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Assessing Energy Communities' Awareness on Social Media with a Content and Sentiment Analysis

Myriam Caratù [1,*], Valerio Brescia [2,3], Ilaria Pigliautile [4] and Paolo Biancone [2]

[1] Faculty of Economics, Università degli Studi Internazionali di Roma, 00147 Roma, Italy
[2] Department of Management, University of Turin, 10134 Torino, Italy
[3] Management Department, University of Social Sciences, 90-113 Lodz, Poland
[4] Department of Engineering, University of Perugia, 06125 Perugia, Italy
* Correspondence: myriam.caratu@unint.eu

Abstract: The development of energy communities has the potential to support the energy transition owing to the direct engagement of people who have the chance to become "prosumers" of energy. In properly explaining the benefits that this phenomenon can give to the population, a key set of channels is represented by social media, which can hit the target of citizens who have the budget to join the energy communities and can also "nurture" younger generations. In this view, the present work analyzes the performance of the topic "energy communities" on the main social media in order to understand people's awareness of its benefits and to assess the societal awareness of this topic in terms of engagement and positive sentiment. The analysis conducted first concerned the definitions and conceptualization of energy communities of academics and practitioners, completed through a content analysis; we then focused on the fallout of these themes on social media and on its engagement (to understand if it was capable of generating a positive attitude). The social media analysis took place through a platform that uses artificial intelligence to analyze communication channels. The results show that there is still poor engagement with the energy community theme in social media, and a more structured communication strategy should be implemented with the collaboration between social media and practitioners/academics. Despite previous studies not analyzing how social media recall the topics of academics and practitioners related to energy communities, this is an important aspect to consider in order to conceive integrated marketing communication for promoting energy communities to citizens, as here demonstrated and proposed for the very first time.

Keywords: energy communities; social media; communication; sustainability; societal awareness; sentiment analysis; content analysis

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1. Introduction

Sustainability today has become a key topic in social media communication and, in general, in informative communication from academics and practitioners to the population. Since the introduction of the triple bottom line model [1], the concept has grown in popularity after the recent tangible effects of climate change have been discerned all over the world (e.g., overheating, floods), together with the trauma of the pandemic [2] and the Ukraine/Russia war, with its associated energy crisis [3]. One of the biggest challenges of sustainability is the transition from a high-carbon society (which has generated instability in international geopolitics in the last three decades) to a more sustainable mode of production and consumption, which requires rethinking the way governments, businesses, financial systems, and individuals interact with our planet. In fact, the emergence of global warming, which threatens the life of human beings, is largely due to the use of fossil fuel for energy generation, which is also increasing air pollution at an alarming level: this is the reason why the Paris Agreement committed to maintain the global temperatures below 2 °C [4]. To achieve this objective and fight the energy crisis, both technologies and social

innovations are needed, especially in developing nations [5] and with the aim of engaging young generations [6].

In this frame, energy communities (ECs) represent a technological community model that adopts technologies for the decarbonization process by directly engaging citizens. In this view, energy communities well embody the opportunity to boost both technological and social innovations since they imply the diffusion of renewable energy generation and storage systems, combined with the development of smart energy grids [7] and the direct involvement of citizens in the energy market as prosumers [8] (especially those who have the budget to join the ECs and young people, in whom it is necessary raising awareness with social media about sustainable energy consumption [9–11]).

Therefore, ECs represent a model that requires intensive participation from citizens in order to become widespread in municipalities all around the world, thus having a significant impact in achieving the Sustainable Development Goals of the 2030 Agenda (in particular, number 7—ensure access to affordable, reliable, sustainable and modern energy for all, 11—make cities and human settlements inclusive, safe, resilient and sustainable—and 13—take urgent action to combat climate change and its impacts) [12]. The diffusion of renewables and novel energy system models such as the ECs, however, involves public acceptance and requires the commitment of a large base of citizens: in fact, as it is possible to see from Figure 1, in order to reach the level of community (the set of all people that the campaign is trying to reach), there is the need for other layers of people who commit with donations and actively contribute to the development of the community [13]. These can be identified in the academics and practitioners who strive to reach the community with their communication efforts but also with the people with strong ethical values of sustainability who, in different ways, support the cause of energy communities.

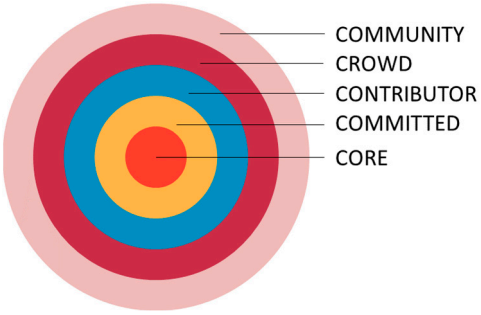

Figure 1. The circle of commitment by Michael Pulsford. Source: https://thechangeagency.org/news-item/circles-of-commitment/ (accessed on 21 January2023).

Given this premise and in the frame of collaboration between the academics, policy makers, and practitioners, it is important to understand what the state of the art of the campaigning process is in order to reach the community. Therefore, some questions are needed:

1. What does the population know about the topic of energy communities, which seems to be a trend well-known only within academia or the practitioners involved in the projects of building energy communities?
2. What are the gaps of topics and knowledge between
   (i). The academic articles about ECs;
   (ii). The articles written by practitioners on the fields within the topic;
   (iii). The communication to the population (community) with social media about the topic?

Addressing the discrepancy in knowledge between these three sectors is necessary to properly inform and guide the actions of future decision-makers: therefore, these research questions are the motivations that informed the content and sentiment analysis of the

present study, which adopted a tech-driven approach with the use of artificial intelligence (AI) [14].

In this view, a recent study [15] has already highlighted the importance of assessing the performance of this topic on online news in order to effectively communicate this topic to the population (who should represent the essential base of citizens needed to develop the energy communities). However, a significant gap remains in understanding the popularity of these topics on social media that, nowadays, are important drivers of decision-making: in order to do so, this study is aimed at exploring the societal awareness of the topic energy communities by conducting a content analysis and a sentiment analysis on the most important social media so as to address the efforts of communication managers who want to promote the importance of energy communities outside academia. To reach this goal, the implemented methodology includes three stages encompassing, for the first time, the content analysis of (i) academics and (ii) practitioners' publications and the content and sentiment analysis on (iii) social media about the topic of ECs. The method adopted, as detailed in the methodology, is appropriate for (i) describing scientifically and analytically the definition of the main themes and the relationship between elements by creating a conceptualization of the theme and (ii) identifying the impact and the engagement of the stakeholders by defining the interpretation key which is provided on social media.

In particular, Section 2 presents an overview of previously published works that are related to this paper, further detailing the key topics of ECs (focusing on benefits of this new energy system models) and social media (as tools for shaping decision making and boosting energy transition). Section 3 presents, in detail, the implemented three-stage procedure, while Section 4 presents the related results. The Discussion section focuses on the comparison among the three performed analyses in terms of emerging themes to understand what the key topics highlighted in articles and reports from both academic and practitioners are, which should be properly communicated to the right audience (individuals between 35 and 60 years with an income that would allow them to buy a house directly involved in an energy community in the territories where energy communities are spread, i.e., mainly people from the Western world). This has allowed the authors to understand the differences and similarities in the topic suggested by academics and practitioners and the popular themes arising from the web. Further recommendations on the communication style and strategies are also developed in the Discussion section, while Further Research and Limitations are presented immediately after the Conclusions.

2. Related Work

The expected green energy transition requires both technological and social innovations. Despite great advances being achieved from a technological perspective (from energy generation and storage systems to innovation in information and communication technologies and automated management algorithms), the uptake of organizational forms such as the ECs is still limited, due to the lack of citizens' understanding of the topic and of direct engage in the process [16].

In the literature, the public acceptance of specific themes and the overall common citizens' understanding of the emerging phenomena is generally addressed through extensive survey campaigns tailored to specific population. As a matter of fact, Thomas et al. [17] focused on the public support on energy transition in Alberta (Canada) through a survey campaign based on 1591 participants. Research outcomes depicted how preexisting values and beliefs on local economy and climate change were strongly structuring individuals' attitudes about transition. Similarly, Siedl et al. [18] investigated the perceived responsibilities and the intended technology uptake of distributed energy sources among different societal groups in Switzerland, Germany, and Austria, for a total of 2104 survey participants. Although they were open to participating in local energy initiatives, the participants in all three countries only acknowledged the responsibility of national governments and major energy suppliers for the transition to a new energy system, neglecting to recognize their own direct role in the process. Questionnaire submissions was also the methodology

implemented by Herbes et al. [19] to address the causes beneath the observed decline in EC growth in early-adopter countries, such as Germany. The research involved 187 members from 125 management teams of the EC, who participated to shed light on their competency and qualifications. The findings indicate that there is a lack of proficiency, particularly when it comes to developing innovative and efficient business models, which is concerning given the expected decrease in incentives in the near future. It is worth mentioning that this study highlights the existence of a gap between research advances and practitioners' awareness. According to Herbes et al., in order to effectively implement new forms of energy systems in the international community, there is a need to fill this gap with several actions, among which there are tailored training programs to be delivered by policy makers.

Therefore, in line with the efforts and suggestions of the previous literature, we attempted to fill this gap by using a methodology (based on content and sentiment analyses) different from the ones adopted in the abovementioned papers (based on questionnaires). Survey-based research, in fact, requires considerable effort in recruiting procedures, is generally limited in time and space (taking into account specific periods and tailored populations), and may be limited in the reliability of its outcomes due to participants' bias [20].

An alternative approach to investigating social acceptance and understanding a topic is represented by the content analysis of nonacademic published materials about the topics investigated, especially in the environment of media and the web. In this sense, some research has been conducted with reference to the topic of energy (but also ECs). For instance, concerning public acceptance of wind energy plants, Dehler-Holland et al. [21] verified that the recent decline in investments in wind power plants in Germany was related to a progressive reduction of the legitimacy of this technology in national newspapers. The implemented approach consisted of a detailed analysis, including topic models, sentiment analysis, and statistics, of the contents of four German newspapers concerning wind energy production from 2009 to 2018. A combination of text mining and social network analysis (semantic brand score approach) was alternatively implemented by Piselli et al. [15], who examined online news as mass communication media that could target ordinary citizens for the successful diffusion of energy-transition-related knowledge. The approach provided insights for policy makers and practitioners interested in the societal uptake of green energy solutions. However, none of the abovementioned papers specifically took into account social media, which are actually recognized as new platforms for supporting policy diffusion and acceptance among citizens. Moreover, users are allowed to express their emotion in the social media, thus creating emotion discourses which are deemed to be tightly interconnected with cognition and deep learning [22], so much so that emotion in social media has also been analyzed with cutting-edge quantum-inspired techniques [23,24].

Relatedly, Corbett and Savarimuthu [25] demonstrated the applicability of social media analytics to examine the emotion discourse on "sustainable energy" emerging from 27 US electricity utilities on the Twitter platform (for a total of 6528 messages processed). Ibar-Alonso et al. [26] adopted a social listening analysis on Twitter to assess sentiment and emotion regarding "green energy" and focused the analysis on the crucial period coinciding with the onset of the war in Ukraine in 2022. As argued by the same authors, knowing the sentiment and attitude of the population is important because it helps to promote policies and actions that favor the development of green or renewable energies.

However, even these articles failed to take into account the impact of academics and practitioners' topics on social media. Therefore, this study aimed at evaluating ordinary citizens' awareness on ECs through a content and sentiment analysis of topics disseminated by both academics and practitioners that resonate on the most important social media platforms (detailly described in Sections 3 and 4), moving from an overview of the main topics expressed in the academic articles (obtained with a bibliometric analysis) and a focus on the role of social media, which is crucial for shaping collective decision-making.

2.1. Energy Communities

By seizing the opportunities offered by new technologies, citizens around the world are already coming together to regain their relevance in the energy sector, through direct and participatory actions aimed at building a fairer and more sustainable society. The growing trend toward decentralized energy systems will lead to new forms of energy systems and markets, as comprehensively presented in the study by Gui and MacGill published in 2018 [27]. In this work, long-term dynamics and possible pathways of this transition are discussed by considering challenges and opportunities related to sociotechnical innovations and the integration of existing structures and emerging ones. Decentralized energy systems are gaining momentum owing to the technological advances both in energy generation and storage systems [28,29] as well as in the development of automated energy management systems and trading bots [30]. Indeed, the deployment of distributed energy sources requires (i) a careful management of electric loads to avoid grid congestions and imbalance; and (ii) a shift toward the smart grid paradigm, which is a cyber-physical energy system [31] that relies upon advances in information and communication technologies (ICT) [32] useful to improving the efficiency, reliability, and sustainability of the existing power grid infrastructures. The development of local energy markets and their careful integration into the existing central one could be the key to fostering a fully transactive energy system, defined as a set of economic and control mechanisms for dynamically balancing supply and demand based on value as a key operational parameter [33].

