portoscuso**. To then conclude that in the blood of these children, there was a high concentration of lead. (ID 13)*

5.2 Making sense of justice: social representations of industrial decline and energy transition

5.2.1 Socio-economic and political subalternity as intersection injustice

On this matter, the analysis reveals a widely shared representation of multiple forms of injustices perpetrated across development pathways. First, regardless of their belonging and identity positioning, the majority of interviewees report a representation of recognition, procedural, and distributive injustice grounded in the belief of being marginalized and subaltern⁹ in the political arena and in defining territorial development trajectories.

*the **problem** is not only **the money** that comes from the outside but also the **projects** that come from the outside, and **ideas that come from the outside** (ID 15)*

*a strong centralization of decision-making power in environmental matters, for which **central governments decide on peripheral territories** (ID 13)*

*we **suffer decisions taken elsewhere** and among other things, we also have **difficulty in interpreting them in the best possible way** (ID 25)*

As the excerpts stress, stakeholders recognize the place as intrinsically dependent, both economically and politically, from the outside. Sulcis area and the Sardinia region are represented as peripheral territories, characterized by economic and political marginality, a subaltern condition about national and supranational interests, and transformative decisions and projects. Projects and planning are represented as top-down imposed decisions. This representation about the place is linked with a largely shared narrative that mixes capitalism and neocolonialism¹⁰ as the main drivers reproducing an extractivist relationship with the environment and place and producing, using the words of interviewees, "passive modernization" or "innovation without development".

***this territory seems hungry on purpose. If you want to work, you must dig coal. If you want to work, you must make weapons for war. If you want to work, you must be among the garbage. That is, here they treat us as they once treated, or perhaps still treat today, certain centres of Africa with the traffic of waste** (ID 9)*

*paradoxically, **the whole industrial affair of Sulcis did not produce development** while it is the **scenario of huge public investments**. This is the **result of a mix of capitalism and colonialism** .. all the leaders were not Sardinians, and there was **some excluding effect**. Sardinian politics does not dare to say no. Okay, **exogenous development** is okay. (ID 12)*

***we sought the colonizer, we did not reject him** (ID 15)*

*This **subordination that we have built for ourselves**. In the sense that is it possible that **every time a very important***

⁹ The term refers to those colonial populations that are socially, politically, and geographically excluded from the hierarchy of power of an imperial colony or homeland to deny their agency and voices in colonial politics. Note that the term has been coined by Antonio Gramsci, who was a Sardinian politician and Marxist philosopher.

¹⁰ N.B. that researchers were very cautious in not proposing the term "colonialism" during the interview to not impose certain assumptions or representations. The concept and related dynamics were deepened only after the interviewees explicitly refer to it.

development opportunity arrives, is it a coincidence that the surnames that arrive always come from outside? (ID 22)

All these excerpts highlight a common representation of historical recognition and distributional injustice. The first excerpt stresses the subaltern condition of workers in Sulcis territory as disrespected, culturally and politically dominated, economically degraded and devalued. This is realized by referring to the allegedly purposeful poverty of the area and the available jobs for locals as dirty in moral (weapon industry) and material terms (waste and coal industry), comparing the received treatment to former colonies. However, interviewees recognize that this domination and the related subaltern and marginal condition is actively reproduced and passively accepted as the only type of available or thinkable development opportunity is exogenous - even though recognizing it as an illusion of development.

5.2.2 Regime resistance and cultural hegemony as a barrier to restorative justice and capability development

Making sense of this passive condition and the missed opportunity for development linked with the rise of the carbon-intensive industry, in their narrative interviewees report multiple perverse effects across spheres related to industrial decline. Among them, interviewees refer to welfare and dependency culture, political consensus, clientelism or looting of resources as interlinked negative elements and consequences of industrial decline.

*in Sulcis Iglesiasiente there is a **very high will to do nothing**. That is, **they just lull themselves into welfare in an almost obscene way**. Some people worked a week in the industry and had layoffs all their life (ID 3)*

*that **economy has lived for fifty years in starvation and unproductiveness, also generating monsters and social distortions such as welfare and clientelism**the myth of industrialization, that was part of a certain political culture, it is good that it is abandoned [...] because in all these years **public resources have been plundered** (ID 15)*

While acknowledging the negative social effects and dynamics of industrial development and decline, interviewees recognize the difficulty of abandoning the 'industrialization myth' and envisioning alternative development pathways. Indeed, many stakeholders recognize the cultural dominance and mythization of Sulcis industrial development, represented as the origin of Italian and Sardinian industrialization through the mines. This makes it hard to imagine a future without a large industry (we discussed this more in-depth also below). This difficulty is represented as caused by a powerful coalition of interests and discourses that reproduce a cultural hegemony and reinforce path dependency impeding alternatives to be thinkable.

***Everything revolves around this necessity, which is an industrial, union, and political necessity at the same time**. When you have a large industry with a lot of employees, you make more of a career in the union, and when you are a politician, the consensus is easier to get. **The trade union**, which elsewhere is a force for innovation, **in Sulcis is a source of conservatism, used instrumentally by the industrials** (ID 21)*

The protection of workers through state subsidies and layoffs is represented as an obstacle to developing alternative visions and development pathways due to the cultural dominance of the dominant narrative, which is based upon the unconventional coalition of workers, industry and unions. This dynamic is often represented by interviewees as a "therapeutic persistence" toward an unproductive and failing economy.

*I have **never seen industrial areas that have recovered from the crises of the large chemical and metallurgy industries.** Because the dynamics are international and geopolitical. So, at that point - I am the son of an anaesthetist - **instead of keeping the patient intubated when it is now clear that he is dead, the machines are disconnected, and we go on** (ID 14)*

*in **face of employment and income emergencies, the wrong Italian instinct is to exercise a real therapeutic persistence towards the company in crisis,** even when the market prospects are unlikely or nil. These are interventions that **burn precious public resources** and, by **creating false expectations, consume the future.** It would almost always be wiser to leave companies to their fate, and take care of workers (ID 7)*

These discourses are centered around a few crucial points. First, the industrialization myth and survival are perpetuated through state aid supported and advocated by the coalition of regional governments, large industries, workers, and unions aligned around the necessity to preserve jobs despite the unlikely economic prospects. Second, state subsidies are recognized to constrain imagination, creating false expectations, and dispersing the efforts and resources that are necessary for imagining and planning for alternatives. Third, these aspects are linked not only to the lack of an alternative vision and long-term project for the community but also to projects considered useless or even damaging, often described as "*missed development and lost funds*". This is the case with the often-mentioned Sulcis Plan. This perspective is shared among almost all the interviewees, and it crosses identity belongings and interest groups.

***there is a myth of industrialization ... of believing that Sulcis is the center from which the industrialization of the region started through the mines.** Historically, the struggles of trade unions contributed to building the myth. And therefore, **there is an inability to see a future other than the industrial one. But industrial based on the large metal industry or mines.** And the **Sulcis plan was conceived according to this industrial vision,** which looks at the restart of industrial activity (ID 14)*

*I don't see anything **in the Sulcis plan,** as well as in all the national and regional plans, because **there is no long-term vision inside.** The minister said we have to spend the money of the European Union at all costs ... This is a very common attitude here because **our territories are scattered with** abandoned warehouses, mountain settlements, youth hostels, and **projects costing hundreds of millions of euros that were useless, they created illusion.** (ID 10)*

***We keep proposing the same models over and over.** If you read the trade union press releases today, they look the same as twenty years ago, nothing has changed. **Coming back to the Sulcis plan, the strategy is to save the existing. The basic project is industrial and social conservation, and there is no renewal in this.** (ID 21)*

From the heterogeneous perspectives presented in the excerpts, the industrial monoculture and related myths are accused of constraining people's imagination and political planning for territorial development. The entire community (i.e., citizens, politicians, unions, industry) is represented as unable to imagine a different future beyond the large industry. This constrained vision is traced by interviewees as the basis of all the territorial plans and strategies over the years, recognizing that in the last decades of crisis, nothing changed, and that stability has been preserved through multiple investments ending up in losing public resources and creating the illusion of economic prospects for the industry. This reveals a widespread perception of procedural and distributional injustices that emphasize how the lack of vision and consequent planning undermined readjustment and recovery after the transitional rupture of industrial decline. Indeed, many interviewees recognize that the absence of a concrete alternative vision and strategy for addressing systematically the structural problem was the main issue that hindered transformation through destabilization and reconfiguration of carbon-intensive industry.

