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Entrepreneurial actions in energy transition: A study of three local energy clusters in Poland

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Abstract

This article discusses the roles that various forms of entrepreneurial action (economic, social, political) play in the emergence of new socioeconomic fields during the process of energy transition. The article is based on the results of qualitative research conducted among actors involved in establishing microgrids in Poland. We analyze three cases that differ in terms of the dominant form of entrepreneurial action, the capital at play, and the state of the field. We assert that the development of local energy initiatives requires the interplay of all three forms of entrepreneurial action. All three are necessary for the newly established field to be resilient, economically optimized, and embedded in not only political and business networks but also in the community at large.

Keywords

Assemblage, capitals, embeddedness, energy clusters, energy transition, entrepreneurial action, socioeconomic field

Introduction

This article examines the relationships between various forms of entrepreneurial action and the formation of grassroots initiatives in the field of distributed energy (Alanne and Saari, 2006). Based on empirical research, we show which combinations of resources and capital work well for establishing microgrids (Mahmoud et al., 2014; Zambroni de Souza and Castilla, 2019), and which do not. The development of distributed energy infrastructure is an important component of the ongoing energy transition in general. In principle, microgrids enable the optimization of production and consumption.

In the case of Poland, microgrids have been recognized as a particularly important element of the energy transition: their establishment (in so-called "energy clusters") has been deemed complementary to the development of renewable energy sources (RES). Our research investigated a variety of initiatives implemented as part of the Polish ministerial energy cluster certification program. Particular energy clusters represented not only different technological approaches but also different organizational models and different types of entrepreneurial actions. It is worth noting that energy clusters have not only a physical and technical dimension but also a social, organizational, and business one. Their success is largely determined by nontechnological factors. The diversity of Polish energy cluster initiatives

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provides an opportunity to examine the role of entrepreneurial actions in energy transition.

For the purposes of this article, we distinguish three forms of entrepreneurial action—economic, social, and political (Christopoulos and Ingold, 2011; Link and Link, 2009; Peredo and McLean, 2006; Saebi et al., 2018)—and focus solely on innovative entrepreneurship (Schumpeter, 2000). We assume that entrepreneurial action is any action that social actors undertake for the production of added value by linking heterogeneous entities together: human actors, organizational resources, capital, technologies, interests, and so on (Aldrich, 2005). An entrepreneur who attempts to establish a socioeconomic assemblage (Hardie and MacKenzie, 2017; Müller, 2015) must successfully convert existing resources and translate interests. This involves finding institutional loopholes, discovering problems, identifying opportunities, and so on (Korsgaard, 2011). Moreover, the value that an entrepreneur provides does not have to be purely economic; he or she can concurrently pursue social, environmental, or political goals (Hayter et al., 2018).

We take the perspective of economic sociology, which has the following characteristics (Swedberg, 2006). First, economic sociology is focused on the issue of the embeddedness of economic action (Callon, 1984, 1998; McKeever et al., 2014). As Polanyi (1944) argued, organizations, markets, industries, and economic processes themselves depend on the sociocultural conditions in which they function. Economic actions rely on the underlying network of social relations which stabilize economic processes, reduce the likelihood of fraud, and keep transaction costs relatively low (Granovetter, 1985). Such actions are also essential in establishing new markets or industries. Second, economic entities are constructed and, to some extent, contingent. These entities are not necessarily optimal solutions capable of reconciling market and technological conditions, but rather, the combined effects of the agency of various actors and local circumstances (Granovetter and McGuire, 1998). Third and finally, economic sociology highlights the coexistence of varieties of economic entities. Different starting conditions may lead to the emergence of myriad systems. Economic sociology attends to the regional differentiation of economic systems, as well as to the migration of various patterns of action.

The structure of the article is as follows. In the first theoretical part, we introduce the concept of the socioeconomic field, drawing, inter alia, on the propositions of Bourdieu (2005). We also define entrepreneurship in terms of field theory, using some of the ontological insights of actor–network theory (Aka, 2019; Callon, 1990; Latour, 1990, 2005).[1] We focus not so much on entrepreneurship or entrepreneurs as such, but on entrepreneurial action treated as the building of connections between heterogeneous resources and actors that have not interacted with each other thus far. This assembly work is crucial to the emergence of socioeconomic fields. Furthermore, we define energy generation and distribution as a specific type of socioeconomic field constituted and reconstituted via the introduction of sociotechnical assemblages (Müller, 2015) established by entrepreneurial action. The second part provides a brief overview of the Polish energy sector and its transition toward renewables (Lis, 2020; Pietrzak et al., 2021). We also focus on the concept of "energy clusters," which—according to Polish legislators—were expected to promote a smoother energy transition.[2] The third part presents our research methodology, while the fourth part focuses on three regional cases in which entrepreneurial actions were undertaken during the establishment of an energy cluster in Poland. The closing sections of the article provide, sequentially, a discussion of the various forms of entrepreneurship in the field of energy, and, finally, our conclusions.

Entrepreneurial action in the socioeconomic field of energy transition

Electricity has become not only a vital product but a key driver of economic development (Carruthers and Babb, 2013). It was around this resource that a structure comprising production, distribution, and consumption was created, forming a powerful economic sector. Technological development—both with time-diversified sources of electricity production and local differentiation in the structure of this production—depends on the type of sources that are

available. Since the climate crisis associated with the fossil fuel-based energy system (Brown, 2011) is leading to a more regional, more sustainable green energy economy (McCauley and Stephens, 2012), local economic fields embedded in organizational and social capital and infrastructure have become interesting subjects of study. We can conceptualize processes for the establishment of an electricity production system, its functioning, and its transformations in terms of socioeconomic fields. Our understanding of the field concept is heavily influenced not only by the works of Bourdieu and Fligstein but also by theories of entrepreneurial action (Hayter et al., 2018).

