



Pluralising the European energy landscape: Collective renewable energy prosumers and the EU's clean energy vision

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ARTICLE INFO

Keywords:

Renewable energy prosumer
Energy actor
Energy transition
Collective prosumer
Energy union

ABSTRACT

To fulfil the European Union's (EU) goal of providing 'Clean Energy for All Europeans', a transformative shift from centralised, fossil-fuel based systems to decentralised systems based on renewable energy sources (RES) is envisaged. Keen to lead the clean energy transition while embedding technological innovation and elements of justice and equitability into the envisioned 'Energy Union', EU Member States need their citizens on board as active participants. Prosumerism or self-consumption is an important part of this citizen involvement. While the new EU regulatory framework for energy now recognises civic-inspired prosumer initiatives such as energy communities, little is known about the full range and diversity of collective actors in renewable energy self-consumption as well as how they engage with the changing energy system. This paper presents an exploratory categorisation of the different collective social actors that produce and consume energy from renewable sources, referred to as 'collective RES prosumers', aiming to clarify their participation in the energy landscape. We find six categories with different engagement and needs, which we relate to the EU's current framing of collective energy actors. We recommend fine-tuning policies to the different actors to support a true-to-vision transposition of the recently completed Clean Energy Package (CEP).

1. Introduction

Renewable energy prosumerism is a fast expanding phenomenon. The European federation of renewable energy cooperatives, REScoop.eu,² has grown in less than a decade to a network of 1500 energy cooperatives—representing one million citizens (Huybrechts and Haugh, 2018). One recent estimate expects prosumer-generated energy in Europe to be able to cover 98–100% of electricity and heating needs by 2050 (Gährs et al., 2020, p. 9). Following Kotilainen and Saari (2018), we understand (energy) prosumerism to refer to the phenomenon of active energy citizens who are producing, self-consuming, or storing energy, and/or participating in energy markets by selling or sharing their energy, either individually or collectively, for example as part of an energy community.

The development of energy cooperatives and energy communities, as well as the rise of smaller and larger individual prosumers, are currently

no longer isolated phenomena of the more progressive countries in terms of the deployment of renewable energy sources (RES), such as Germany. Inspired by the political interest in renewable energy production and further facilitated by the drop in price of several RES technologies (Lavrijssen and Carrillo Parra, 2017) as well as their scalable and distributed characteristics (Szulecki, 2018), the trend is now diffusing across Europe (Bertam and Primova, 2018).

Recognising the potential of a prosumer-driven energy transition, European Union (EU) governments have given these new energy actors, whom they call self-consumers, a prominent role in their vision of an 'Energy Union': providing all EU consumers with secure, sustainable, competitive, and affordable energy (European Commission, 2019a). While this vision in part relies on the modernisation of EU economies through innovative clean energy technologies, 'smart' 'low energy' design and equally 'smart' management of energy systems and markets (European Commission, 2019a), it also includes embedding elements of

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² www.rescoop.eu.

<https://doi.org/10.1016/j.enpol.2021.112262>

Received 3 February 2020; Received in revised form 24 January 2021; Accepted 19 March 2021

Available online 10 April 2021

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justice and equitability such as fairness, inclusiveness, and job growth into the transition towards a low-carbon energy system (European Commission, 2019b). In espousing such strong values, the EU's vision is compatible with the concept of energy justice, defined by McCauley et al. (2013, p. 2) as aiming to 'provide all individuals, across all areas, with safe, affordable and sustainable energy.'

In reality, however, the rise of prosumerism has met with widely differing cultural, political-legal and geographic factors across European countries and consequently experienced very different growth rates (Horstink et al., 2020; Hewitt et al., 2019). While the match between developing RES technologies and a country's natural resource endowments will often determine prosumer success, unexpected barriers may arise from what Butenko (2016) has called a 'regulatory disconnection', where the existing regulatory framework of the country is no longer responsive to the market innovation.

Acknowledging that the energy transition is a complex, multi-stakeholder 'process of technology transfer, in which each technical step requires action or has organisational, economic, social, and cultural implications' (European Commission, 2011, p. 6), in 2016 the EU proceeded to perform an overhaul of its energy policy framework. This ambitious undertaking has resulted in the so-called Clean Energy Package (CEP), completed in 2019 and expected to be transposed to member states' legislation by end of June 2021. The CEP, among other goals, sets in place common regulatory pillars to support the self-consumption of renewable energy across Europe. It formally recognises several new energy actors, distinguishing them along two axes: individual vs collective actors, and those exclusively producing RES vs those producing non-RES or mixed energies. Included in these types are the 'active customer' and the 'renewables self-consumer', constituting the individual actors, while 'jointly acting final customers', 'jointly acting renewables self-consumers', 'renewable energy communities' (RECs), and 'citizen energy communities' (CECs) represent the collective forms of prosumerism.³

Research into the proliferation and simultaneous diversification of prosumers has prompted Hoppe et al. (2018) to speak of a new multi-actor complexity in the EU's energy sector. The growth of prosumerism has seen the emergence of new business/organisational models, among them peer-to-peer energy trading platforms, energy aggregators, ESCOs (energy service companies), and mobility service providers (Brown et al., 2019). For a number of collective forms of RES prosumerism, namely the growing group of RES community energy initiatives, as well as energy cooperatives, characteristics and motivations have been well-documented (Bauwens et al., 2016; Dóci, 2017; Hagggett et al., 2013; Hewitt et al., 2019; Smith et al., 2016; Walker and Devine-Wright, 2008). Civil society initiatives are found to be more motivated by social drivers (i.e., responding to societal challenges or local social needs, promoting the democratisation and decentralisation of energy, being part of a community) than by technological advances or policy incentives (Bauwens et al., 2016; Brummer, 2018; Hewitt et al., 2019; Hielscher et al., 2013; Howaldt et al., 2016). Additionally, researchers have linked civic forms of prosumerism to greater potential for the realisation of sustainability, justice, democratic quality, and the fair distribution of costs and benefits in the energy transition (Gregg et al., 2020; Hewitt et al., 2019; Hiteva and Sovacool, 2017; Hoppe and de Vries, 2018; Wierling et al., 2018). Other forms of collective initiatives, however, in particular public-private partnerships, regional agreements, energy aggregators, other RES facilitating and representative umbrella organisations, have so far had less attention, whether from researchers or policymakers.