*Perhaps the **greatest injustice of this territory is precisely the lack of alternative ideas that could revive it.** That is, **the industrial pole** could have been fine when it was done, but then it **had to have an end.** The great injustice is that nothing has been reprogrammed in this territory (ID 11)*

*we have had **spot projects that may have short-term effectiveness** or are limited to a small reality, but **a 360-degree coordinated plan has not been made**. They aimed to solve one problem, giving "the fish to those who were hungry" and not "the fishing rod". So, **the single problem is solved, but not the structural problem, of which the single was only the consequence**. (ID 17)*

5.2.3 Energy transition: colonialism, place exploitation and disrespect

In continuity with injustices of industrial development and decline, energy transition is depicted by local stakeholders as a transformation that is instrumental to others but not the Sardinian people. The energy transition process is often represented by making sense of place as a "colony" that is instrumental to energy companies or the country and reproducing the extractivist relationship that permeated the rise of the mining industry.

*today we are witnessing an **onslaught in Sardinia** by producers who come from outside, who will earn money, and who will give us very few jobs, to the detriment of our territory. This is because we have not planned, **we have been a bit, like historically always happened, colonized** (ID 5)*

*Sardinia as a **gigantic platform for renewables**, but it seems to me that the **same thing is being proposed again as there was for mines**. In the past they were massive **mineral** resources, **today the sun and the wind** are the resources of the future. **Sardinia is uninhabited, so we make this mega cable. The concept is neo-colonial** (ID 23)*

***Sardinia** in its complexity, precisely because it is an island, in the centre of the Mediterranean, because it has been mistreated for centuries, **is considered useful** for what purpose? **For its transformation into an energy platform**, as well as a military one, **at the service of others but never of us Sardinians**. (ID 13)*

This narrative is clearly at stake in the discourse of experts and political representatives as much as environmentalists. All in all, the common perception is that energy transition reproduces dynamics of exploitation of abundant natural resources, transforming the island into an energy platform serving the interests of the country (for energy supply) and large energy companies (for profits) while producing none or little benefits for Sardinians. Again, participants' discourse emphasizes the lack of forward-looking planning about transformation and the passive role of regional political agents. This sense-making about renewable energy colonialism also depends on the awareness of how the regional energy infrastructure is structured.

*on energy production, Sardinia is structured on **three [industrial] poles**. Portovesme which had energy-intensive industries, Sarroch and Porto Torres. The **Sardinian grid is structured to meet the needs of these three centres, not to meet the needs of the community**. This is important. After all, it will affect us when we tackle the issue of renewable energy **because it is one of the limits** we have in Sardinia **as regards the production of renewable energy** is just how the Sardinian grid is structured. (ID 7)*

As testified in the excerpt, the regional energy infrastructure is based upon three main poles of energy production. These coincide with the main thermoelectric plants and industrial clusters of the island, leaving little space for the integration of renewables into the internal grid.

What is relevant in all the interviews is the total lack of socio-political acceptance for large-scale renewables. The reasons behind the lack of acceptance and opposition are mostly justified by the environmental impacts (e.g., landscape disruption and land consumption), distrust toward foreign companies and capitals, the perceived lack of distributive justice, namely invisible benefits for locals, as well as participation in decision-making processes.

*the **biggest problems come from larger projects**. I could analyze all the reasons, which are not only of involvement of the territory, of people, etc. ... but also have to do with evaluations that, for the current law, **these projects leave very limiting positive effects on the territory and therefore there is no perception of the positive impact** on the territory. And therefore there is still **a basic mistrust**, due to a lot to this aspect of **believing that these kinds of projects are plundering the territories** (ID 14)*

Indeed, making sense of the energy transition, several of the interviewed stakeholders often rhetorically asked who is going to benefit from renewables or who is going to use energy generated from them, claiming that renewable energy production is already abundant, with a surplus of the 38/40%, while aware that Sardinia is still dependent for its electricity from coal for the 70% and that coal-fired powerplants are still operating and producing negative environmental externalities. This discourse highlights that according to interviewees the territory is not benefitting from the energy transition. Rather, energy transition represents a further impact and distributional injustice to be added to fossil fuels.

***Is this energy needed by Sardinia?** If it is needed, that's ok, but if it is needed by large multinationals to make a turnover, the region risks becoming an energy platform. The point is: **do renewables serve large companies or industries? Because if they serve the communities, in Sardinia we have some virtuous examples** [of energy communities], which can be easily followed by 80% of Sardinian municipalities, and all can live happily ever after. But if renewables become a business, this is where it becomes a problem, there is the risk of a devastating environmental impact (ID 21)*

***Do we need to produce all this energy? Because it can serve on a national level but not on a Sardinian level.** So we have to ask ourselves: **Sardinia is it right, functional, and compatible that it also produces energy for Italy?** We have an energy production surplus of 40% (ID 6)*

These excerpts make evident the perceived contrast between the interest of the regional territory and the national interest, as well as the interest of citizens and the interest of businesses. This discourse, however, is not limited to renewables, but every energy plan and energy source, denoting the common perception of distributional injustices in energy system transformations.

*the **methane project in Sardinia has been justified as gas for the Sardinians, but the majority of Sardinians would still be cut off** from methanization. So, what's the use of methanizing? And the project itself says that there is no economic advantage for Sardinians to connect to methane, so **the only interest would be at most for industry, not even transport** (ID 10)*

Regarding the coal-to-gas transition, the majority of stakeholders interviewed agree that strategies and plans for Sardinia, both at the national and regional level, have been anachronistic and not fully justifiable or understandable, especially for the gas pipeline project, accused of potentially locking in infrastructurally the whole region. In this regard, the use of methane as a transition material is a matter of social struggle between competing visions of transition, and while many interviewees support the idea of developing coastal deposits and regasification plants to support energy transition at this stage, many others (especially environmental NGOs) argue that it constrains the acceleration of low-carbon transition and renewable deployment.

*One of the problems of Sulcis and the industrial crisis was precisely the lack of electricity and thermal energy at acceptable costs. **Methane could be a solution. But** it would mean **creating a huge structure, and thinking about 2050 would be a senseless investment. Probably** not the gigantic pipelines or infrastructures, but **"light" infrastructures that are only needed in the transition phase**, but it is hoped that sooner or later this transition will lead to a **definitive solution that cannot be based on methane** (ID 17)*

*The type of **methanisation** proposed **through coastal deposits is the most sustainable one for Sardinia**, without preventing us from taking other paths and not being thirty years behind other European countries (ID 26).*

5.3 Making sense of low-carbon futures: Socio-technical and spatial imaginaries for transformation

Regarding the interplay of socio-technical and spatial imaginaries of transformation, the analysis reveals multiple concepts and shared discourses that enlighten how places, existing infrastructures and natural environments can be used or transformed in line with place meanings and values to create or revitalize

economic sectors and promote a just transition.