The concept of the field

The concept of the field is used in organizational studies mostly in reference to the organizational field of a recognized area of institutional life (DiMaggio and Powell, 1991). In this article, we understand the field in a manner closer to Bourdieu's approach (Bourdieu, 2005), according to which the field represents the structure of some part of society. A field is a certain area of society in which actors generate capital and resources, make exchanges, establish relationships, and, above all, vie for better positions. Yet, while there is tension and competition within and among fields, actors in a distinct field need to cooperate with one another against other fields. Furthermore, since there is no predefined catalog thereof, the field is an analytical concept: a researcher decides upon the level of analysis adopted and what will be defined as a field (including possible subfields). One may distinguish, inter alia, the fields of art (Bourdieu, 1996), religion (Verter, 2003), science (Albert and Kleinman, 2011), and economy (Bourdieu, 2005), but any of these can be subdivided into subareas, as long as the rules of the game are internally consistent within the field and its subfield(s).

Various actions can be taken within a field. Actors may focus on production, turning assets into various types of capital (e.g. social, financial, cultural, or symbolic), establishing alliances, converting resources from other fields, divesting other players of their resources, appropriating resources, and so on (Bourdieu and Wacquant, 1992). For the pursuit of an individual's or group's own ends, a "durable network of more or less institutionalized relationships of mutual acquaintance and recognition" needed to be established (Bourdieu and Wacquant, 1992: 119). In analysis of such networks, Bourdieu's main question is why some in a given society achieve more than others. Entrepreneurial action is a unique type of action: it is responsible for establishing and transforming the socioeconomic fields in which other types of activities take place.

Varieties of entrepreneurial actions

In our approach, we focus not on entrepreneurs (actors), entrepreneurship (attributes of actors), but on the actions of actors. Each actor, individual or collective, may engage in entrepreneurial action at different times and to varying degrees. Traditionally, entrepreneurial actions were associated with the domain of economics. Later conceptualizations assumed that one could talk about entrepreneurship in a non-economic setting, if the activities of the non-economic actor were influencing (i.e. regulating) economic activities or were executed with the aim of achieving economic effects. We assume, for our purposes here, that entrepreneurial action need not be carried out in the economic sphere, and that an actor engaging in such activity need not carry out actions with economic benefits or effects in mind. It is the structure—not motivation, nor setting—of entrepreneurial action that is important.

Let us, therefore, focus on that structure, highlighting six features. First, entrepreneurial action requires an opportunity-seeking attitude as well as opportunity-recognizing and exploiting skills (Corner and Ho, 2010; McMullen and Shepherd, 2006). Nevertheless, seeking opportunities and exploiting is not reserved for individuals alone: organizations can also operate in this mode (Beunza and Stark, 2004). Second, entrepreneurial action takes place under conditions of increased uncertainty pertaining to the possible reactions of other actors in the field, imaginable externalities, chances of success, and feasible side effects. However, efficacious entrepreneurial action reduces the level of uncertainty for all actors in the field. Third, entrepreneurial action takes place within

a particular socioeconomic field or at the intersection of two or more fields, while also transforming the field (changing its status quo), creating subfields, or giving rise to completely new fields. Fourth, the transformation or creation of (sub)fields may meet with resistance from other actors who fear for their interests. The interactional dynamics between actors undertaking entrepreneurial action and other actors in the field can be quite complex. This is described, among others, by the strategic action field (SAF) concept (to which we will return later). Fifth, an entrepreneurial action constitutes, in essence, the creation of assemblages formed by coordinating the actions of elements that have not yet interacted. Entrepreneurs bind human agents and resources in such a way that enables capital production and conversion unachievable outside of the newly established network (Smith et al., 2017; Van der Duim, 2007). Entrepreneurial actions take different forms: connecting social groups (Burt, 2004), meeting investors and innovators, establishing interest groups, and reconfiguring sociotechnical relations. The possibility of linking heterogeneous elements into one network is often obscure; the benefits that different actors can derive from the creation of an assemblage are also not obvious. Entrepreneurial action requires, among other things, the articulation and translation of interests (Latour, 1983). Sixth and finally, entrepreneurial actions are motivated by the fact that they allow the actor to occupy a unique position in the field and to increase his or her influence. In the case of a social network, entrepreneurial action exploits structural holes providing a broker with great benefits. The ability of actors to mobilize resources by virtue of their social affiliations is often described as social capital (Portes, 1998). In turn, the level of social capital in a given community is generally seen as enhancing economic welfare and civic governance (Stryjan, 2006). On the whole, the multiplication of entrepreneurial actions and contexts for entrepreneurship democratizes entrepreneurship itself by multiplying the practices through which it occurs in society (Steyaert and Hjorth, 2006).

Here, we distinguish economic entrepreneurial actions, political entrepreneurial actions, and social entrepreneurial actions, but other forms of entrepreneurship or entrepreneurial actions can also be identified. What differentiates them is their outcome. Economic activities aim to create economic value, for example, by creating a new product, market, or industry. Political entrepreneurship works to create various visions of the future, articulate values, but also coordinate various interest groups. Social entrepreneurship is about establishing and maintaining social networks, linking the activities of a given community's members, and building various organizations.

The energy sector is a specific type of field due to it being geographically situated. Moreover, the production and distribution of energy is always associated with a specific technical infrastructure. That physical infrastructure is also important due to the quasi-monopoly nature of this field. The energy sector has always been a field in which economic and political actions combine, but its development in recent years has meant that grassroots social activities are also playing an increasingly important role. This means that the functioning and transformation of the energy sector are not only geographically, but also socially, embedded.

