The role of citizen-based support and finance mechanisms for strengthening and managing energy transition[1]

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Abstract

Renewable and energy efficiency projects are usually developed in a local context. These projects need funds to be realized; however, public funds are often lacking. Crowdfunding and cooperatives structures, citizen-based support and finance tools could go a long way towards fostering energy transition and filling the financing gap for the local public administrations. Indeed, cooperative and crowdfunding models can help municipalities to work around procedural boundaries (debt ceiling, for example) and procurement barriers.

Moreover, social acceptability must be taken into consideration. Crowdfunding and cooperative models are based on involving communities of people in the process of innovation, thus making the renewable and energy efficiency projects familiar and more easily acceptable for the communities.

By analysing the platform 'Citizenergy', the first European platform that provides information on sustainable energy projects, this paper aims to evaluate the diffusion of this phenomenon across European countries, and to compare the two different solutions (i.e., crowdfunding platforms and cooperatives). The analysis aims to underline the principal features of the renewable and energy efficiency projects posted on the platform and to point out emerging trends.

Keywords

Crowdfunding platform, cooperative business model, clean energy sector, community engagement, Citizenergy

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1. The clean energy sector: financing problems and the need for citizens' engagement

To achieve ambitious climate change targets, significant investments are needed in the energy sector in the next decade. According to Cañete (2017), "The order of magnitude […] is estimated at some 379 billion EURO worth of investment every year from 2021 until 2030 […] That is 177 billion EURO more than expected under a status quo scenario".

In particular, the field of renewable energies (RE) is even more important. The RE field includes energies produced through wind, solar, hydro, biomass and geothermal, and, subsequently, the supply of electricity. Moreover, it includes everything related to energy efficiency: that is, the way to reduce energy consumption. The majority of these investments will have to be made by local actors—private (e.g. households) but mainly public (e.g. municipalities and local administrations).

The territory is a crucial element for fulfilling these type of investments, and there are two ways they must be considered: geographical and administrative territories (or public bodies) (Tyl & Lizzaralde, 2017). Geographical territories can be defined as a community of stakeholders that use and manage a geographical area. Renewable energy is inevitably decentralized, which allows regionalized energy production and the participation of consumers as "prosumers"—people who themselves produce the energy they consume.

If sustainable production of clean energy can be guaranteed above all by a model based on the direct participation of the energy users in energy production, the role of the citizens and end-users in the financing process of the clean energy sector is also fundamental. The cooperative model and the crowdfunding model are two ways of engaging citizens/end-users.

What seems to emerge is the birth of different types of citizen groups that organize and operate through a cooperative model (Huybrechts & Mertens, 2014). Applying this business to the RE field is quite new and differs from the traditional model, as it adopts a multiple stakeholder system. More importantly, these cooperative models have a "stronger orientation towards general interest goals (beyond traditional mutual interest at the basis of most cooperatives)" (Huybrechts & Mertens, 2014, p. 195). Crowdfunding is an innovative and alternative way of financing RE investment. More detailed analysis is needed on the role played by crowdfunding platforms for helping energy transition.

By analysing the platform "Citizenergy", the first European platform that provides information on sustainable energy projects, the paper aims to evaluate the diffusion of this phenomenon across European countries, and to compare the two different solutions (i.e. cooperative and crowdfunding platforms). The analysis aims to underline the principal features of the renewable and energy efficiency projects posted on the platform and to point out emerging trends.

2. The state-of-the-art on crowdfunding platforms and cooperatives for RE projects

2.1 The role of finance in affecting energy transition: some open questions

Mobilizing funds, both private and public, for investments in renewable and energy efficiency projects is a key challenge for managing energy transition. Indeed, a gap persists between the total amount of funds already invested and the total amount of funds required for the transition (OECD, 2017). In the early 2000s, public funds were the most important source of funding for the RE market; however, in later years, private investments became increasingly important for this type of project. On one hand, there is an increasing reliability

on technology and correlated costs are declining, and on the other hand, public policy has created new market opportunities (Wustenhagen & Menichetti, 2012).

Financial barriers, as well as economic and institutional ones, represent factors that are slowing down the clean technology transition (Polzin, 2017). What makes RE investments unattractive is mainly higher uncertainty and capital intensity. Indeed, in the short term, critical elements that make investing in RE unattractive include profitability thinking and liquidity risk (Tyl & Lizzaralde, 2017; Campiglio, 2016). Moreover, during the recent financial crisis, the financial system prioritized the investments according to size and secure assets over investments in more innovative sectors, which slowed down RE investments (Polzin et al., 2017).