5.3.1 Circular economy, environmental remediation, and recovery as the rationale for a new economy

A recurrent imaginary that crosses expert and non-expert narratives is that of *circular economy* paired with the *restoration, recovery, and reconversion of brownfields*. This imaginary promotes a representation of Sulcis territory as a laboratory and a model for a new economy rising from territorial problems and losses and creating productive chains to fix them. Discourses coming especially from experts and political representatives mention the recovery of wastes and contaminated sites as a resource for innovation and industrial development.

we could build a new development model starting also from reclamation, from re-use, and we could become exporters of knowledge, of technologies, and we must do it by making it fruitful. Can reclamations be done by doing business? this is the challenge (ID 5)

reclamation problem must be addressed, which can also feed in part a circular economy, in the sense that in many cases these landfills still contain many metals, even in considerable quantities, that can be recovered with current technology (ID 15)

a change in the development model cannot ignore remediation because nothing can be born on polluted land. So, reclamation, the re-naturalization of those territories and then the promotion of a circular economy ... On waste collection, we can select a lot of aluminium, which is a raw material ready to be processed. And this raw material leaves for other regions that have no environmental pollution and that take clean aluminium and enrich their industry (ID 13)

As in the metaphor of the mine: we extracted an m3 of earth, 5% zinc, and threw the rest away, not understanding that inside those 95% thrown away were many other valuables. From the material as a road substrate, up to the circular economy in general, to the recovery of materials that appeared to be waste but were not waste. We have businesses that are already doing this. Portovesme s.r.l is a company for the recovery of fumes from the steel mill (ID 22)

These extracts stress that experts and political representatives view the change in the development model as inevitable and guided by a place-based approach to economic development. Territorial features encompassing environmental, socio-economic, or infrastructural conditions are often mentioned as the starting points for new economic and sustainable sectors inspired by the circular economy principle. This imaginary can be described by the motto "from waste to resource".

To the same extent, the reconversion of brownfields, such as mining sites or dismissed industrial areas, is often mentioned as key to decarbonization. In this light, phase-out and de-industrialization are conceived as a new opportunity for developing a low-carbon economy that is attentive to energy saving and energy production while recovering contaminated sites and bringing them back to beneficial uses.

The "decarbonization" in a Sulcis perspective means the decontamination of the mining sites and the reconversion in a productive key. Do you know what can be done inside a mine? you can build data centres because it is the safest and most inaccessible place that can exist, as well as the most advantageous, because you always have the same constant temperature, or you can store cheese spending 30% of the energy you normally need.... Those are ready and usable infrastructures (ID 22)

some of the abandoned industrial areas, almost decommissioning, can be reconverted and exploited precisely for applications with renewable sources, for biomasses or for photovoltaic panels for electricity generation (ID 17)

5.3.2 Ownership, agency, and shared responsibility in spatial and socio-technical change

While stressing the techno-economic potential of this imaginary, experts, civil society and political actors

interviewed highlighted that planning and implementing such a socio-technical and spatial change for sustainability transition requires to co-produce with the community a strategic vision and a feasible alternative, fostering community ownership, engagement and shared responsibility over the transformative pathway, as well as providing economic benefits and prospects for the community.

*The **projects should be done together with the communities**, in the sense that when you design a productive activity, it must be **shared by the local communities and firms**. They must enter into the logic of the project in such a way that they **understand the consequences, and evaluate them**, and the proposing industries must present that project together **with parallel projects that serve the communities** (ID 19)*

*with all these financial resources, **if we keep thinking that the government will take care of our problems, if we keep thinking passively, it will become much worse**. We start now, or we are not starting anymore. (ID 17)*

*When it comes to spending European funds, **it is necessary to carry out processes of animation of the public debate**. From the boy in the suburbs, up to the great entrepreneur. There must be **a great call to everyone so that everyone is aware of what we are going to do**, and so that **they also begin to plan their lives** and the lives of their children, **based on what we are planning** for the next twenty years. (ID 22)*

*In light of the once-in-a-lifetime opportunity we have, **we must stop and say okay, let's get together and try to understand where we want to go, trying to go all together**. (ID 26)*

The first excerpt stresses how according to participants planning and implementation of renewable energy projects require preliminary involvement of the communities interested and the design of projects of community benefits. The other extracts reflect participants' perspectives on EU funds (i.e., Recovery Plan, Just Transition Fund), viewed as a unique opportunity that requires including, actively engaging and empowering the whole population to co-produce a long-term vision and strategy for change so that everyone can understand, act, and orient themselves accordingly.

5.3.3 Spatial imaginary for energy transition: decentralization, distributed community energy, and brownfield large-scale renewables

In this regard, socio-technical imaginaries about alternative pathways for the territory reveal a predominant preference for energy system change characterized by decentralization, distributed generation, and energy communities as the main socio-organizational model for energy production and distribution.

Energy system changes and the territorialization of renewable energies are foreseen as possible and desirable mainly through renewable energy communities and districts (i.e., municipality consortiums). The aspired socio-technical configuration is based on self-consumption, storage solutions and distributed generation of renewable energy technologies and the autarky principle, namely territorial independence and autonomy.

*the **principles of renewables must be the decentralization of production, solidarity, the involvement of communities** so that there is **self-production and self-consumption**, and the **minimization of impacts**, through **energy communities** that produce the essential and exchange the surplus among themselves minimizing the impact. **A community that must meet its needs is also a community attentive to its territory** because if it degrades the territory in which it lives, it no longer has the possibility of eating from that territory. It is different from a company arriving from outside that has no interest in safeguarding the territories where it is building its plants (ID 10)*

*The prospect is to give **more power to the municipalities** since **local authorities are those closest to the citizen**. Even from the point of view of **energy production**, it would be very interesting if **each municipality organized itself according to its needs**, right? This would create enormous wealth, but always **starts from bottom-up processes!** (ID 13)*

***we must move away from the broadcast model**, that is, a single producer that distributes to all. We must go **towards energy communities**, towards the **energy independence of some countries**, even if aware that we are part of a nation, of Italy, that we are part of a national electricity grid and that we must also contribute to this (ID 6)*

This imaginary emphasizes that such a configuration implies the minimization of impacts and a different people-place relationship, characterized by the attention on community needs and consequent ecological conservation, which is counterposed to allegedly environmental degradation and scarce attention to community wealth by renewable energy firms.

Most of the interviewees' discourse reflects a dominant imaginary that opposes energy colonialism and proposes the use of local natural resources to reach energy independence and emancipate the local communities, and in turn, the region, almost excluding further contribution to national energy security – a marginal position expressed in the latter extract.

This imaginary of decentralization and distributed generation of small-scale and community-based renewables is argued as not totally in contrast with large-scale renewable energy projects proposed and promoted by energy firms and the national government. Nevertheless, according to interviewees, these projects must fit with spatial transformation imaginaries that oppose an extractivist view of nature and place common to previous development pathways and orient energy transition imaginaries to act in discontinuity with such developments.

*If we **identify areas already affected by previous anthropogenic activity, we could install photovoltaic systems corresponding to 16 GW of power**, that is to say about 20,000 GWh of energy per year. Keep in mind that our energy needs in Sardinia are 8,000 GWh per year (ID 7)*

*it is about projects of speculation and devastation of the territory. Because **renewables consume soil**, this is a fact, and therefore when I talk about renewable, **I should try to minimize land consumption**, how? In the meantime, **using the covered surfaces and the already degraded areas** such as quarries, industrial areas and so on. Instead, these people here, prefer flat land because it costs less to build plants on flat land (ID 9)*

As testified by the extracts, large-scale projects are considered acceptable only when they do not compromise arable or uncontaminated land, and if their industrial and anthropogenic nature is sited within industrialized or built environments. This spatial imaginary coincides with visions of alternative and post-industrial pathways, which emphasize the potential economic prospect of the agri-food sector (beyond tourism), which was undermined or constrained over time by the development of large industry and is now conceived as the natural vocation for the region.

