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SHARED VALUE CREATION DURING SITE DECOMMISSIONING: A CASE STUDY FROM THE ENERGY SECTOR

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Highlights

- A role-shift is emerging for firms carrying out site decommissioning processes
- Firms' proactivity can foster shared value creation during site decommissioning
- Shared value in site decommissioning is not automatically created
- Activation, Integration and Co-design strategies can be applied

Abstract

Recent trends of globalization and industrial relocation have made the issue of industrial site decommissioning increasingly urgent.
The outcome of decommissioning processes is generally highly dependent on the "economic status" of the specific industrial site, with a high risk for those sites that have low land value and high reclamation costs of being simply abandoned by the site owners. This represents a lose-lose situation, both for the companies that have to close their sites and the neighbourhood.
To overcome this situation, some firms are starting to implement more proactive strategies, for supporting shared benefits in site remediation. Nevertheless, research is still scant on the consequences of such emerging solutions and on whether and how they can create shared value.
To fill this gap, the paper studies the evolution of the decommissioning strategy of an Italian energy company (Energ.IT), that started to take on a more proactive role to foster site redevelopment. The case analysis is articulated around the conceptual elements of the Social Resource Based View: resources, capabilities, stakeholders, interactions and outcome, identifying three different strategies, defined as *Activation, Integration or Co-design* and appraising, in a qualitative way, their impact on shared value and the conditions that make each strategy feasible.

Keywords

Site decommissioning, Shared Value, Social Resource Based View, Case study, Energy industry

1. Introduction

Today in Europe there are around 3 million abandoned industrial sites and, according to recent researches, they are expected to grow further (EEA, 2014). This figure represents one of the unintended consequences of the industrial reconversion processes, whereby, in past years, many companies modified and relocated their business activities, passing through the decommissioning of entire industrial areas (Hou and Al Tabbaa, 2014; Invernizzi et al., 2017).
The outcome of a decommissioning process[1] is highly dependent on the "*economic status"* (CABERNET, 2006) of the areas to be dismissed, in terms of location, size and risks position (Schädler et al., 2012). Some sites have high land value and low reclamation costs, which enable the owners to quit the areas successfully through market arrangements (e.g. sale to other organizations,

[1] The term decommissioning is here used in a broad sense to refer to the process that that starts after announcing the shutdown of industrial plants.

privately funded projects, real estate initiatives). In other cases, low land value (e.g. isolated areas) and high reclamation costs (wide in size, polluted…) make sites unprofitable for the owners and unattractive for potential buyers (CABERNET, 2006; Dixon et al., 2006; Hou and Al-Tabbaa, 2014). Consequently, these sites typically cannot be dismissed through market arrangements and require public intervention for remediation (CABERNET, 2006). As public resources are shrinking, less valuable sites are often left-behind, becoming "grey areas", neglected ruins of *Cathedrals in the Desert*. They generate "*lose-lose situations*", with negative impacts for both local communities and the original site's owner. On the one hand, abandoned sites could cause social and environmental problems, decreasing the overall quality of life in the area (Dixon, 2006; Schädler et al., 2012; Cappuyins, 2016). On the other hand, they affect the reputation of site owners (Favi et al., 2016), whose image is linked to the areas where they used to operate. Indeed, today companies are more than ever constrained and influenced by the pressures exerted by their stakeholders (Mitchell et al., 1997; Beckmann et al., 2014; Perko et al., 2017), who increasingly demand for socially and environmentally sustainable behaviours (Onkila, 2011; Maltz et al., 2011; Dobele et al., 2014; Brookes and Locatelli, 2015; Invernizzi et al., 2017).

From this point of view, the plain "abandonment" option as a possible outcome of the decommissioning process is clearly not in line with stakeholders' expectations, stimulating companies to search for approaches that could limit their liability. Some companies began to introduce advanced accountability tools while managing the phase out of their settlements (Nehring and Cheng, 2016; Invernizzi et al., 2017; Espinoza and Morris, 2017). This primarily consists in a more structured interaction with the stakeholders during the decommissioning process (Invernizzi et al., 2017), with early involvement of both who could be more impacted by the decommissioning, and who could replace the original owners in the redevelopment phase. In addition, there is also anecdotal evidence[2] of the possibility of transforming decommissioned industrial sites through reconversion and social innovation processes with the original owners of the sites taking on more proactive roles aimed to foster replacement and redevelopment (JRC, 2015).

However, the consequences of these emerging solutions have not been deeply explored or questioned yet, and there is no evidence whether they simply limit a potential reputational damage for the companies or are able to create win-win situations, leading to shared benefits for both

[2] Some cases that support such anecdotal evidence are, for instance: Drax Plc (https://www.drax.com/press_release/drax-moves-closer-coal-free-future-unit-four-conversion/); Novamont (https://www.novamont.com/il-modello-novamont), Arkema with the LCC30 project (https://www.arkema.com/en/media/news/news-details/Launch-of-Lacq-Cluster-Chimie-2030-an-exemplary-redevelopment-of-the-Lacq-industrial-basin/).

companies and local communities i.e., in the words of Porter and Kramer (2011), creating shared value (SV).

Such research gap leads to our first research question, i.e. *can a company create SV, intended as the capacity to enhance its competitiveness while simultaneously advancing the economic and social conditions of the communities, in the decommissioning phase*?

Furthermore, in case the answer to the first question is positive, a second issue emerges. The empirical evidence shows that companies could adopt different operational strategies to take on a more proactive role in the decommissioning phase, and an analysis of the conditions that make such strategies successful is missing. This consideration leads to our second research question, i.e. *which strategies are available in the phase out and what conditions are relevant for creating SV*?

To answer to these research questions, we carried out a longitudinal case study (Yin, 2014), concerning one of the main Italian energy companies (named here as Energ.IT).

The energy sector appears particularly interesting to analyse the issue of decommissioning, because the drastic changes occurring in the field of renewable energy from a policy and technological perspective are forcing companies either to convert less efficient fossil-based power plants or to decommission them. Under the pressure of these industry dynamics, Energ.IT had to understand how to manage the transition of 24 industrial sites, heterogeneous in size and located in diverse Italian regions. The company addressed the issue of decommissioning with the explicit strategic intent of creating SV, and, in order to achieve this objective, adapted its strategy over time, according to the specificities of different sites and to what they learnt from previous trials. Such evolution makes the case particularly suitable to explore alternative ways of proactively addressing the phase out and the underlying conditions that could (or could not) lead to create SV.

To analyse the case, the paper exploits the theoretical lenses of the *Social Resource Based View* proposed by Tate and Bals (2016). This framework grounds on the recent developments of the *Resource Based Theory* and models SV creation, by considering how a firm leverages on different resources and capabilities and interacts with its stakeholders (JRC, 2015; Invernizzi, et al. 2016; Perko, et al. 2017). Accordingly, for each strategy adopted by the company we analysed how Energ.IT addressed the issue of decommissioning in terms of resources and capabilities mobilised, stakeholders involved and interactions between the company and the stakeholders. For each strategy, we also analysed outcomes in terms of SV creation, providing a qualitative evaluation of the benefits for the company and the communities, and the conditions that influenced the achievement of different results.

The remainder of the article structures as follows: Section 2 introduces the theoretical framework used for guiding the empirical analysis. Materials and methods (case selection and data collection)

are presented in Section 3 and case findings described in Section 4. Finally, we discuss implications in Section 5 and conclusions in Section 6.

2. Theoretical background

The theoretical framework of this paper is provided by the *Social Resource Based View* (SRBV) of Tate and Bals (2016). Such framework grounds on the *Resource Based View* (RBV) and proposes an overall theoretical base that integrates the economic issues (deriving from the RBV) with the environmental and the social ones.