In view of the reduction of carbon emissions in the electricity sector expected by 2050, it is estimated that 264 million EU citizens will join the energy market as prosumers, generating up to 45% of the overall renewable electricity of the system [34]. However, what does "prosumer" mean? Liberalization of the energy market and cost reduction of related technological components, e.g., photovoltaic system (PV), are the undeniable conditions for the existence of prosumers, who are users who do not limit themselves to the passive role of consumers but also participate also in the different phases of the energy production process [35]. Essentially, the prosumer is a person who owns his or her own production energy plant and consumes just a portion of its energy: the remaining quota of energy can be placed on the network, exchanged with consumers close to the prosumer, or even stored in properly sized storage systems and therefore returned to the consumption units at the most appropriate time. Therefore, the prosumer is an active player in the management of energy flows and can enjoy not only relative autonomy but also economic benefits. Nevertheless, to become a prosumer, it is necessary to own resources that could be valued in terms of energy production such as buildings where you can install solar panels. This requires investing in purchasing, installing, and managing the equipment. Not everyone has access to these requirements. In this view, ECs represent a fundamental step in energy democratization [36].

ECs are legal entities based on voluntary and open participation that are effectively controlled by their members that could be local authorities (including municipalities), natural persons, or small-medium enterprises (SMEs). Members of an EC could be simple energy consumers or prosumers all united under a common primary purpose of providing environmental, economic, and social benefits to the community rather than generating financial profits. This is the ECs' potential in energy democratization: a consumer, a member of an EC, has access to the energy generated by the community at special rates as established by the community's statute that is approved by all its members [37]. The sprawl of ECs is thus changing the shape of the energy market into a constellation of local consumer-centric energy markets. In this view, a considerable effort of the scientific community has been recently been exerted to the financial optimization of ECs with the aim of maximizing economic benefits for all the members [38]. Saif et al. [39] explored the concept of a smart community-based electricity market (SCEM) by assuming smart homes (with PV and energy storage systems) as local distributed energy resources and quantifying the achievable energy (and costs) savings through real-life measurements from an EC in Ireland. Hupez et al. [40] conducted a study where they compared the prices of electricity produced

using three different game theory billing methods in a residential EC, showing that different approached could be preferable for the community or individuals' empowerment. In this context, the concept of peer-to-peer (P2P) energy trading (the possibility for prosumers to sell their self-generated energy to other members of the community without the need of an intermediary) has also been addressed over the years from several standpoints. From a technological point of view, P2P looks for necessary digital innovation, such as smart meters [41] and blockchain technologies [42–44]. Moreover, the integration of the P2P trading model into the energy market implies extensive research on P2P market design and business model definition [45]. Finally, the social acceptance of such novel concepts has also being investigated, among others, in [46], by exploring EC members' trading preferences.

Therefore, the ECs could play an important role in fighting energy poverty: this is recognizable in two main areas of intervention:

(i) By contributing to the energy security of the community (reliable and affordable access to locally generated energy) and enhancing local energy system resiliency [47];
(ii) Through the provision of energy efficiency services to EC members [48], generally involving demand response (DR) mechanisms aimed at shifting the electricity demand to prevent electric grid imbalance.

Along with the implementation of DR mechanisms which imply a shift in consumer behavior as highlighted by De Vizia et al. in [49], a key role in social innovation has been attributed to ECs. This is because citizens' engagement can reinforce positive social norms that support energy transition [50], and such initiatives have the potential of increasing public acceptance of specific technologies, e.g., renewable generation plants [51]. For instance, Radtke et al. [52] verified, through the distribution of more than 500 questionnaires among 16 ECs in Germany, that people pay more attention to their energy behavior once engaged in EC projects.

Furthermore, renewable energy communities (RECs) are those ECs whose members are located in the proximity to one or more renewable energy plants that are owned and managed by the same community. Here, the environmental benefits are not only related to the energy transmission and distribution processes (consumption of locally generated energy) [8] but also include the replacement of fossil fuels with renewable energy sources. In this view, the widespread diffusion of RECs would be beneficial not only for the community members but would also contribute to mitigating the anthropogenic impact on the ongoing climate change by boosting clean energy production. RECs, directly engaging citizens, play a key role in the promotion of public acceptance of renewables also through the mobilization of private capital [53].

Despite the presented benefits related to the establishment of an EC, ECs are still not widely diffused globally. In Europe, ECs have been officially recognized in the EU legislative framework in the Clean Energy Package which introduced Citizens' Energy Communities (CECs; defined in the Directive on common rules for the internal electricity market (EU, 2019/944) [54]) and Renewable Energy Communities (RECs; defined in the revised Renewable Energy Directive (2018/2001/EU) [55]). These directives thus introduce a governance model for ECs and establish the energy-sharing possibilities. Additionally, EU established an enabling framework to facilitate EC development, but many of the EU member states are still dealing with the transposition of these directives which implies a reorganization of the internal energy market. As recognized by Lowitzsch et al. [56], EC organizational structures proposed in the EU legislative framework represent prototype governance models for the emerging decentralized energy systems that, in their paper, are more broadly referred to as "renewable energy clusters". These clusters generally include a few important technical capacities such as demand flexibility, energy efficiency measures, storage systems, and P2P trading mechanisms. The European legislation has enriched these clusters with formal recognition of their members' rights and duties, with the aim of linking ECs' technical capacities to social topics (e.g., fighting energy poverty, increasing acceptance, fostering local development, and incentivizing demand flexibility). Therefore,

the abovementioned European directives represent the opportunity to integrate social justice principles into energy system development.

Along with the regulatory adaptation for a formal recognition of these entities, it is worth properly communicating all the benefits of ECs (environmental, economic, and social benefits) related to citizens to facilitate their diffusion via bottom-up initiatives.

2.2. Social Media for Shaping Decision-Making and Boosting Energy Transition Acceptance

The development of ECs relies massively on the participation of citizens since this is a model aimed at involving the majority of the population in order to reach sustainability goals. Therefore, a critical point in promoting ECs is played by online news and information, which should not be limited to circulation only among the field of experts, such as energy providers or academics, but should target the whole population in general and, in particular, people who can become active members of the ECs, mainly house purchasers (mostly those between 35 and 60 years old). In order to do this, information should be spread not only on paid media (mass media) but also and mainly on owned and earned media (social media, for instance), which offer good cost-effectiveness [57] and improved information accessibility and interaction with the promoter of the content.

Given this premise, in this paper, the authors analyze the performance of the topic "energy community" on the web and on social media contents, following the idea that online media can be leveraged for citizens' engagement in new projects [58] and that it can be also used, in general, to raise awareness toward societal issues [59], such as environmental change and the need for a more sustainable world (which represents the reasons why green communities are born). All kinds of media, actually, are important to spread information and communicate the importance of ECs. In this sense, for instance, they have been proven by both Lyytimäki at al. [60] and Scheer [61] to be strategic for addressing citizens' perceptions and expectations of energy technologies. In particular, mass media are important, according to Lyytimäki [62], for policy makers that want to make media coverage and raise acceptance about policies on climate. However, compared to mass media, social media are more apt for addressing people's behavior, as Lee [63] points out, individuals pursue an active role in information searching. Social media contents, moreover, allow for persuasive communication, not only in the younger generations but also in 30–60-year-old people who (i) represent the segment of population who have the economic means to afford the purchase of a house; (ii) who are still sensitive to sustainability issues; and (iii) who are active on social media, especially, Facebook, Instagram, and LinkedIn, which are the social media where they find more use and gratification [64,65], as well as Twitter, which is the medium where both millennials (born between 1981 and 1996) and baby boomers (born between 1946 and 1964) read information online.

These media, therefore, reach many ordinary citizens who could be the target of ECs' communication campaigns and bring them toward the decision of becoming members of an existing community or to support the establishment of a new one; in fact, it has been demonstrated that social media have a large impact on the decision-making of consumers [66] and citizens [67]. In particular, Instagram has been proven to instill a change of attitude within millennials via the advertising (ADV) placed in the stories [68].

Therefore, to reach a proper audience and obtain a change in attitude toward a stimulus so as to address citizens' decision-making, ECs campaigning must catch the attention of ordinary citizens aged 30–60 years. In the social media marketing literature, this attention is usually measured via two KPIs:

- At a quantitative level, the most important one is community engagement, which is normally assessed by calculating the number of "likes", number of post shares, and number of comments. This can be done through a content analysis [69].
- The latter should be also accompanied by the positive attitude of the community toward the posts commented or liked or shared. This is normally measured through a sentiment analysis [70].

In order to reach this goal, the posts about ECs should also use strategies of communication typical of the marketing realm. To promote scientific communication to the broader population on social media, communication about ECs should adopt the following strategies:

1. The use of "ambassadors" or testimonials [71], possibly popular in the targeting of millennials and/or baby boomers.
2. The start of an e-WOM (electronic Word of Mouth) process among users of all the social networks, which influences purchase decision-making in many sectors [72] because it leverages the trust that we unconsciously give to our peers' decisions [73]. In fact, "celebrities, influencers, and people whom consumers know personally impact the ways in which millennials use social media information to gain information", but they still trust endorsements from people whom they know personally, above all else, regarding their purchasing decisions [74]. Relying on celebrities and social media influencers to promote products does not substitute or replace targeted marketing efforts to build consumers' trust.
3. The content of the message about ECs should be also treated as a promotional message, and therefore integrated in the place par excellence of ADV in social networks (e.g., stories on Instagram).

In this frame, however, how do ECs perform in terms of good communication strategies? The study conducted a content analysis and a sentiment analysis in order to test the resonance of news about ECs on social media and their acceptance by the audience in terms of engagement and positive attitude.

3. Methodology

The implemented approach was structured in three stages. First, the academic perspective on ECs was established via a content analysis performed on a publication database defined through a search in Scopus, which is a multidisciplinary database suitable for information systems researchers in [75]. Subsequently, the second stage involved a content analysis of professionals/practitioners' production, useful for identifying the main themes of the ECs defined by this category. Finally, the third stage focused on the analysis of the main themes related to ECs on social media and how these are perceived by users. This approach guarantees a full awareness of how the concept has been investigated, disseminated, and acquired among the whole community. The implemented longitudinal analysis approach associated with the literature guaranteed a complete reading of the collected data [76]. The adoption of multiple methods and approaches allows to fill some gaps in the literature and to formalize theories and thematic schemes [77,78].

The three approaches were adopted (1) to identify and represent the academic knowledge on the subject provided by the bibliometric analysis of the results of the Scopus database, which allows for the conceptual map and the areas of analysis to be identified through a re-elaboration of the data [79–81]; (2) to identify and represent the knowledge on the subject provided by professionals by identifying information from the NEXIS UNI platform through the Leximancer software and constructing a conceptual map by area [82]; and (3) to identify and represent the information on social media by interpreting and creating a conceptual map of areas guided by a sentiment analysis that considered the engagement generated [83–85]. The three methods were adopted because they are significant for the analysis of big data and interpretation aimed at constructing concept maps used in discussions and conclusions to analyze and interpret the theme [79,83,86].

3.1. Content Analysis of Academics' Production on ECs

The analysis of academic literature transitioned to a bibliometric approach utilizing a database containing 609 contributions. This database was the result of a preliminary search in Scopus, using the keyword "energy communit*" that resulted in 1.820 documents. Therefore, items in peer review that were written in English and published as of 2022 were selected, yielding 866 results. Finally, duplicates and inconsistent articles were

excluded based on keywords and abstract reading. The defined publications subset was thus analyzed to determine the main thematic clusters representative of the academics' emerging topics regarding ECs through a dedicated science mapping tool (Bibliometrix [79]). More specifically, a multidimensional scaling analysis was conducted as an exploratory method to visualize emerging thematic clusters into a bidimensional space, as presented in [87]. The undelaying data analysis technique employed was multiple correspondence analysis (MCA), which is aimed at detecting and representing the underlying structures in a data set. Indeed, the obtained conceptual map presents publications' keywords as distributed points whose position reflects the existing similarities among them. The similarity drives the clustering, and the closer a keyword is to the cluster's center, the more central and vital it is in that context [88]. A similar procedure has already been implemented in previous studies on different topics [89].