*take the situation into our hands and then **focus on agri-food and invest in the beauties of Sulcis**. And **agri-food tourism and culture** can be done, **must be done**, you have no other situation. (ID 8)*

*if we have a new economy, a new development model, then we also have a new energy model. Do we want to focus on agriculture? Well, then **let's do the agri-food supply chains**. If we do not enhance agriculture, agri-food, which are **natural vocations of the region**, then what do we do? If it has already been shown that industrial models have proved unsuccessful. (ID 21)*

6 Mapping narratives, discourse coalitions, and (de)legitimation of transition pathways

Adopting a discursive perspective that considers how narratives and discourse coalitions can re-produce or undermine lock-in, the triangulation of findings from different datasets (interviews, newspapers, public documents) reveals the presence of three main narratives and discourse coalitions about the energy transition.

In line with Lieu et al (2020), we defined these narratives as mainstream, alternative on-stream, and alternative off-stream narratives.

In our case, the mainstream narrative re-produces lock-in undermining the phase-out of coal and renewable energy deployment by promoting the survival of the coal regime through carbon capture and storage or mostly promoting a coal-to-gas transition. This narrative supports institutionalized energy discourses that rely on dominant values and assumptions about representations of place (i.e., industrial/coal tradition, culture, and identity) excluding other perspectives and resisting transformative impulses and forces.

The alternative on-stream narrative promotes a sustainable transition through large-scale renewables and circular economy industrial reconversion that adopts a business-as-usual (BAU) model. On energy transition, it involves a technological substitution that reproduces the rules of the game of the existing energy regime (i.e., large, centralized infrastructures, mostly based on private investments and gains, and instrumental views of nature and place). This narrative is supported by incumbents with strong discursive agency operating a narrative co-optation of emerging socio-economic, socio-political and opinion trends (e.g., need to diversify energy supply, coal phase-out decisions).

The alternative off-stream narrative is a counter-narrative to the onstream narrative; in line with Smith and Raven's (2012) conceptualization, the on-stream narrative can be considered a "fit and conform narrative", while the off-stream a "stretch and transform" narrative. This narrative assumes the same goal of a 100% renewable energy system but emphasizes the potential of a decentralized and community-based energy system as opposed to large-scale renewables owned by private investors (see Fig 22 showing the main characteristics of these discourses and the coalitions supporting them)¹¹. We present more in-depth each narrative in the paragraphs below.

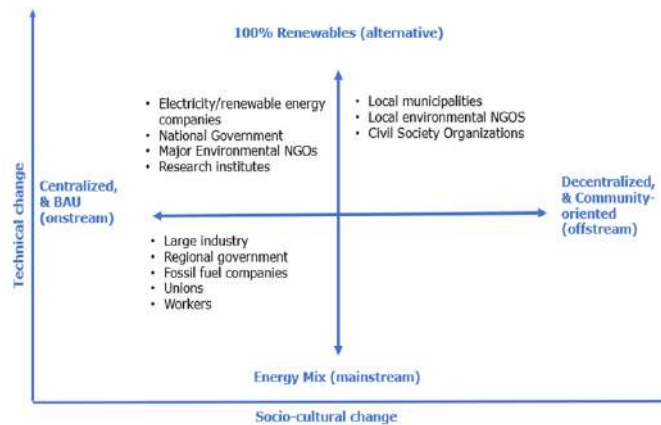


Figure 22. Positioning of narratives and supporting actors on a factorial plan operationalizing different views of socio-technical change

¹¹ Adopting a social representation perspective, we acknowledge the intrinsic difficulty of drawing lines/boundaries between narratives and visions across time, and of segmenting groups according to their adherence. Instead, we recognize that meanings and positionings can change over time, groups and discourse coalitions can enlarge, degrow or collapse, hegemonic representations can be destabilized and delegitimated, or polemic ones can become emancipated acquiring more legitimacy. Moreover, some groups may share and agree on some aspects of a representation but not all of them. Thus, the segmentation of narratives, stakeholders and institutions supporting such narratives is artificial and should be considered an analytical plot and narrative tool. All this considered, we tried to keep into account and report the dynamics of narratives and group positioning in the trajectory.

6.1 The mainstream narrative: industrial trap, fossil fuel survival, and extractivism

The mainstream narrative is characterized by three ideological components that can be labelled as “industrial myth/tradition”, “extractivist view of the environment” and “economic dependence”. As reported in previous paragraphs, the region severely depends on coal for energy generation and the carbon-intensive industry for its socio-economic stability. These two aspects are interlinked not only spatially and infrastructurally (coal mine, coal-fired power plant, and industrial cluster working in synergy) but also politically. Industrial re-opening and reconversion were aspired for different purposes, such as keeping jobs and restoring the sites. This, however, demands a stable and large energy supply at favourable prices. The mainstream narrative is mainly conveyed by a discourse coalition comprising the Regional Administration, regional and national unions, workers and large industries, that alternatively pushed for postponing phase-out¹², or timely development of the needed infrastructure for a coal-to-gas transition to support phase-out and secure energy supply with the methane pipeline or coastal deposits with regasification plants (see figure 23).



Figure 23. Project for coastal deposits with regasification plants

Nowadays, it seems that the methane pipeline project has been abandoned and stakeholders present natural gas deposits as necessary for the industry - and rhetorically also for families despite the distribution network for the household is lacking.

This powerful discourse coalition can be seen as culturally hegemonic. It operates at different scales and connects big players (gas-related companies) with political environments (different Regional Administrations in the last decades), intermediary actors (unions), and finally, workers and citizens concerned about the occupational and socio-economic crisis. Their dominance is traceable especially looking at the topics identified in the press or the discourses of interviewees who felt forced to take this narrative as a starting point for

¹² Decades of state aids from early 2000 (cf. law 80/2005; law 99/2009; 2012 clean coal center of excellence agreement, law 9/2014) can be identified as attempts of the socio-technical regime to resist destabilization and keep alive the coal mining activity and coal-based energy generation, financing for many years, regional companies and R&D centres such as Carbosulcis (coal mine company) or Sotacarbo (Regional firm for R&D on coal and low-carbon technologies) and working on projects such as clean coal or carbon capture, storage, and use.

argumentation - sharing or contesting the narrative.

According to the mainstream narrative the crisis in southern Sardinia is represented as the inevitable result of the exhaustion of the coal-based economy, the disproportionate cost of labour in Italy, and energy in Sardinia compared to the rest of the country. Thus, phasing out coal without knowing how to replace it means economic damage to the entire regional economy. Economic stakeholders and the Regional Government are aligned in demanding the methanization to reduce the energy costs for industries and families. On the contrary, environmental NGOs oppose such development that risks locking in the regional energy system.

The energy transition is therefore depicted as a way of exploiting the abundant natural resources available, offering local people new economic opportunities instead of old jobs while still proposing fossil infrastructures and sources as a transition material. Moreover, the rationale is to replace coal-based generation through a mix of natural gas and centralized large-scale renewable energy technologies (mainly wind, solar and wave energy) and strengthen the distribution network.

According to the mainstream narrative, local communities are represented as passive agents or emerge only as a barrier to infrastructural and economic development. Citizens are often excluded from the framework or relegated to the background, as the problem is characterized by industrial crises, trade union struggles and territorial development plans protecting and safeguarding industries. Workers emerge only within company crises, while the problems for the communities affected by the transformation are simply invisible.