According to RBV (Barney, 1991; Peteraf and Barney, 2003), firms can obtain sustainable competitive advantages and create shareholders' value by combining and managing tangible and intangible resources that are Valuable, Rare, Inimitable and Non-substitutable (VRIN), through the actions of an efficient Organization (VRIN/O; Barney, 1991; Litz, 1996; Kraaijenbrick et al., 2010). While sharing the idea that resources are the source of value creation, Tate and Bals (2016) underline two main limits of the RBV:

- Focusing on internal resources, owned by a company, RBV underestimates the role of interactions between companies and stakeholders in creating value;
- Besides, RBV measures value as economic results for shareholders, somehow neglecting the idea that corporate performance should cover not only economic, but also environmental and social objectives (Bowen, 1953; Carroll, 1979).

To deal with such issues, SRBV extends the domains of the RBV, introducing a shift in the objectives of the firm, here defined according to the *triple bottom line framework*, i.e. adding environmental and social value to economic value. Tate and Bals (2016) also point out that to achieve such objectives, a company must have not only internal resources, but also social and relational capabilities, defined as "the capability to leverage internal or external stakeholder relationships with the goal of reciprocal exchange" (Tate and Bals, 2016, p.6).

In brief, the SRBV framework grounds on five conceptual elements, which are particularly relevant to articulate our analysis: *expected outcome, resources, capabilities, stakeholders, interaction with the stakeholders*. Below, we explain their relevance for our study, highlighting some specificities that are derived from prior literature in the field of decommissioning and brownfield.

Moving from the first element, according to the vision of SRBV that states results should be measured under an economic, environmental and social perspective, we assume that the ultimate *outcome* of an organization is the creation of SV, as the capacity to enhance its competitiveness while simultaneously advancing the economic and social conditions of the communities (Porter and

Cramer, 2011). In the specific field of analysis, this focus means that, to understand and appreciate the outcome of the decommissioning process, we need to consider not only how and to what extent the company is able to ensure the ability of the site owner to make money from the selling of the site, but also how environmental and social impacts are incorporated and dealt with in the closing plan.

As second element, *resources* - either tangible or intangible - should be valuable, non-substitutable and socially complex (Tate and Bals, 2016). In the case of decommissioning processes, a first set of resources are related to the industrial plant to be decommissioned and are land, buildings, facilities (tangible), skills, knowhow, human resources (intangibles). However, according to the broad view of SRBV, we should consider as resources also company assets located in other places, that could be used to complement what is on site.

The third element, *Capabilities*, represents an organization's ability of individuating, managing and bundling resources. We will use it to describe the ways a company uses to create value from available resources. Some preliminary evidence in the field of site decommissioning shows that, more proactive companies leverage capabilities as project management and stakeholders' involvement (Invernizzi et al., 2017), accountability and modelling (Nehring and Cheng, 2016); stakeholder engagement (Espinoza and Morris, 2017).

The fourth element is represented by the set of *stakeholders* involved. As previously highlighted, the SRBV calls for the enlargement of this domain. Specifically, stakeholders provide funding, expertise, products, context shaping (institutions) (Tate and Bals, 2016). In this connection, literature concerning brownfield and decommissioning proves the relevance of involving actors with different competencies and backgrounds such as local administrators, community groups, NGOs, land owners, professional advisors, experts (CABERNET, 2006; Ferber et al., 2006; Norrman et al., 2016).

Lastly, there are the *interactions* among stakeholders. The SRBV emphasizes the significance of the structural and relational qualities of the organization's social ties, for overcoming the juxtaposition of social and sustainability concerns with commercial bottom-lines. This brings higher attention to how and when these social ties are built and developed, especially between stakeholders (CABERNET, 2006) and the site owner (Hou and Al Tabbaa, 2014; Invernizzi et al., 2017).

In synthesis, applying the SRBV to site decommissioning requires studying its five core conceptual elements as shown in Table 1, which summarizes the dimensions that will be investigated through the empirical analysis.

Table 1. Dimensions of the SRBV framework and their synthetic adoption when applied to the research issue

	Conceptual elements and their specificities
Outcome	Economic Environmental Social
Resources	Valuable (Barney, 1991) From non-valuable to valuable: Identification of hidden value of resources that are going to be re-valued according to the reuse option considered. Non Valuable: Tangible or Intangible resources that will be discarded.
Capabilities	Identification of capabilities available / put in place for bundling resources, thus achieving the outcome. Economic: e.g.: Project management, planning, financing Environmental: e.g.: Pollution prevention, sustainable development Social: e.g.: Stakeholders engagement (Tate and Bals, 2016)
Stakeholders	Actors involved and enlargement of the domain. Economic: e.g.: Shareholders, Managers Environmental: e.g.: Environment, Environmental committee Social: e.g.: Local communities, Public administration, Experts
Interaction with Stakeholders	How interactions are structured and fostered When they take place (before the shut-down, decommissioning, remediation, redevelopment…)

3. Materials and Methods

The research method grounds on a single *longitudinal case study* (Yin, 2014), which aims at inducing from real observations insights about whether and how firms can create SV during decommissioning. We analysed the case of one of the main Italian energy companies (here called Energ.IT) that since 2015 started dealing with the decommissioning of 24 marginal sites in Italy. This case has been selected for three main motivations.

First, the energy industry is crucial per se. The energy sector employs in Europe 1.6 mln people and adds a value of € 250 billion to the European Economy (European Commission, 2019). In recent years, energy production and consumption have undergone drastic changes, concerning both the energy offer (increased competition after market liberalization, adoption of renewables) and the demand side (reduced energy consumption, increased efficiency and attention to sustainability issues). In this scenario, policy makers at the international level promoted the diffusion of low carbon innovative technologies (EU Sustainable Development Strategy framework). As a consequence, the Italian government in 2017 put the target of reaching 28% of renewables in energy consumption by 2030, and strengthening security of supply while phasing out coal generated electricity by 2025 (MISE, 2017). Therefore, the entire market, assets and energy production systems have been impacted, requiring companies and entities to deal with the decommissioning of entire production sites (JRC, 2015).

Second, the selected case is relevant for the potential impact that the phenomenon under investigation has. The sites in decommissioning were responsible of an overproduction of 13 GW, with a gross power installed ranging from 88 MW to 3.600 MW and cover an area of about 30 million sqm spread over all the Italian territory, employing, in peak years, more than 3.400 people[3]. In addition, these sites are located in scarcely inhabited zones, where the activity of the plant had historically driven the economic sustainability of communities. Therefore, their phase-out is crucial: it represents both a potential risk and a key opportunity for entire areas.

Third, the specific case is peculiar because the company addressed the issue of decommissioning with the explicit strategic intent of creating SV and adapted its strategy over time. While performing a strategic shift towards openness and sustainability, the firm modified its way of facing decommissioning, using different approaches and instruments for managing the phase out of different sites. In this respect, the selected case offers the opportunity of comparing different strategies and related results.

To answer the RQs, we focused the analysis on 7 sites that are paradigmatic of the different strategies implemented by the company. Data were collected about three main embedded units of analysis: i) the firm (Energ.IT), ii) the decommissioning project, iii) seven selected decommissioned industrial sites, triangulating *multiple sources of proof* (Yin, 2014).

Specifically, secondary data were collected accessing both publicly available documents (website, annual and sustainability reports of the company, news – *LexisNexis*, ISTAT and demo.istat for national statistics) and not publicly available ones. Among data that are not publicly available, authors could access to internal presentations and reports, detailed technical documentation on the sites to be decommissioned and on regeneration proposals.