3.2. Content Analysis of Professionals' Production on ECs

Content and thematic analyses were adopted as the main tools to analyze textual contents created by professionals with a replicable and objective method. The content analysis approach is particularly adapted to analyzing emerging issues [90] and creating concept maps where the amount of data to be analyzed is large, requiring information coding. This approach has also been employed in other investigations, such as searching and extracting thesaurus-based concepts from the text data [91]. Therefore, the identification of data on professionals' adoptions of ECs was pursued through the combination of the Nexis Uni search engine, to generate the database object of the analysis, and Leximancer software, to identify the main emerging concepts and their mutual relationship. The combined implementation of the two tools has already been adopted in other studies [90,92,93]. In our study, it was applied to identify the key themes developed by practitioners and technicians in the field of EC. Nexis Uni is a leading international database in the legal and economic information field produced by professionals. The analysis considered the articles published by professionals and practitioners by selecting the appropriate section in the initial phase, as suggested by Stratopoulos et al. [94]. The accessible information collects sources from European countries (it also contains Celex, the database relating to European Union legislation) and from many Commonwealth countries. The search engine is mainly used in the management sector and, in general, in social sciences and economics research [95–97]. Therefore, the professional articles about the topic of EC were identified using the keywords "energy community" and "energy communities" on Nexis Uni. Due to this broad search, it was possible to determine that the EC theme has seen a progressive increase in sources on the platform since 2015. The initial sources were 23,455. Only sources relating to technical articles from 2015 in English were selected, yielding 9734 articles. The typology of selected articles guarantees the objectivity of the analysis on the theme, reducing the selection's discretion, as reported in [92].

Given the obtained database, Leximancer was used to automatically identify the main concepts and the relationship between the main themes by adopting a Bayesian model [98]. Indeed, the software adopts thematic and semantic term relations, using two co-occurrence information types—semantic and relational [6]. Therefore, it is a means to convert, without supervision, lexical co-occurrence data from natural language into semantic patterns, as mentioned in previous research [99]. In the analysis, conjunctions or nonlexical expressions such as "and", "or", "of", and "on" were eliminated, and similar concepts were merged in order to facilitate the creation of an initial thesaurus [100]. A thematical map was thus generated reporting the main themes grouped in circles, whose size represented the weight of each theme [101], with their mutual distance defining the relationship between the terms [102].

3.3. Content and Sentiment Analysis of ECs on Social Media

Social media can be used to influence managerial choices and to perceive the general opinion on and involvement in specific topics by involving actors in the social arena of

confrontation as already demonstrated by Bellucci and Manetti [103]. In order to perceive these opinions, it is necessary to perform a sentiment analysis, an approach linked to the concept of opinion mining. Indeed, a sentiment analysis is a computational study to understand people's opinions and emotions for entities such as individuals, organizations, issues, events, and topics [104]. It offers market insight into boosting business performance and brand image [105]. Through this technique, it is possible to process a search based on specific keywords and to identify, for each term, the associated attributes (positive, neutral, negative) and thus to extract the opinion associated with each key term [106,107]. The analysis techniques generally implemented to perform sentiment analysis can be divided into three macrocategories: keyword detection, lexical affinity, and statistical methods. The first macrocategory, keyword detection, allows text to be classified through easily recognizable emotional categories, identified based on the presence of unambiguous emotional words, such as "happy", "sad", and "bored". On the other hand, the lexical affinity method detects emotional keywords and assigns to arbitrary words a probable "affinity" to particular emotions. Compared to the first methodology described, lexical affinity allows for the refining of the selection and the attribution of the polarity (positive, neutral, or negative). Finally, statistical methods rely on supervised and unsupervised machine learning elements that perform sentiment classification based on the co-occurrence frequencies of words [108,109].

In this view, the third approach implemented in this study identified what is widespread in the ECs through the analysis of social media and communication channels, guaranteeing the most significant information provided through an application based on AI by incidence. The study used Talkwalker, a social media monitoring and a valuable social listening platform for monitoring social networks regarding particular trends, brands, or keywords [83]. The platform performs the content and sentiment analysis by implementing statistical methods [108,109]. Detailing the available statistical methods, supervised learning includes labeled datasets. This approach allows the AI to learn from predicted labels and extrapolate them into larger datasets. Unsupervised learning does not require labeling, and it is up to the machine to self-categorize the data. Unsupervised learning, despite its ability to execute sophisticated learning tasks, can result in the creation of superfluous or intricate data categories, leading to ambiguity regarding the contextual evaluation and identification of the evaluated feature and the grammatical associations between words [110]. Grammatical dependency relationships are obtained by in-depth scanning of the text. The learning process of the machine (also called machine learning) uses models that associate a polarity (positive or negative) to the different types of comments and, if necessary for the analysis, also a topic [111].

In this study, the content and sentiment analysis were conducted for one year (the maximum period possible) using "energy community" and "energy communities" as keywords, which produced 459 results. In the content analysis, the Talkwalker platform showed posts related to a given topic worldwide or only from a specific location. We chose to span the entire data analysis worldwide and, through the filtering operation of Talkwalker, the posts were grouped according to country of origin, language, demographics, content of posts, tags, and devices (however, the software also allowed to create an ad hoc scheme of analysis [112]). The use of this platform has already been adopted as a tool to study policies and projects as a basis for reporting and decision-making tools of the information process [113]. The use of social media and sentiment analysis has also been adopted numerous times to analyze the actors' perceptions, especially in issues concerning sustainability and the diffusion of new approaches [14,114,115]. The results of the social media analysis related to themes pertaining to the ECs are presented in the next section.

4. Results

The following paragraphs contain the results of the content analysis and of the sentiment analysis. Content analysis is defined [116] as a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of

coding, while Krippendorff [117] specified that content analysis is a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use. According to the theoretical framework proposed by Krippendorff, [117] (page 38) and with the use of the AI, as suggested by [14], we analyzed the texts from the world of social media so as to answer to our research questions. The results are described below.

4.1. Topics Regarding ECs Identified by Academics

The analyzed database comprising 609 academic contributions covered a publication timespan from 1981 up to 2022. Despite the first publications on the EC topic being dated as early as 40 years ago, it is a relatively novel topic in the scientific production since most of the contributions were published recently. Indeed, 93% of the total amount was published in the last five years (from 2018 to 2022) and 39% only in 2022. Figure 2 shows the thematic map generated through the analysis, depicting the five following emerging clusters:

- Structural reforms and enabling legislative context (blue cluster): This was the biggest cluster in terms of number of contributions. It encompasses all of the published items aimed at investigating the role of the energy communities within the desired energy transition for a sustainable development in the framework of climate change [118]. The impact of the European Commission directives about energy communities has been extensively investigated [54–56]. Contributions suggesting proper interventions from policy makers (including incentives to foster private investments for renewable energy resources deployment) have also been computed in this cluster [119,120]. The most relevant keywords recognized in this cluster were (in order of decreasing relevance) climate change, renewable energy community, sustainable development, energy policy, economics, economic analysis, investments, alternative energy, decision-making, housing, energy efficiency, energy conservation, sustainability, photovoltaics, European Union, and energy transitions.
- Technologically oriented (green cluster): This cluster included those published papers focused on innovative technological solutions for renewable power generation and storage [28,29], representing novel procedures for optimizing the energy system design (size and allocation of generation and storage components) to maximize environmental [121], economic [122], and social benefits [123]. The ambition of these contributions is to provide tools for the design of zero-energy communities [124] by further limiting environmental impacts and costs. The keywords associated with this cluster were electric energy storage, photovoltaic cells, optimization, electricity generation, heating, digital storage, energy storage, photovoltaic system, zero-energy, energy utilization, electricity, and costs.
- Energy management (violet cluster): Energy management is the red line underneath many publications that explore the integration of multiple distributed energy resources into the electric power transmission network [30]. Indeed, the proper management of energy resource is fundamental considering the intermittent behavior of some renewables, e.g., solar and wind energy, and the variety of energy needs of different EC members. Within this topic, integer programming has emerged as novel and suitable solution for optimizing resource management [125]. Emerging relevant keywords for this cluster were optimizations, energy management, electric power transmissions networks, energy management systems, integer programming, commerce, and energy resources.
- Energy market (red cluster): This was the central topic of another thematic cluster. The body of the literature that fits this topic mainly concerns observed changes in the energy market that follow the diffusion of local energy communities [39,40]. Novel energy-trading mechanisms have been investigated to ensure a just energy transition. Prosumers [35,46,126] and peer-to-peer mechanisms [45] emerged in this cluster as relevant keywords, along with the following: power markets, local energy, energy community, energy, and peer-to-peer networks.

- Smart grid (orange cluster): This cluster emerged as an isolated topic [25,32], while smart grid definition and the optimization of delivered services were a starting point for all the other themes. This suggests that there is enough literature available to justify the creation of a separate cluster for this topic. Only two keywords emerged in the thematic map: smart grid and smart power grids.

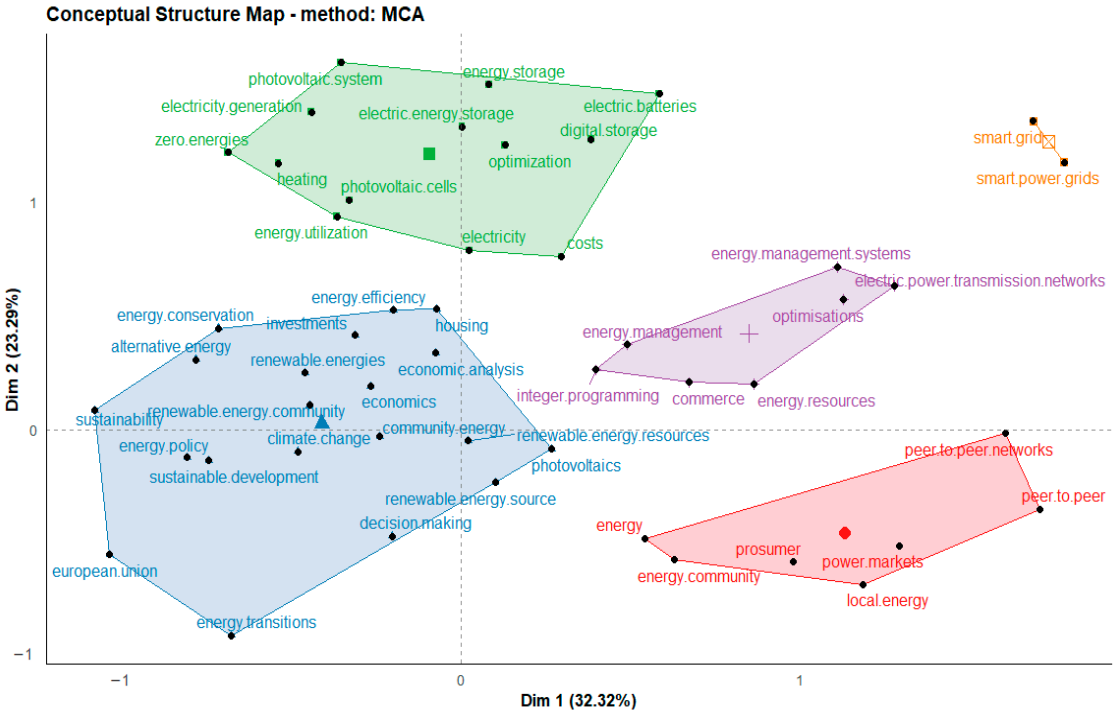

Figure 2. Thematic map emerging from the multidimensional scaling analysis of topics covered by academics.

4.2. Topics Regarding ECs Identified by Practitioners

The themes identified by analyzing the sources in technical journals by the practitioners allowed us to define six main terms defining the clusters of energy communities: energy, community, climate, homes, panels, and city (Figure 3).

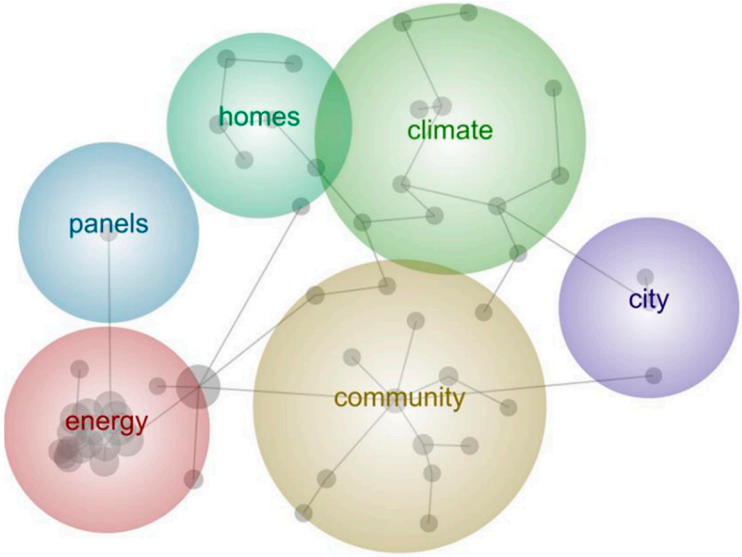

Figure 3. Key themes and their relationship in practitioners' sources.