By and large, any economic field is always dependent (to some degree) on other fields, and the economic actions of actors in the economic field will always have a social dimension, meaning that it will always be socially embedded (Boltanski and Thévenot, 2006). According to Granovetter (1985), economic actions are embedded in networks of social relations. The concept of embeddedness itself has been reframed in many studies (see Swedberg, 2006).

What is important in the context of our analysis is an approach that considers two types of actors: organizations with their economic relationships and individuals with their social relationships (Friedland, 2009). This requires that the actors, who act on and create social resources and social capital via economic activities, conduct a multilevel analysis of formal and informal social structures. This concept of embeddedness in the network of social relations facilitates avoidance of under- and oversocialized views of human actions (Granovetter, 1985). Furthermore, it is fully compatible with the field approach: fields offer actors standard strategies, but actors can attempt to change existing rules or create

new ones. Fields are not independent of social actions but are structured by them. The concept of embeddedness also explains why entrepreneurial action (e.g. alteration of existing rules or creation of a semi-autonomous field) may be met by opposition: there are actors who consider the current layout of the field to be beneficial for them. Other actors might not necessarily block a change but might attempt to translate it to fulfill their own interests. Such dynamics are discussed, inter alia, by Fligstein and McAdam who introduced the SAF concept (Fligstein and McAdam, 2011).

The concept of the strategic action field

The strategic action field is

> a constructed meso-level social order in which actors (who can be individual or collective) are attuned to and interact with one another on the basis of shared (which is not to say consensual) understandings about the purposes of the field, relationships to others in the field (including who has power and why), and the rules governing legitimate action in the field (Fligstein and McAdam, 2011).

The SAF concept highlights the unequal positions of actors in a field, what the interrelations among those actors are, and what their strategic possibilities for actions are. The dominant actors in the field (incumbents) have the capacity to mobilize different resources to achieve their goals. However, those actors holding subordinate positions in the field (challengers) do not have the same access to critical resources and, therefore, display a greater tendency to articulate alternative visions for achieving goals. Nevertheless, all the actors are embedded in institutional and cultural environments, setting the conditions for different types of entrepreneurial actions.

SAF has proven to be a useful approach in analyzing the emergence of new subfields in the domain of energy production and consumption and energy transition (Kungl and Hess, 2021; Mey and Diesendorf, 2018). Unfortunately, however, SAF has not proven itself to be a universally suitable framework for our analyses. The dynamics of challengers-incumbents alone was analytically applicable only in a single case. The classification of fields as developing, stable, or in crisis was also valuable. However, as a rule, we did not identify external shocks or local governance units as significant. In some respects, the gradual changes within clusters could be better described in terms of a sociotechnical transition (Geels, 2007). However, neither SAF nor the sociotechnical transition literature brings to light the entrepreneurial actions undertaken by different actors at different stages of processes, guided by different motivations, and following different logics. Entrepreneurial action theories worked better in the analysis of qualitative data, largely gathered by ethnographic methods.

The energy sector itself can be considered a socioeconomic field, and the development of solutions such as energy distribution can be analyzed as an attempt to transform the field or delineate a subfield. Initially, the energy industry was embedded in business and political relationships that could be geographically dispersed (Granovetter and McGuire, 1998). Today, however—due to such trends as distributed generation, social ownership of energy infrastructure, energy cooperatives, or energy democracy (Burke and Stephens, 2017)—the networks in which the energy system takes root include households, neighborhoods, and local communities. The inclusion of these actors in the process requires not only the implementation of various technological solutions, building business models, articulating collective interests (Wagner, 1966), and creating visions, but also engagement with communities. This means that energy transition likewise requires actors to assume the roles of social entrepreneurs.

Moreover, the energy field is presently much more diverse than the sizable technological systems described by Hughes (1993). Currently, we see niches, subfields, and various competitive energy models (Stephens et al., 2015). This is a consequence of the fact that the energy sector is starting to rely on inverse infrastructures (Egyedi and Mehos, 2012). Perhaps at some point there will be integration of the field, but, at this time, we have different energy subfields coexisting at different stages of their life cycle. The transition of the energy sector is not the result of a search for optimal solutions to reconcile environmental, market, and technological constraints.

Instead, it often takes the form of a competition between incumbents and challengers (as in the SAF model). Since an energy transition involves a transformation of the existing field or the creation of a new field, entrepreneurial activities will be vital. Simultaneously, this transition involves not only economic entrepreneurship, but also activities in the spheres of politics and social relations.

Energy clusters in Poland: an overview

As in many countries, the Polish energy sector relies on fossil fuels. Nevertheless, in recent decades—due to the deterioration of Poland's energy infrastructure and the requirements of the European Union—RES have been gradually introduced into the Polish energy system. The process, however, is too slow, and the assumed goals have not been achieved (*Bariery rozwoju odnawialnych źródeł energii*, 2020).

The most important Polish legislative act in the relevant field is that of February 20, 2015, on RES (Dziennik Ustaw, 2020, poz. 478). This law defines the principles of and conditions for the performance of activities pertaining to the generation of power from renewable sources; it also describes the mechanisms and instruments which are to support the production of such energy. This act has been revised many times and, through these revisions, has incorporated two concepts that are key to our analysis: the concept of energy clusters (2016 amendment) and the concept of prosumers (2019 amendment). According to this act (as it currently stands), an energy cluster is a civil law agreement into which individual persons, legal entities, scientific units, research institutes, or local government units may enter. That agreement applies to the generation and stability of the demand, distribution, or trading of energy from RES (or other sources or fuels) within a distribution network with a rated voltage of less than 110 kV. The energy cluster's area of operation—determined on the basis of the connection points linking producers and energy consumers who are cluster members—may not exceed the boundaries of one county or five communes. Officially, the goal of an energy cluster is the development of distributed energy to satisfy the needs of a given region.