The entire innovation chain for the renewable energies sources (RES) (from R&D, to deployment and commercialization) requires different types of private finance instruments and structures and different types of investors (Polzin, 2017). Certain types of investors are more likely than others to finance high-risk and capital-intensive projects. Consequently, it is important to underline that the features of different financial actors and different financial system structures might influence what is being financed (Mazzuccato & Semieniuk, 2018).

A heterogeneous set of actors composes the landscape of RE investments (Buchner et al., 2017), but more in-depth analysis is needed to understand their different roles. In particular, the role of finance (meaning who finances what) in RES is still not clear.

It seems to be easier to finance R&D investments, mainly through grants (public and corporate), while downstream high-risk and capital-intensive projects are more likely to be lacking in finance. Moreover, some types of technology might be over-financed, while others might be under-financed (Mazzuccato & Semieniuk, 2018).

Recent works have focused on the impact that different types of funders can have on the types of firms and technologies that are going to be financed (see, among others, Mazzuccato & Penna, 2016 and Foray et al., 2012). This topic needs more detailed analysis with specific reference to RES.

The amount of funds needed is only one key challenge to foster and manage energy transition. Another main challenge is the directionality of these funds, as it is widely recognized that a diversified set of technologies would be better in terms of the increased resilience of energy supply (Stirling, 2010). The role of finance influencing the directionality of innovation and the pattern of technological change and transition is under-researched (Mazzuccato & Semieniuk, 2018).

In addition to the question of how finance affects the directionality of innovation for the RES, other open issues include the type of relationship that might exist between private and public funds, and the role played by innovative and alternative ways of finance, such as crowdfunding. With reference to the former, it is interesting to analyse how the role of private and public funds can differ according to the type of investments needed and the phase in the innovation technology life cycle.

Regarding the latter issue, it is important to note that energy transition needs a huge amount of funds and is too big to be financed only through citizen-based tools. But there are two conditions that make these tools more coherent: the initial phase of R&D and the small-step logic adopted by Robust Action (Polzin et al., 2017). Crowdfunding could play a significant role at the beginning of a renewable and energy efficiency project's life cycle (Lam & Law, 2016).

The possible role played by citizens as investors in renewable and energy efficiency projects needs more in-depth analysis. Citizens can be involved in different ways in the RE

investing process: as private, individual investors; as investors in a community-owned project; or as investors in a local project led by a professional developer (Curtin et al., 2017). Further, the role played by crowdfunding platforms also needs more detailed analysis, with particular reference to the relationship between their business model and the successful conclusion of the funding rounds (Vasileiadou et al., 2016).

2.2 Some suggestions from the new cooperative models

Citizen-based support is necessary for strengthening and managing energy transition. To search for this support, focus can be placed on some specific finance mechanism, or the underlying business models at the basis of the organizations.

The "new type" of cooperative model (Huybrechts & Mertens, 2014) seems to be in line with what is needed for RE development. What characterizes these new cooperative models is the multi-stakeholder orientation, which can comprise, for example, producers, workers, consumers and partners (Münkner, 2004; Galera, 2004), and the fact that the aim of the cooperative is not only to gain the interest of the member, but some general interest that could be linked to ambitious international targets (Borzaga & Santuari, 2001).

One of the great strengths of the cooperative model is that it is possible to reduce the market relationship costs through assigning ownership to a particular stakeholder, such as the investor. On the other hand, one of the main weaknesses of the cooperatives is the limited access to capital and the linked feature of under-capitalization. Consequently, it is necessary to find new ways to gather new member-investors.

This objective could meet some barriers, as stakeholder knowledge of this business model is still limited. The cooperative model appears as "hybrid organization", existing between a for-profit business and the special world of social welfare organizations. The problem is that many potential investors avoid supporting those forms of business that they do not know sufficiently well (Dart, 2004; Billis, 2010; Battilana & Dorado, 2010). This problem is greater regarding the development of cooperative models in the field of RE. The energy produced by RE cooperatives is "weak although growing" (Huybrechts & Mertens, 2014, p. 201). The RE market seems to be dominated by large corporations, although the cooperative model offers some interesting advantages.