The opening up of the energy market to new actors and actor

³ These definitions can be found, respectively, in the following EU Directives and articles: EU 2019/944 Art. 2(8), EU 2018/2001 Art. 2(14), EU 2019/944 Art. 2(8), EU 2018/2001 Art. 2(15), EU 2018/2001 Art. 2(16), and EU 2019/944 Art. 2(11).

configurations has undoubtedly pluralised the ways that citizens can partake in the energy system, beyond the position of the mere consumer. This paper zooms in on this pluralisation of actors and the new relations that they are forging in the energy system, and thus takes a social innovation perspective on energy (Wittmayer et al., 2020; Pel et al., 2020; Hoppe and de Vries, 2018; Hewitt et al., 2019). Such a perspective recognises that transitions cannot depend on the citizen energy actor alone and instead involve multi-actor interactions. However, how these interactions come about and develop, as well as change over time, is open to different interpretations as Fischer and Newig's (2016) review points out. For the present paper, we follow Fischer and Newig's assumption as well as that of Geels and Schot (2007), that actors employ multiple, dynamic, and sometimes contradictory forms of agency. We also assume that, as agents of social innovation, prosumers are potentially at the forefront of a more democratised and decentralised energy future by 'imagin[ing] new ways of creating and sharing value between the private and the public, and between users, consumers and citizens, and businesses' (Hiteva and Sovacool, 2017). By forging their own energy democracy, they are taking over roles previously fulfilled by the incumbent energy companies and thus challenging the status quo (Szulecki, 2018); while, through cooperating and self-organising, they are gaining greater ownership of energy production (van Veelen and van der Horst, 2018).

While Brown et al. (2020) and Campos et al. (2020) have provided, respectively, normative and regulatory dimensions for key collective forms of prosumers, no research to our knowledge has attempted to explore the full spectrum of actors in RES collective prosumerism. Therefore, the aims of this paper are twofold. Firstly, this paper seeks to provide insights into the multi-actor complexity of the current energy landscape by categorising collective forms of prosumerism according to 11 attributes. Secondly, it intends to unpack key differences among these actors and relate them to how the EU has framed energy actors in its energy policy framework. Taking into account the core values of the EU's clean energy vision, we then make recommendations on how policies can be more adjusted to the reality of collective RES prosumers, in order to facilitate a true-to-vision transposition of the CEP. Based on a grounded theory approach, we carried out a critical analysis of a broad range of collective prosumers in nine EU countries (the UK, Netherlands, Germany, Belgium, France, Italy, Croatia, Spain, and Portugal), using mixed methods including literature review, documentary analysis, criteria-guided database building and analysis, as well as content and discourse analysis, which we further validated with the results of a survey carried out in the same nine EU countries. Our multidisciplinary research is guided by the following research questions:

- Which categories of collective RES prosumers can be empirically differentiated in the EU's new energy landscape?
- How does this actor categorisation relate to the EU's operationalisation of prosumer actors and the realisation of the core values of the EU's clean energy vision?

In the present section, we have provided a backdrop for the development and interpretation of collective prosumerism in the EU, building on a documentary review as well as relevant insights from social sciences research into the energy system. In the following section, we present our methodology for creating a mutually exclusive categorisation of collective RES prosumers, focussing on key distinguishing attributes. In section 3 we submit the results of our iterative database analysis. The resulting model is then used in section 4 to discuss how our categories can inform EU energy policy-making, particularly the fine-tuning of policies to meet collective prosumer actor needs, while taking into account the strong values the CEP is meant to help uphold. Finally, in section 5, we succinctly answer our research questions and present the policy and research implications of our findings and discussion.

2. Methodology

Our exploratory categorisation of collective RES prosumers in the changing energy landscape was carried out using mixed methods that included documentary research, literature review, criteria-based database building, snowball data collection, as well as content and discourse analysis conducted on the data collected. In this way, we documented the diversity of RES prosumer initiatives across nine EU member countries (the UK, Netherlands, Germany, Belgium, France, Italy, Croatia, Spain, and Portugal). The results of this categorisation, drawing on data from close to 1700 different initiatives, were further validated by the results of an in-depth survey carried out among 198 prosumer initiatives in the above-mentioned countries. The survey results shed light on the following characteristics of collective RES prosumers: general demographics; RES technologies deployed; mode of governance/organisational structures; forms of financing; motivations/ambitions; and perceived hindering and facilitating factors—technological, regulatory, political, socio-cultural, financial (Horstink et al., 2019, 2020).

Considering the relatively recent but rapid growth of RES prosumers in the EU as well as a gap in knowledge about their different profiles and the boundaries that can be drawn between them, our manner of database building and actor typing was necessarily of an exploratory nature. To help capture a diversified sample of RES prosumer actors across the nine EU countries, two criteria-based databases were built, one for collective RES prosumer initiatives proper, i.e. initiatives *actually* producing and consuming renewable energy, and one for other 'RES prosumer stakeholders', that may influence RES prosumers in some way or other (for full definitions, see Horstink et al., 2019, pp. 24–25). Examples of the former include energy cooperatives; renewable energy communities; not-for-profit organisations (including socio-cultural or sports associations, home-owners associations, and NGO's); companies in different sectors; public institutions (whether municipalities or schools and retirement homes); public-private partnerships; and other energy partnerships or collectives. Examples of the latter consist of energy companies, commercial peer-to-peer energy platforms, aggregators of RES production (i.e. buying from prosumers, selling to customers), energy project developers, energy agencies, and public authorities at different governance levels.

For each initiative or stakeholder, data was collected for 11 attributes, complemented by demographic information (name of initiative, name of organisation running the initiative, website, contact person). Documentary research, benchmarking from similar projects looking into collective sustainable and/or social innovation initiatives, as well as a focus group session with energy researchers—from both technical as well as social sciences backgrounds—and energy policy consultants were used to validate the initial set of attributes. These were: a) date of founding; b) location and country of operation; c) type of organisation (legal form of ownership) and respective sector; d) scale of the initiative; e) stage of development; f) public vs private nature; g) for-profit vs not-for-profit nature; h) energy needs addressed; i) RES technologies used; j) beneficiaries; k) key mission.