Primary data were collected through semi-structured interviews. Interviews lasted around an hour and most of them were recorded and transcribed. Informants include company employees (Energ.IT's CEO, the Head of Communication, the Sustainability Manager, the Responsible of the Decommissioning project - Project Coordinator) and other stakeholders (as presidents / vice presidents of industry associations, public authorities). The interview protocol was diversified depending on the type of interviewee (see Appendix B for an example of interview guidelines followed). Concerning internal stakeholders, interviews aimed at exploring how the company was addressing the issue of the site decommissioning in connection to the conceptual elements

[3] The employment figure has been computed considering the average number of employees for MW installed in power plants with diverse production technologies (combined cycle, coal, burning oil).

introduced in section 2. Concerning external stakeholders, the interviews explored the engagement mechanisms put in place by the company. Further insights were collected through direct observation, during site visits and participation to some project activities.

Data, collected as described above, were then summarised and analysed thematically (Miles and Huberman, 1994; Silverman, 2011). To this aim a coding procedure was used, referring to the conceptual elements identified in section 2: expected outcome, resources, capabilities, stakeholders, interaction with the stakeholders.

As concerns the outcome, a quantitative evaluation, in terms of economic, social and environmental achieved benefits was not feasible, since the development of decommissioning processes are still ongoing. Hence, we evaluated the results of different strategies in a qualitative way, analysing their impacts on the main value drivers for the firm (e.g. reputation, reduction of decommissioning costs, valorisation of land) and for the community (e.g. time for individuating a feasible solution, potential contribution for the local development).

The results emerging from the analysed interview data are discussed in the section 4.

4. Case analysis

In this section, the case company is briefly described and then the different strategies implemented by the company to manage the site decommissioning are illustrated with reference to the theoretical lens of the SRBV.

4.1 The case company and the case sites

Energ.IT is the main Italian electricity provider, active in the Italian and Latin America. The company employs around 69.000 people (28.000 of which in Italy); in 2018 it made more than 75.000 mln € revenues and generated 250 TWh (39% by renewables).

In last years, in line with the dynamics of the sector and policy requirements, the company has revised its strategy (posing high emphasis on sustainability and innovation) and modified its organizational structure accordingly.

Since the beginning of the 21st century, Energ.IT, as many other companies in the energy sector, has been dealing with *overproduction.* As a consequence of over-capacity determined by the liberalization of the Italian electricity and gas markets (2003-2007) and growing incentive-based investments in renewable energy sources, entire plants became redundant and obsolete. In 2015, the company started a project to strategically cope with this problem, aiming at reducing dismissal costs, preserving its own reputation and valorising land.

The company was able to easily sell only a few sites, usually small and located in competitive areas (CABERNET, 2006). Conversely, for most wide sites, located in isolated areas and complex socio-economic contexts, the company was not able to manage the decommissioning process through straightforward market arrangements and a more proactive approach was needed. Such approach evolved over time, gradually widening the set of resources used to create SV and increasing the involvement of stakeholders.

To present and discuss the evolution of the company's strategy, we refer to seven sites under decommissioning, that can be considered paradigmatic of three different approaches. Table 2 reports key site-related data: size of the area to be decommissioned (23.522*10^3 sqm), installed capacity (overall 8.982 MW), employees occupied in the power plants, geographical location, size of the areas where the power plants are placed (number of residents on 1st January 2019)[4].

[4] Data extracted from demo.istat, ISTAT, on the number of residents on 1st January 2019 by municipality, province and region. The amount has been benchmarked with the last ISTAT census of 2011. Available at http://demo.istat.it/pop2019/index.html [November 2019]

Table 2. Overview of the sites decommissioned by Energ.IT in three phases. The table shows details on the size, technology, employees[5], location. We specify by municipality, province and region hosting the plant: number of residents [N.Res.] (demo.istat, 1st January 2019); employment[6] / unemployment rate[7] [E.R., U.R.] (ilSole24Ore, elaborations on MEF data for municipal data, ISTAT 2018 for provincial and regional ones).
As reference, consider that in Italy in 2018 there were 60.357k residents; employment rate = 58,5%; unemployment rate = 10,61% [ISTAT].

						Municipality		**Province**				**Region**		
Phase	**Site**	**Size** [ksqm = sqm*10^3]	**Gross Power installed** [MW]	**Technology**	**Employees**	**N. Res.** [k people]	**E.R.** %	**N. Res.** [k people]	**E.R.** %	**U.R.** %	**Name**	**N. Res.** [k people]	**E.R.** %	**U.R.** %
I	A	66	176	Gas Turbine	25	93,6	65,06	421,3	64,58	10,03	Piedmont	4.365,4 k	65,89	8,22
II	B	3.800 (plant: 2.350)	2.640	Thermoelectric with burning oil	634	9,5	61,98	234,9	64,38	6,85	Veneto	4.905,9 k	66,65	6,45
	C	900 (plant: 240)	690	Thermoelectric, combined cycle	97	7,0	59,30	170,9	66,44	7,18	Piedmont	4.365,4 k	65,89	8,22
	D	690,7 (plant: 388)	1.738	Thermoelectric with burning oil and gas	418	36,6	62,35	705,7	41,36	23,50	Calabria	1.947,1 k	42,15	21,60
	E	2.000	3.600	Thermoelectric with burning oil	864	8.,9	66,89	317,0	55,92	11,84	Lazio	5.879,1 k	60,91	11,14
III	F	16.000 (30.000 overall)	n.a.	Mining Area Lignite extraction	n.a.	M1: 23,4 M2: 9,5	70,18 73,33	P1: 1.011,3 P2: 342,6	69,69 64,74	5,82 9,32	Tuscany	3.729,6 k	66,53	7,34
	G	65	88	Gas Turbine	13	7,9	54,60	221,2	54,33	11,21	Molise	305,6k	53,45	12,99

[5] The employment figure has been computed considering the average number of employees for MW installed in power plants with diverse production technologies (combined cycle, coal, burning oil).
[6] E.R.: employment rate is calculated by ISTAT as the ratio between the employed population (15-64 years old) and the total population in the same class age.
[7] U.R.= unemployment rate is calculated by ISTAT as the ratio between people looking for a job and labour force in a specific area

These sites are very different and cover a wide spectrum of possible technologies, size and installed capacity. Focusing on location, all sites (but A) are hosted by small municipalities and quite far from highways or other infrastructure: they are typically surrounded by rural areas, agricultural fields and naturalistic parks (see Appendix C). Some of these sites are characterised by difficult socio-economic situations at provincial level (as sites D, E, G), where economic activities are highly fragmented, scarcely diversified and where unemployment rates are higher than the national average (Table 3).

Table 3. The table shows the evolution in 15 years of unemployment rate by province hosting the site . Rows in the table are ordered from the lowest to the highest unemployment rate by province in 2018. Last row provides national data as reference.

Site	2004	2005	2006	2007	2008	2009	2010	2011	*2012*	*2013*	2014	2015	2016	2017	2018
F	4,9	4,6	4,4	3,6	4,5	5,0	4,7	5,9	*7,0*	*8,1*	7,7	7,7	8,0	6,8	5,8
B	6,1	6,3	4,5	3,8	3,4	3,3	6,0	5,5	*9,2*	*8,5*	9,3	8,5	8,7	8,3	6,8
C	4,7	5,0	3,6	4,2	4,4	5,2	5,8	6,3	*11,0*	*11,9*	11,1	9,6	9,0	9,6	7,2
F	4,5	5,5	4,9	4,6	4,9	5,5	5,9	6,0	*7,3*	*8,0*	9,3	10,3	9,2	9,7	9,3
A	5,3	5,4	4,6	4,6	4,8	5,8	5,3	6,6	*10,4*	*11,7*	13,4	11,5	10,8	11,6	10,0
G	11,5	10,4	10,3	8,0	9,5	9,4	8,6	10,7	*13,6*	*16,4*	*13,9*	*14,4*	*13,4*	*14,2*	*11,2*
E	8,1	9,0	7,4	8,8	9,7	11,4	10,6	10,5	*12,4*	*15,4*	*15,6*	*13,7*	*14,9*	*13,0*	*11,8*
D	10,6	12,1	12,1	10,5	11,0	10,9	12,5	12,2	*20,4*	*23,3*	*27,8*	*22,5*	*23,7*	*21,2*	*23,5*
ITALY	**8,0**	**7,7**	**6,8**	**6,1**	**6,7**	**7,7**	**8,3**	**8,4**	***10,7***	***12,1***	***12,6***	***11,9***	***11,7***	***11,3***	***10,6***

Above data show that in 2012-2013, when most Energ.IT's plants closed, unemployment rate increased in all areas and, in some cases, the situation has not recovered yet (Site D).