4.2.1. Energy

The energy cluster was associated with the words utilities, natural, power, policy, industry, Ukraine, COVID, and Europe. The topic of utilities identified several central themes, including the adoption of green economy, the creation of a market dedicated to community networking managed by utilities, and financial projects dedicated to the construction of new infrastructure to support ECs. The concept of nature is based on the use of the land; energy efficiency; the adoption of environmental, social, and governance (ESG) goals; the attention to greenhouse causes; and on the exploitation of local resources earmarked for the budget and investments to protect the environment that can support the use of local energy sources. The policies associated with the energy cluster, particularly regard the following: (i) investments for the production of solar energy, predominantly as a priority policy in England; (ii) the production of wind energy in the countries of Northern Europe; and (iii) policies associated with the use of recyclable batteries for the energy storage in communities to avoid brownouts. The policies also concern the involvement of dedicated actors who can push for the installation of renewable energy production tools integrated into buildings (e.g., real estate, owners' associations, nonprofit associations, and telecommunication companies). The industry concept does not define which companies are of particular interest to ECs. However, it directs attention to the impact of ECs on using sustainable energy and includes footprint assessment, emission assessment, required energy capacity, and emission of authorizations to build new plants. The themes of COVID, Ukraine, and Europe are intertwined: COVID has created an economic crisis linked mainly to companies and has had an impact on the development of alternative energies with the relaunch of new green deal policies through next-generation investments; at the same time, the war in Ukraine and the conflicts with Russia have led to a crisis in gas supply with a new push of possible alternatives.

4.2.2. Community

The theme of the community in this context is related to the ability of generating resources to develop plants. The main themes concern, for one, the formation of the population and guidance through public places of aggregation, such as libraries, gyms, and schools, and for another, information on the platforms that can be used, such as those of crowdfunding and the market. In fact, in Europe, we found several offshore wind projects where joint ventures launched experimental projects financed by consortia and private individuals at different times, based on risk appetite. In some countries, however, public funding is active for developing solar parks and hydrogen facilities in ECs. It was noted from the sources that the theme of the community in the ECs suggests in the need for Europe to develop a proper institutional design for overcoming the partnership complexities (e.g., conflict resolution) to try to mediate between the needs of individuals and communities with climate change and with the needs of industries. The theme of the community is also strangely correlated with COVID, which on the one hand, has prompted all companies to rethink autonomous and self-sufficient business models concerning the community and, on the other hand, has led to particular attention to local needs by seeking energy solutions in contexts that have gone from international to local. The community also entails the functioning of the service; in fact, it is required to secure the network by accelerating the roll-out of the batteries (storage). The working community battery plan should be carried forward, starting with the most vulnerable communities in edge-of-grid locations. The new community development system has been pursued through the multiobjective collaborative optimization method and is oriented toward zero-carbon consumption. Currently, several communities have adopted wind farms. They do not want to live near them, but they are all aware and agree that these are the best solution to create sustainable communities with zero net carbon production by 2050.

4.2.3. Climate Change

Climate change is the other main concept professionals talk about with regard to ECs. In particular, it is worth mentioning the attention drawn to this topic in the COP 27 Summits and in the UN climate summit, aimed at seeking a faster cut in CO_2 production and the use of nonrenewable energy. Although the keyword seems very specific, some practitioners' documents point out that it also refers to the inability of governments to support the millions and billions of euros needed for industry and private consumption following the increase in the cost of gas and petrol generated since the war in Ukraine began. According to these same documents, the boost in ECs may be generated by the sudden increase in utility bills. This paradigm shift of consumption and development focuses particular attention to the characteristics of the service, which, according to common sense, must guarantee levels of stability, reliability, quality, and control. Several professionals report that the topic of climate change, especially among young people, has pushed the search for a more sustainable life approach that rejects nuclear power, which has long-term repercussions for the development of ECs based on clean energy.

4.2.4. Homes, Solar Panels, and Cities

The cluster linked to homes was particularly centered on the new global context, where COVID has led to an economic crisis with rising inflation and a progressive increase in energy and raw materials costs. According to the estimates of this clusters' papers, 50% of the world's population will have progressive difficulty in finding enough energy for their needs, and thousands will live in cold and unhealthy homes. The increase in the cost of gas has led to a crisis in domestic consumers who, for the future, are aiming to install integrated solar panels in homes using other renewable energies to set a cap on energy expenditure with the modulation and flexibility of systems and consumption.

The development of solar panels directly on the roofs of houses and new modes of financing has been adopted by many people for the development of ECs. The use of solar panels for homes is considered by many to be a new energy-efficienct approach that leads to greater air quality and the construction of terraces and spaces for the future that can benefit from the effects generated in nature.

The last cluster identified by professionals concerns the city and the paradigm brought by COVID-19, which involves the movement of many people from larger urban centers to neighboring communities where the quality of life is higher in some respects, but where energy sustainability has yet be developed. In this cluster, there were also the keywords "information" and "campaigns" that are connected to the communication campaigns, which are mainly based on the following topics: (a) the type of funds available, (b) the renewable energies that can be adopted, and (c) the possibility of changing the system with a possible financial return. The information in these campaigns mainly focuses on disseminating reliable material and controlled funding for the development of ECs, as there are currently many uncontrolled services and networks that could generate effects totally opposed to the one expected.

4.3. Themes Identified by the Web and Features on the ECs

Concerning the social media analysis, the keywords were "energy community" and "energy communities". The available results refer to the last year from 11 September 2021 to 11 September 2022 (Figure 4).

The platform identified 459 results: 93% were the interactions received from the sources, while 266 were from unique authors; 97.8% of the results came from Twitter, 1.3% from online news, 0.7% from blogs, and 0.2% from magazines. This is in line with the findings of the academic literature since "among the communication channels to convey messages of firms' Corporate Social Responsibility (CSR) initiatives, social media are becoming increasingly important and, particularly, Twitter is the social media platform where more CSR-related content is generated" [127]. Sustainable initiatives such as those

of ECs, in fact, can be seen as social initiatives [128] and, when also involving companies, can be inscribed in the academic topic of the CSR.

Figure 4. Overview of results, engagement, and sources.

The analysis (Figure 5) showed that there was no gender balance between users who interacted on the topic of energy policies, as the majority of them were men. All users were aged between 18 and 54 years, with a concentrated distribution (38.6%) between 25 and 34 years and a good engagement (26.5%) between people aged 35–44 years; meanwhile, there was only a 19.7% engagement and interaction among people aged between 45 and 54 years, and zero interaction among people aged 55–64 years.

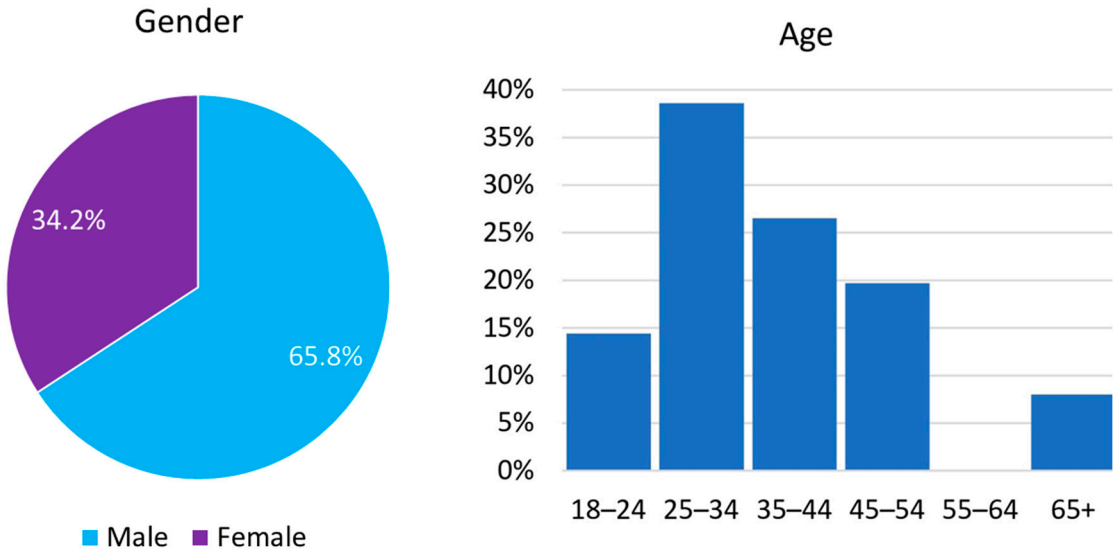

Figure 5. Results according to age and gender of the audience.

Figure 6 presents a distribution of the type of occupation of users, identified on the one hand, by their specific professions (builders, engineers, executive managers, construction workers) and on the other, as individuals who can lead to a change in policies and the dissemination of information (politicians and communicators) or the interest of a different life paradigm (students).

The main concentration of information and debates was developed in the two areas that have defined policies for developing and promoting ECs, namely Europe and America (Figure 7). The leading role of these two geopolitical areas was reflected in the analysis of the language used for the analyzed online news: almost all were written in English (97.4%), and just a few in other European languages, i.e., French (1.1%), German (0.9%), Italian (0.4%), and Dutch (0.2%).

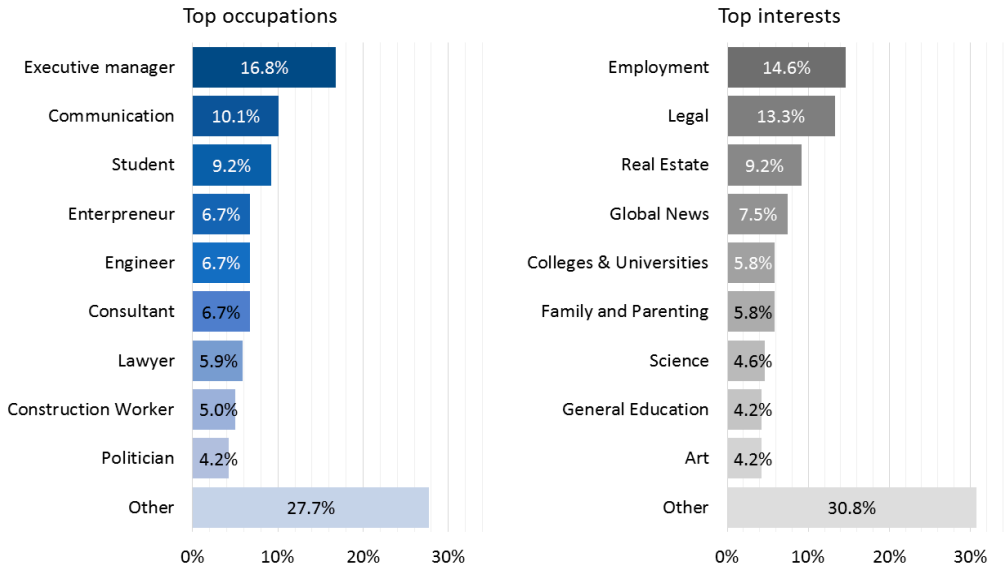

Figure 6. Results according to occupations and interests of the population.

Figure 7. Results according to geographical distribution of the audience.

4.3.1. Content Analysis and Top Themes

The most commonly recurring EC themes (Figure 8) were the following:

Figure 8. Top themes of the content analysis: a tag cloud.

- Recurring topic no. 1: the hashtag energy communities.

This keyword is connected, on the web, mainly to a book chapter on "Energy Communities" published by Academic Press and written by Nicolò Rossetto et al. [129]. The chapter provides a taxonomy of the ECs by defining five categories of communities depending on their role in the energy system and on the maturity of the associated business model. Each category has particular characteristics and gaps related to regulatory policy. Below, a summary of the most important information given by the abovementioned academic chapter that is popular on social media, where people therefore can be well-informed about ECs by reading directly from an academic source.

Currently there are 3500 ECs in Europe. Through an overview of the existing cases, the information presented by the chapter is oriented toward peer development of systems between companies and municipalities. The majority of the posts also promote some elements of the EC development strategy, including direct control over the infrastructures, coplanning through a cooperative model of self-production and regulation, community involvement also through the creation of new jobs dedicated to the development of technologies, and networks in the community. Moreover, the same chapter highlights that the organizational form of the EC is based not only on a replicable business model but also on a process oriented more toward the mission and the social purpose of reinvesting in the community, thus creating benefits for all. The members of the community are not only the citizens who produce for themselves and make energy available on the grid but also real communities oriented toward sustainability, who jointly invest in associated elements such as energy efficiency and saving services, flexibility, storage, heating, and transport. Currently, ECs have developed more in Western countries owing to the sharing of their replicable business models. Of the European ECs, 1500 are organized in the European network REScoop EU (see topic no. 5 in this section), which is trying to replicate its models in Southern and Eastern Europe. There are a number of advantages that may be noted when discussing ECs: enhanced public engagement and buy-in, increased money from local renewables that fulfill local requirements, and the building of more direct relationships with and confidence from individuals for local authorities. Some additional benefits include more motivated citizens who advocate for and deliver the innovation required to achieve net-zero energy usage profiles, reinvestment of profits in locally specific demand reduction, energy efficiency, and fuel poverty work (that brings carbon, well-being, health, and cost-saving benefits). These benefits also include added social value, activation of the local economy and supply chain, money staying local with multiplier effect benefits, and the creation of new future-appropriate local jobs. The ECs, according to the information provided, are based on a type of financing with high profitability where all the members of the community finance the investment with a minimum quota and receive exponential benefits. Moreover, the European investments that are available for EC development currently allow for a long-term return with the current payback of the investment. The access barriers to ECs for the poorest residents of neighboring areas are therefore broken down by this approach that allow for the acquisition of EC membership through payment of a minimum fee to the community while costs are covered with profits generated by energy production and networking in the long run. Municipalities play an essential role in this change. Since they must present long-term objectives in their strategic plan, they must be able to put all residents online and communicate with the utilities, guarantee access to public funding and dividends linked to investments for the creation of the network, and guarantee technical support with the acquisition of new professional skills. Land use is one of these specific skills and must consequently be an integral part of the long-term development of the policies that one intends to implement with the support of the community. Furthermore, without the municipalities, it would be impossible to develop an extensive network to create local energy markets, roll out energy efficiency programs, or finance renewable energy projects on public buildings.