Our data collection and analysis from beginning to end were guided by a grounded theory approach (Strauss and Corbin, 1994). The process of distilling actor categories from the database of 1700 actors involved multiple iterations of the following three steps: 1) collecting empirical data; 2) carrying out content and discourse analysis of the data; 3) categorising the different actors. A total of four iterations were applied with each iteration resulting in additional insights that could help refine the categories and match them with the distinguishing attributes of the diversity of collective prosumers. Doing so allowed for an inductive database analysis that was systematic, iterative, and attribute guided.

The database analysis resulted in a categorisation (presented in the next section), based on attributes with the strongest clustering potential. These categories were subsequently tested on a stratified sample of 236 actors (selecting for country, type of organisation, public vs private and profit vs not-for-profit nature, energy needs, and target audience). In a

final step of our research, the initial categories were confronted with the results of our survey among RES prosumer initiatives, which yielded additional information on the key attributes 'organisational form/legal form of ownership', 'beneficiaries', and 'key mission', as well as revealed a new key attribute: that of governance mode.

3. Results: A model for collective RES prosumer actor categorisation

Out of the 11 attributes used to profile the collective RES prosumers, three were found to be key, i.e., allowed for meaningful clustering: the profit vs not-for-profit nature of the initiative, their beneficiaries (e.g., members, general public, local community, other prosumers) and their self-stated mission (e.g., 'reducing the organisation's carbon footprint', 'achieve autonomy in energy production', 'sell clean electricity', 'promote RES-based energy transition'). The attribute 'type of organisation/legal form of ownership', although clearly important, led to contradictory categorisations, as we will discuss below. It was therefore not used for clustering but kept as an additional descriptor of the different actors and taken up in our subsequent analysis. Our database, and where necessary, documentary confirmation, provided us with 10 main legal forms of ownership. After correcting for country differences and clustering similar forms (several countries have more than one type of cooperative form), these were: cooperatives, commercial companies/businesses, public institutions (e.g., local authorities, public schools, public hospitals), private not-for-profit organisations (e.g. NGOs, associations, foundations), social enterprises, projects (i.e., a project run by an organisation as a separate initiative), partnerships between organisations and/or collectives, informal collectives or communities, public-private-partnerships, other forms of ownership.

In Table 1 below our first characterisation of collective RES prosumer actors is presented, encompassing the full range of stakeholders analysed.

This first round of clustering allowed us to make a number of observations. Firstly, to adequately describe the emerging prosumer landscape, it is important to distinguish between what we have called '*actually* prosuming' prosumer actors and the plethora of organisations, collectives and projects that are not themselves prosuming but assume an important role, by influencing or supporting RES prosumers. The first group can be further divided between those prosuming as a secondary activity and those prosuming as their *raison d'être*. The second group we have broadly called RES prosumer stakeholders, and we find them to either facilitate the work of prosumers or the phenomenon of prosumerism in some way or other, or wishing to influence, condition, and/or benefit from, prosumers and prosumerism.

Secondly, a distinction should be made between those actors profiting from RES prosumerism (RES energy utilities, project developers, financiers, ESCOs), those for which the primary goals are societal and/or environmental rather than commercial (energy communities, most energy cooperatives, RES supporting organisations), and those that have a more political agenda, potentially conditioning or even hindering the development of RES prosumerism (e.g. energy agencies, energy lobby groups, regional agreements). This observation led us to look at the focus of the different energy actors: inward- (benefiting self), outward- (benefiting others, a group, a community), or process-focused (benefiting an agenda or benefiting from the process of prosumerism).

Thirdly, a disparity was observed between the legal form of ownership adopted by the organisation or collective as an energy actor and their self-stated mission in RES prosumerism. The fact that an initiative had opted, for example, to create a company rather than a more cooperative legal form, was independent of their self-stated mission (Horstink et al., 2019, pp. 67–75). Conversely, the fact that an initiative had opted for a more cooperative legal form of ownership did not necessarily correlate with a more civic mission. This mismatch has also been noted by Gregg et al. (2020, p. 651), who provide some possible explanations for this occurrence. They propose that the initiative's goals, issues of tax

Table 1
Early categorisation of RES prosumer actors. Adapted from Horstink et al. (2019).

Broad collective RES prosumer actor category	Description of the RES prosumer actor
1. Energy cooperatives	Energy cooperatives come in many shapes and forms, they may spring from a community or region—set up by locals or local associations and/or authorities—they may be formed by a group of companies aiming to prosume, or they may have stemmed from an active consumer initiative. There are also cooperatives of cooperatives and/or utilities. This is therefore in itself a broad category that has been extensively studied (e.g. Bauwens et al., 2020). Some energy cooperatives will behave more as energy utilities (in some cases because they are obliged to do so by law), while some business projects with an exclusive profit objective may opt for the cooperative form to circumvent certain legal or policy hurdles. Thus, energy cooperatives can be different prosumer actors according to their key mission.
2. Energy communities	Renewable energy communities exist in two main forms: the first type is made up of those that have a clear local perspective, following the EU definition, which demands that these (necessarily legal entities) are effectively controlled by shareholders or members who are located in the proximity of the renewable energy projects, which in turn are owned and developed by that legal entity. They may be run by a cooperative, an association, a municipality, other public authorities, or through partnerships between different entities, including companies. Their motivations are primarily to 'provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits' (RED II Directive ^a). The second type is made up of those that do not fulfil the RED II stipulation that the community be a legal entity. These may be informal collectives or partnerships with a clear local perspective and similar ambitions as mentioned above.
3. Organisational prosumers	<i>Organisational prosumers are a borderline collective case, since in many instances they may take on the role of a big household, consuming mostly for their own benefit, bringing them closer to the objectives of individual prosumers. Four main forms were found:</i> a) Public sector prosumers: schools, universities, retirement homes, hospitals, institutes of public authorities, etc. b) Not-for-profit sector prosumers: foundations, NGO's, and associations (e.g. sports or cultural associations). c) Business sector prosumers: companies in industry, services, or agriculture, examples of which are paper companies, farms, factories, large shops. d) Property sector prosumers: a hybrid case of organisational RES prosumers, these can be social real estate projects, homeowner or tenant associations, municipal real estate energy schemes, or district heating projects.
4. RES prosumer facilitators	These actors are stakeholders facilitating the work of prosumers proper. Examples of these initiatives are municipal, regional, or NGO campaigns to achieve CO2 neutrality, energy efficiency, green mobility, greener housing, or more generally "sustainability" in their territory, that include prosuming in their strategy. Other examples of RES prosumer-focussed initiatives are not-for-profit organisations that help with financing and development, peer-to-peer energy trading and community energy aggregators, which technically cannot be considered prosumer initiatives, but tend to mediate for prosumers.
5. RES prosumer influencers	