From an economic point of view, it is important to underline the value accrued to local member-citizens, rather than private shareholders. From an environmental point of view, there is an opportunity to educate more citizens to reduce energy consumption (beyond green energy production). From a social point of view, there is potential to overcome citizen resistance to RE projects in the neighbourhood, and for democratic decision-making involving concerned stakeholders.

Ultimately, the cooperative model could be seen as a necessary and useful organization, something that it is possible to call "bridging organizations" (Kampelmann et al., 2016), strengthening and managing energy transition.

3. The Citizenergy initiative and the sample of European projects: a multiple case studies research

This is a research paper based on a case study research strategy (Bonoma, 1985). In this case, the presented results are obtained through archival observation of an online database that presents multiple case studies. Further data, resources and literature have been considered to

obtain an empirical description of particular instances of the phenomenon studied in this research (Yin, 1994). The case study method has been chosen to illustrate the phenomenon and to inspire new ideas and motivate some research questions (Siggelkow, 2007).

The database that has been analysed is the platform Citizenergy, which defines itself as a sort of 'Tripadvisor' of the sustainable energy landscape for investors' choices. It is the first European website aimed at providing information on sustainable energy investing opportunities and to encourage cross-border investment in sustainable energy. These energy investing opportunities come from both cooperative and crowdfunding platforms.

Citizenergy aims at boosting effective citizen engagement and investment in RES, bringing together relevant citizen energy initiatives. Citizenergy's website advertises a list of renewable and energy efficiency projects searching for funds, the database on which this research is based.

On the whole database (54 projects), this research is focused only on the European renewable and energy efficiency projects that are searching for funds and advertised on the platform (47 projects).

These 47 projects were classified according to the following aspects: Country in which the project has been realized (or is going to be realized); Type of technology (solar, wind, hydro, energy efficiency, biomass and other, as residual class); Project's status (active, planning, and under construction); Type of promotor (cooperative and crowdfunding platform); Type of crowdfunding platform (equity, lending and reward); Amount of funds required; Amount of funds raised by crowd contributions; Language used to describe the projects to the investors; and Number of links to social networks available on the individual project's webpage.

Table 1 shows the sample composition. The projects are widespread throughout 13 countries, even if some countries seem to be more relevant than others. France is the more representative country in the dataset, with 14 projects out of 47. Other interesting cases are Portugal (7 projects), Spain (6 projects) and the UK (5 projects).

As far as Type of technology is concerned, Table 2 shows a clear prevalence of solar projects: 24 out of 47. Wind projects account for eight cases and biomass for only five. Of particular interest is that the energy efficiency projects are also a minority (seven projects). It is important to remember that there are two options for transitioning towards a low-carbon society: to increase the share of energy generated from renewable energy sources, and to increase overall efficiency in the energy sector (Polzin et al., 2015).

The choice of the crowdfunding platform (37 projects) overcomes the choice of the cooperative model (10 projects). France is an interesting case study because all 14 projects were funded by crowdfunding platforms. Instead, in the other more representative countries of the sample (Portugal, Spain and the UK), there is a co-presence of the two models, even if crowdfunding is prevalent. Regarding the types of crowdfunding models, Figure 1 shows a marked predominance of the lending model.

Equity and reward models are a minority. Finland's platform 'Invesdor', which defined itself as a pioneer of digital fundraising in the Nordics, is a unique case of an equity platform. The under-representation of projects backed through a reward crowdfunding platform is a remarkable fact. Indeed, in the energy sector, there should be an appropriate type of reward-based crowdfunding, in which the reward comes in the form of electricity supplied or a discount on the electricity price. Conversely and consistently, the role of the donation model seems to be absent in the renewable and energy efficiency sector.