The mainstream narratives are imbued with what we may define as an industrial myth and trap. Industry must be preserved at all costs for preserving the delicate regional situation, and social imagination and planning about the territorial future cannot escape from industrial decline and dilemma. This ideology is also accompanied by an instrumental and extractivist view of nature and deficit and a passive view of the territory and its community. This is clearly at stake in policy and planning reports such as the Sulcis plan, the national energy and climate policy or the regional energy strategy.

6.2 The alternative onstream narrative: Renewable energy transition as a business-as-usual technological substitution

This alternative onstream narrative is characterized by an imaginary of a fully renewable energy transition for the island and an alternative territorial development based on the circular economy principle. It claims the environmental and economic unsustainability of a fossil-based scenario, emphasizing aspects such as the public costs for infrastructure development, further pollution and GHG emissions, the intrinsic economic vulnerability due to the cost of materials, and the risk of locking in infrastructurally and economically the region for a long time (e.g., the deployment and penetration of renewables are difficult due to the deficient grid and the fact it is mainly occupied by electricity from fossils).

This vision has been primarily conveyed by a coalition of major environmental NGOs (operating at a national or international scale and more concerned with global climate issues) and some research institutions, envisioning and assessing a 100% renewable energy scenario (coalition *Sardegna Rinnovabile*). In recent times (i.e. 2020), the discourse coalition enlarged with powerful stakeholders and institutions with their projects for Sardinia. Among them, ENEL, the main national electricity company pushing forward the "Green electrification" project for Sardinia (cf. Multi-Stakeholders Energy Compact UN, Figure 24), and the national government proposing Sardinia as the energy model and Italian green laboratory for energy transition (PNRR – Recovery plan)

foreseeing for the upcoming year an increase of 2,600 MW for wind energy and 2,200 MW for solar.



Figure 24. Green electrification project 2022 (promoted by Enel, Multi-stakeholder energy compact UN, National Government)

This view foresees a full transition to renewables through large-scale facilities exploiting the island's abundance of natural resources (wind, wave, sun) to substitute coal-fired power plants and secure energy supply. Locally in the Sulcis region, an example is represented by the wind farm located in Portoscuso, in operation from 2011 (ENEL – 89,7 MW), or the offshore one planned 35 km from the coast of Portoscuso and involving 42 floating turbines and planned and authorized in 2019 but subject to contestation (504 MW) (see Figure 25).



Figure 25. Wind offshore and onshore projects in the area of Portoscuso

The green electrification project for the island is increasingly conveyed by an emerging coalition of actors and groups. The scenario foresees for 2030 the abandonment of fossil fuels and their substitution with renewables, the diffusion of technologies for the electrification of final consumption, such as electric mobility, heating and cooling systems, energy efficiency and electric cooking.

This scenario can be considered onstream as it takes for granted or explicitly promotes a BAU and technocratic model for the energy transition. It foresees mostly private investments and a technological substitution from fossil-based facilities to large-scale renewables integrating storage solutions and distributing energy through the grid or exporting it to the continent through the submarine powerline. Moreover, this view also involves a 'touristification' of the island and the circular economy reconversion for industries, which however is in line with

an instrumental view of natural resources and the territory. In this context, large environmental NGOs adhering to this discourse coalition support large-scale infrastructures and try to persuade citizens to accept them or contribute to energy transition through technology adoption, but also support political administrations in the development of energy communities and districts guided by the rationale of climate mitigation and neutrality.

The characteristic that makes onstream the alternative narrative is that the structure of power, the limited agency and ownership of the local population, the instrumental view of the environment, and the business as the usual and technocratic rationale of the pathway envisioned remain unchallenged. Indeed, the region is considered a green laboratory due to its reserves or its demographic characteristics, such as low population density. Stakeholders claim that their vision is socially legitimated due to studies revealing that 94% of Sardinian citizens agree on electrification, environmental restoration, reconversion and use for economic purposes¹³.

However, ownership and agency are somehow excluded from this picture. The socio-organizational scheme considers only marginally the contribution of alternative forms of development and management for renewables and natural resources. The territory is described, even when talking about development plans, as something that should be reclaimed from the polluting effects of previous economic activities and preserved and valued to attract tourists or for other productive purposes. The underlying ideology reduces locals to almost invisible actors, whose function is merely to passively accept policies and projects or preserve nature for the amusement of outsiders. The exploitation of local resources for producing energy (e.g. large off-shore power plants) is not presented in terms of value-based transition, but as a way to secure new jobs for locals or protect the climate and local environment.

In summary, the main ideology depicts locals as waiting for something to happen from the outside: i.e., tourists will come, investors will arrive, jobs will be created, the State and Region must solve, etc. which implies a deficit and passive view of the population as subject to decisions taken elsewhere, external economic investments and control over local resources. In this narrative, new jobs are mainly brought from the outside with no sense of ownership and agency for the local population. Whereas the value of tourism is recognized, without local ownership and agency, it condemns Sardinia and Sulcis to be a space suitable only for the aesthetic enjoyment by the inhabitants of the "continent" (i.e., Italy), and for agriculture and small commerce.

These aspects are rarely problematized in this narrative and represent the basis of the off-stream narrative, which emphasizes issues about agency and ownership, social justice, and a different people-environment relationship. Locally, the resistant counter-narratives, seem rather an attempt to have a voice in the face of dispossession of lands and sea by mainland stakeholders.

¹³ <https://sardegnarinnovabile.org/sondaggio-cittadini/>

6.3 The alternative off-stream narrative: Community-led and place-based energy transition

The alternative off-stream narrative emphasizes the history of exploitation, marginality, subalternity and dependence of Sardinia and Sulcis represented as a form of colonialism (industrial colonialism, military servitude, colonialism of state or energy colonialism).

This narrative is conveyed by a discourse coalition that involves environmental NGOs (those more 'environmentally conservative', focused on the protection of the local environment and acting at a local scale), local activist groups and movements, local politics/authorities, and some marginal union. This perspective is summarized also in the advocacy document "Sardinia Zero CO2 Island – phase out 2025: operational proposal for Sardinia decarbonization" (Bullegas et al., 2020).

In this narrative, both coal mining and metalworking industries are recognized as vertically imposed decisions in the regional development path and failed models. However, coal mining is recognized as a characteristic feature of the territory and its identity (thus a development that is perceived in line with place-based meaning and material aspects). Stakeholders recognize that the coal industry led to locally developing know-how and capacities (e.g., through dedicated education programs such as the mining school of Carbonia and the nautical school in Carloforte), infrastructural and socio-economic development.

The memory of this pathway is charged with emancipatory feelings and achievements, recognizing the value of mining heritage for past and future local development. On the contrary, the development of subsequent carbon-intensive industries is re-presented as a "*de-contextualized development*" characterized by a lack of ownership and agency and determined by the misrecognition and valorization of the territory. In this view, industrial development altered the socio-economic diversification of the area at the expense of local traditional activities and capacities (agriculture, farming, fishing). This involves negative social and environmental effects that involve losing territorial identity, knowledge, and tradition, with ecological costs and increasing economic dependence due to the industrial monoculture. All these discourses refer to the mainstream narrative described as a mix of capitalism and colonialism, which conduced to Sulcis' economic subordination and marginalization. Industrialization is represented as "*modernization with passive development*", or "*innovation without development*". The "*industrial myth*" or "*industrial mirage*" is perceived as corruption and passivation of collective consciences. The consequence is the inability to envision a different path or to act for change due to an entrenched social convention and imagination that is constrained by the sense of responsibility toward the community regarding jobs (i.e., occupational blackmail).