Table 1 (continued)

Broad collective RES prosumer actor category	Description of the RES prosumer actor
	In this second "non-prosuming" category we can find, among others, the energy utilities; the ESCOs (energy service companies) that will help set up prosumer projects as developers, as well as offer other technical services; local, regional, national, and EU authorities; energy agencies; energy funds; and energy lobby groups. We may also include here peer-to-peer trading platforms and aggregators when their purpose is exclusively market-oriented. These actors play an influential role in RES prosumerism, they may condition or even hinder its development (as in the case of the fossil-fuel lobby group).

^a EU 2018/2001 URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L._2018.328.01.0082.01.ENG&toc=OJ%3A1%3A2018%3A328%3ATOC

and profit redistribution, as well as laws and policies for community ownership of energy production may all play a role. While community energy initiatives tend to prefer collective or charitable legal forms such as the cooperative, allowing for internal democracy as well as for collective rather than individual benefits (Brown et al., 2020), circumstances may not always favour this choice. EU member countries in the pre-transposition phase of the RED II directive treat citizen engagement in renewable energy production differently, some supporting the more classical local renewable energy community (REC in the CEP) business models (such as the energy cooperative), others supporting more innovative business models, and yet others still struggling to create a framework to accommodate the very idea of community energy initiatives (Gregg et al., 2020). For example, in countries such as Belgium, Croatia, and Italy, collective self-consumption is only available for commercial or industrial prosumers (Campos et al., 2020). Walker alerts to the polysemous nature of the term 'community', which in itself does not indicate whether it is an 'actor, a scale of activity, a spatial setting, a form of network or a type of process' (Walker, 2011, as cited in Bauwens, 2019). Bauwens (2019, p. 841) himself asks how we may then identify 'genuine' community energy initiatives and proposes to use the following attributes: locality of scale; extensive community engagement; participatory form of decision-making; local actor involvement; and distribution of benefits within the community. These considerations led us to build on the definition for renewable energy communities provided by the RED II directive Art. 2 (16), which encompasses energy production, consumption, storing, and/or sharing initiatives that are based on open and voluntary participation, are autonomous, effectively owned and controlled by shareholders or members of the initiative, who must be natural persons, having as its primary purpose the provision of environmental, economic, or social community benefits for its shareholders, members, or for the local areas where it operates, rather than financial profits. From this basic definition, we built our different categories of energy communities by adding the geographic scale (local, regional, virtual) and by distinguishing between types of beneficiaries (e.g., local community, virtual community, members).

Since our study seeks to provide insights into the multi-actor complexity of the current energy landscape by identifying and categorising collective forms of prosumerism, we needed to address the observations derived from our early characterisation in order to create mutually exclusive collective RES prosumer actor categories. Therefore, we re-clustered our collective RES prosumer actors using two of our initial attributes, 'beneficiaries' and 'key mission' as well as an additional attribute, 'governance mode'. While the concept of beneficiaries goes beyond profit/not-for-profit and public/private dichotomies, focussing instead on who benefits from the activity, the self-stated mission sheds light on whether the initiative has more collective vs more individualist goals, and whether the set-up is purely market-

oriented or includes social, ecological, or political goals. Finally, an initiative's mode of governance tends to distinguish well between the top-down, bottom-up, and hybrid projects as described by Roby and Dibb (2019). This attribute was operationalised by looking at staff characteristics, decision-making style, participation of staff/members, networking attitude, and inclusiveness vs exclusiveness (Horstink et al., 2019, p. 57).

In Table 2 we present our final categorisation of collective RES prosumer actors. Here, we distinguish the different actors according to their particular engagement in the changing energy system. This engagement is a constellation that arises from their mission, type of beneficiaries, and mode of governance. It can be more inward-looking, with actors looking primarily after their own interests, guided by mixed motivations (societal/environmental as well as economic) and by a top-down or mixed mode of governance (Self-focussed). In contrast, it can be outward-looking, valuing cooperation and a community spirit, strongly motivated by societal and environmental goals (Civic-focussed). Finally, it can be looking at the process of prosumerism itself, aiming to facilitate, influence or benefit from prosumers and the phenomenon of prosumerism (Prosumer-focussed). Each of these dimensions holds one or more categories and, in some cases, sub-categories of RES prosumer actors. For each category, a description of their engagement is given, as well as concrete examples of the RES prosumer actors.

The first dimension, that of the Self-focussed actors encompasses the category of Organisational Prosumers, which we find to behave like a large individual prosumer, the beneficiary being mainly the entity itself, with missions that range from achieving energy savings to desires of energy autonomy. Key to this category is that for them, prosumerism is not their main activity, as is the case for energy communities and energy cooperatives. Examples are businesses, schools, libraries, or any organisations that are self-consuming primarily to provide in their own energy and/or to contribute to environmental goals. In distinguishing the prosumer actor that *prosumes as an activity* from the prosumer actor that *prosumes as a way to organise* (the categories in our second dimension) we follow the clarification suggested by REScoop.eu and Clientearth (2020), which aims to avoid a restrictive interpretation of energy communities as mere self-consumption initiatives. The Organisational Prosumer is further categorised according to the broad sector it belongs to: Business Organisational Prosumer (businesses), Public Organisational Prosumer (public institutions), and Not-for-profit Organisational Prosumer (e.g., NGOs, associations).