4.2 Energ.IT Case: Activation

Initially, the company's strategy was focused on communicating the availability of the sites for new uses, launching *calls for ideas*. The company assumed that this could "activate" projects, providing a new future for the sites and demonstrating to local authorities and citizens the commitment of the company towards the local community.

> "We want to show that we care about this area. […] We want to demonstrate that even if we are closing the plant, other activities can flourish and bring value to the community" [Project manager]

Coherently with these objectives, the requirements for submitting ideas were loose, resulting in a high number of collected proposals (more than 100 in the first area). They ranged from a retirement home, a museum, amusement parks, different types of multifunctional centers etc.

The ideas were evaluated by a commission, made up by the Head of Business Development of Energ.IT, two university professors, and two representatives of the local entities. The commission selected the three best ideas, based on broad evaluation criteria (economic, social and environmental sustainability). The "winner" of the call was a proposal for a new extreme sport park. Overall, the initiative was well received by the local authorities and by the citizens; however, after the completion of the competition, it became clear that the proponents had no intention to go on and develop a real project, leaving the issue of redevelopment open.

> "It was a key moment for deeply listening to local communities […]. However, […] we found ourselves equipped with brilliant ideas, but unable to find someone willing to realize them". [Project manager]

According to the SRBV framework, the *resources* levered by the company in this approach are partly related to the site and partly to the company. The formers include some physical assets, in particular the land and part of the built infrastructure (big fuel tanks) and they became part of the proposed projects for the redevelopment phase. The latter include those resources owned by the company, not site-specific, and exploited for enacting and managing the *call for ideas*. They are mainly intangible and include the company's reputation, communication infrastructure (website and media connection), knowledge of the site and its context (the company operated in the area from 1979 up to 2013;Appendix D.).

The *capabilities* used to combine resources are mainly related to communication and stakeholder management. In this phase, Energ.IT strategy was mainly aimed at limiting the company's liability towards the local community. The *call for ideas* was an instrument used to communicate to citizens and local authorities (i.e. those stakeholders that could be negatively affected by the closure of the plant) that even if the company was closing the plant, it was not leaving a negative legacy. On the contrary, the company wanted to demonstrate that "many other things could still happen here" (Project manager). From this point of view, Energ.IT put in place an approach that could ensure the visibility of the initiative, to foster a broad participation. This approach obviously required also mobilizing the stakeholder management capability, to coordinate and respond to pressures set by the main *stakeholders*. However, it is worthy of noticing that, in this phase, no (potential) investors were explicitly involved in the process.

The interaction with stakeholders took place at different stages. At the beginning, the company met the local representatives, to share the process and the main steps, and it organized a public presentation to communicate the project to the citizens. During the evaluation phase, the company involved local representative as part of the evaluation committee, hence establishing a bidirectional interaction, while collecting feedbacks and suggestions from them.

> "The involved actors are many. Local communities are for sure involved since the first steps" [Project manager]

The *outcome* of the process was controversial. The ideas collected through the call appeared interesting for supporting the redevelopment of the site, but they were far from being translated into real projects. This was mainly due to the lack of a structured economic pre-feasibility study and of an ex-ante identification and involvement of potential investors. In part, this situation was determined by a gap between the expectations of the company and of the participants to the *call for ideas*. Such gap impeded the realization of the selected proposals.

> "The participants expected us to invest in their projects and finance the new activity. Instead, we never meant to do something similar. That's not our business." [Project coordinator]

From this point of view, the strategy was not really able to achieve the expected outcome that the company was pursuing: there is no reduction of decommissioning costs, nor valorization of land. Moreover, the reputational effect was positive only at the beginning, but it risked becoming a boomerang once the solution was not realized. For the community, there were initial apparent benefits, since the project seemed developing fast. However, when unfeasible ideas were selected, it revealed its low potentialities, thus highlighting that to really initiate redevelopment a different approach was needed.

> "Things do not happen on their own. We have to make sure that there is someone that care about these projects and that is really interested in putting them in place and to ensure that they will be completed. If there are no investors that participate to the project, we do not have any guarantee that the project will be completed. We do not want that something starts and then the project is left half-done." [Project manager]

Table 3. Analysis of the *Activation* strategy based on the SRBV framework

Resources	Valuable	Intangible: reputation, image, communication infrastructure, knowledge of the site.
	From non-valuable to valuable	Tangible assets, land and built infrastructure; Human Resources: relocated
	Non Valuable	Machinery and buildings; technological facilities; skills related to the specific technology (obsolete)
Capabilities	Economic	Planning, Evaluating, Technical Expertise
	Environmental	Sustainable reconversion as a strategic objective Pollution prevention
	Social	Mission-driven: commitment of the company as outlined in its mission statement; Communication and involvement of locals to present the opportunity
Stakeholders	Economic	Shareholders, Managers, Energ.IT's head of business development, project coordinator;
	Environmental	Environment, Experts (university professors)

	Social	Local communities, public administration, assessors, local schools, universities
Interaction with Stakeholders	When	Before decommissioning starts, to share materials and information After selection, to share results of evaluation
	How	Experts invited to participate to call for ideas; Sharing of materials on a proper webpage + transparent communication; Expert, local administrators and managers participated to evaluation commissions
Outcome: SV	Economic	No project finalized, no investors involved: costly for the company and not valuable for the area. Initial positive reputational effects for the firm, but increased risks of negative boomerangs
	Environmental	No project finalized; no land reclamation nor valorization
	Social	No project finalized; raised awareness and participation on the issue, but enlargement of time needed and solutions with low potentialities

4.3 Energ.IT Case: Involvement

Afterwards, the company decided to use a different approach for the decommissioning of four sites: B, C, D, E. They are not very different in size, gross power and technology (Table 2). Compared to Site A, they are bigger, located in more isolated, and poorly inhabited areas. The four sites are all inserted in local economies driven by agricultural activity and tourism. However, their contexts differ by geographical location, unemployment rate (Table 3) and socio-economic structure (the situation is more positive for Site B and C, while particularly critical for site D).

In order to stimulate the development of feasible projects, the company tried to identify and involve from the beginning who could possible design innovative solutions.

> "With this approach we aim to move a step further towards redevelopment. We want to make sure that those that present a project, they really intend to do it and to finish it."
> [Project manager]

Consistently, proponents were required through a *call for projects* to present a more complete project (compared to the *Activation* strategy) and to demonstrate their ability of realizing it, developing a preliminary feasibility plan and identifying and involving investors (and detailing the sources of founding) before submitting the proposal. Proponents were also asked to sign a binding agreement for the acquisition of the site. Coherently with these requirements, more detailed site materials and technical information were accessible.

For each site, a specific commission was set up, including three members of the local entities, (municipality, province and region), two Energ.IT managers, and three university professors. They were in charge of evaluating the proposals, on the basis of sustainability - social, financial, environmental - and innovation drivers.