On the other hand, stakeholders supporting this narrative make salient other forms of colonialism and injustice. First of all, the military servitude and occupation of Sardinia and Sulcis, with the presence of training polygons, consequent pollution (Teulada), or bomb factories (Domusnova). Secondly, energy colonialism or state colonialism, with foreign investors ("*lords of sun and wind*") speculating, grabbing land, exploiting local places and resources for making profits, and producing energy to be exported to the rest of the country while producing locally no development. Rhetoric about colonialism, dependence, deprivation, and lack of ownership and agency are all main points of this narrative that is supported and amplified by regional newspapers (see

e.g., Fig 26 reflecting this claim).

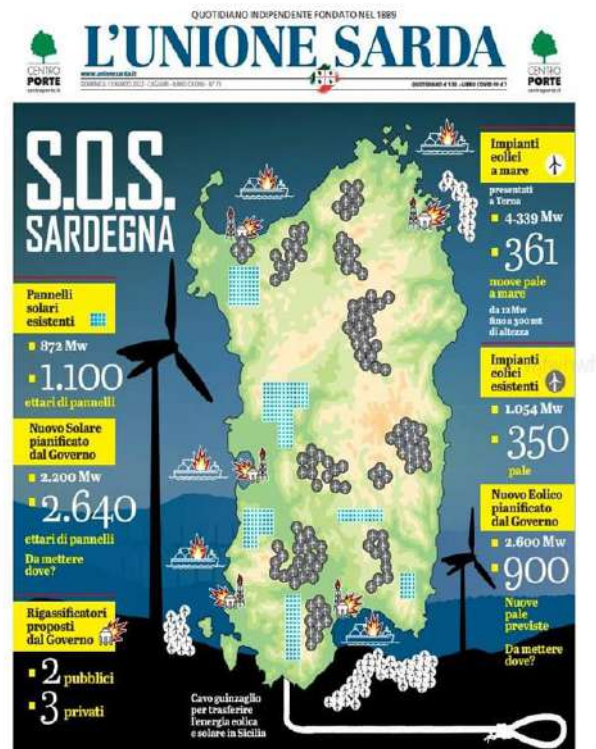


Figure 26. Front page of a regional newspaper (March 11th, 2022) depicting energy plans and projects for Sardinia. Note that the noose at the bottom represents the cable that connects Sardinia and Italy

What characterizes both alternative narratives is the reference to the circular economy as a way to transform the system creating an alternative development path solving existing criticalities and creating new economic sectors. This involves converting and reusing sites such as waste fills, mining and industrial areas, improving the processing and recycling practice of materials or innovating in the field of environmental remediation. However, the off-stream narrative conceives them as a way to give back to the community stressing its emancipatory potential (e.g., entirely developing economic sectors, productive chains and creating new jobs and competencies) and the risk of using it as an empty word (which applies also to distributed generation). According to this narrative, renewables need a community vision acknowledging socio-ecological values, needs and state, and avoiding or reducing impacts on cultural heritage and landscape.

The off-stream narrative emphasizes more elements of agency and ownership for alternative development. It envisions an energy system characterized by distributed generation across the territory, based on self-sufficiency and self-consumption principles, promoting an alternative model for energy management through energy communities or energy districts (e.g. municipality consortiums) coupled with energy efficiency and saving as the primary form of energy generation.

Regarding the socio-technical imaginary, photovoltaic development and siting are recognized as having a great potential (16,3 GW, assessed in a study from the Joint Research Center, see figure 27) sited in built environments (i.e., non-agricultural land, rooftops and mining and industrial areas), while the development of wind energy is

considered favouring publicly owned farms or developing (chains providing) community benefits.

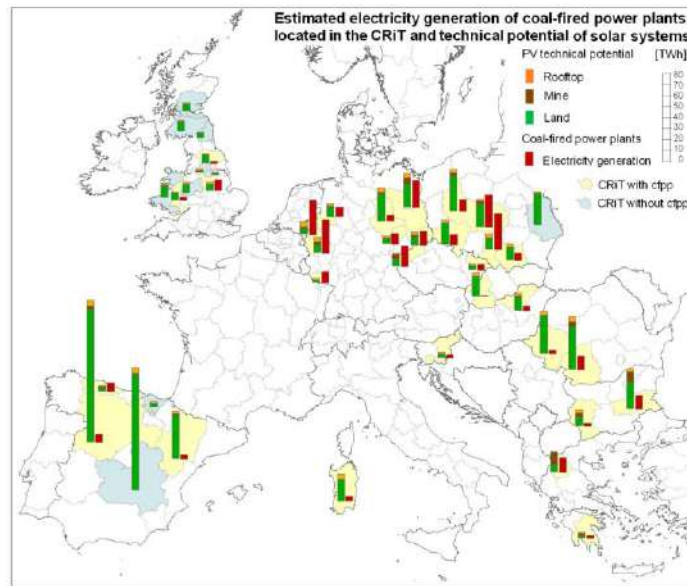


Figure 27. The technical potential of solar systems compared to electricity generated from coal-fired power plants in EU coal regions in transition. Source: Bódis et al. (2019).

Discourses about power generation from renewables are coupled with discourses stressing the revamping of the distribution grid and the development of storage solutions at different scales for addressing intermittency of production (i.e., hydroelectric pumping, batteries).

To conclude, the narrative stresses that previous pathways suffered a lack of ownership and multiple forms of environmental injustice (land dispossession, lack of participation in development decisions, colonialism and dependency relations). Even recent policies and plans (e.g., Sulcis Plan, Methanization) are represented as protecting the status quo and industrial hegemony and legitimacy while disempowering the population. This discourse is amplified and conveyed by local media (e.g., regional newspapers) making visible the conflict between change ambitions and projects and their effects.

6.4 Trends of pathways (de)legitimation

Starting from a situation of lock-in and path dependency reinforced by the cultural legitimacy of coal and carbon-intensive industry, across the years we observed a transformation of the mainstream narrative (from the survival and adaptation of the coal regime to the coal-to-gas transition) and an increasing trend of regime destabilization and delegitimation by actors with strong discursive agency that exceeded the boundaries of mainstream discourses supporting continuity (lock-in) for leaping into the alternative ones promoting transition and undermining lock-in (See Figure 28).

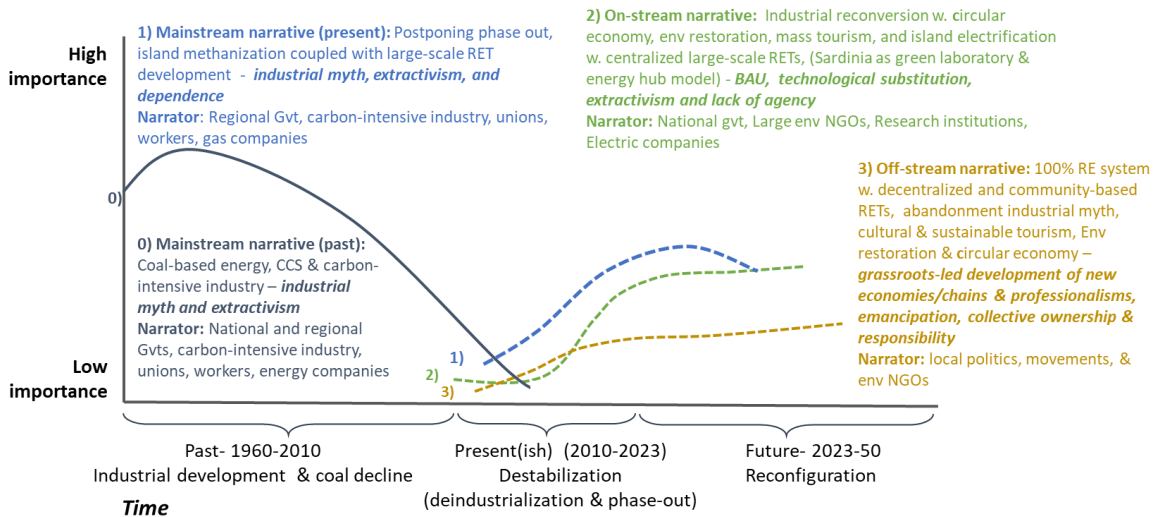


Figure 28. The trend of narratives and their legitimacy across time

Indeed, in recent times the discourse coalition supporting the mainstream narrative lost crucial actors such as the national government and the main national power company that joined and enlarged the alternative onstream discourse coalition.