The second dimension, that of the Civic-focussed actors, attempts to create a conceptual space for civic-inspired prosumer initiatives (motivated by societal, environmental, and/or communal goals, with benefits flowing back to the community or group, and employing highly participative forms of governance), while at the same time refining and enriching the existing definitions of energy community, by extricating the subtle differences in who is benefitting, as well as how and where, from the prosumer initiative. Local Energy Communities exclusively aim to benefit the local community and can be further categorised as either Formal Energy Communities, Informal Energy Communities, or Neighbourhood Energy Communities, in recognition of the different arrangements that we encountered (including the growing number of district heating schemes). Those that wish to form a community independently of geographical barriers have been categorised as Virtual Energy Communities, while self-styled energy communities that focus on their members rather than the wider community but still fulfil all the necessary criteria (in particular pursuing societal or environmental goals rather than financial profits) to set them apart from commercial endeavours are called Civic Energy Cooperatives in our model. The Civic Energy Cooperative is singled out here to accommodate the cases where the initiative is set up for the benefit of a group of consumers, who are not necessarily from a community nor intend to form a community, but pursue common goals such as energy independence, energy affordability, control over energy sources. A good example is the case of the

consumer/producer cooperative.

Finally, the third dimension attempts to clarify what we have called RES prosumer stakeholders in our research. These can all be considered to have RES prosumers either as their beneficiaries or as their target (in the case of service providers or lobby groups). The first category we have named Prosumer Facilitators, examples being energy campaigns, not-for-profit RES consultants and developers, or not-for-profit peer-to-peer trading platforms. The second category is more complex, as its agenda may not always be transparent. Their mission is to influence prosumerism or benefit from it for their own gain or the gain of an interest group. Examples of these Prosumer Influencers/Benefiters are RES energy utilities (including municipal utilities), prosumer financiers, project developers, energy lobby groups, but also authorities at local, regional, national, and EU level. This category raises a number of issues that we will try to address in our discussion of policy implications.

To illustrate the dynamic interrelations between and among the different collective RES prosumer actor categories, in Fig. 1 we have plotted the categories according to their engagement in prosumerism. The result is an image of a political energy landscape where different groups of RES prosumer actors are carving out their space while interacting with each other and the changing energy landscape.

Having in the present section provided insights into the multi-actor complexity of the current energy landscape by categorising collective forms of prosumerism, in the next section, we proceed to discuss the implications of our findings for the implementation of the EU's energy policy framework.

4. Discussion: RES prosumer actor engagement in the new energy landscape and the implementation of the EU energy policy framework

Having created an engagement-based categorisation of collective RES prosumers, we will now discuss how our categories can inform EU energy policymaking. This particularly concerns the fine-tuning of policies to meet energy actors' needs, while taking into account the strong values the CEP is meant to help uphold. Some of the ambitious goals that the vision of a clean Energy Union is expected to deliver on are the provision of secure, sustainable, competitive, and affordable energy to EU consumers, while guaranteeing fairness, inclusiveness, local economic development, and citizen empowerment. These goals are echoed at national, regional, and local levels across Europe. Prosumerism, as we have seen, may play a key role in realising these objectives. It is also a prime example of the complexities of transforming a sociotechnical system, specifically that this is not achieved by putting technological innovation central, but also requires social innovation (Wittmayer et al., 2020; Hoppe and de Vries, 2018). Similarly, Jenkins et al. (2018, p. 71) remind us that a transition does not come about by changing one variable, instead, uncountable interacting and mutually reinforcing variables will change together into something difficult to foresee. Prosumer actors have been advanced as potential heralds not only for social innovation, but for the promotion of the expected democratisation and decentralisation of energy systems (e.g., Bauwens et al., 2016; Brummer, 2018; Hewitt et al., 2019) and for the reconfiguration of the energy market (Hoppe et al., 2018).

Thus, bearing in mind the EU's framing of collective energy prosumers as enshrined in the RED II and recast Electricity⁴ directives, as well as the strong values of the EU's clean energy vision, we make the following observations.

Firstly, the collective form of prosumerism that we have called Organisational Prosumers can be considered a large example of the household prosumer. They are producing energy as individual

⁴ Art. 2(16) of the RED II directive (EU, 2018/2001) specifically requires a REC to be a legal entity, whereas the same applies to a CEC in Art. 2(11) of the recast Electricity Directive (EU, 2019/944).

Table 2
Proposed RES prosumer actor categorisation.

Key focus	RES prosumer actor categories	Sub-categories	Key attributes of engagement in prosumerism	Examples of RES prosumer actors
Self-focussed	Organisational Prosumers	Business Organisational Prosumer	Primary beneficiary is the entity itself. Self-consume RES for the organisation. Prosumerism is not their key activity, and the mission is usually mixed (e.g., societal: be part of the solution; marketing: self-promoting a green image; economic: lowering energy costs, taking advantage of RES technologies or of RES subsidies). Governance is top-down or mixed (in the case of not-for-profits) but generally not related to the prosumerism activity.	Businesses in different sectors: industry, services, agriculture. Public institutions such as schools, universities, libraries. Not-for-profit organisations such as associations, NGO's, non-energy cooperatives, informal groups.
		Public Organisational Prosumer		
Civic-focussed	Local Energy Communities	Not-for-profit Organisational Prosumer	Beneficiary is the local community, mission is societally driven (e.g. energy autonomy, clean energy for the community, more control over energy and energy costs), provide RES energy and other services to community, using cooperative governance where majority decision-makers are natural persons and there is high inclusion, with all benefits flowing to the community.	Cooperatives or other legal entities: partnership, association, company, or social enterprise, if effectively run by citizens. Informal collectives, partnerships, or groups.
		Formal Energy Communities		
		Informal Energy Communities		
		Neighbourhood Energy Communities		
	Virtual Energy Communities		Beneficiaries form a tight geographical community, mission is driven by societal/community goals, provide RES energy to tenants, homeowners, neighbours, using cooperative governance with decision-making by natural persons, there is high inclusion at the geographic level, with benefits mostly related to energy access and costs.	District heating schemes, tenant/homeowner energy schemes, or other property RES schemes, run by different legal entities but controlled by participants. Non-commercial RES cooperatives or other legal entities, using aggregation to bridge geographical boundaries.
			Beneficiaries consist of members of a virtual community who are driven by societal goals (participate in the clean energy transition, help mitigate climate change, ...) and not by the market, provide RES energy to members, using cooperative governance with decision-making by natural persons. Benefits, besides access to clean energy, are considered societal.	
			Beneficiaries consist of members of a possibly wider geographical community (can be regional) who are driven by societal goals and not by the market, provide RES energy to members, using cooperative governance with decision-making by natural persons, with benefits flowing back to the cooperative.	
Prosumer-focussed	Prosumer Facilitators		Beneficiaries consist of RES prosumer initiatives, to which these stakeholders offer services on a non-profit basis. Governance is top-down or mixed (some decisions shared with the general assembly, when applicable).	Energy campaigns; community/political organisers; community funders; regional energy agreements; non-commercial peer-to-peer energy trading platforms; not-for-profit developers.
		Prosumer Influencers/Benefiters	Beneficiaries are highly diverse, and include the stakeholder itself: policymakers, RES prosumers, civil society, energy industry and service sector, ... Their key objective is to influence prosumerism or benefit economically from prosumerism. May have mixed missions, but market focus is part of it. Governance is top-down or mixed (some decisions shared with the general assembly, when applicable).	