Energy clusters—as per the intention of the concept's creators—were designed to improve local energy security in a manner ensuring environmentally friendly economic efficiency. The new provisions in the act aimed to ensure optimal organizational, legal, and financial conditions (Fraś and Ivashchuk, 2017). However, it is unclear which mechanisms should be implemented to achieve these goals, which organizational forms energy clusters should take, and what benefits their members should expect. While there has been a long-standing tradition of cooperative activity in Poland (Matyja, 2012), there is no legal formula that would underpin an energy cooperative. That is, if an energy cluster operates on the principle of regulatory sandboxes (Heymann et al., 2021; Van der Waal et al., 2020), then the invention of institutional and organizational solutions optimal for the Polish context would be enabled—but this is not the case. In practice, instead of giving its members free rein, an energy cluster in Poland imposes various incomprehensible restrictions on them. This is particularly the case with the boundaries of territorial units which, according to the statutory definition, are to encompass rural communes, peripheral to urban centers. Officially, therefore, energy clusters were to be an instrument of compensation for development deficits in outlying areas (Dragan, 2020). In fact, an energy cluster could be a useful tool, if it allowed members of such entities to bypass electricity operators who play the role of incumbents in the macro field. In practice, this possibility, too, is limited for both legislative and infrastructural reasons.

Ultimately, the idea of energy clusters amounted to a certification system. In 2018, the Ministry of Energy opened and brought to closure two competitions for a Pilot Energy Cluster Certificate; 66 cluster bids from all over Poland won certificates. Certification was supposed to simplify, among other things, applications for funds under the Infrastructure and Environment Operational Program. Yet, the legislative concept was not backed by any real funding for the development of microgrids which would have enabled local generation and consumption of power without the need to transfer energy to high-voltage networks. In many cases, therefore, the energy cluster plan neither stimulated changes in the

field of Polish energy nor facilitated the stabilization of already-constituted actors.

An additional barrier to the development of the energy cluster program was the unstable political situation in Poland. As a result of the frequent restructuring of government ministries in 2019, the Ministry of Energy was liquidated, distributing its responsibilities to the Climate and Environment Ministry and the Ministry of State Assets. Thus, energy cluster development lost its political patronage.

The energy cluster promotion program failed, too, in terms of its economic and environmental impact, but still represented a political success based on the number of certificates issued. Here, the energy cluster program can be interpreted in terms of political entrepreneurship: through legislative measures, with symbolic financial outlays, it was possible to demonstrate that there were independent, ongoing processes as a result of a top-down policy aimed at moving Poland away from fossil-fuel-derived energy. That said, our research focuses, instead, on how the originators and coordinators of specific energy clusters found themselves in the space that the Polish legislature had created.

Methodology

Although the idea of energy clusters was not subsequently supported by investment in infrastructure, numerous resources were still allocated to research on energy clusters, deliberation processes, and expert opinions. Indeed, this article is one outcome of our sociological research project—KlastER—supported by government funding.[3]

Our research began in 2020 with a review of solutions in the field of distributed energy and smart grids worldwide, following which we analyzed the existing data on Polish energy clusters. We then conducted 20 in-depth interviews with stakeholders and experts. These interviews were semi-structured: an interview guide, containing 25 questions, had been scripted, but the order in which questions were posed changed (see Kvale, 2007) depending on the specific interview situation. Six interviews were conducted with experts in the field of RES (representatives of the government and non-governmental organizations); 14 interviews were conducted with representatives of energy clusters in Poland (generally representatives of the coordinator or cluster office).

The sampling was purposeful. From a previously prepared list of coordinators of all energy clusters in Poland, we selected persons willing to give an interview; their personal data has been anonymized. With the knowledge and consent of our interlocutors, all interviews took place in Poland, were carried out remotely (due to the COVID-19 pandemic), were recorded, and were transcribed for analysis.

Applying Kvale's (2007) distinction, we were interested in a meaning-oriented analysis (not a language-oriented one), and, therefore, did not use any specialized interview transcription system. Consequently, we coded the analyzed material. Gibbs (2007) lists two coding strategies—one based on theory, the other on data. The theoretical-based one relies on analyses via an established list of codes; the data-based one, also called open coding, relies on approaching data analysis without a predetermined list of codes, generating them as the analysis process proceeded. Neither of these approaches precludes the other; hence, we employed a mixed strategy in coding the interview transcripts. All these steps were implemented with the assistance of MAXQDA software.

The interviews were to assist in the identification of the prime barriers in the development of the Polish energy cluster program, leading to recommendations for improvement. We queried interviewees about the background of energy clusters (in general and with reference to the local cluster), the current state of affairs, and forecasted opportunities for development. We also asked directly about the most important barriers as perceived by our respondents. That same year, we conducted ethnographic research on selected energy clusters: a focus group interview with representatives of cluster participants, in-depth interviews with local activists, and on-site participant observation. Adopting the approach of multisited ethnography (Falzon, 2016), we planned for two-person teams to take short trips to three, geographically separated energy clusters: Czorsztyn, Tomaszów Mazowiecki, and Zgorzelec.

Interestingly, data from both the in-depth interviews and the ethnographic research revealed that most energy clusters exist only as legally-established institutions, essentially inactive in the field of local

energy sustainability. In some cases, a cluster was no more than an office space looked after by a single administrator—most often the person who had obtained a certificate, sometimes for even two or more clusters. Hence these Polish clusters existed only in a formal sense: they had no economic, environmental, or social impact. In other cases, however, there was a network of actors engaging in actual energy activities. Notwithstanding this more active form, interviewees here, too, tended to view the governmental program as something of institutional fiction.