Regime destabilization can be traced back between 2014 and 2017. In 2014, in line with EU pressures, the national government and regional council approved the closure plan for the coal mine by 2018. In 2017, the government approved the national energy strategy that foresaw the phase-out of coal-fired power plants and the development of the gas pipeline for Sardinia. This decision exacerbated conflicts and protests over the possibility of infrastructural carbon lock-in due to investment return while fostering the discourse coalition for the renewable energy transition. In 2019, the government approved the national integrated energy and climate plan that foresaw the coal phase-out by 2025 and opened the discussion over what form of coal-to-gas transition to undertake, creating destabilization dynamics over the island energy security and industrial re-opening in Sulcis. Afterwards, in 2021, they abandoned the option of developing the methane pipeline project supporting a lighter coal-to-gas transition and the green electrification for Sardinia.

On the other hand, ENEL (owner of the coal-fired powerplant and main electricity company in Italy) decided to not reconvert/decommission the coal-fired powerplant, and pursue the electrification project for Sardinia, expecting to invest 15 billion euros for developing 4/5 GW of renewable energy projects, storage facilities for 1 GW and creating 10-15.00 new jobs by 2030.

Supported by actors with a strong discursive agency the alternative onstream narrative is starting to socially consolidate and institutionally sediment in political and business plans, while the off-stream remains marginalized or weakened by mainstream and onstream narratives – despite recent political developments on energy communities at the regional and national levels, which are still in the making.

7 Conclusions and policy implications

In this case study, we adopted social representations and discursive perspectives to examine the cultural and psychosocial aspects of the trajectory and tipping dynamics in a coal and carbon-intensive region (see Figure 29).

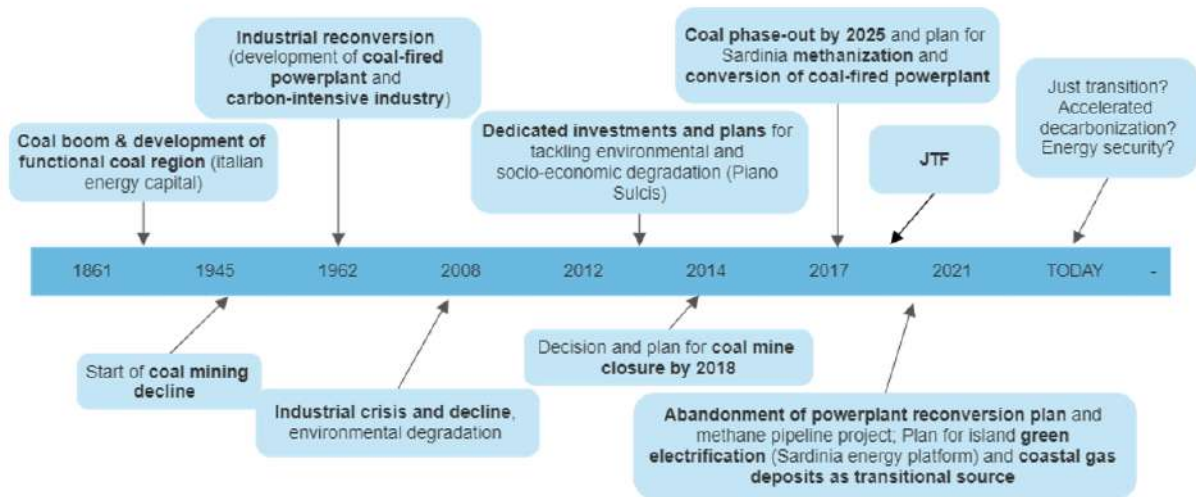


Figure 29. A simplified visualization of the regional trajectory and the examined tipping events and interventions

Following a societal approach, we tried to connect individual levels of explanation with the analysis of the cultural and societal dynamics shaping the contextual politics of change.

At a first sight, the region seemed characterized by socio-cultural and socio-psychological patterns underlying path dependency and lock-in mechanisms.

Our study of newspapers' lexicon and discourses reveals that the discourse circulating in media about energy issues in the Sulcis region is heavily entrenched in the carbon-intensive industrial crisis and decline. Almost half (47%) of the total classified text segments and 2 of 5 total topics identified, reflect this issue, stressing how a stable and secure energy supply at an affordable price is a key determinant of industrial survival or decline. Overall, the topics identified in newspaper discourse can be interpreted along the two dimensions of energy transition and deindustrialization, opposing discourses that concern politics and policy (i.e., knowledge and interest struggles; strategies, plans, governance arrangements) with discourses about their local implementation (projects, territories, and actors involved).

In this regard, in the social representation of energy transition, decarbonization and phase-out policies are depicted as problems or even a potential trauma due to Sardinian dependence on coal and the lack of gas infrastructures, which in turn affect the survival of carbon and energy-intensive industries and the related socio-economic stability.

In this context, coal (and coal-fired power generation) is legitimated over time by discourses that represent it as:

- a potentially "clean source" referring to clean coal and carbon capture and storage technologies;
- the "most suitable source" and "local asset" for responding to industrial energy needs and the stability

- of the power system; and
- c) part of the “local tradition, culture, heritage, identity, and vocation”.

The latter discourse redefines coal as a cultural resource, at the same time re-presenting the place through its industrial history and vocation. In this way, the social representations of energy and the sense of place are objectified in and linked by coal mining, the extractive industry and the more recent metalworking industry. Within this discourse, transformations cannot be envisioned outside the existing skills and culture based on the mining and industrial tradition.

Also, the representations of energy supply that are vehiculated by the newspapers stress the high energy costs for industry and families and the macroeconomic trends underpinning the disadvantages for Sulcis and Sardinia, which ultimately legitimated the survival of the coal regime and later support the coal-to-gas transition. A large part of newspaper discourses on energy production revolves around the debate over the coal-to-gas transition while relegating renewable energies almost into the background.

Energy production is almost always discussed referring to large-scale facilities promoting a picture of the energy transition as a technological substitution, reproducing the centralized model of energy production and distribution typical of fossil fuel-based infrastructure. Indeed, on one hand, these projects are often presented as a feasible alternative to replace coal-fired power generation and thus enable coal phase-out and decarbonization limiting their negative economic impacts.

On the other hand, the dominant representation of renewables objectifies transition through large-scale infrastructures, that serve the country more than the island. A symbol of the unjust power relationship which is often evoked in the press is the submarine powerline connecting the island and the mainland.

Social representations of transition and renewable sources are thus connotated by power unbalance and unjust relationships. The interpretation of reality fostered by some actors is a form of “energy colonialism” that preserves national energy security but not the regional one: Sardinia is portrayed as a colony subject to industrial and national interests and suffering unjust environmental impacts and energy costs with no visible benefit (e.g., redistribution of economic benefits, creation of economic/job opportunities, termination of polluting activities).