> Through the call, Energ.IT looks for projects that "satisfy mainly two criteria: innovation and sustainability. […] Why innovation? Because we hope that the new business activities that could be developed on the site could keep on sharing their future with the local territory for the next 50 years" [Project coordinator]

In this case, the commission did not select one project, but just decided whether they were acceptable or not, or specified some conditions or requirements to be integrated in the development of the project. Most of these constraints and requirements were posed by the representative of the local entities, and professors of the local universities and aimed at integrating the "vocation" of the context (i.e. leveraging on natural parks and biodiversity, traditional agricultural activities, production and research districts…)

> "The projects should consider the vocation of the site, the history of the site." [Member of the commission]

> "Some of the projects that were presented suffered from a limited involvement of the local stakeholders. […] When the projects were presented the representatives of the local entities provided a critical reading of some parts of the proposals, suggesting possible corrections in order to consider the results of past initiatives, or to incorporate their feelings about what kind of activities could be more coherent with the needs and the expectations of the local communities" [Member of the commission]

After this step, the company started a confrontation with the proponents of the acceptable projects in order to: verify the integration of the above requirements, support in refining the projects and reach with proponents an economic agreement for the acquisition of the site.

The *resources* levered in this strategy are mainly land and part of the physical infrastructure (again, tanks and some parts of the power plants) that could preserve the remembrance of the past function of the area. As before, the company levered on its image and reputation, and on its communication infrastructure to foster the interest of proponents. Moreover, also the firm's knowledge of the site and the local context are leveraged to both evaluate the proposals and support the proponents in refining them (i.e. making them more in line with the expectations of the local communities). This implies that Energ.IT structured multiple channels for communication to identify hidden value for the territory of available resources.

Capabilities were linked to a structured and open communication with and management of stakeholders (as in *Activation* strategy), as well as to the introduction of a "mission driven approach". In this respect, the proactive management of decommissioning began to be considered as a way to make explicit Energ.IT's new mission, which is based on openness, inclusion and sustainability.

> "[This strategy and Energ.IT's new vision] are permeated reciprocally. One of them is the theory, the other the practice: they are extremely integrated, they are the same thing. They are the same concepts on different levels". [Project coordinator]

Finally, the company levered also on its capabilities of financial analysis and investment decisions, supporting proponents with the incorporation of requirements and constraints put forth by the representatives of local entities.

The set of involved *stakeholders* wad enlarged, including investors, to grant the existence of funders for proposals and the *interaction with the stakeholders* was more intense than before. Before launching the *call for projects*, the company met the local representatives, organized some public events to present and promote the initiative and levered on the media (newspapers; web) to communicate what was going on. In this respect, the company augmented communications and the number of events, but did not change their scope (to inform the stakeholders). During the evaluation phase, the company involved the local representative as part of the evaluation committee. The stakeholders provided feed-backs, suggestions, and posed constraints to the projects. After the completion of the evaluation, the company interacted directly with the proponents to make sure that the requirements of the evaluation commission were incorporated in the projects.

> "It is a long and complex process, that lasts even after the contract has been signed. It is a process done hand in hand with investors" [Project manager]

The *outcomes* of this strategy were controversial. On the one hand, the projects that were presented were more feasible; but obviously the number of the proposals was much lower (for each site from 2 to 6 proposals were presented). On the other hand, the proposed projects had not always been drafted according to the needs and peculiarities of the local context and this gap emerged only during the evaluation of the projects thanks to the confrontation with the stakeholders.

> "In this case, the commission was tougher. In general, there was a high expectation that these projects would have been implemented. As a consequence, the local representatives paid high attention to all the details of the projects and put forth different constraints, asking for assurance by the company about the possibility of modifying the projects." [Member of the evaluation commission]

As a result, the whole process became quite long, leading to a progressive refining of the proposals. Specifically, outcomes were positive only in some cases, when the company could actually have a positive reputational return and reduce costs, with the community experiencing the fast realization of interesting projects (Site B and C). Conversely, for Site D even additional efforts of the firm could not bring positive results.

Table 4. Analysis of the *Involvement* strategy based on the SRBV framework

Resources	Valuable	Intangible: reputation, image, communication infrastructure, knowledge of the site.
	From non valuable to valuable	Land, infrastructure, tangible assets: leveraged according to the peculiarities of the territory and the proposals. HR: relocated in other open positions
	Non Valuable	Intangible assets, machinery
Capabilities	Economic	Accounting, investment decision
	Environmental	Pollution prevention, reclamation
	Social	Stakeholders management, mission driven, inclusion through the opening of new communication channels
Stakeholders	Economic	Bodies of the economic development, shareholders, Energ.IT's managers
	Environmental	Environment, governmental agencies, bodies of environment
	Social	Population, majors, council members, Politecnico di Milano and University of the territory, assessors, Region, Province
Interaction with stakeholders	When	Before decommissioning starts; During the evaluation procedure. After the evaluation procedure for refining the selected proposals.
	How	Experts invited to take part to call for projects + investors involved since the beginning; Transparent communication: materials available on a dedicated webpage; Commissions evaluate and refine presented projects; Technical support of experts and Energ.IT's managers to grant the feasibility of the project and its realization
Expected outcome: SV	Economic	Twofold: feasible project starts, but sometimes the process is longer and more expensive than expected (reputational boomerang)
	Environmental	Land reclamation and pollution decreased + raised awareness only in successful cases
	Social	Raised awareness and participation of local communities Acceptance of the proposals and legitimacy when there was a fast approval of interesting solutions

4.4 Energ.IT Case: Co-design

A further evolution, was followed later on two quite diverse sites (F and G), where the company co-designed the future for the area with local stakeholders and potential partners.

> "The previous experiences made evident that we need to anticipate the phase of stakeholder engagement, and we need to find a way for incorporating in the calls the requirements of the local stakeholders, in order to avoid to collect projects that are not in line with the expectations". [Project manager]

The company decided to introduce this strategy, for the first time, for managing the closure of a wide ex-mine area (Site F). Decommissioning and remediating that area was perceived as particularly challenging for Energ.IT, since the mine and the related facilities expanded over multiple municipalities and embraced artificial lakes, woods, industrial facilities and infrastructure of various kind (see Appendix C).

To cope with the fragmentation and diversity of resources to be managed, a more participatory approach was adopted. First, local stakeholders were preliminary interviewed for identifying interesting and feasible redevelopment options. After that, potential scenarios for the area were formulated by Energ.IT's consultants, then refined during workshops and individual meetings with stakeholders. In particular, the company involved ex-ante representatives from local companies, research centers and academia, local community.

At the end, a masterplan for the area was developed by the company itself that maintained a coordination role. The area was divided into main zones and a schedule for the launch of a *call for projects* was prepared incorporating the requirements emerged from the stakeholder engagement. This extensive ex-ante stakeholders involvement increased time and costs in the first phases of the decommissioning process and also introduced challenges and risks.

> "We anticipate costs a lot. And this is a great risk. […] The risk of being unsuccessful is high, also because the authorizations needed are many, as well as the actors to involve. […] Listening to them is a non-avoidable starting point. If it works, it then brings advantages, but it can also become a hurdle: listening to everyone risks inducing a paralysis." [Project manager]

Nevertheless, this strategy enabled structuring proposals in line with the vocation and need of the territory, thus enhancing acceptance and accelerating further decommissioning steps.

The same process has been applied to decommission a very diverse, but highly challenging site: Site G. Indeed, despite being much smaller than F, it is located in a quite poorly inhabited and socio-economically complex context. As learnt with the scarce success of Site D, the company approached the decommissioning of Site G with a more participatory approach: an initial and integrated involvement of key stakeholders was perceived as needed to avoid future delays and unacceptance.