Table 1: Main features of Citizenergy's European renewable and energy projects

Country - Type of technology	Promoter		*Subtotal (technology)*	Total (country)
	Cooperative	Crowdfunding platform		
Belgium				2
Efficiency	1		***1***	
Other		1	***1***	
Subtotal (promoter)	***1***	***1***		
Germany				3
Biomass		1	***1***	
Efficiency		2	***2***	
Subtotal (promoter)	***0***	***3***		
Spain				6
Efficiency		1	***1***	
Solar	1	3	***4***	
Wind	1		***1***	
Subtotal (promoter)	***2***	***4***		
France				14
Biomass		1	***1***	
Hydro		1	***1***	
Other		1	***1***	
Solar		7	***7***	
Wind		4	***4***	
Subtotal (promoter)	***0***	***14***		
Greece				2
Biomass	2		***2***	
Subtotal (promoter)	***2***	***0***		
Croatia				2
Efficiency		1	***1***	
Solar		1	***1***	
Subtotal (promoter)	***0***	***2***		
Hungary				1
Efficiency		1	***1***	
Subtotal (promoter)	***0***	***1***		
Italy				1
Solar	1		***1***	
Subtotal (promoter)	***1***	***0***		
Norway				2
Efficiency		1	***1***	
Wind		1	***1***	
Subtotal (promoter)	***0***	***2***		
Nederlands				1
Wind	1		***1***	
Subtotal (promoter)	***1***	***0***		
Portugal				7
Solar	2	5	***7***	
Subtotal (promoter)	***2***	***5***		
Sweden				1
Solar		1	***1***	
Subtotal (promoter)	***0***	***1***		
UK				5
Biomass		1	***1***	
Solar		3	***3***	
Wind	1		***1***	
Subtotal (promoter)	***1***	***4***		
Total	**10**	**37**		**47**

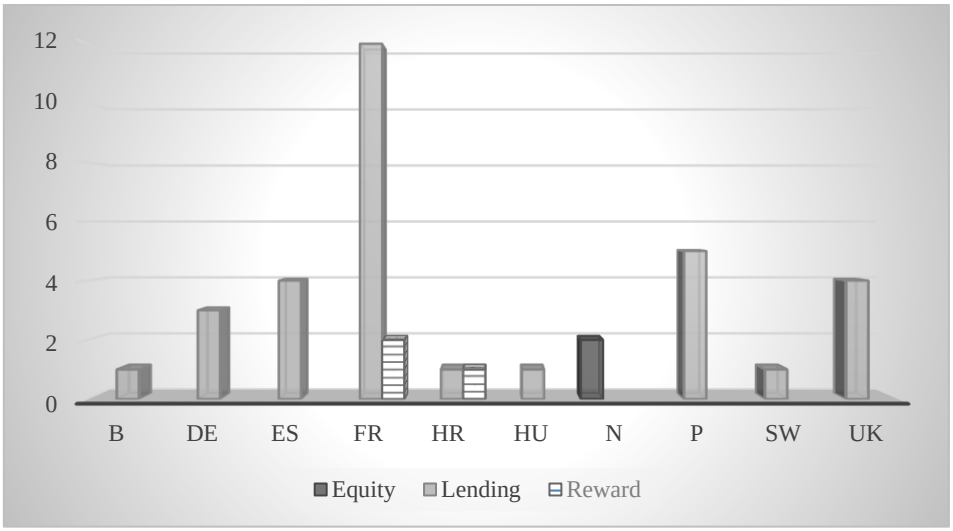
Source: own processing

Table 2: The distribution among the different types of technology

	Cooperative	**Crowdfunding platform**	***Total***
Solar	4	20	***24***
Wind	3	5	***8***
Efficiency	1	6	***7***
Biomass	2	3	***5***
Other		2	***2***
Hydro		1	***1***
Total	***10***	***37***	***47***

Source: Own processing

Figure 1: Citizenergy's projects and the type of crowdfunding model



Source: Own processing

4. The engagement of the community: some preliminary results from the sample

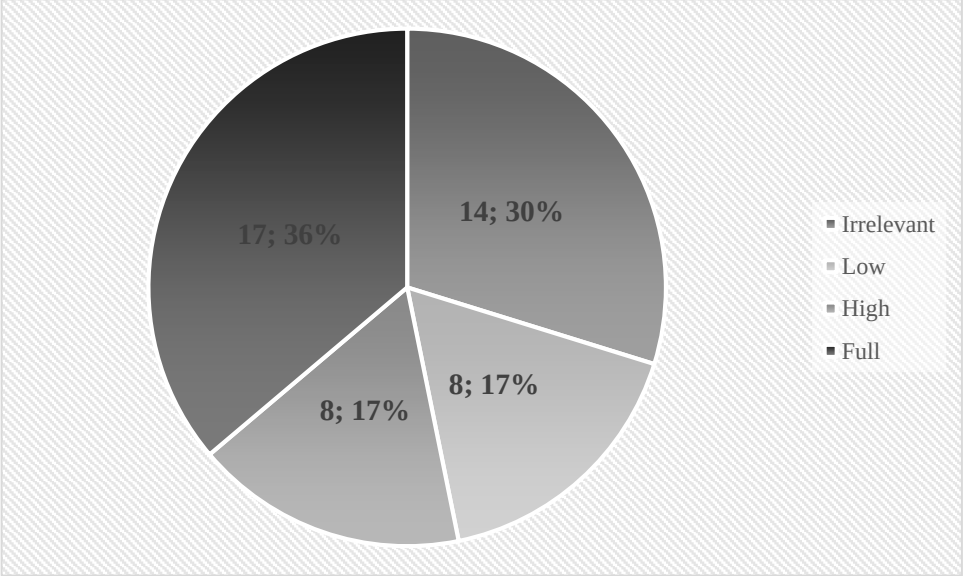
To underline the main features of Citizenergy's sample of renewable and energy efficiency projects, the analysis is first focused on the role of the crowd contributions in reaching the total amount of funds needed to realize the project. An index was required to evaluate the level of the crowd's contribution, defined as a ratio between the crowd's investment and the total amount of funds needed. If the ratio is equal to one, the project has been completely funded by the crowd. If the ratio is more than one, the crowd's contributions overcome the total amount of funds needed. However, what matters most is the analysis of the cases in which the crowd's contributions are at a lower rate than the total amount of funds needed. According to the level of this ratio, the projects were divided into four groups:

a) Irrelevant contribution (from 0 to 15 per cent);

b) Low contribution (from 16 to 49 per cent);
c) High contribution (from 50 to 99 per cent);
d) Full contribution (100 per cent and more).

As Figure 2 shows, 17 out of 47 projects were fully funded by the crowd. For 14 out of 47 projects, the crowd's contribution can be considered irrelevant. Only eight projects are respectively included in the Low and High contribution groups.

Figure 2: Role of crowd contribution

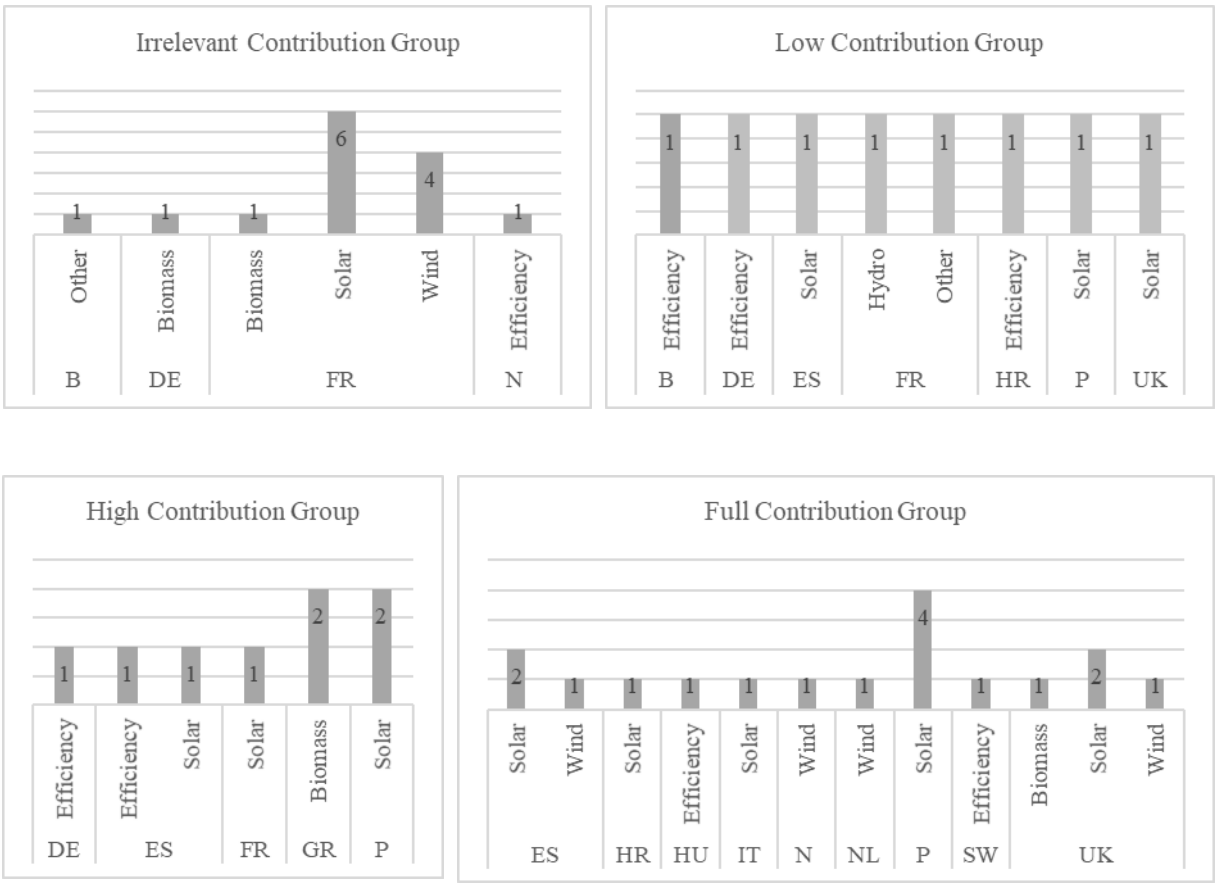


Source: Own processing

Within each group, the analysis takes into consideration the Country, Type of technology and Type of promoter in each project.

Figure 3 shows the composition of the different groups in terms of Country and Type of technology. Concerning the Irrelevant contribution