The theme of the EC is also associated with #EUSEW2022 (European Sustainability Week), the renewable energy investment program aimed at rural areas and islands of the

Mediterranean region. The EUSEW is open to public authorities, private companies, non-governmental organizations (NGOs), and consumers with the aim of promoting initiatives for going green and digital within the broader objective of achieving Europe's energy transition.

- Recurring topic no 2: the word "Energy"

The energy tag in the cloud of Figure 8 mainly refers to posts associated with the website dedicated to the European Energy Cities communities. The community aims at realizing a network of cities worldwide to exchange best practices and initiatives for future-proof cities. The Energy Cities community mainly addresses local authorities, but the empowerment of citizens in the energy transition process is also recognized. In this framework, several educational initiatives are organized by the same community to explain to municipalities how to fully engage citizens in their initiatives and thus engage all the stakeholders [130].

- Recurring topic no 3: the word "Policy"

The European Commission has presented many seminars about the policies for ECs, thus trying to push toward a needed green transition. Policies mainly focus on the purchase and sale of renewable energy (for shaping the new energy market) [126], and the same policymakers are generally invited as speakers of #EUSEW2022 [131] for disseminating the new initiatives and regulations.

- Recurring topic no, 4: the word "Project"

Among the research projects that have resonance on the web and that are worth noting, there is one being conducted by Dr. Padraig Lyons, Head of Group at IERC (International Energy Research Centre), called UP-STAIRS. The UP-STAIRS project assists citizens in becoming prosumers and enables their involvement in the energy transition, so as to speed up the development of energy villages. In order to encourage local stakeholders to cooperate, it creates adaptable and iterative business model frameworks for one-stop shops that have been established in five pilot regions: Austria, Bulgaria, Germany, Ireland, and Spain. The expected key impacts include the setup and testing of the five one-stop shops for energy communities and local collective action, triggering 66 million euros in sustainable energy investments and engaging 10,000 consumers in sustainable energy activities.

Among the results of this keyword there is also an article of The Guardian which defines how citizens can support the energy transition [132].

- Recurring topic no 5: the account @REScoopEU

REScoopEU is a European federation of energy cooperatives that pushes the transition toward a low-carbon future by actively participating in the European energy debate. On social media, the REScoop account promotes informative events such as the Sustainable Energy Day Event, organized during the European Sustainable Energy Week (EUSEW2022) [133]. Among the @REScoopEU ECs projects, it is possible to identify some of particular note [134]: the first Portuguese energy community project [135], the AURORA_H2020 project [136], the energy neutrality workshop to be achieved by 2050 [137], and the MUSE GRID project [138].

- Recurring topic no. 6: the word and hashtag Community.

Related to this keyword, it is worth mentioning that the dialogue promoted experimentally by the European community toward citizens mainly identifies a collaborative approach to community development, guiding and officially informing them about the available possibilities. Furthermore, the communication focuses on the type of renewable energy that is expected to involve 10,000 residents in Europe by 2025.

4.3.2. Sentiment Analysis

This study found that 55.5% of social media users had a positive sentiment towards experimental and H2020 (Horizon 2020) projects and adopted policies. Meanwhile, 43.4%

of users held a neutral sentiment related to the UP-STAIRS project, which was discussed at the Interreg Europe Conference. The UP-STAIRS project focuses on investments dedicated to moving rural areas and Mediterranean islands toward energy transition. The negative 1.1% refers to false claims in the Spanish energy community [139].

The identified trend is represented in Table 1, where the main trends by source type are described. Blogs, online news, and Twitter mainly generate the positive sentiment. From a comparison between sources and positive and neutral sentiment, it is possible to identify a low incidence of positive sentiment on sources derived from online news (31% positive against 62% neutral) and blogs (33% positive against 21% neutral). In comparison, it seems to affect Twitter significantly, with a positive sentiment generated by 21% of sources compared to a consistency equal to 12% for neutral results. Although blogs, online news, and Twitter appear to be significantly represented for both positive and neutral sentiment, Twitter has a greater ability to disseminate information on the topic and also to generate more positive sentiment in social media. The key drivers of a positive sentiment on social media are shown in Figure 9.

Table 1. Trend of sentiment on EC based on type of source.

	Sources					
Sentiment	**Blog**	**News Online**	**Twitter**	**Forum**	**YouTube**	**Newspaper**
Total positive results	83	78	53	23	8	9
Positive percentage %	33	31	21	9	3	4
Total neutral results	42	124	23	5	3	2
Neutral percentage %	21	62	12	3	2	1
Total negative results	0	6	0	0	0	0
Negative percentage %	0	100	0	0	0	0

Figure 9. Key drivers of positive sentiment in social media: a tag cloud.

Among the main influencers in the EC topic, REScoop EU [140], was recognized to be the most active and influential author, followed by the profile of the European and Sustainable Energy week—EUSEW2022—in Twitter (15 and 14 posts respectively, associated mainly to a positive sentiment). On the other hand, Forbes magazine was the most influential site even if it just presented 1 post on the EC topic. The content of the post from the Forbes magazine had a neutral sentiment, as most of the other websites focused on the ECs at least once in the analyzed year (September 2021–2022).

This could represent a difference between Twitter (or other social media) and online news: the latter generally aims at presenting new topics that are worthy of notice to a wider

public from a neutral standpoint, while posts published on social media platforms mainly aim at presenting projects outcomes, being posted by the same projects' participants and supporters or opponents (associated with positive and negative sentiments, respectively). An exception is represented by the website dedicated to the EU Agenda (www.euagenda.eu, accessed on 21 January 2023) that has the purpose of promoting initiatives and events in the framework of the same EU Agenda and is, therefore, mainly associated with a positive sentiment.

5. Discussions

The amount of analyzed items for each of the investigated fields, i.e., academic literature, practitioners' production, and social media, reveals that the EC is still an emerging topic which is rapidly gaining popularity among academics but that still needs to reach the general audience. Indeed, the 93% of the whole academic production (609 papers) was published in the last five years (39% only in 2022) despite the oldest academic paper concerning the theme of ECs being dated to 1981. On the other hand, the social media analysis found out only 459 results, which is very little compared to the amount of data generally retrieved through the same method but on different topics. To illustrate, Troisi et al. [83] retrieved a total of 12 million posts for the investigation of the main impacting factors on students' university choice, and Shukri at al. [141] analyzed 3000 tweets when focusing on the Twitter sentiment analysis of the automotive industry. Concerning practitioners, a huge database was retrieved on ECs: 9734 articles from 2015 to 2022. Nevertheless, the content analysis of both academic and practitioners' production reveals that not all the main topics emerging from the scientific literature reach the nonacademic field. Indeed, the six clusters highlighted in the partitioners' content analysis mainly referred to topics included in the biggest thematic cluster of academics, the one related to "structural reforms and legislative context". This is partially highlighted in Table 2, which summarizes the main topics emerging from the content analysis of academic literature, practitioners' production, and social media. Words that are common to the three different fields are highlighted in bold. Innovative solutions anticipated by academia related to technology, energy management, and energy market structure seemed not to be of interest to professionals. A lack of interest toward these topics from practitioners could be a first limit in the diffusion of ECs, meaning that there are not yet professionals fully aware of the complexity required by this novel energy model. Practitioners seems to be mostly interested in funding opportunities for renewable installation (e.g., solar and wind energy incentives) that are part of both the "Energy" and the two smaller "Panel" and "City" clusters, as detailed in the results Section 4.2. Focusing on the "Energy" cluster, this interest seems to come from the recent economic and energy crisis, the first one following the outbreak of the COIVD-19 pandemic and the latter related to the Russian invasion of Ukraine. The energy crisis and the consequent inflation of prices are also emerging topics within the "Climate Change" cluster, in which communications are mainly related to international institutional summits, e.g., COP27 and the UN climate summit. Here. the focus is more on the social consequences of this crisis (actually the core of the "Home" cluster), and ECs are depicted as an opportunity to reach stability, reliability, quality, and control in energy supply at the local scale. Moreover, "local" is a recurring term especially within the "Community" cluster dealing with bottom-up initiatives that require community engagement and cooperation to support local projects for the energy security of the community. "Community" is an emerging topic also present in social media but is a perspective missing in the academic production. Despite EC benefits for the community being generally recalled in each contribution related to the topic, it seems that the literature on social engagement and observations of existing coplanning practices is still poor.

Table 2. Main topics from academia, practitioners, and the web.

Academia	Structural reforms and legislative context: climate change, renewable energy community, sustainable development, energy policy, economics, economic analysis, investments, alternative energy, decision making, housing, energy efficiency, energy conservation, sustainability, renewable energy sources, photovoltaics, European Union, energy transitions.
	Technological innovation: electric energy storage, photovoltaic cells, optimization, electricity generation, heating, digital storage, energy storage, photovoltaic system, zero energy, energy utilization, electricity, costs.
	Energy management: optimizations, energy management, electric power transmissions networks, energy management systems, integer programming, commerce, energy resources.
	Energy market: power markets, local energy, energy community, energy, peer-to-peer networks. Smart grid: smart grids, smart power grid.
Practitioners	Energy: utilities, natural, power, policy, industry, Ukraine, COVID, Europe.
	Community: local, system, projects, funding, sector, wind, market, green, group, storage, infrastructure, clean.
	Climate: climate change, emissions, carbon, services, life, people, time, future.
	Homes: Fuel, crisis, home, costs, bills, costumers, crisis.
	City: Information, campaign.
	Panels
Social media	Energy communities
	Energy
	Policy
	Project
	REScoopEU
	Community

Finally, it is worth noting that the main topics that emerge from social media analysis are associated with posts coming from academics (Rossetto et al. [129] and the IERC, which leads the UP-STAIRS project) or established groups representative of policy makers (the EU commission and EUSEW) and energy cooperatives (REScoop). As a matter of fact, the Energy Cities Communities, emerging as prominent author of those posts populating the "Energy" topic, is a network of local authorities aimed at sharing good practices for a more sustainable future for communities that further aims at engaging citizens for a more effective transition. On the other hand, REScoop is an energy cooperative federation that brings requests and needs from its sector to policy makers. Finally, institutional profiles of the European commission populate the "Community" topic with posts oriented toward the dissemination of renewables availability and funding opportunities for citizens.

In this view, the EC topic seems to be too distant from the general audience despite ordinary citizens being the target of the communication. This result confirms previous research outcomes [15], and it is indicated to also by the analysis of the users' typologies, mainly coming from the communication and education fields (19.3% of the identified users). Nevertheless, the most engaged user typology on the theme of ECs on social media is the executive manager (16.8%) and among the users' interests, "employment" comes in first (14.6%). It appears that the topic of ECs is gaining attention and is seen as attractive for both funding and hiring opportunities. This is further supported by our content analysis of the practitioners' topics.

Therefore, two gaps have emerged from this research that must be addressed in the communication related ECs to support the topic's diffusion on a large scale: (i) practitioners' awareness on all the aspects underlying the EC setup (including new opportunities in the energy market and management) and (ii) effective engagement of ordinary citizens in the topic through social media. Moreover, it is important to raise awareness in the right audience that has the budget to join or even promote ECs. According to our analysis, this

is far from being achieved since there is little or no engagement on the topic, which is even lower in people over 55 years old. This means that some communication strategies must be improved to reach the target.

First of all, the digital divide must be considered, as it affects older generations and, in particular, social media: people over 55 years old are not the main target of social media, apart from Facebook, which, however, attracts people who are not necessarily interested in the topics of sustainability. On Instagram and LinkedIn (the latter of which is aimed at professionals) as well as Twitter (which is the main source of online news regarding ECs), the majority of people are below 55 years old and are typically between 25 and 34 years old according to [142,143], which is also the age that our analysis was more engaged in (see Figure 5). Therefore, in the attempt to address the decision-making of older generations regarding the sustainable choice of joining an EC, communication managers should take into account the use of mass media instead of social media in order to hit the "last mile" of the target (those 55–60 years old): different communication means having a different impact on decision-making according to the buyer persona. In particular, the geographical origin of the target should be a variable that is taken into account. In this sense, the communication on the web properly addresses people of the Western World, even though communication toward the wealthy population of the Middle East could raise awareness in a society where, lately, sensitivity toward sustainability is rising [144].