The *resources* levered in the *Co-design* strategy were: part of the site infrastructure, machinery (i.e. for an open air museum in Site F), paths and trails of the mining area. The company also levered on the employees of the mine area, to support the development of the master plan, of contacts and negotiations with local communities and public authorities. This was done to foster a positive climate around the initiative and required mobilizing also external resources to co-design a solution with the territory.

Sites under analysis are, for diverse reasons, very complex: the company was asked to anticipate some decisions, having scarce information while proactively including multiple players with different needs. Therefore, concerning *capabilities*, strong project management, negotiation, involvement and co-design were required.

In line with this, the number of *stakeholders* involved was large. Beside the representative of the local entities and communities, also some local companies, associations, tourist operators, sport

associations were involved in the stakeholders' workshops. This means they were not only informed during events, but also interviewed ex-ante. Taking part in workshops, stakeholders contributed to the formulation of the final scenario, then used for the development of the masterplan, and, in turn, as basis for the individuation of specific fields for the collection of proposals.

The first step of the remediation process was complex and slow. Indeed, the company had to face typical problems connected to stakeholder engagement and exposed itself to the risk of initiating a confrontation with stakeholders that were negative towards the initiative.

> "We had to put around a table many people, that had different interest. Some of them were suspicious, in the beginning, because they thought that we were just looking for a way to spend less money in the remediation. That's not true. We only want to spend our money better and be sure that something will happen here". [Project manager]

However, results are by now positive for the firm (in terms of reputation, reduction of decommissioning costs and valorization of land) and the territory. Indeed, despite the initial time needed increased, this process resulted in a final masterplan that was well received by the local communities and by the representative of the local municipalities. Furthermore, the company decided to keep a project management role for the start-up of the masterplan, making clear that it was investing in the area also to facilitate the activation of a new life for the site. Hence, acceptance increased and pressures started for putting the masterplan in place. At present, the remediation projects are not concluded and the company is launching the first calls. These calls are coordinated with the masterplan, with a clear vision for the redevelopment of the area and this vision stemmed also from the confrontation with local needs and expectations.

Table 5. Analysis of the *Co-design* strategy based on the SRBV framework

Resources	Valuable	External resources approached through co-designing + communication, knowledge of the site
	From non valuable to valuable	Land, infrastructure, tangible assets: leveraged according to the peculiarities Soft skills and knowhow individuated and leveraged
	Non Valuable	Intangible assets
Capabilities	Economic	Accounting, investment decision, decommissioning, project management,
	Environmental	Pollution prevention, land remediation
	Social	Stakeholders management, mission driven, inclusion, communication and negotiation for mobilizing external resources, co-design
Stakeholders	Economic	Bodies of the economic development, shareholders, Energ.IT's managers, investors
	Environmental	Environment, governmental agencies, bodies of environment, experts
	Social	Local population, Majors, Council members, Politecnico di Milano and University of the territory, associations
Interaction with stakeholders	When	Before decommissioning starts; Before the definition of the call for proposals;

	How	During and after evaluation procedure; during reclamation and refinement of selected proposals; Interviews performed with: representatives of local communities, public administration and experts, to identify feasible areas of interest for proposals; Experts invited to take part workshop for reasoning upon the main areas of remediation individuated; Experts invited to take part to call for projects (with specific areas of interest) + investors involved; Transparent communication: material available on a dedicated webpage; Commissions evaluate and refine presented projects; Technical support of experts and Energ.IT's managers to grant the feasibility of the project and its realization
Expected outcome: SV	Economic	Feasible project starts: the massive involvement is expensive and time demanding at the beginning, but a faster project realization is expected: reduced costs overall and improved reputation
	Environmental	Land reclamation and pollution decreased + raised awareness
	Social	Longer initial phases and complexities BUT Raised awareness and participation of local communities; expected improvement of quality of life and neighborhoods, acceptance of the proposals (defined in line with the peculiarities of the territory)

5. Discussion

The analysis of Energ.IT's decommissioning strategy provides empirical evidence to answer to the initial research questions: *can a company create SV in the decommissioning phase*? If yes, *which strategies are available and what conditions are relevant for creating SV*?

Concerning the first research question, the case shows that creating SV during the decommissioning phase is possible, but it is not automatically achievable. The results of the *Activation* strategy demonstrate that making the site available for reuse (even if for free) and communicating this opportunity extensively is not enough to realise a feasible solution. The main motivation of this failure can be found in a misalignment between the expectations of the site owner and those of the participants to the *call for ideas* that implicitly assumed that the company would have acted as an investor. On the other hand, the case also provides evidence of the possibility of creating SV, under certain conditions, through both the *Involvement* and the *Co-design* strategy. In the *Involvement* strategy the company can create SV by: i) unveiling the opportunities opened by resources whose value is somehow hidden; ii) supporting actors in understanding whether and how such resources can be functional for implementing solutions. In the *Co-design* strategy, the firm can create SV by directly contributing to the design of the second life of the site and by making available non-site related resources.

Moving to the second research question, the case of Energ.IT provides evidence of three different strategies that are characterised by some distinctive features, relevant in explaining SV creation. In particular, the strategies are diversified in terms of the range of resources (site and company

related), that are exploited for remediation. Moving from the *Activation* to the *Co-design* strategy, not only land and infrastructure, but also soft intangible assets started being positively re-valued (i.e. the "soul" of the area, workers' skill), a shift that is closely connected to the ability of the company and other stakeholders of identifying "hidden value" of resources. Similarly, the set of *capabilities* used by the company to support the decommissioning is different, including in *Involvement* and more intensively in *Co-design* capabilities such as: mission driven and participatory approach, intentionality, negotiation, technical evaluations, investment decisions and project management. The modification of the set of capabilities reflects the role change of the company, that leverages on capabilities that are usually not leveraged during site decommissioning, despite being commonly used in the normal operations of a company. Finally, the strategies are distinguished by the width of the panel of involved s*takeholders* and *the intensity and directionality of interactions.* Both internal and external ones were engaged since the beginning, but investors and financers, who assumed a prominent role in the *Involvement* and *Co-design* strategies. In parallel, also the intensity, frequency and directionality of *involvement* was enhanced, which is fundamental for awareness and acceptance.

Finally, considering the conditions that are relevant for creating SV, the results show that the success / failure of different strategies depend on both the features of the three approaches (highlighted above) and some contextual factors: the uncertainty and the complexity of the site that should be decommissioned and the alignment of the interests of the local stakeholders in connection to redevelopment projects.

In particular, the *Activation* strategy, generating limited SV, can only be adopted when the objective of the company is the minimization of negative reputational effects in the short term

The *Involvement* strategy should be preferred when uncertainty and complexity are quite limited and when the local stakeholders share a similar vision about the future of the area and the redevelopment opportunities. In this case, the company can rely on its own knowledge of the site, analyse which available resources could be exploited to answer to the needs of the local communities and open up a channel of communication to facilitate the individuation of initiatives for the re-development coherent with the expectations of the stakeholders.

However, when the level of the complexity and uncertainty increases, this approach risks that projects end up not capturing the desires of the local stakeholders. Under these conditions, results are controversial and time enlarges, due to subsequent negotiation and refinement.

Instead, the *Co-design strategy* is more suitable in cases of high complexity and uncertainty. This strategy mobilizes external resources to design with the local community a project for the site and grounds on an extensive and structured dialogue between the company and the stakeholders for the

identification and redesign of redevelopment initiatives for the area. This anticipated involvement may inflate initial time and costs, because it surfaces potential contrasts since the beginning. However, in this way, it reduces risk and delays in the execution phase and drives higher potential benefits, since it helps sustaining SV creation thanks to links tied with the territory (Tate and Bals, 2016). Overall, *Co-design* is not necessarily always the best strategy, since its successful application requires a, sometimes highly complex, initial convergence among diverse stakeholders.