group, Figure 3 shows that 11 of the 14 French projects are characterized by an irrelevant financial contribution from the community of people.

Figure 3: Composition of the different contribution groups (in term of Country and Type of technology)



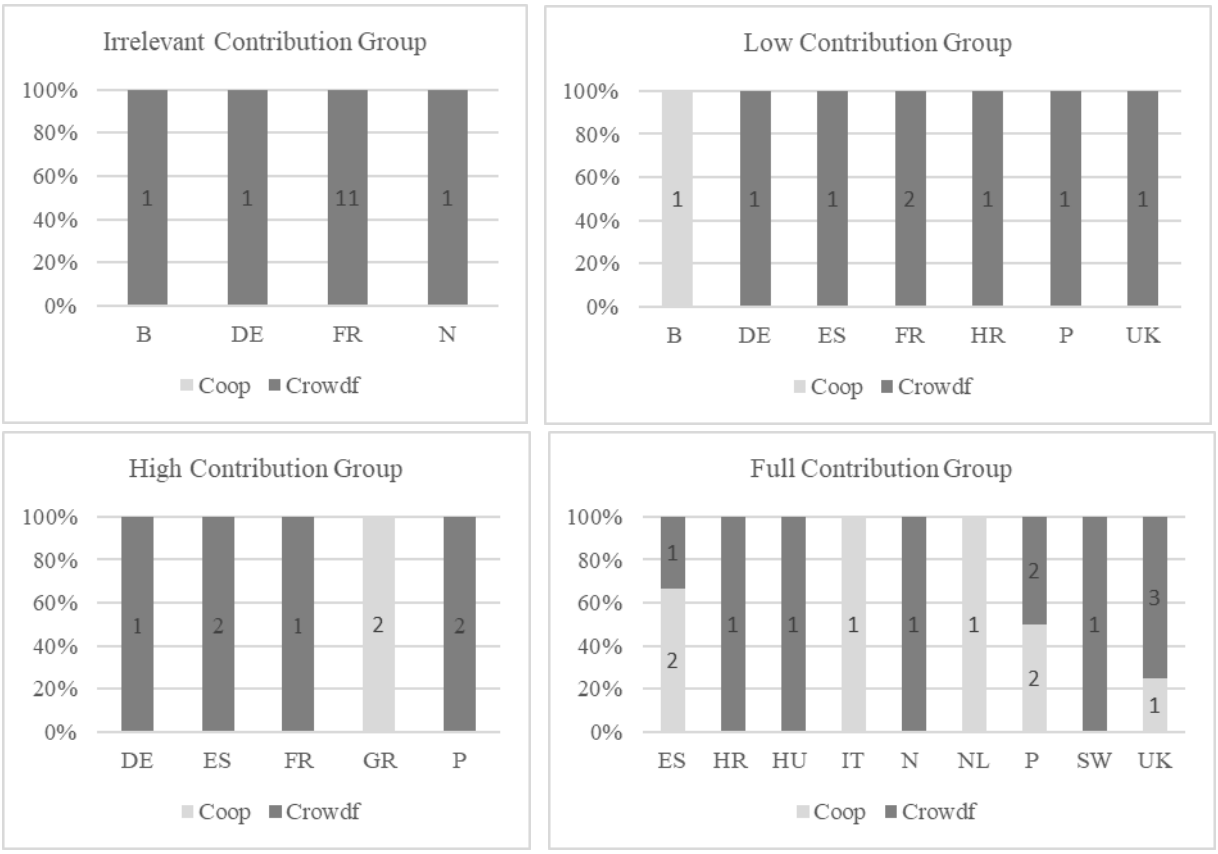
Source: Own processing

Figure 4 shows another interesting element: all the projects belonging to this Irrelevant contribution group were promoted by a crowdfunding platform. The overwhelming majority of these platforms are lending-based (12 out of 14). The other two projects are promoted by an equity and a reward platform. The project backed through an equity crowdfunding campaign is the only one that must be considered unsuccessfully closed because the equity-based model is an 'all or nothing' model.