Secondly, as highlighted in Section 2.2 of the present research, the modalities and strategies of communication should also be implemented to properly reach the target: since the majority of the online news focus on projects and/or sustainable events like the EUSEW2022, there is no substantial use of testimonials or "sustainability" ambassadors. Moreover, the use of "Stories" (like those of Facebook or Instagram) has proven to be more effective; therefore, this is a tool to take into consideration together with the right choice of hashtags in order to generate e-WOM.

Finally, the information should be structured with a strategic mindset, as currently, the left to the operations of a few popular journals and/or the papers of practitioners and/or projects. This means that a proper connection and collaboration between the academic, practitioners, and policy makers who create the guidelines on media communication should start as soon as possible in order to provide mass and social media the opportunity to highlight the topics that would most convince people to join energy communities.

6. Conclusions

There is still a great deal to do in terms of the communication of sustainability. If we assume the concept first emerged in the late 1980s' (it appeared for the first time in 1987 in the Brundtland Report, also entitled "Our Common Future", and signed by several countries for the UN [145]), more than 30 years have passed, but only younger generations (e.g., Gen Z) base their decision-making on sustainability drivers. As discussed in this paper, however, younger generations make sustainable choices in sectors (like the one of fashion for instance [146,147], different from the one of energy consumption. Here, a three-stage approach allowed us to identify the differences among the emerging topics that are associated with main theme of energy communities (ECs) in the following communication domains: scientific literature, practitioners' production, and social media. The analysis revealed that there is still a lack of interest, and consequently awareness, among practitioners on specific topics that are detailed in the literature as fundamental components of the changing energy system, e.g., energy management strategies or new trading mechanisms. Moreover, the engagement of ordinary citizens on the topic is still far from being addressed. This was evident in the social media analysis that was based on a broad search in the web and resulted in only 459 results.

Since the introduction of policies regarding climate change and all the technologies that allow "green behaviors", academics, practitioners, and policy makers have had to deal with the hybrid nature of people as "citizens-consumers" [148], who are the real agents of change in the process of making our societies sustainable [149] since they have the power

to decide whether or not to adopt new technologies that could make the difference in addressing sustainability goals. Previous studies [148,150] empirically demonstrated that technology diffusion is characterized by a learning environment since most subjects in an experiment needed to learn feedback from multiple people/customers before adopting a new technology—thus showing the importance of relationship marketing.

In this sense, communication managers that want to promote ECs need to understand that the use of social media should focus on tactics that instill this sense of "word of mouth", which is the most powerful tool for promoting the adoption of a new technology in consumers. One possibility could be to deal with the EC audience not as an audience of citizens but of consumers "tout court" (potential green consumers, but still consumers). Therefore, communication should be sharpened regarding the economic of joining an EC more than the environmental and social benefits that academics are used to pointing out on social media, e.g., posts from the chapter by [129]. In particular, these should be benefits for the consumers (e.g., saving of money, energy) rather than the benefits for the generic society or the governments, as the public sphere is a concept that is less felt by consumers as a motivation for their purchase decision-making.

The present study, therefore, has demonstrated how a convergent communication policy is needed to develop energy communities' policies capable of creating a single vision for all the actors involved in ECs' sustainable model.

7. Limitations and Future Research

This study has some limitations that could be the object of study for future research. First, the study identified some gaps and similarities among the conceptualization and diffusion of the themes regarding ECs by academics, practitioners, and policies. However, it did not provide any solution for closing these gaps, being an exploratory study.

Future investigations, therefore, should focus on closing the gaps identified between the conceptualization and diffusion of the themes regarding ECs among academics, practitioners, and policies, so as to create a structured vision of each cluster that also takes into account the sentiment of the population toward ECs (this would be useful for policy makers in implementing their communication strategies for EC promotion). Finally, the strong connection among technologies, climate change, and quality of life that emerged as a central theme in EC communication has already been associated with the concept of smart cities. In this sense, policies could require future investigations to understand if even small- and medium-sized ECs in rural areas could be assumed to be smart cities [7,151]. This study, instead, has only cited the concept of smart cities but has not investigated, in depth. the connection with the ECs and the sentiment of citizens toward this connection.

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References

1. Elkington, J. The triple bottom line. *Environ. Manag.Read. Cases* **1997**, *2*, 49–66.
2. Hörisch, J. The relation of COVID-19 to the UN sustainable development goals: Implications for sustainability accounting, management and policy research. *Sustain. Account. Manag. Policy J.* **2021**, *2*, 877–888. [CrossRef]
3. Kick, A.; Rottmann, H. *Sustainable Stocks and the Russian War on Ukraine—An Event Study in Europe*; CESifo Working Paper; CESifo: Munich, Germany, 2022; p. 9798.

4. Welsby, D.; Price, J.; Pye, S.; Ekins, P. Unextractable fossil fuels in a 1.5 °C world. *Nature* **2021**, *597*, 230–234. [CrossRef]
5. Mustafa, J.; Almehmadi, F.A.; Alqaed, S.; Sharifpur, M. Building a Sustainable Energy Community: Design and Integrate Variable Renewable Energy Systems for Rural Communities. *Sustainability* **2022**, *14*, 13792. [CrossRef]
6. Krajnc, D.; Kovačič, D.; Žunec, E.; Brglez, K.; Lukman, R.K. Youth Awareness and Attitudes towards a Circular Economy to Achieve the Green Deal Goals. *Sustainability* **2022**, *14*, 12050. [CrossRef]
7. Ceglia, F.; Esposito, P.; Marrasso, E.; Sasso, M. From smart energy community to smart energy municipalities: Literature review, agendas and pathways. *J. Clean. Prod.* **2020**, *254*, 120118. [CrossRef]
8. Caramizaru, A.; Uihlein, A. *Energy Communities: An Overview of Energy and Social Innovation*; Publications Office of the European Union: Luxembourg, 2020.
9. Zobeidi, T.; Komendantova, N.; Yazdanpanah, M. Social media as a driver of the use of renewable energy: The perceptions of instagram users in Iran. *Energy Policy* **2022**, *161*, 112721. [CrossRef]
10. Hamid, S.; Ijab, M.T.; Sulaiman, H.; Anwar, R.; Norman, A.A. Social media for environmental sustainability awareness in higher education. *Int. J. Sustain. High. Educ.* **2017**, *18*, 474–491. [CrossRef]
11. Carpenter, S.; Takahashi, B.; Cunningham, C.; Lertpratchya, A.P. The Roles of Social Media in Promoting Sustainability in Higher Education. *Int. J. Commun.* **2016**, *10*, 4863–4881.
12. Otamendi-Irizar, I.; Grijalba, O.; Arias, A.; Pennese, C.; Hernández, R. How can local energy communities promote sustainable development in European cities? *Energy Res. Soc. Sci.* **2021**, *84*, 102363. [CrossRef]
13. Tachelet, S.; Giovannini, S. Community Energy: Community Energy Communications at the Local Level. April 2022. Available online: https://www.rescoop.eu/toolbox/community-energy-communications-at-the-local-level (accessed on 21 January 2023).
14. Serna, A.; Soroa, A.; Agerri, R. Applying Deep Learning Techniques for Sentiment Analysis to Assess Sustainable Transport. *Sustainability* **2021**, *13*, 2397. [CrossRef]
15. Piselli, C.; Colladon, A.F.; Segneri, L.; Pisello, A. Evaluating and improving social awareness of energy communities through semantic network analysis of online news. *Renew. Sustain. Energy Rev.* **2022**, *167*, 112792. [CrossRef]
16. Lagendijk, A.; Kooij, H.-J.; Veenman, S.; Oteman, M. Noisy monsters or beacons of transition: The framing and social (un)acceptance of Dutch community renewable energy initiatives. *Energy Policy* **2021**, *159*, 112580. [CrossRef]
17. Thomas, M.; DeCillia, B.; Santos, J.B.; Thorlakson, L. Great expectations: Public opinion about energy transition. *Energy Policy* **2022**, *162*, 112777. [CrossRef]
18. Seidl, R.; von Wirth, T.; Krütli, P. Social acceptance of distributed energy systems in Swiss, German, and Austrian energy transitions. *Energy Res. Soc. Sci.* **2019**, *54*, 117–128. [CrossRef]
19. Herbes, C.; Rilling, B.; Holstenkamp, L. Ready for new business models? Human and social capital in the management of renewable energy cooperatives in Germany. *Energy Policy* **2021**, *156*, 112417. [CrossRef]
20. De Martino, B.; Kumaran, D.; Seymour, B.; Dolan, R.J. Frames, Biases, and Rational Decision-Making in the Human Brain. *Science* **2006**, *313*, 684–687. [CrossRef] [PubMed]
21. Dehler-Holland, J.; Okoh, M.; Keles, D. Assessing technology legitimacy with topic models and sentiment analysis—The case of wind power in Germany. *Technol. Forecast. Soc. Chang.* **2021**, *175*, 121354. [CrossRef]
22. Wu, P.; Li, X.; Shen, S.; He, D. Social media opinion summarization using emotion cognition and convolutional neural networks. *Int. J. Inf. Manag.* **2019**, *51*, 101978. [CrossRef]
23. Shi, J.; Li, Z.; Lai, W.; Li, F.; Shi, R.; Feng, Y.; Zhang, S. Two End-to-End Quantum-Inspired Deep Neural Networks for Text Classification. *IEEE Trans. Knowl. Data Eng.* **2021**, *35*, 4335–4345. [CrossRef]
24. Chen, Y.; Pan, Y.; Dong, D. Quantum Language Model with Entanglement Embedding for Question Answering. *IEEE Trans. Cybern.* **2021**. [CrossRef]
25. Corbett, J.; Savarimuthu, B.T.R. From tweets to insights: A social media analysis of the emotion discourse of sustainable energy in the United States. *Energy Res. Soc. Sci.* **2022**, *89*, 102515. [CrossRef]
26. Ibar-Alonso, R.; Quiroga-García, R.; Arenas-Parra, M. Opinion Mining of Green Energy Sentiment: A Russia-Ukraine Conflict Analysis. *Mathematics* **2022**, *10*, 2532. [CrossRef]
27. Gui, E.M.; MacGill, I. Typology of future clean energy communities: An exploratory structure, opportunities, and challenges. *Energy Res. Soc. Sci.* **2018**, *35*, 94–107. [CrossRef]
28. Say, K.; Schill, W.-P.; John, M. Degrees of displacement: The impact of household PV battery prosumage on utility generation and storage. *Appl. Energy* **2020**, *276*, 115466. [CrossRef]
29. Kloppenburg, S.; Smale, R.; Verkade, N. Technologies of Engagement: How Battery Storage Technologies Shape Householder Participation in Energy Transitions. *Energies* **2019**, *12*, 4384. [CrossRef]
30. Parag, Y.; Sovacool, B.K. Electricity market design for the prosumer era. *Nat. Energy* **2016**, *1*, 16032. [CrossRef]
31. Facchinetti, T.; Della Vedova, M.L. Real-Time Modeling for Direct Load Control in Cyber-Physical Power Systems. *IEEE Trans. Ind. Inform.* **2011**, *7*, 689–698. [CrossRef]
32. Laroui, M.; Nour, B.; Moungla, H.; Cherif, M.A.; Afifi, H.; Guizani, M. Edge and fog computing for IoT: A survey on current research activities & future directions. *Comput. Commun.* **2021**, *180*, 210–231. [CrossRef]
33. Lezama, F.; Soares, J.; Hernandez-Leal, P.; Kaisers, M.; Pinto, T.; Vale, Z.M.A.D. Local Energy Markets: Paving the Path Toward Fully Transactive Energy Systems. *IEEE Trans. Power Syst.* **2018**, *34*, 4081–4088. [CrossRef]