For our fieldwork, we selected a few energy clusters that had been certified and were visibly active in the local community. Nevertheless, interviews with the creators of these selected clusters, and analysis of the brief cluster histories, did not yield a true overview of how distributed energy functions in Poland. These were, instead, instances of positive deviance (Herington and Van de Fliert, 2018; Pascale et al., 2010). A positive deviation is a situation in which an actor possessing resources similar to those of the general population, and operating within the same constraints, manages to obtain greater benefits than the rest. In addition, positive deviants manage to obtain above-average results through the intelligent use of limited resources. Their local strategies can usually be studied, have been proven effective, and have been replicated by other actors functioning under similar constraints.

In our research, various forms of entrepreneurship were crucial for at least limited success. Each of the three energy clusters at the center of our analysis excels in a specific type of entrepreneurship in which we were interested: the Czorsztyn cluster demonstrated a highly developed and resilient form of social entrepreneurship; the Tomaszów Mazowiecki cluster exemplified political entrepreneurship; and the Zgorzelec cluster manifested purely economic entrepreneurship. Since each cluster case stems from unique local circumstances, a more detailed background for each follows.

Energy clusters in Poland—three case studies

The analysis here will focus on the relationship between types of entrepreneurship, capital, and the state of the field as illustrated by three case studies of specific, locally embedded energy clusters. Our analysis aims to indicate how, in a given set of local conditions, the creation of such a cluster influences the entrepreneurial actions taken by dominant actors, the relations formed with other actors, and the limitations arising in the evolutionary development of the distributed energy field.

Czorsztyn

The first energy cluster presented here is nestled in the highlands of the Carpathian Mountains in southern Poland. Bordering with Slovakia, the region is highly attractive for tourism. That taken into account, mountain rivers, particularly the Dunajec, are not only picturesque, but, from time to time, dangerous for local residents. Plans to regulate this river to prevent sporadic floods materialized in the 1970s, under the communist regime. The process of building a dam, hydroelectric plant, and reservoir took more than a quarter of a century. The project was technologically challenging and socially controversial: among other things, it required relocating two villages known for their rich architectural value. The monoparty government negotiated with local people, but civil society voices were generally not tolerated during communist times. Protests, organized by young ecological activists, came to the fore in the early 1990s, after Poland's political transformation. However, the objections arrived too late to change anything, and, more significantly, were organized by outsiders. Due to the hardship of everyday existence in the mountains, the autochthonous inhabitants of this region had developed a particular mentality: they are resourceful, staunchly loyal to their own, and distrustful of strangers. This combination of factors creates an idiosyncratic *local context* for the functioning of this cluster.

Construction of the physical infrastructure was completed in 1997 and the premises fell under the sole proprietorship of the state treasury. Shortly after opening, the hydroelectric complex proved its usefulness: it successfully protected the region from a 100-year flood. That fact has strongly anchored social support for the entire enterprise. The conglomerate invested in a distribution network, a smart grid system of measurements, the photovoltaic production of

energy, and many regional activities associated with green energy. In addition, the hydropower plant led to the establishment of the Academy of Young Power Engineers; over the past 2 years over 200 children and adolescents from the nearby vicinity have been educated in the field of energy production.

Regionally, the plant became the *dominant actor* in the local green energy field—an incumbent in SAF terminology. The plant was effectively connecting human and nonhuman actors. It stands as an example of how political decision-making on a centralized, national level (political entrepreneurship) can be transformed into economic and social entrepreneurship at the local level.

The company with all its infrastructure (technological capital) is located partly on the territory of three communes, hence local governments—and especially ecological advisors employed by these communes—have become natural partners in the developing of social entrepreneurship and the building of social capital. But the network of business activity (developing economic capital) has also been inclusive of local entrepreneurs and other recipients of the energy produced by the power plant which currently has 172 institutional and individual clients. Together, this makes for quite a dense network of challengers (again, in SAF nomenclature) in a stably functioning field. It seems that these good *relations* at the regional level—alongside already-established cooperation with other entities such as local governments, businesses, and activists—have become a sound basis for establishing an energy cluster.

When the Ministry of Energy announced its first competition for a certified energy cluster, actors associated with the Czorstyn plant decided to take part, winning the bid and becoming the first certified energy cluster in Poland (2018). The following projects were included in the cluster development strategy presented to the national government: construction of new RES (10 projects—8 MW in hydropower, 4.5 MW in photovoltaics); execution of heating, energy efficiency, and antismog measures (10 projects, including, in the 2017/2018 season, air purity measurements taken in fifteen locations); e-mobility (4 projects, including a car and electric bike rental facility located at the tourist promenade at the top of the dam); and activities promoting energy clusters themselves (3 projects). The implementation of these and subsequent development projects was associated with the possibility of obtaining external financing. That expectation, however, was never fulfilled. Unsurprisingly, this lack of financial support and the lack of mechanisms to support local economic and social entrepreneurship have become significant *limitations* in cluster development.

Without financial backing the field already created was affected negatively. Earlier methods of cooperation and communication between field actors were inserted into a flawed institutional framework. Local entrepreneurs wasted time and energy on new endeavors that neither brought desired outcomes, nor developed previous initiatives. Nevertheless, capital continues to be concentrated around local resources: both the reservoir and its energy infrastructure continue to be important for the adjacent communes and the cluster. This is the case despite the absence of external impulses (legislative and/or financial) and despite available resources functioning under unfavorable circumstances. The actors of *social and economic local entrepreneurship* have been able to reconstruct a green energy field while taking into account this "existing-nonexistent" cluster entity. Last, but not least, the experience gained during the establishment of this energy cluster and the relations formed between actors during their attempts at real implementation have contributed to an increased resilience across the entire local field.[4]

Tomaszów Mazowiecki

Tomaszów Mazowiecki is a city of approximately 60,000 inhabitants, located in central Poland, but in a more rural area of the Łodź Voivodeship. In the context of our research, it is distinguished by its urbanity, though meeting the official conditions of a peripheral center. The surrounding area constitutes an extremely attractive (both historically and naturally) region for tourism.