Within the Low and High contribution groups, the cooperative model remains in the minority (one and two projects for the Low and High groups, respectively).

The cooperative model is more relevant in the Full contribution group (seven projects out of 10 promoted by cooperatives belong to this group). Moreover, 4 out of 5 UK projects belong to this group, even though the prevalent type of promoter is a crowdfunding platform.

Figure 4: Composition of the different contribution groups in terms of Type of promoter



Source: Own processing

The dimension of the crowd's contribution is another element that must be taken into consideration. In the Irrelevant contribution group, this amount ranges from a minimum of 5,000 euro to a maximum of 1,360,000 euro. In the Full contribution group, the same amount ranges from a minimum of 10,000 euro to a maximum of 5,000,000 euro. Projects that required huge amount of funds to be realized belong to both these groups. Consequently, the project's dimension seems not to be the decisive factor that influences the investors' decision to back the project.

To underline the main features of Citizenergy's sample of renewable and energy efficiency projects, consideration is given to the language used to describe the project, the use of social networks (numbers of links present on the individual project's webpage on Citizenergy's website) and their relationship to the Type of promoter.

The use of more than one language to describe the project is typical of the crowdfunding model. Instead, the cooperative model tends to favour the home country project's language to describe the project, even if investors from all over the world are accepted by half of the cooperatives. The crowdfunding platforms that use more than one language always accept investors from all over the world.

It is also interesting to note that the number of links to social networks is highest (three links) in all the cases in which the crowdfunding platforms use more than one language for the description.

5. Conclusion

The analysis aimed to underline the principal features of the renewable and energy efficiency projects posted on the platform Citizenergy and to point out emerging trends comparing the two different solutions of crowdfunding and cooperatives.

First, as supported by the literature referenced here, there is little development of the cooperative model to support RE investments. The data show that the use of the crowdfunding platform is more prevalent (37 projects) than the use of the cooperative model (10 models). What is interesting is that the projects promoted by cooperative models are the ones that most populate the Full contribution groups. It seems that the cooperative model guarantees success rates above the crowdfunding model (seven projects out of 10 promoted by cooperatives belong to this group). As stated by Huybrechts and Mertens (2014), the great advantage of the cooperative model from an economic point of view seems to be confirmed.

In contrast to what has been stated regarding the possible advantage of the cooperative model to educate more citizens to reduce energy consumption, this research shows very little attention to the energy efficiency projects by cooperative promoters. Only one of six projects are presented by cooperative promoters. This does not mean that the role of education is not gained by a cooperative model, but simply that the cooperative model does not attract this specific type of investment. The aim of education could indeed be reached through a different type of project (in terms of the type of financed technology).

Further interesting, strange and unexpected evidence that emerged through analysing the different types of crowdfunding models, is the predominance of the lending model and, above all, the under-representation of the reward model. Beyond what may be an interest in further investigation to understand the motivations, the under-developed though evidently appropriate reward model demonstrates that the crowdfunding model for the RE projects needs to be further developed.

Finally, the huge amount of funds needed to finance a RE project is one of the most discussed problems of the citizen-based tools. By comparing the two solutions (cooperative and crowdfunding), differences did not emerge, and the project's dimension seems not to be the decisive factor that influences the investors' decision to back the projects.

In general, the research underlines that the importance of the role of citizen-based support and finance mechanism for strengthening and managing energy transition is influenced by two main barriers: cultural problems, since the community operates on a short-term way of thinking and, hence, does not take into account environmental problems, and the lack of cooperation between different territorial stakeholders. These two barriers need to be further analysed.

This research represents only the first step of major research that could take into consideration more variables (aspects of classification) available on the platform Citizenergy. What could be most interesting is further developing the research with a qualitative analysis, for instance, through interviewing those responsible for the projects promoted on the platform.

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