34. Euroelectric. Citizens Energy Communities—Recommendations for a Successful Decarbonization. 2019. Available online: https://www.apren.pt/contents/publicationsothers/eurelectric--citizens-energy-communities.pdf (accessed on 22 November 2022).
35. Bellekom, S.; Arentsen, M.; van Gorkum, K. Prosumption and the distribution and supply of electricity. *Energy Sustain. Soc.* **2016**, *6*, 22. [CrossRef]
36. Heldeweg, M.A.; Saintier, S. Renewable energy communities as 'socio-legal institutions': A normative frame for energy decentralization? *Renew. Sustain. Energy Rev.* **2020**, *119*, 109518. [CrossRef]
37. Casalicchio, V.; Manzolini, G.; Prina, M.G.; Moser, D. From investment optimization to fair benefit distribution in renewable energy community modelling. *Appl. Energy* **2022**, *310*, 118447. [CrossRef]
38. De Villena, M.M.; Aittahar, S.; Mathieu, S.; Boukas, I.; Vermeulen, E.; Ernst, D. Financial Optimization of Renewable Energy Communities Through Optimal Allocation of Locally Generated Electricity. *IEEE Access* **2022**, *10*, 77571–77586. [CrossRef]
39. Saif, A.; Khadem, S.K.; Conlon, M.F.; Norton, B. Impact of Distributed Energy Resources in Smart Homes and Community-Based Electricity Market. *IEEE Trans. Ind. Appl.* **2022**, *59*, 59–69. [CrossRef]
40. Hupez, M.; Toubeau, J.F.; Atzeni, I.; Grève, Z.D.; Vallée, F. Pricing Electricity in Residential Communities Using Game-Theoretical Billings. *IEEE Trans. Smart Grid* **2022**, *14*, 1621–1631. [CrossRef]
41. Sanduleac, M.; Ciornei, V.I.; Toma, L.; Plamnescu, R.; Dumitrescu, A.-M.; Albu, M.M. High Reporting Rate Smart Metering Data for Enhanced Grid Monitoring and Services for Energy Communities. *IEEE Trans. Ind. Inform.* **2021**, *18*, 4039–4048. [CrossRef]
42. Petri, I.; Barati, M.; Rezgui, Y.; Rana, O.F. Blockchain for energy sharing and trading in distributed prosumer communitie. *Comput. Ind.* **2020**, *123*, 103282. [CrossRef]
43. Galici, M.; Mureddu, M.; Ghiani, E.; Pilo, F. Blockchain-Based Hardware-in-the-Loop Simulation of a Decentralized Controller for Local Energy Communities. *Energies* **2022**, *15*, 7623. [CrossRef]
44. Nykyri, M.; Kärkkäinen, T.J.; Levikari, S.; Honkapuro, S.; Annala, S.; Silventoinen, P. Blockchain-based balance settlement ledger for energy communities in open electricity markets. *Energy* **2022**, *253*, 124180. [CrossRef]
45. Sousa, T.; Soares, T.; Pinson, P.; Moret, F.; Baroche, T.; Sorin, E. Peer-to-peer and community-based markets: A comprehensive review. *Renew. Sustain. Energy Rev.* **2019**, *104*, 367–378. [CrossRef]
46. Hahnel, U.J.J.; Herberz, M.; Pena-Bello, A.; Parra, D.; Brosch, T. Becoming prosumer: Revealing trading preferences and decision-making strategies in peer-to-peer energy communities. *Energy Policy* **2020**, *137*, 111098. [CrossRef]
47. Zakeri, B.; Paulavets, K.; Barreto-Gomez, L.; Echeverri, L.G.; Pachauri, S.; Boza-Kiss, B.; Zimm, C.; Rogelj, J.; Creutzig, F.; Ürge-Vorsatz, D.; et al. Pandemic, War, and Global Energy Transitions. *Energies* **2022**, *15*, 6114. [CrossRef]
48. Biswas, S.; Echevarria, A.; Irshad, N.; Rivera-Matos, Y.; Richter, J.; Chhetri, N.; Parmentier, M.J.; Miller, C.A. Ending the Energy-Poverty Nexus: An Ethical Imperative for Just Transitions. *Sci. Eng. Ethics* **2022**, *28*, 36. [CrossRef]
49. De Vizia, C.; Patti, E.; Macii, E.; Bottaccioli, L. A User-Centric View of a Demand Side Management Program: From Surveys to Simulation and Analysis. *IEEE Syst. J.* **2022**, *16*, 1885–1896. [CrossRef]
50. Pigliautile, I.; Caratù, M. Application of Crowd Sensing for Sustainable Management of Smart Cities. In *New Metropolitan Perspectives-Post COVID Dynamics: Green and Digital Transition, between Metropolitan and Return to Villages Perspectives*; Springer: Cham, Switzerland, 2022; pp. 2800–2808.
51. Linnerud, K.; Dugstad, A.; Rygg, B. Do people prefer offshore to onshore wind energy? The role of ownership and intended use. *Renew. Sustain. Energy Rev.* **2022**, *168*, 112732. [CrossRef]
52. Radtke, J.; Yildiz, Ö.; Roth, L. Does Energy Community Membership Change Sustainable Attitudes and Behavioral Patterns? Empirical Evidence from Community Wind Energy in Germany. *Energies* **2022**, *15*, 822. [CrossRef]
53. Wolsink, M. Distributed energy systems as common goods: Socio-political acceptance of renewables in intelligent microgrids. *Renew. Sustain. Energy Rev.* **2020**, *127*, 109841. [CrossRef]
54. EU. Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU (Recast). 2022. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0944 (accessed on 21 January 2023).
55. EU. Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the Promotion of the Use of Energy from Renewable Sources (Recast). 2022. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001 (accessed on 21 January 2023).
56. Lowitzsch, J.; Hoicka, C.E.; van Tulder, F.J. Renewable energy communities under the 2019 European Clean Energy Package—Governance model for the energy clusters of the future? *Renew. Sustain. Energy Rev.* **2020**, *122*, 109489. [CrossRef]
57. Nilasari, M. The Effect of Interactivity, Cost Effectiveness, and Compatibility on the Use of Social Media and its Implications for Organizational Performance. *Am. Res. J. Bus. Manag.* **2019**, *5*, 1–17. [CrossRef]
58. Cappa, F.; Franco, S.; Rosso, F. Citizens and cities: Leveraging citizen science and big data for sustainable urban development. *Bus. Strat. Environ.* **2021**, *31*, 648–667. [CrossRef]
59. Severo, E.; Guimarães, J.; Dellarmelin, M.; Ribeiro, R. The Influence of Social Networks on Environmental Awareness and the Social Responsibility of Generations. *Braz. Bus. Rev.* **2019**, *16*, 500–518. [CrossRef]
60. Lyytimäki, J.; Nygrén, N.; Pulkka, A.; Rantala, S. Energy transition looming behind the headlines? Newspaper coverage of biogas production in Finland. *Energy Sustain. Soc.* **2018**, *8*, 15. [CrossRef]

61. Scheer, D. Communicating energy system modelling to the wider public: An analysis of German media coverage. *Renew. Sustain. Energy Rev.* **2017**, *80*, 1389–1398. [CrossRef]
62. Lyytimäki, J. Mainstreaming climate policy: The role of media coverage in Finland. *Mitig. Adapt. Strat. Glob. Chang.* **2011**, *16*, 649–661. [CrossRef]
63. Lee, E. *Impacts of Social Media on Consumer Behavior: Decision Making Process*; Turku University of Applied Science: Turku, Finland, 2013.
64. Sheldon, P.; Antony, M.G.; Ware, L.J. Baby Boomers' use of Facebook and Instagram: Uses and gratifications theory and contextual age indicators. *Heliyon* **2021**, *7*, e06670. [CrossRef]
65. Smith, S.A.; Watkins, B. Millennials' Uses and Gratifications on LinkedIn: Implications for Recruitment and Retention. *J. Bus. Commun.* **2020**, *60*, 560–586. [CrossRef]
66. Goodrich, K.; de Mooij, M. How 'social' are social media? A cross-cultural comparison of online and offline purchase decision influences. *J. Mark. Commun.* **2014**, *20*, 103–106. [CrossRef]
67. Power, D.J.; Philips-Wren, G. Impact of Social Media and Web 2.0 on Decision-Making. *J. Decis. Syst.* **2011**, *20*, 249–261. [CrossRef]
68. Arya, M.P.; Kerti, Y.N.N. Advertising value of instagram stories and the effect. *Russ. J. Agric. Socio-Econ. Sci.* **2020**, *99*, 29–39.
69. Torelli, R.; Balluchi, F.; Furlotti, K. The materiality assessment and stakeholder engagement: A content analysis of sustainability reports. *Corp. Soc. Responsib. Environ. Manag.* **2020**, *27*, 470–484. [CrossRef]
70. Serrano-Guerrero, J.; Olivas, J.A.; Romero, F.P.; Herrera-Viedma, E. Sentiment analysis: A review and comparative analysis of web services. *Inf. Sci.* **2015**, *311*, 18–38. [CrossRef]
71. Sadrabadi, A.N.; Saraji, M.K.; Zadeh, M.M. Evaluating the Role of Brand Ambassadors in Social Media. *J. Mark. Manag. Consum. Behav.* **2018**, *2*, 54–70.
72. Tjhin, V.U.; Aini, S.R.N. Effect of E-WOM and Social Media Usage on Purchase Decision in Clothing Industry. In Proceedings of the 2019 International Conference on E-business and Mobile Commerce, Taichung, Taiwan, 22–24 May 2019. [CrossRef]
73. Hatzithomas, L.; Boutsouki, C.; Pigadas, V.; Zotos, Y. PEER: Looking into Consumer Engagement in e-WOM through Social Media. In *Advertising Research (Volume VI). European Advertising Academy*; Springer Gabler: Wiesbaden, Germany, 2016.
74. Cooley, D.; Parks-Yancy, R. The Effect of Social Media on Perceived Information Credibility and Decision Making. *J. Internet Commer.* **2019**, *18*, 249–269. [CrossRef]
75. Oakleaf, M. Writing Information Literacy Assessment Plans: A Guide to Best Practice. *Comminfolit* **2010**, *3*, 80. [CrossRef]
76. Dubois, A.; Gadde, L.-E. Systematic combining: An abductive approach to case research. *J. Bus. Res.* **2002**, *55*, 553–560. [CrossRef]
77. Aleksandrov, E.; Bourmistrov, A.; Grossi, G. Participatory budgeting as a form of dialogic accounting in Russia: Actors' institutional work and reflexivity trap. *Account. Audit. Account. J.* **2018**, *31*, 1098–1123. [CrossRef]
78. Esposito, P.; Brescia, V.; Fantauzzi, C.; Frondizi, R. Understanding Social Impact and Value Creation in Hybrid Organizations: The Case of Italian Civil Service. *Sustainability* **2021**, *13*, 4058. [CrossRef]
79. Aria, M.; Cuccurullo, C. bibliometrix: An R-tool for comprehensive science mapping analysis. *J. Informetr.* **2017**, *11*, 959–975. [CrossRef]
80. Fergnani, A. Mapping futures studies scholarship from 1968 to present: A bibliometric review of thematic clusters, research trends, and research gaps. *Futures* **2019**, *105*, 104–123. [CrossRef]
81. Zhao, Y.; Wang, L.; Zhang, Y. Research thematic and emerging trends of contextual cues: A bibliometrics and visualization approach. *Libr. Hi Tech.* **2020**, *39*, 462–487. [CrossRef]
82. Thomas, D.A. Searching for Significance in Unstructured Data: Text Mining with Leximancer. *Eur. Educ. Res. J.* **2014**, *13*, 235–256. [CrossRef]
83. Troisi, O.; Grimaldi, M.; Loia, F.; Maione, G. Big data and sentiment analysis to highlight decision behaviours: A case study for student population. *Behav. Inf. Technol.* **2018**, *37*, 1111–1128. [CrossRef]
84. Hajiali, M. Big data and sentiment analysis: A comprehensive and systematic literature review. *Concurr. Comput. Pr. Exp.* **2020**, *32*, e5671. [CrossRef]
85. Masih, J.; Joshi, A. Understanding health-foods consumer perception using big data analytics. *J. Inf. Decis. Sci.* **2021**, *24*, 1–15.
86. Wilk, V.; Cripps, H.; Capatina, A.; Micu, A.; Micu, A.-E. The state of #digitalentrepreneurship: A big data Leximancer analysis of social media activity. *Int. Entrep. Manag. J.* **2021**, *17*, 1899–1916. [CrossRef]
87. Xie, H.; Zhang, Y.; Zeng, X.; He, Y. Sustainable land use and management research: A scientometric review. *Landsc. Ecol.* **2020**, *35*, 2381–2411. [CrossRef]
88. Mori, Y.K.M.; Makino, N. Multiple Correspondence Analysis. In *Nonlinear Principal Component Analysis and Its Applications*; Springer: Singapore, 2016; pp. 21–28. [CrossRef]
89. Secinaro, S.; Mas, F.D.; Brescia, V.; Calandra, D. Blockchain in the accounting, auditing and accountability fields: A bibliometric and coding analysis. *Account. Audit. Account. J.* **2021**, *35*, 168–203. [CrossRef]
90. Massaro, M.; Secinaro, S.; Dal Mas, F.; Brescia, V.; Calandra, D. Industry 4.0 and circular economy: An exploratory analysis of academic and practitioners' perspectives. *Bus. Strategy Environ.* **2020**, *30*, 1213–1231. [CrossRef]
91. Smith, A.E.; Humphreys, M.S. Evaluation of unsupervised semantic mapping of natural language with Leximancer concept mapping. *Behav. Res. Methods* **2006**, *38*, 262–279. [CrossRef]
92. Mas, F.D.; Massaro, M.; Ndou, V.; Raguseo, E. Blockchain technologies for sustainability in the agrifood sector: A literature review of academic research and business perspectives. *Technol. Forecast. Soc. Chang.* **2023**, *187*, 122155.