Tomaszów also functions as a key sports hub, especially due to its Ice Arena. This facility, belonging to the municipal district and operated by a dedicated association, was built in 2016–2017 on almost two hectares, and was intended as a strategic investment for the city. Although concentrated on ice

skating, it is a multifunctional facility, used by both professional and amateur athletes for training and competitions as well as local residents for recreational sports activities. As would be expected, cooling and maintaining the indoor ice requires constant and considerable energy expenditures. From conversations with our guide, as well as from an earlier focus group interview, it is clear that Ice Arena Tomaszów Mazowiecki is a showcase for the city. Therefore, if the cluster began operating, this facility would be a considerable and important consumer of the energy generated by it. The local government is a vital investor and organizer of economic life in this city: this comprises the *local context* of this case study.

The energy cluster in Tomaszów Mazowiecki was established in 2018. Its core partners are the municipal commune along with crucial municipal utilities (e.g. the water and sewage company, the heating plant, etc.), and the sports association which is the formal operator of the Ice Arena. Neighboring communes of the city are also partners in the cluster which was awarded a certificate of distinction from the Ministry of Energy in 2018. Activities undertaken in the initial organization of the cluster took place at a time when the city's mayor was previously a member of parliament aligned with the national ruling party. Thus, the local authorities have been the *dominant actor* in many local fields, including the cluster. The Tomaszów Mazowiecki energy cluster is deeply rooted in the existing local structures of political and interpersonal connections. This cluster is a typical local government initiative which is why we believe that dominant in this case is *political entrepreneurship*. Trust, based on a long history of effective cooperation in various fields, is the social glue that integrates individual actors here. The authorities of the city and of the rural communes belonging to the Tomaszów Mazowiecki district have been strongly involved in the cluster from the very beginning, using a well-developed network of connections within strategic municipal companies and the neighboring communes. The social capital thus accumulated—according to people involved in the cluster and participating in the focus group interview—is an important resource facilitating entrepreneurial actions. Participants in our study strongly emphasized the role of trust, both in the creation of the cluster and in maintaining its structures (legislative capital)—despite the lack of concrete results.

In the context of this cluster's developmental *limitations*, one should also mention the (crucial in this context) unsuccessful attempts to enter the field of local energy. The Tomaszów Mazowiecki energy cluster can be understood in the context of categories developed by Fligstein, that is, in terms of a rival (challenger) trying to develop its own niche. Our interlocutors repetitively mentioned skirmishes with the existing dominant actor (incumbent) within the energy field: PGE, one of four strategic energy companies in Poland (the others being Enea, Tauron, and Energa). When talking about the future of their cluster, some participants in our study did not see the blockage of cluster development inherent in the distribution of funds, but rather in the mind-set of a monopolist: PGE constantly tries to impede various cluster investments or the gaining of autonomy from its distribution networks. This opinion was confirmed in interviews with both local officials and RES producers (windmills and photovoltaics).

As a consequence, despite the social and political capital of local politicians and businesspeople associated with them, it was not possible to create a full-fledged microgrid here. Nevertheless, the existing network of politicians and business people managed to use the new regulations and certification program to optimize the functioning of public utilities. Changes took place only in the organizational sphere—none were in the technical or social sphere, as local residents were not included in the network. While the new assemblage could be presented as a political success, the microgrid is incomplete: the grid lacks crucial technological resources and is disconnected from the inhabitants, in both a symbolic and technical sense. This cluster, without new technical resources and social and economic entrepreneurs, cannot have a significant economic or environmental impact. Tomaszów Mazowiecki actors have, so far, failed to effectively transform the field of local energy. Activated is a stream of local, political barriers in the form of entrenched inertia shaped by political actors at the national level, and by resistance from the existing dominant actor in the field of local (and national) energy, PGE. Due to

these problems, no effort has been made to impose one's own cultural framework, considered by Fligstein to be an effective strategy for establishing new niches within the energy field. On the one hand, the establishment of a network of different municipal actors is still an accomplishment, but, on the other, a local field of energy has not emerged.

Zgorzelec

The ZKlaster is located in Zgorzelec, a city lying on the Polish-German border, but also situated not far from the Polish-Czech border. This cluster operates in the neighborhood of the Turów coal mine and power plant complex, a component of PGE. The power plant itself is an important incumbent in the Polish field of energy, responsible for the annual production of (by some estimates) 8 percent of Poland's energy demand. In 2021, the Czech Republic sued Poland at the European Court of Justice (ECJ) due to the environmental damage caused by open pit mining, directly affecting Czech (and other) communities in the greater region. In 2021, the ECJ ordered mining to be stopped at Turów, but Poland did not comply with the decision, incurring daily financial penalties (ultimately withheld from budget funds by the European Commission). This conflict weakened Turów considerably in the energy field, particularly at the regional level. The location of a dominant actor of the Polish energy field in the immediate vicinity of this part of Lower Silesia created a unique *local context* for challengers in the SAF sense: as a consequence of all the controversy, a niche had opened up for such local actors.

The beginning of cluster creation centered on Turów dates back to 2015, when its initiators (the business community) came up with the idea of creating a solar farm, the implementation of which began in mid-2016. This constitutes a manifestation of pure *economic entrepreneurship*. The formal establishment of the ZKlaster took place in March 2017, and, in the following year, it received a certificate of distinction from the Ministry of Energy. The operating area of the ZKlaster is within the administrative boundaries of five neighboring communes and thus involves its local governments. Currently, the Zgorzelec energy cluster is an *ecosystem* of well over a hundred entities: aside from the local governments, it encompasses several universities, enterprises producing energy from renewable sources (which, in accord with Bourdieu, yields financial capital), and startups engaged in the development of increased energy efficiency. Among the entities operating under the auspices of Zklaster are the Silesian University of Technology, the Wrocław University of Science and Technology, and the cluster's own innovation hub (scientific capital). The Innovation AG hub has created, among other products, the first electric Sokół 4x4 off-road vehicle in Poland (basically an eco-conversion of the LandRover Defender 110).