consumers do, but the installed capacity and energy production will be superior to that of the average individual prosumer. In some EU countries, such as Portugal (Campos et al., 2020), provisions have been made for larger individual prosumers (rules are different according to the size of the installation, simpler for small individual prosumers, increasingly more demanding for larger prosumers). This distinction protects the smaller individual prosumer from potential prohibitive fees, while it safeguards and welcomes the right of organisations to prosume, in light of the overall goal of switching to clean energy. However, the REScoop.eu and Clientearth (2020) report on the transposition of the REC and CEC concepts alerts to the need to separate industrial and commercial prosumers from energy communities. Such a separation is important to avoid that the former type of prosumers can set up RECs or CECs, and take advantage of their privileged status, with the sole purpose of reducing their energy costs or of selling energy at a profit (the case of commercial RES utilities or RES aggregators), rather than realising benefits for a larger community.

Secondly, the increasingly ubiquitous form of prosumerism called

energy community is, per our analysis, a plurality of actors with a civic focus/social inspiration, further distinguishable according to the type of community that they wish to benefit (local, virtual, neighbourhood, or a self-styled community of members). The current provisions existing for renewable energy communities in the CEP do not account for this plurality. In particular, the CEP outlaws informal energy communities.⁵ However, for the rapid decentralisation of the energy system, it may be useful to allow informal not-for-profit initiatives to operate within reasonable limits of production capacity. Informal arrangements for prosumerism combine a desire for the informality of community logics and institutional independence with the need for 'institutional shelter to secure resources' (Wittmayer et al., 2021). High levels of regulation and formalisation tend to stifle the creativity and openness of these spontaneous initiatives. Wittmayer et al. (2021) recommend a careful

⁵ EU 2019/944 URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1570285915486&uri=CELEX:32019L0944>.

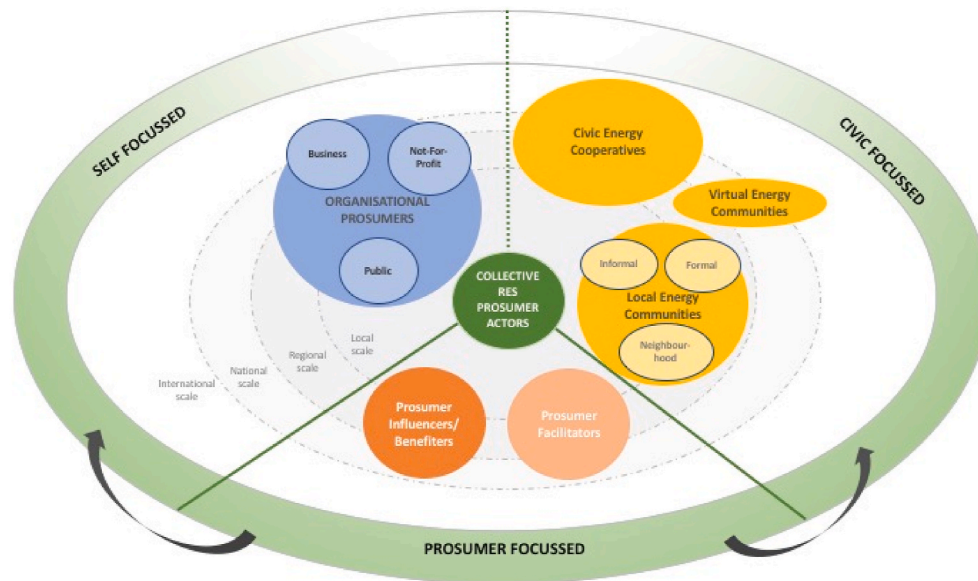


Fig. 1. Dynamics of collective RES prosumer actors and their geographic scales.

consideration of trade-offs between the advantages of spontaneous civic initiatives and the need to formalise some level of support that these initiatives may need to scale up. The federation of RES energy cooperatives, REScoop.eu, already recognises informal arrangements as long as they agree to follow a total of seven strict cooperative principles that place control over the assets and operations firmly in the hands of members, following the one member-one vote rule (REScoop.eu, 2018).

Within the discussion of ownership arrangements for prosumer initiatives, the issue of the number and type of legally recognised entities that EU member countries will adopt to accommodate the different collective forms of prosumerism remains very much open. Whereas some countries may restrict the legal form of ownership for a REC to that of the cooperative or similar entity in their legislation, others are contemplating to elevate RECs and CECS themselves to legal entities in their own right. It is a matter of concern (Brown et al., 2020; Horstink et al., 2020; Lacey-Barnacle, 2020; REScoop.eu and Clientearth, 2020), how RECs and CECS will be distinguished from what we have called Organisational Prosumers, Neighbourhood Energy Communities (that may share a RES installation), Prosumer Facilitators (for example community-owned peer-to-peer trading platforms), and finally, Prosumer Benefitters (including project developers that lease installations to tenants and energy utilities that have opted for the legal form of cooperative, without the aim of being an energy community). Each of these actors has specific objectives, forms of engagement in the energy market, and needs, that cannot be met with the same policy response. In particular, market-oriented actors, whether producers or lobbyists, have access to very different resources than do most energy communities and many of the local energy cooperatives. Their engagement requires very different regulation from what is needed for those that we have called Civic-focused prosumer actors. While a number of RES energy utilities are run by municipalities or by a local cooperative and conform more closely to the spirit of a REC or CEC, others are exclusively market-oriented operations. Both are needed, but the way they are regulated should be distinct. Additionally, while aggregating and peer-to-peer trading is defined in the CEP, the distinction between market-oriented operations and community-operated ones is not touched upon. Providing both categories of actors with the same incentives will lead to unfair market conditions and most certainly to community-operated ones being outcompeted. For example, at the moment a framework condition that may limit RECs is the fact that they must be local and are not allowed to be virtual communities, whereas CECS as well as utilities and other operators will be allowed to operate

virtually and across borders. Additionally, RECS cannot take on the role of Distribution System Operator, whereas CECS will be given this possibility (and utilities already have this right). Either of these limitations may hamper the spread of civic initiatives of renewable energy consumption.