Table 6. The table highlights, by phase, the main conditions of success and failure (features and contextual factors) for each strategy and qualitative outcomes reached. They refer to the value drivers we identified in connection to the firms' and community's objectives.

Strategy by phase	Conditions of success	Conditions of failure	Outcome	Firm's reached objective	Community's reached objective
I	Limited mobilization of resources and capabilities; Transparency and effective communication of opportunities; Knowhow of the territory; Involvement of local stakeholders; Site available for free for reuse; Not enormous uncertainty nor complexity of the site and its context;	Scarce revaluation of intangible assets; Misalignment between the expectation of the company and participants; No investors involved, nor the company acted as such;	Minimization of negative effects No pre-feasibility study; No project realization	No cost reduction; No land valorisation; Initial positive reputational effect, but risk of later negative boomerang.	Enlargement of time needed; Projects with low potentialities.
II	Intangible assets valued, as the "soul" of the area; Application of company's capabilities: knowledge of the site, project management, technical evaluation, mission driven approach and communication (new channels opened); Increased transparency and sharing of technical material; Involvement of investors; Uncertainty and complexity limited.	Directionality of interactions remains unchanged: from the firm to stakeholders; Proposals evaluated with no ex-ante involvement in defining solutions; Acceptance taken for granted; Crucial when complexity increases (wide areas; unstable socio-economic context; fragmented actors and interests, not clear vocation…).	Twofold Feasible projects individuated and initiated only in some cases; Risk of low acceptance of proposals and need of renegotiations	Positive reputational impact, cost reduction only in successful cases; in cases with low acceptance, time and risks increased: no fast land valorisation, and reputational boomerang	Fast approval of solutions vs. no accepted solutions

III	Mobilization of external resources and skills; Structured co-design processes; Intentionality driving company's role change; Capabilities leveraged: negotiation, investment decision, project management, co-design; Ex-ante proactive involvement (interviews, workshops); High level of complexity and uncertainty.	More time and effort (cost, people…) needed in the first phases; Risk of initial paralysis and complexity in managing multi-actor decision systems to reach initial convergence	Positive TBL: Proposals in line with the vocation of the territory; Higher acceptance Faster overall remediation.	Positive reputational effect; Overall decommissioning cost and time reduction, High initial effort. Valorisation of land and areas	Longer initial phases, but joint individuation and co-design of relevant projects.

6. Conclusions

This paper addresses the issue of SV creation during site decommissioning. As discussed above, SV cannot be automatically achieved by just making sites available for reuse, but it can be actually reached, though under certain conditions, through *Activation, Involvement* or *Co-design* strategies. In particular, the Co-design strategy has the highest potential benefits, but it requires that both the firm and institutions put more effort since initial phases. This is crucial when underestimating initial stakeholders' alignment risks blocking the project later on, thus increasing overall time and costs for realization.

From a practical perspective, findings can be relevant for managers and policy makers dealing with the problem of decommissioning in the energy sector and also in other ones, as the strategies that emerged from the analysis and the related success / failure factors are not sector nor country specific. In particular, the research provides managers with evidence-based examples of strategies for SV creation in decommissioning and individuates more general conditions of applicability. This can support managers in changing their attitude towards the identification and deployment of resources (internal and external), capabilities (economic, environmental and social), and ex-ante interactions with territories for shaping SV creation strategic processes. Furthermore, the analysis can also suggest policy makers to think about the opportunity of introducing dedicated measures aimed at stimulating companies to take on proactive role for supporting such processes.

Concerning theoretical contributions, first, the paper originally joins the literature on brownfield redevelopment (CABERNET, 2006; Schädler et al, 2012; Stezar, et al., 2013), which traditionally focused on the role of public actors. Conversely, we here analyse the corporate level, suggesting that site owners can be both responsible towards territories and increasingly competitive. Second, we provide a unique adoption of the SRBV, which has been, by now, mainly applied to small non for profit firms and social enterprises (Tate and Bals, 2016). Here, the SRBV is deployed to analyse the decommissioning strategy of a for profit firm. Third, this paper provides a real example of SV creation, thus facing one of the core criticalities moved to the paradigm: its vagueness (Crane, et al., 2014) and limited capability of providing guidelines in regulatory voids (de los Reyes, et al. 2017).

In conclusion, we acknowledge the limitations of this research and open paths for future ones. This paper grounds on a qualitative analysis, which obviously does not support a systematic generalization of results. Conversely, it stimulates the exploration of the issue in different contexts: we suggest further research in this direction. A second limitation concerns the quantification of the impacts, that have been here evaluated in terms of contribution of the company to SV drivers. Future research could focus on extending the period of observation, to capture the conclusion of the redevelopment phase. Last, this paper focuses on the role of the company and takes on a firm's perspective while studying the interactions with policy makers. Therefore, it does not study how policy makers themselves could influence the proactive efforts of firms in the decommissioning, phase, which could be worth further investigations.

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731 **APPENDIXES**

732 **A.**

733 Details on the 24 sites that the case company is decommissioning in Italy

Site	Dimension [ksqm]	Capacity [MW]	Technology	Region	State
A	66	176	Gas turbine	Piemonte	Towards a new destination of use
B	3800	2640	Thermoelectric with burning oil	Veneto	Solution identified
C	900	690	Thermoelectric combined cycle	Piemonte	Solution identified
D	690,7	1738	Thermoelectric oil and gas	Calabria	Towards a new destination of use
E	2000	3600	Thermoelecric oil and gas	Lazio	Towards a new destination of use
F	16000	n.a.	Mining area	Tuscany	Procedure to be started
G	65	88	Turbogas	Molise	Towards a new destination of use
H	48	295	Thermoelctric, carbon	Liguria	In use, procedure to be activated
I	76	176	Turbogas	E.Romagna	Solution identified
J	118	140	Thermolectric, carbon	Veneto	Solution identified
K	720	1282	Thermoelectric, combined cycle	Liguria	Procedure to be started
L	130	310	Thermoelectric, burning oil	Tuscany	Towards a new destination of use
M	1400	1240	Thermoelectric, burning oil	Tuscany	Solution identified
N	79	104	Turbogas	Marche	Towards a new destination of use
O	1136	553	Turbogas	Umbria	Procedure to be started
P	140	150	Thermoelectric, carbon	Umbria	Towards a new destination of use
Q	150	250	Turbogas	Molise	Procedure to be started
R	80	206	Thermoelectric oil and gas	Puglia	Towards a new destination of use
S	281,1	1341	Thermoelecrtic gas	Sicily	Towards a new destination of use
T	150	210	Thermoelectric, burning oil	Sicily	Towards a new destination of use
U	138	320	Thermoelectric, burning oil	Sardinia	Towards a new destination of use
V	57	177	Turbogas	Sardinia	Solution identified
W	82	352	Turbogas	Campania	Towards a new destination of use
X	69	352	Turbogas	Campania	Procedure to be started

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B.

An example of general questions posed to internal informants:

Considering your company:

1. How would you define the strategic orientation (growth and renewal, flexibility and stability, value innovation, operating efficiency, new product development…) and goal orientation (growth, stability, flexibility, quality…)?
2. What key contingencies would you define as useful to shape the context (regulations, technological changes, macroeconomic conjunctures…)?

Considering the strategy (strategies) adopted in site decommissioning:

3. What kind of rules, values and habits are mainly affecting it?
4. Are there also opportunities for the company? What are they?
5. How would you define the strategy adopted by the company in dealing with obsolete resources (or a precise example)? Is there one holistic strategy or are there dispersed approaches? Who is the responsible?
6. What are the resources affected by these strategies? Is it possible to indicate their monetary value now?
7. Which characteristics resources should have to be considered valuable and strategic?
8. Which capabilities are considered key?
9. Are impacts considered (before-while shaping the strategy)? How?
10. Does the strategy imply a high –medium or low risk level? Why?
11. Who are the main stakeholders? Would you define them as allies, opponents, dangerous or key ones?
12. How and when are stakeholders engaged?