What makes this energy cluster unique is its distribution company, Gepol, which has its own network and license for the distribution of electricity (technological capital). This is the first Polish distribution company operating within a recognized energy cluster. Based on private capital, Gepol was established by local entrepreneurs intensively involved in RES development in the cluster region. The company was established to distribute energy generated from RES (photovoltaic installations and wind farms). The advantage of ZKlaster over other clusters of this type is its scale, diversity, and hybridity; the energy it generates draws on several different sources (e.g. solar farms, wind turbines, etc.). This energy cluster's activities are concentrated on the creation of further RES based on the current business model. The long-term goal of the cluster is to gradually replace the energy produced by the Turów plant (especially in the local context).

That said—despite the extensive network of entities involved and the scale of its operation—the ZKlaster does not plan to engage with individual households. This creates *limitations* on the full development of the local energy field. The ZKlaster will still invest funds in educational activities popularizing renewable energy, but it does not plan to invite citizens into its network. The sociotechnical network established here consists of many well-coordinated elements and is an example of well-functioning *relations* among network actors. There are, however, very few links to the public sector in this network, and no substantial links to local

citizens at all. There are also no activities in the field of social entrepreneurship, and political entrepreneurship plays a secondary role. Due to the fact that households are not connected, the energy is not fully distributed. In other words, this is not a mature, full-fledged microgrid. Due to its business success, this cluster was treated as a model by many of our interviewees, yet it is incomplete from the perspective of the local field of energy and energy transition.

Discussion

Let us start with a general overview of the energy cluster initiative. According to our respondents, the project to promote and certify energy clusters has not met its official goals. Further certification competitions will probably not be announced, and people connected to the already-established clusters do not believe the program will benefit them in any way. The project can, thus, be seen as a failed institution due to the lack of clear mechanisms animating energy transition, real organizational support, and allocated funding. For years, oversight institutions have illustrated the state's inability to effectively remove barriers to energy transition (*Bariery rozwoju odnawialnych źródeł energii*, 2020). However, energy clusters can also be viewed as a manifestation of political entrepreneurship at the government level. Therefore, this appears to be a pro-environmental change with no real investments, an action which, in Polish sociology, is referred to as an "apparent action" (Lutyński, 1990).

Local transmission grids are necessary for the development of distributed energy. Many established operators, however, have been able to block the development of microgrids in various ways, such as by refusing to permit usage of elements of their networks or hindering land purchases. Moreover, cluster initiatives require control and regulatory support from the government—something pointed out not only by our interlocutors, but also by numerous experts and project consultants. Yet, the government did not provide such support. Some respondents were convinced that energy clusters exist solely in presentations and reports that the ministry has commissioned. The respondents listed the many barriers: no promised cluster tariff was introduced, no support mechanisms are available, the legal nature of energy clusters is vague, no resources are made available for the establishment of the necessary physical infrastructure for microgrids, and no legal solutions exist which would enable the use of existing grids for local energy distribution and consumption.

Only a handful of certified energy clusters have gained benefits and generated value. Still, even in these cases, results did not meet the expectations of their founders. As a result, most of the energy clusters—including those highly rated in the certification process—have suspended their activity. According to our interviewees, only a few energy clusters have been successful; most function as "apparent actions." Those clusters which have been able to demonstrate that they have an impact on the local energy market and environment have most often achieved this without the aid of the governmental program.

We have presented two cases of energy clusters with significant impact and one with considerable potential. In the case of both Zgorzelec and Czorsztyn, physical microgrids have been established. Still, while a local energy network constitutes key technical capital, it does take more than just financial resources to develop it. Looking at these two energy clusters, it is evident that strong local assemblages of technical infrastructure were created, and economic or social actions were set in motion. The field model we employed enabled in-depth analysis of the energy sector in Poland, bringing to the fore the lower-order fields embedded in higher-order fields. All three of the energy clusters presented herein constitute examples of how local energy fields are formed. However, at the macro-analysis level, these clusters become challengers vis-à-vis the four largest energy concerns in Poland occupying the position of incumbents.

Let us focus now on the case studies and the entrepreneurial efforts that have shaped each field. In all three cases, the role of entrepreneurial actions is key. In each case, completely different opportunities were identified and acknowledged. The three energy clusters differ much in terms of the technological and business solutions that have been explored. Noticeable, however, is the ability to turn something that is a burden into a resource. Artificial

water reservoirs can be a source of local conflicts, generating many negative environmental and social externalities. Yet, the example of Czorsztyn shows how a reservoir was translated into a beneficial resource, not a troublesome inheritance from the People's Republic of Poland. In turn, the Ice Arena in Tomaszów Mazowiecki is a typical urban "white elephant" (Robinson and Torvik, 2005) and attempts have been made to limit the losses it generates. Taken together, the three case studies show that entrepreneurship is not only important at the beginning, when the field is emerging; it is also necessary at various subsequent stages, such as scaling or reacting to an invasive attempt from another field.

Our three case studies show that impulses to change the field can be very different: an attempt at optimization, the utilization of a potential investment opportunity, the tapping of existing social support, and actively seeking development opportunities. This shows that various types of entrepreneurship can act as initiators and may be dominant in the process of energy transition.