93. Lu, Q.; Atadil, H.A. Do you dare to travel to China? An examination of China's destination image amid the COVID-19. *Tour. Manag. Perspect.* **2021**, *40*, 100881. [CrossRef] [PubMed]
94. Stratopoulos, T.C.; Wang, V.X.; Ye, H. Use of Corporate Disclosures to Identify the Stage of Blockchain Adoption. *Account. Horiz.* **2021**, *36*, 197–220. [CrossRef]
95. Charitou, A.; Louca, C.; Panayides, S. Cross-Listing, Bonding Hypothesis and Corporate Governance. *J. Bus. Financ. Account.* **2007**, *34*, 1281–1306. [CrossRef]
96. Lamoreaux, P.T.; Mowchan, M.J.; Zhang, W. Does Public Company Accounting Oversight Board Regulatory Enforcement Deter Low-Quality Audits? *Account. Rev.* **2022**. [CrossRef]
97. Smith, L.; Carder, P.; Bucy, T.; Winfree, J.; Brazier, J.F.; Kaskie, B.; Thomas, K.S. Connecting policy to licensed assisted living communities, introducing health services regulatory analysis. *Health Serv. Res.* **2021**, *56*, 540–549. [CrossRef]
98. Smuts, H.; der Merwe, A.V. Knowledge Management in Society 5.0: A Sustainability Perspective. *Sustainability* **2022**, *14*, 6878. [CrossRef]
99. Biancone, P.; Brescia, V.; Jafari-Sadeghi, V. The impact of the COVID-19 on policies and investments of the European Green Deal. *Eur. J. Volunt. Community-Based Proj.* **2021**, *1*, 60–77.
100. Li, L.; Zhuang, Y.; Gao, Y.; Li, S. One Man's Trash Is Another Man's Treasure: Negative Experiences of Tourists with Different Satisfaction Levels. *Sustainability* **2022**, *14*, 15964. [CrossRef]
101. Massaro, M.; Dumay, J.; Garlatti, A.; Mas, F.D. Practitioners' views on intellectual capital and sustainability: From a performance-based to a worth-based perspective. *J. Intellect. Cap.* **2018**, *19*, 367–386. [CrossRef]
102. Massaro, M. Digital transformation in the healthcare sector through blockchain technology. Insights from academic research and business developments. *Technovation* **2021**, *120*, 102386. [CrossRef]
103. Bellucci, M.; Manetti, G. Facebook as a tool for supporting dialogic accounting? Evidence from large philanthropic foundations in the United States. *Account. Audit. Account. J.* **2017**, *30*, 874–905. [CrossRef]
104. Kumar, A.; Beri, T.; Sobti, T. A survey of sentiment analysis and opinion mining. *Emerg. Technol. Data Min. Inf. Secur.* **2021**, *2*, 407–416.
105. Verma, S. Sentiment analysis of public services for smart society: Literature review and future research directions. *Gov. Inf. Q.* **2022**, *39*, 101708. [CrossRef]
106. Kushal, D.; Lawerence, S.; Pennock, D.M. Mining the Peanut Gallery: Opinion Extraction and Semantic Classification of Product Reviews. In Proceedings of the 12th International Conference on World Wide Web, Budapest, Hungary, 20–24 May 2003; Association for Computing Machinery: New York, NY, USA, 2003; pp. 519–528. [CrossRef]
107. Ortigosa, A.; Martín, J.M.; Carro, R.M. Sentiment analysis in Facebook and its application to e-learning. *Comput. Hum. Behav.* **2014**, *31*, 527–541. [CrossRef]
108. Hussain, A.; Cambria, E. Semi-supervised learning for big social data analysis. *Neurocomputing* **2018**, *275*, 1662–1673. [CrossRef]
109. Majumder, N.; Hazarika, D.; Gelbukh, A.; Cambria, E.; Poria, S. Multimodal sentiment analysis using hierarchical fusion with context modeling. *Knowl.-Based Syst.* **2018**, *161*, 124–133. [CrossRef]
110. Ceron, A.; Curini, L.; Iacus, S.M. *Social Media e Sentiment Analysis: L'evoluzione dei Fenomeni Sociali Attraverso la Rete*; Springer: Milano, Italy, 2014.
111. Tripathy, A.; Ankit, A.; Rath, K.S. Classification of sentiment reviews using n-gram machine learning approach. *Expert Syst. Appl.* **2016**, *57*, 117–126. [CrossRef]
112. Brescia, V. *Smart City e Citizen Participation. Strumenti, Governance e Performance*; Giappichelli, G., Ed.; Giappichelli: Turin, Italy, 2020.
113. Grossi, G.; Biancone, P.P.; Secinaro, S.; Brescia, V. Dialogic accounting through popular reporting and digital platforms. *Meditari Account. Res.* **2021**, *29*, 75–93. [CrossRef]
114. Păvăloaia, V.-D.; Teodor, E.-M.; Fotache, D.; Danileţ, M. Opinion Mining on Social Media Data: Sentiment Analysis of User Preferences. *Sustainability* **2019**, *11*, 4459. [CrossRef]
115. Borrajo-Millán, F.; Alonso-Almeida, M.-D.; Escat-Cortes, M.; Yi, L. Sentiment Analysis to Measure Quality and Build Sustainability in Tourism Destinations. *Sustainability* **2021**, *13*, 6015. [CrossRef]
116. Stemler, S. An overview of content analysis. *Pract. Assess. Res. Eval.* **2000**, *7*, 17.
117. Krippendorff, K. Content Analysis: An Introduction to Its Methodology. *J. Am. Stat. Assoc.* **1984**, *79*, 240.
118. Balletto, G.; Ladu, M.; Camerin, F.; Ghiani, E.; Torriti, J. More Circular City in the Energy and Ecological Transition: A Methodological Approach to Sustainable Urban Regeneration. *Sustainability* **2022**, *14*, 14995. [CrossRef]
119. Golla, A.; Röhrig, N.; Staudt, P.; Weinhardt, C. Evaluating the impact of regulation on the path of electrification in Citizen Energy Communities with prosumer investment. *Appl. Energy* **2022**, *319*, 119241. [CrossRef]
120. Eichman, J.; Castelló, M.T.; Corchero, C. Reviewing and Exploring the Qualitative Impacts That Different Market and Regulatory Measures Can Have on Encouraging Energy Communities Based on Their Organizational Structure. *Energies* **2022**, *15*, 2016. [CrossRef]
121. Hodencq, S.; Coignard, J.; Twum-Duah, N.K.; Mosquini, L.H.N. Including greenhouse gas emissions and behavioural responses in the optimal design of PV self-sufficient energy communities. *COMPEL-Int. J. Comput. Math. Electr. Electron. Eng.* **2022**, *41*, 2072–2083. [CrossRef]

122. Ceglia, F.; Marrasso, E.; Roselli, C.; Sasso, M.; Coletta, G.; Pellegrino, L. Biomass-Based Renewable Energy Community: Economic Analysis of a Real Case Study. *Energies* **2022**, *15*, 5655. [CrossRef]
123. Ceglia, F.; Marrasso, E.; Samanta, S.; Sasso, M. Addressing Energy Poverty in the Energy Community: Assessment of Energy, Environmental, Economic, and Social Benefits for an Italian Residential Case Study. *Sustainability* **2022**, *14*, 15077. [CrossRef]
124. Isaac, S.; Shubin, S.; Rabinowitz, G. Cost-Optimal Net Zero Energy Communities. *Sustainability* **2020**, *12*, 2432. [CrossRef]
125. Volpato, G.; Carraro, G.; Cont, M.; Danieli, P.; Rech, S.; Lazzaretto, A. General guidelines for the optimal economic aggregation of prosumers in energy communities. *Energy* **2022**, *258*, 124800. [CrossRef]
126. Magyar, J. Buying and selling their own renewable energy makes prosumers more independent and sustainable. *Forbes* 2022.
127. Siano, A.; Tench, R. Editorial. *Ital. J. Mark.* **2022**, *2022*, 267–270. [CrossRef]
128. Boulanger, S.O.M.; Massari, M.; Longo, D.; Turillazzi, B.; Nucci, C.A. Designing Collaborative Energy Communities: A European Overview. *Energies* **2021**, *14*, 8226. [CrossRef]
129. Rossetto, N.; Verde, S.F.; Bauwens, T. 1—A taxonomy of energy communities in liberalized energy systems. In *Energy Communities*; Löbbe, S., Sioshansi, F., Robinson, D., Eds.; Academic Press: Cambridge, MA, USA, 2022; pp. 3–23.
130. Energy Cities. The European Learning Community for Future-Proof Cities. Available online: https://energy-cities.eu/ (accessed on 3 December 2022).
131. European Sustainable Energy Week. Available online: https://sustainable-energy-week.ec.europa.eu/index_en (accessed on 3 December 2022).
132. Henley, J. Energy Citizenship: Europe's Communities Forging a Low-Carbon Future. *The Gurdian*, 3 September 2022.
133. EC2 at EUSEW 2022. Available online: https://ec2project.eu/news/ec2-eusew-22 (accessed on 3 December 2022).
134. ETU Initiative Flagship Cases. Available online: https://www.youtube.com/playlist?list=PLLxIkqK5TkmLs3klDo7kNpzWyKrhbsQVd (accessed on 3 December 2022).
135. Donn, N. Introducing Portugal's First Renewable Energy Community. *Portugal Resident*, 3 August 2022.
136. AURORA. Available online: https://www.aurora-h2020.eu/ (accessed on 3 December 2022).
137. Sustainable Places. Citizen Energy Communities: Engaging People and Technologies in the Future of Energy. Available online: https://www.sustainableplaces.eu/citizen-energy-communities/ (accessed on 3 December 2022).
138. Muse Grid Project. Available online: https://muse-grids.eu/ (accessed on 3 December 2022).
139. Macke, M. Energy Community on Tenerife: E.ON and the Municipality of Adeje Pilot Innovative Concept. 2022. Available online: https://www.eon.com/en/about-us/media/press-release/2022/energy-community-on-tenerife:-e.on-and-the-municipality-of-adeje-pilot-innovative-concept%20.html (accessed on 3 December 2022).
140. REScoop. Available online: https://www.rescoop.eu/ (accessed on 9 January 2023).
141. Shukri, S.E.; Yaghi, R.I.; Aljarah, I.; Alsawalqah, H. Twitter Sentiment Analysis: A Case Study in the Automotive Industry. In Proceedings of the IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT), Amman, Jordan, 3–5 November 2015. [CrossRef]
142. Dixon, S. LinkedIn: Distribution of Global Audiences 2022, by Age Group. 2022. Available online: https://www.statista.com/statistics/273505/global-linkedin-age-group/ (accessed on 3 December 2022).
143. Hirose, A. *24 Twitter Demographics That Matter to Marketers in 2023*; Hootsuite: London, UK, 2022.
144. PwC. Middle East Consumers Are Now Healthier, More Digital and Prioritise Sustainability While Shopping, New PwC Report Finds. 2022. Available online: https://www.pwc.com/m1/en/media-centre/2022/pwc-middle-east-consumer-insights-2022-report-finds.html (accessed on 22 March 2022).
145. Hajian, M.; Kashani, S.J. 1—Evolution of the concept of sustainability. From Brundtland Report to sustainable development goals. In *Sustainable Resource Management*; Elsevier: Amsterdam, The Netherlands, 2021; pp. 1–24.
146. Gazzola, P.; Pavione, E.; Pezzetti, R.; Grechi, D. Trends in the Fashion Industry. The Perception of Sustainability and Circular Economy: A Gender/Generation Quantitative Approach. *Sustainability* **2020**, *12*, 2809. [CrossRef]
147. Caratù, M.; Cherubino, P.; Menicocci, C.; Martinez-Levy, A. Does sustainable communication have an impact on international social media audiences? A neuromarketing explorative study between Finland and Italy. In *Proceedings of the XIX SIM Conference Next Generation Marketing. Place, People, Planet: Cooperation & Shared Value for a New Era of Critical Marketing*; Società Italiana di Marketing Location: Salerno, Italy, 2022; ISBN 978-88-943918-8-6.
148. Klintman, M.; Boström, M. Citizen-Consumers. In *Research Handbook on Climate Governance*; Bäckstrand, K., Lövbrand, E., Eds.; Edward Elgar Publishing: London, UK, 2015; pp. 309–319.
149. Spaargaren, G.; Oosterveer, P. Citizen-Consumers as Agents of Change in Globalizing Modernity: The Case of Sustainable Consumption. *Sustainability* **2010**, *2*, 1887–1908. [CrossRef]
150. Beaman, L.; Yishay, A.B.; Magruder, J.; Mobarak, A.M. Can Network Theory-Based Targeting Increase Technology Adoption? *Am. Econ. Rev.* **2021**, *111*, 1918–1943. [CrossRef]
151. Secinaro, S.; Brescia, V.; Lanzalonga, F.; Santoro, G. Smart city reporting: A bibliometric and structured literature review analysis to identify technological opportunities and challenges for sustainable development. *J. Bus. Res.* **2022**, *149*, 296–313. [CrossRef]