Energy transition as much as de-industrialization are therefore represented as external forces jeopardizing community well-being and capability, while the community is represented as dispossessed, lacking the agency and ownership for taking control and responsibility over development pathways and the necessary resources.

All in all, these findings suggest that renewables remain marginal in the media discourse, a niche that finds multiple difficulties in scaling up due to the long-time regime stability (coal legitimacy) and recent transformation (coal-to-gas transition), and in its diffusion due to the proposed business-as-usual and centralized model of large-scale infrastructures, which is locally resisted and considered unacceptable.

The findings from the interview study confirm that the sense of place (i.e., place meanings, attachment and identity) has been heavily influenced by mining history. In line with territorial functional development, the sense of place is characterized by a functional place attachment and industrial identity. Collective memories about the mining period reflect a nostalgia for a period characterized by increasing well-being, social emancipation, and the creation of capacities that participants recognize as contributing to a mythization of the mining period.

The decline in the mining sector and the following industrial reconversion are understood with ambivalence (we could say cognitive polyphasia, see Del 2.1). On the one hand, the development of the metalworking industry allowed somehow to maintain continuity in sense of place, especially for what concerns the industrial identity of the place. On the other hand, however, it is represented as a transitional rupture that undermined place

dependence and reverse the condition from emancipation to domination. Most interviewees make sense of this industrialization as an imposed and decontextualized development pathway, that had detrimental consequences such as a corruption of consciences and socio-economic destabilization. Industrial reconversion thus jointly resulted in the continuity and loss of place-based identities, traditions, capacities, and economic means of subsistence. Overall, the place is represented as a sacrifice zone, where experiences of socio-political marginality (concerning political decisions) and socio-economic subalternity (concerning investments and jobs created) intersected with the pride of mining labour (involving the class fights and workers' emancipation) and of having been the vanguard of modernity.

In this context, the current industrial decline often associated with decarbonization is represented as a further transitional rupture followed by inadequate adjustment and recovery. In this sense, contemporary Sulcis is represented as a territory disrespected, culturally and politically dominated, economically and environmentally degraded and devalued. Job opportunities are presented as dirty in moral (e.g., weapon and military industry) and material terms (waste, coal). Participants made sense of this experience of injustice as an effect of neo-colonialist and capitalist rationales that created the illusion of territorial development. According to interviewees, this produced socio-economic distortions (i.e., lack of economic diversification, dependency on state aid or external resources) that contributed to hindering community agency and sense of responsibility (i.e., welfare and dependency culture, economic marginality, and subordination). As testified by heterogeneous actors, the difficulty of abandoning the industrialization myth and envisioning alternative pathways is a sign of cultural hegemony – that is, the system of power, identified in a coalition of interests and discourses, manipulates the cultural frames and norms of the community reinforcing path dependency and impeding alternatives to be thinkable. The cultural dominance of the industrial myth contributes to the therapeutic persistence toward industry, characterized by state subsidies, layoffs and – psychosocially – a sense of responsibility toward the community occupational state, represented as an obstacle that constrains the imagination and expectation of the entire regional community, unable to imagine, plan, and invest alternatively.

This historical and socio-cultural underpinning is crucial to understanding how people make sense of current developments such as the energy transition. Indeed, the interview study corroborates many of the findings from newspaper analysis. In continuity with injustices experienced with industrial development, energy transition is conceived as a further development pathway that is instrumental to others but not the locals. The place is represented as a “colony”, instrumental to energy companies or the country, and reproducing a human-nature extractivist relationship that permeated the rise of the mining industry.

It is in line with this understanding that participants advocate for imaginaries, mirroring an increasing discourse structuration around guiding concepts and principles for a place-based approach to sustainable transformation.

The representation of the sustainable future of place is objectified in a laboratory and a model for innovation and development, anchored to and guided by the circular economy principle and a waste-to-resource approach. This imaginary involves the widespread sustainable restoration and reconversion of contaminated places. From being a source of environmental degradation and territorial stigma, brownfields, polluted sites, and wastes are re-presented as territorial features that can become local assets, even for the energy transition.

Looking at justice issues, this imaginary can be pursued only if the strategic vision and feasible alternative are developed through co-production, ensuring that the community is fully engaged in the transformative process and can feel co-responsible, develop agency and ownership, and perceive the socio-economic prospects of transformation. This aspect concerning the appropriation and territorialization of a new transformative narrative is well exemplified in the following excerpt from a regional politician opposing two pathways for tackling energy transition.

It is the concept of **Sardinia as a laboratory and not as a guinea pig** (ID 26)

Indeed, energy transition imaginaries expressed by stakeholders reveal a predominant preference for energy system change characterized by decentralization of power, competencies and benefits, and distributed generation and renewable energy communities and districts as the main socio-technical configuration for energy transition.

To summarize, following a tipping dynamic of destabilization incorporated by the decline of coal and carbon-intensive industry, reconfiguration has been constrained by corridors of the possible (path dependency) and multiple lock-in mechanisms (psychosocial, socio-political, infrastructural, and socioeconomic).

Political resistance from powerful discourse coalitions fostered for a long time a therapeutic persistence to protect industry and workers, locally constraining energy visions and strategies, delegitimizing and postponing the phase-out of coal, justified by an infrastructural and socio-economic lock-in – i.e., energy security and affordability for industrial survival; lack of appropriate grid for diversifying the energy supply; lost professionalisms and scarce occupational diversification. These lock-in mechanisms interact with each other via self-reinforcing feedback reproducing a path-dependent trajectory. The trap and addiction metaphor (Marschke & Berkes, 2006; Bailey et al., 2010) is an appropriate way to frame the situation that characterized the Sulcis region. Psychosocially, the sense of place embedding the industrial myth, identity, and tradition undermined the development of new/alternative visions, identities, and pathways for the regional community. It remains to be explored if cognitive patterns have been developed also at the individual level, denoting subalternity, passivity, fatalism, and psychological conservatism in the local population, and played a key role in this dynamic.

Nowadays, the coal phase-out, the recovery plan, the just transition mechanism, or the green electrification narrative and project are windows of opportunity for a sustainable reconfiguration and low-carbon transition.

Nevertheless, political action is urgently needed to avoid recent tipping events (i.e., the Ukraine war and energy crisis) accelerate unsustainable choices motivated by national energy security reasons while disregarding the just transition. Indeed, while opening a window of opportunity for disrupting a locked-in development and promoting energy transition, the increasing legitimacy of the alternative onstream narrative involves several risks in re-configuration dynamics. First, taking a new direction without opening up discursive space – marginalizing or co-opting the off-stream narrative - risks disregarding the emerging and already existing drivers of injustice, which may exacerbate inequalities and cross-scale conflicts, ending up not stimulating the development of capacities to support the transformation, and losing momentum for socio-cultural reconfiguration.

A just transition can still be pursued by navigating transition momentum through the confrontation of competing visions and pathways that considers key uncertainties and creates mutual understanding and actionable meaning. The discourse structuration of concepts such as circular economy, green electrification and 100% renewable transition must be problematized in terms of agency and ownership of development paths, including coordinating collaborations, envisioning alternative pathways, identifying leverage points and strategies for addressing barriers, linking them to the specific window of opportunity for gaining momentum. Hopefully, this process could foster learning and inform the pathway selection and adoption (Moore et al., 2014; Olsson et al., 2014).

Without addressing these elements, the regional transition is destined to suffer harsh resistance, increase vulnerability and uncertainty, and make investments that do not bring the expected or effective territorial development.

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Appendix: Policy reports and advocacy briefs

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