Nevertheless, the experience of the three clusters shows that, when dealing with a transition toward distributed, community-embedded energy systems, no single form of entrepreneurship will create a field on its own. With reference to Zgorzelec, economic entrepreneurial actions were dominant, supported by political entrepreneurship—and yet this cluster is unable to reach households and community representatives. This makes the entire initiative not only organizationally fragile, but hinders achievement of a certain level of technological optimization which would require taking into account the perspective, interests, and practices of the local residents. In Tomaszów Mazowiecki, the leading form was political entrepreneurial action. Alliances have been created here that stabilize conditions for the development of local energy infrastructure. However, political entrepreneurs specialize in translating interests and creating visions, and can stabilize the rules of the game: they neither provide technological solutions, nor are they adept at participatory activities. They are advocates of interests, not facilitators of social processes. Regarding Czorsztyn, the long-term functioning of the water power plant and cooperation with the community created a foundation for the very strong networking of social entrepreneurial actions based on economic entrepreneurship. The involvement of local authorities in these activities also adds a component of political entrepreneurial activities. Combined with technological and social capital, this field is the most fully developed of the three analyzed. This provides the field with the capability of responding resiliently to emerging crises.

Generalizing, the domain of economic entrepreneurship involves seeking ways to generate profit; hence, the cost-effectiveness of distributed energy is important. Economic entrepreneurs, however, struggle to reach the citizenry; they may also struggle with creating sustainable solutions. A given microgrid or photovoltaic power station may be money-making in a given location, but energy transition requires looking for general and scalable solutions, not necessarily those that will bring the greatest tangible benefits. On the one hand, different actors from different levels of the social structure should participate in the energy transition process. On the other hand, political entrepreneurs struggle to take decisive action when numerous resources and risks are involved. Such actions can involve confronting operators and investing in microgrids. The domain of political entrepreneurs operates on symbols and social relations. However, these still matter, if only because of the need to connect public utility buildings to the local network, creating imaginaries (Engels and Münch, 2015) and increasing the level of society's trust in technology. The activity of social entrepreneurs is directed at the local community. Using local resources and capital, they create social networks that support the resolution of specific local problems or foster local development strategies. Actions of this type are conducive to the building of social coherence and resilience in the face of external crises (see footnote 4).

Conclusion

Economic sociology has provided us with apt tools for the comprehensive analysis of the transition process in Poland's energy sector. We were able to identify and present significant relationships found in the formation of local fields at the meso-social level, allowing us to draw the following conclusions. First,

for the emergence and development of a local energy field, it is necessary for various types of entrepreneurial actions to coexist. Second, any activity in the energy sector requires the existence of technical infrastructure, as this is the basis for creating local assemblages. Third, developing local fields requires higher-level legislative and financial support. Instead of (or together with) the certification process, state policies should be directed at supporting the development of local fields and ensuring the dissemination of knowledge and good practices. Even under the same initial (which cannot be assumed) and organizational conditions, the processes of local embeddedness lead to the emergence of various field models. This local diversity is the added value of such a method of transition and influences the stability of development processes.

It is worth noting that economic sociology provides, too, a different understanding of the field than that assumed in the SAF. A focus on the processes of embedding and assembling yields analytical possibilities that neither SAF nor the concept of socio-technical transitions offer. Both of these concepts impose a very rigorous framework of interpretation, although—as our research shows—the fields emerge in idiosyncratic, eclectic, and often surprising ways. This is due to various entrepreneurial actions and unexpected opportunities.

The issue of a stable institutional framework provided by the state remains relevant. While entrepreneurs at the local level were able to generate added value, the activities of the ministry can be considered in terms of predatory entrepreneurship (Baumol, 1996; Coyne et al., 2010). Here, at low cost, without real expenditures on energy infrastructure, and without supporting clusters in their battle against incumbents, it was possible to create the impression that energy transformation is progressing in Poland. However, as we have pointed out, many certified initiatives do not actually function, and those that do have achieved success independently or counter to the energy cluster program.

It is worth emphasizing that the certification and the promise of financial support that was supposed to follow constitute a mechanism that stimulates, first of all, thinking in terms of economic opportunity-seeking, and then a search for political opportunities. When it comes to social entrepreneurship, a more attractive mechanism by which to endorse the development of distributed energy might be spaces in which experiences and innovations could be freely exchanged. If we focus on entrepreneurial activities as a key phenomenon, a much more effective institution would be regulatory sandboxes that allow one to build and experiment with various assemblages.

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Notes

1. Noteworthy, too, are theoretical attempts to combine Bourdieu's theory of the field with the perspective of actor–network theory (see Prior, 2008).
2. The energy clusters described in this article are of a unique nature, and are not clusters of entities developing energy technologies. Although similarities do exist between these and the energy clusters cultivated in other EU states that are employing RES in compliance with the RED (Renewable Energy Directive) II directive (Lowitzsch et al., 2020), the Polish and other EU institutional solutions are not identical.
3. The *Development of distributed energy in energy clusters (KlastER)* project was co-financed by the National Center for Research and Development under the auspices of the GOSPOSTRATEG program. The project partners included the AGH University of Science and Technology and the National Center for Nuclear Research; the partner on the government side was the Ministry of Energy, and, after its liquidation, the Climate and Environment Ministry and Ministry of Economic Development and Technology. We would like to thank all members of the KlastER project for their contribution to this research.

4. Only after our analyses were completed did we learn of a new idea in the field of political-economic entrepreneurship in relation to a hydroelectric power plant. The national government is considering the sale of this power plant to a large company partially controlled by the state. In fact, centralization is one of the prevailing state management policies, favored by the present government. The municipal council where the power plant is located has already passed resolutions against the sale; that commune is one of the actors in the cluster and the field. The local community, having internalized the plant, is also against the sale of "its" property. Likely observed in the near future will be a conflict between state and local political entrepreneurship within the same political camp. If this transaction were to take place, it would cause another crisis in the studied field, possibly leading to cluster collapse.

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