What our analysis clearly shows is that recognising one form of collective prosumer will not be doing justice to the myriad actors engaging in prosumerism. Rather, while such recognition might lead to legal security for some actors, the system as such continues to exhibit unclear framework conditions for other actors, inhibiting them from realising their full potential to contributing to just and sustainable energy transitions.

Lastly, the categories that we have included in our Prosumer-focused dimension—the Prosumer Facilitators and the Prosumer Influencers/Benefitters—merit further unpacking, since these categories hold important stakeholders that can make or break prosumerism. From our dynamic agency perspective (e.g., Fischer and Newig (2016); Geels and Schot (2007), these stakeholders' forms of engagement in the energy system are clearly distinct from, yet interact with, what we have called the 'actually prosuming' collective prosumer actors. The Prosumer Facilitators are assumed by us to be agents for prosumerism's successful development, with a non-market-oriented, although possibly also political, focus. While they should not be equated with the prosumers that they are supporting, the EU might consider incentivising this group of stakeholders that can help mainstream prosumerism since they are part and parcel of the framework conditions within which prosumerism develops. Within the category of Prosumer Facilitators, we have included energy campaigns, community organisers or funders, community-owned peer-to-peer trading platforms, and not-for-profit project developers.

In contrast, the stakeholders that we have named Prosumer Influencers/Benefitters will tend to have private agendas within the field of prosumerism, which do not always align with key EU Energy Union goals. We consider Prosumer Influencers/Benefitters to be either political or industrial lobbyists or market players that see prosumerism as an opportunity for developing new services or selling existing ones. While the former, lobbyists, in particular the incumbent fossil fuel players, but to some extent local, regional, and national authorities as well, have an interest in controlling the rollout of renewable energy prosumerism, the latter can undoubtedly provide important support and structure. Among them, we find RES energy utilities, financiers, project developers and ESCOs, commercial peer-to-peer trading schemes, as well as

aggregators. The issues that might arise with this plethora of new market players relate to how they will influence cost, ownership, and governance of the civic-inspired initiatives such as energy communities. While solar photovoltaic production of electricity is becoming increasingly affordable, other technologies such as wind farms and heat pumps can still be prohibitive. If access to resources, technology, and knowledge for renewable energy production is left to the markets to determine, this may undermine the goals of democratisation and decentralisation of the clean energy system.

By re-categorising actors that appear similar (i.e., cooperatives and communities of different types, businesses involved in prosumerism either as prosumers or as service providers, etc.) according to their engagement, we hope to inform policymakers in their transposition of the CEP in a way that supports the realisation of underlying values such as transparency, fairness, and justice. The CEP is vague on the guidelines for separating energy communities from other prosumer activities, such as self-consumption and energy sharing; and it also fails to distinctly separate what we have called the *actually prosuming* prosumer from entities that facilitate the activities of prosumers or sell them the services to carry out their activities (REScoop.eu and Clientearth, 2020). The REScoop.eu and Clientearth transposition guide warns that restrictive definitions may limit innovation on the part of commercial project developers. Meanwhile, Gregg et al. (2020) warn that states may be tempted to let energy communities 'take care of themselves', reducing the role and support of the state. They also remind us that the investments and other resources (including human resources) required for advanced RES technologies may be beyond the capacity of groups of citizens and could result in a less affordable and less inclusive energy system, thereby going against the goal of energy justice. On a similar note, Jenkins et al. (2018) advocate for more explicit recognition of the variables of agency, power, and politics in transitions, as well as special attention to the roles of non-traditional actors. Considering the rapid growth of new business and financing models (Brown et al., 2020), some so recent that we have not yet been able to include them in our framework (e.g., mobility service providers), it makes political sense to qualify those actors in prosumerism that are unquestionably providing a commercial service as opposed to a civic service, whatever their activities may be. Whereas the market logic will work well for the first, it will hamper the second, due to their more fragile status. Finally, those that wish to facilitate the civic-inspired initiatives, require an approach that takes into account the fact that they are not themselves the prosumer, but either provide commercial services to prosumers or provide important not-for-profit support to help the initiative succeed. Any incentive schemes will need to take these very different goals and needs into account.

5. Conclusion and policy implications

The study presented here was inspired by two parallel and equally rapid developments in the EU's energy system: the growth of a diversity of collective actors in self-consumption or prosumerism of renewable energy sources and the on-going transposition of the EU's energy policy framework in which some of these actors will be formally recognised and incentivised to varying degrees. We start from the premise that, in the hope of ensuring an energy transition that is fast, innovative, and competitive, but also guarantees fairness, inclusiveness, jobs, as well as the growth of local economies, the EU has given prosumers a prominent place in the envisioned Energy Union. In our research into collective prosumerism we have come across a plurality of actors, with different motivations for engaging in the new energy landscape that prosumerism is helping shape. This pluralisation of actors is forging new relations in the energy system, which in turn are changing the actors, their agency, and their dynamics, leaving the pathways for the transformation of the energy system largely unpredictable. At the same time, the directives from the Clean Energy Package can be considered a momentary stabilisation of the rules for prosumerism for the coming decade. The aims of

our study were thus twofold: firstly, we sought to provide insights into the multi-actor complexity of the current energy landscape by categorising collective forms of prosumerism; secondly, we wished to relate our categorisation to the EU's operationalisation of prosumer actors and to the realisation of the core values of the EU's clean energy vision, with which prosumerism has been intimately linked in research.