C.

Location & Characteristics of the territory by site

Site	Territory and location: characteristics and infrastructure	Territory: economic activities and main sectors	Inhabited areas
A	The plant is located in industrial dedicated zone. It is surrounded mainly by fields for agricultural activities (with a few farms). It is also close to a zone for social structures and hospitals and to public areas and parks (some of them protected)	The province is strategic for industry, commerce, research and cultural heritage. Indeed, it is strategically located in the middle of an area defined by Turin, Milan, Genova and it is historically a juncture of Piedmont between Lombardy and Liguria Regions. In the province there is the 10% of firms of Piedmont and 1% of Italian ones and are active in diverse sectors (agriculture, services, mining, jewellery).	
B	The plant is set on a "island", which is delimited by the sea and two rivers. The closest municipality is made up by 11 very small fractions: it is 14 kms far from the Porto Tolle Centre. The area is 25 km far from the closest main road and 35 from a harbour. The area is characterised by a high biodiversity and it is close to a natural park.	The plant is located in the area of Po River Delta, that is characterised by natural, agricultural, industrial and research (Ferrara, Rovigo, Padua, Verona) districts. Agriculture, fishing and commercial services (in wood, fashion and food) characterise the economy of the province and municipality.	In 0-30 minutes distance there are 10.058 residents. In 30-60 mins, there are more than 93 k inhabitants
C	The area where the power plant is located is known for its agricultural activity. Concerning infrastructure, both the main provincial road and highway are 18 km far from the site. This helps the connection of the site with bigger centres as Turin, Alessandria, Ivrea, Novara. The area also hosts a natural reserve wood and there are also historic rural buildings.	The territory is characterised by agricultural activities and it is particularly famous for rice production. In the province, there is the 30% of Italian surface for rice production. In the lst years, also other production districts have grown, centred on mechanics, concrete, fridges and logistics. In the province there is the 3,8% of the firms of Piedmont and they employ around 70k people.	In 0-10 mins distance there are mainly agricultural fields and few inhabitants (around 580). In 10-20 mins one can find areas inhabited by around 29k residents and more than 90k in 20-30 mins.
D	The plant is located between the seashore and the city. It is 9 kms far from the centre of Rossano and 50 km far from the closest highway. The neighbourhood is characterised by sparse agglomerations of urban, industrial settlements and bathhouses. The area is characterised by an important natural and cultural heritage: indeed, there are natural parks and touristic attractions	The area has mainly a touristic (seaside resorts, an archeologic park) and agricultural vocation. Close to the plant there are also high quality industrial sites (i.e. liquorice production, local eno-gastronomic excellences).The strong criticality of the production system is due to the high fragmentation: individual firms are more than the 60% of the total and the density of firms is much lower than the national average (but in line with the regional one).	scarce infrastructure and low density: in 0-10 mins distance there are around 36.000 residents and in 10-20 mins, 48.000. In the area 0-60 mins, there are more than 300.000 residents.
E	The entire area is characterised by agricultural activities and touristic attractions: i.e., the Etruscan natural and archeologic park nearby, naturalistic parks and seaside. The area is not far from the inhabited centre of the municipality (8 km). The area is bounded by the Sea, an important Road and the Railroad.	The territory is characterised by diverse excellences: nature, archaeology (touristic attractions), universities and production. Local products of high quality are produced in the area (oil, wine, cheese…). There are also numerous small medium enterprises linked to the activities of the industrial and harbour area of Civitavecchia and to extraction activities. Overall, in the municipality	In the territory there are no extended urbanized areas, nor strong infrastructure. In a distance of 0-10 mins, there are areas inhabited by around 8.700 people. This number doubles considering the 10-20 mins zone. In the macro-zone 0-60 mins, one can reach around 491.000 inhabitants.

		the agricultural sector is the most developed (74%, in terms on registered enterprises), followed by the commercial one.	
F	Lignite was industrially extracted in galleries (Mines) since the first half of the XIX century. Mining activity was at the base of the industrial development of the entire area. The site is 40 km far from Florence and Arezzo, 50 from Siena. Both the highway and the closer train stations 5 km far from the site. In the site there is an industrial area and some industrial archaeology. Artificial lakes have been created and an activity of re-naturalization of the area have been in place (woods...). Nowadays, different areas belong to various private entities and diverse municipalities.	Historically, the area strongly depended on the mining activities. Occupation strongly decreased in the 50s, with the mechanization of mining activities. Local industrial activities started, with a focus on furniture, food, shoes and clothes. They also drove commercial activities. Agriculture (high quality products) is we developed in the territory. The production sector is very diversified (agri-food, jewellery, fashion...) and well grounded on manufacture. Moreover, there are important technologically advanced sectors, as ICT production, medical devices, biotechnology, pharma... The region is also reach in terms of research and education	The nantional statistic agency maps the area into a local system of 11 municipalities and around 126.000 inhabitants.
G	The power plant is located in a wide agricultural area, not far from the inhabited centre (4 km) and the sea (3 km far). A highway passes 10 km far from the site, through the municipality that hosts the plant, which can be reached through a national road. Railways and harbours are not very far. The closest airports are 100 km far.	Agriculture is the main sector (grapes and wine, cereals, oil and fruit…). Tourism is also important: the municipality is a well known location at the seaside. Concerning the production system, in the province there is around the 70% of firms of the Region. They are mainly operating in the agricultural sector (36% of firms). Also commercial and construction activities have a relevance (respectively, around 22% and 12% of the firms). In the municipality, activities are specialized in: mineral extraction, utilities, construction and accomodation.	Few residents live in the zones close to the plant: 9.600 people inhabit the area which is 0-10 mins far from the plant. In the macroarea 0-60 minutes, there is a population of 580.000 people.

D.

Details on operating hours and years by site

Sources: Silvio di Pasqua, 2015, Partecipare; Dossiers on the sites to be decommissioned

PHASE	*SITE*	*Operating hours*	*Operating years*
1	**A**	Period 1: less than 150 hours / year From 2009 to 2013 few hours (136 in 2011 - 36 in 2012)	1979-1993 1994-2003:stop 2004-2009: only NG 2009-2013: decrease 2013: set out of service
2	**B**	10-15kwh in the 90s (**10% of Italian production**) Around 5 k hours in 2006 and then decreased up to 0 for all4 Groups in 2010.	start 1980-1984 inactive in 2009 not available since 2013
2	**C**	when it started the production, the yield was of 46% (the plant was designed to function around 6000 hours / year).	start 1996-1997 2013 stop 2016: procedure for acquisition
2	**D**	Production started declining due to the increase of energy process. In 2010, total operating hours (considering all sections) amounted to 2328. They decreased, up to 30 hours / year in 2014.	start 1976 (with 4 thermoelectric steam sections). In 1994-95 4 turbogas units. In 2014, 2 turbogas units started operating in simple cycle and the other two were put out if service. Concerning steam sections: one is available, one is under conservation and two out of service.
2	**E**	First years: **5% of the Italian demand of electric energy** (16GWh / year) decrease to 12.000 GWh/ year 2009: 1.600 GWh 2011: 200 GWh	Start progressive functioning since1992 High production 1999-2003 decrease between 2004 and 2006 Strong decrease till 2009 In 2009, a fotovoltaic plant of 12 ha (8,5-9Gw/ year) was installed nearby now the plant is out of service
3	**F**	overall 44 mln tons of lignite extracted. The power plant is still active	cultivation started in 1955 and ended in 1994 power plant installed in 2006 and STILL ACTIVE.
3	**G**	1984-2000 from 2003-2013: availability for emergency (last production in 2012)	