Through an exploratory, iterative, attribute-guided database analysis of close to 1700 collective RES prosumer actors, supported by a literature and documentary review, as well as content and discourse analysis, we came up with an actor categorisation that allowed us to plot the full spectrum of collective actors in RES prosumerism. These include the following types: Self-focussed (i.e., the categories of Organisational Prosumers, further differentiated as Business Organisational Prosumers, Public Organisational Prosumers, and Not-for-profit Organisational Prosumers); Civic-focussed (i.e., the categories of Local Energy Communities, further differentiated as Formal Energy Communities, Informal Energy Communities, and Neighbourhood Energy Communities; Virtual Energy Communities; and Civic Energy Cooperatives) and Prosumer-focussed (i.e., the categories of Prosumer Facilitators and Prosumer Influencer/Benefitters).

We subsequently reflected on the EU's framing of collective energy actors in its key energy policy framework, the Clean Energy Package, bearing in mind its core values. We offer the following recommendations for prosumer policies that we believe will support the realisation of the goals of the Energy Union, i.e., transitioning to an energy system that is not only clean, efficient, and innovative, but also translates the EU's desire for a just and fair energy system through its effective decentralisation and democratisation:

1. The pluralisation of prosumer actors has resulted in new business models, some of which are market-oriented, others civic-inspired. The resources and access to funding, as well as other needs, of these two groups of actors are incommensurable, which is why we recommend that the civic-inspired actors be subject to a regulatory framework that is distinct from that of the market-oriented actors. This recommendation is echoed by other recent studies (Campos et al., 2020; Lowitzsch et al., 2020).
2. Organisational Prosumers (i.e., organisations that self-consume without this being their primary activity) should be considered a large version of the household prosumer and thus not be equated with RECs or CECs. The fact that ownership arrangements may be the same for Organisational Prosumers as for RECs could represent a disadvantage for civic-inspired initiatives for which the bottom line goes well beyond energy saving or -trading.
3. To ensure the realisation of the societal and environmental purposes of a truly decentralised and democratised energy system, the plurality of actors with a civic focus needs to be taken into account through appropriate policies and/or incentive structures. More must be done to further refine the concepts of REC and CEC and their respective rights and obligations, distinguishing those that aim to benefit communities and/or society as a whole from those that have a market orientation and corresponding resources, while additionally discerning between *renewable* and *non-renewable* energy production. Many civic-inspired prosumer initiatives lack resources, time (relying heavily on volunteer work), and in many countries regulatory support (Horstink et al., 2020). At the same time, attention must be paid to less desirable characteristics of community initiatives, such as possible gender, social status, and educational biases, as well as their difficulties to scale up due to limited resources, and finally, the risk of 'energy parochialism' (Brown et al., 2020) that may hamper the realisation of energy justice and the mainstreaming of prosumerism.
4. Our model separates those RES prosumer actors that are not *actually* prosuming from those that are (i.e., the categories above). We suggest that what we have called Prosumer Facilitators, stakeholders that offer non-commercial support to prosumers, many of which are

contributing to the development of innovative business models, be differentiated from the category that we have named Prosumer Benefitters (the category that we have identified as Prosumer Influencer is merely a political category, to be taken into account in analyses but without a place in any regulatory framework). Prosumer Benefitters have found a market in offering commercial services to prosumers and their engagement with this new market is, likewise, in creative flux. This group of actors is clearly important to ensure the quality as well as manage the complexity of an increasingly prosumer-connected grid. For example, they can provide the necessary access to high investment/high risk technological solutions (such as heat and mobility solutions) or provide platforms for prosumers to pool their production (aggregators and peer-to-peer platforms). Many civic-inspired initiatives lack the resources and knowledge for more ambitious projects. Nevertheless, care must be taken not only to safeguard the transparency of, and fair competition within, this new market niche, but also to clarify the ownership and governance rules for these partnerships.

We hope that our clarification of the multi-actor dynamics in collective prosumerism can help support the smooth transposition of EU directives into national policies and law, by promoting the implementation of appropriate policies and/or incentive structures targeted to the intended actors based on each member state's contexts. At the same time, the policies and incentives must safeguard the values of democracy, justice, and sustainability that characterise the clean energy vision of the Energy Union. In defence of this holistic vision of the new energy system and in light of the power imbalances in the current market-based and highly regulated energy system, we would like to emphasise the importance of acknowledging the plurality of RES prosumer initiatives with a civic focus. Additionally, efforts should go to providing adequate support structures for these diverse initiatives since these are the local and relational foundation of a decentralised and democratised energy system that puts energy justice high on its agenda.

Our research and resulting categorisation of collective RES prosumer actors were explicitly inductive and exploratory. There is, therefore, a need to continue collecting empirical data to further test, refine, and validate the proposed actor categories. The authors will continue their research in this sense and encourage other researchers to comment and/or build upon the tentative framework presented here.

Data sharing statement

Due to GDPR rules for the protection of personal data, the sensitivity of certain information shared by respondents, and the commitment of researchers to preserve the anonymity of the RES prosumer initiatives surveyed, the raw research data that informed the database analysis in this paper cannot be shared.

CRedit authorship contribution statement

Lanka Horstink: Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing, Supervision, Formal analysis. **Julia M. Wittmayer:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing. **Kiat Ng:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing, Formal analysis, Visualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors wish to thank the following researchers for their contribution to the data collection and to the discussion that formed the basis of the present analysis: Mark Soares (UPORTO); Inês Campos (FC.ID); Esther Marín (FC.ID); Sem Oxenaar (DRIFT); Kristian Petrick (ECO-UNION); Mireia Reus (ECO-UNION); Swantje Gährs (IÖW); Lars Holstenkamp (LEUPHANA); Tomislav Novosel (UNIZAG); Thijs Scholten (CE DELFT); Stephen Hall (ULEEDS); Arthur Hinsch (ICLEI). We thank Guilherme Luz (FC.ID) for his technical support in reclassifying the legal forms of ownership from the final dataset. Finally, we thank the guest editors, Prof. dr. Rolf Künneke, Dr. Thomas Hoppe, and Dr. Aad Correljé, for organising the special issue and reviewing the earlier versions of the manuscript, and three anonymous reviewers for their comments, which helped strengthen the manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.enpol.2021.112262>.

Funding

The research leading to the results presented in this article has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 764056. K.N. was supported by the Fundação para a Ciência e a Tecnologia (FCT) post-doctoral fellowship grant (SFRH/BPD/120394/2016). The responsibility for the content of this document lies solely with the authors. The document does not necessarily reflect the opinion of the funding authorities.

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