

Fragmented Participatory Bioenergy

Abstract

Bioenergy plays a significant role in expanding a sustainable energy transition and achieving climate targets by defossilising global production and consumption patterns. For civil society, the energy transition allows for an active collaborative engagement. However, collectives of participation are challenged by fragmentation on material resource streams, immaterial artefacts and actors. This working paper reflects on challenges connected to these aspects and identifies starting points for further research.

Keywords: *bioenergy, participation, fragmentation, citizen energy, energy transition*

Bioenergie spielt eine wichtige Rolle bei der Ausweitung der nachhaltigen Energiewende und der Erreichung der Klimaschutzziele durch die Defossilisierung der globalen Produktions- und Verbrauchsmuster. Für die Zivilgesellschaft ermöglicht die Energiewende ein aktives kollaboratives Engagement. Die kollektive Beteiligung wird jedoch durch die Fragmentierung der materiellen Ressourcenströme, immateriellen Artefakte und Akteure erschwert. Dieses Arbeitspapier reflektiert die mit diesen Aspekten verbundenen Herausforderungen und identifiziert Ansatzpunkte für weitere Forschung.

Schlagworte: *Bioenergie, Partizipation, Fragmentierung, Bürgerenergie, Energiewende*

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Following the Paris agreement, the exit from nuclear energy until 2022 and the coal phase-out by 2038, Germany is under tremendous pressure to source renewable energy for power generation (Zeigermann et al. 2021). In this sector, biomass is one of the three primary energy sources. Furthermore, biomass is a potential alternative energy source for heat generation in the staggering German heat transition.

Germany's energy transition occurred primarily in a decentralised way. It is characterised by considerable diversity of actors (Moss et al. 2015; Baasch 2021) and shaped by citizen involvement until today. The diverse forms of citizen involvement are individually or collectively organised and reach from awareness to the steering of the energy transition (Koirala et al. 2018). Critical actors are thus bottom-up initiatives, so-called *energy communities*. In 2020, the "Gemeinsame Register der Länder" listed 382 entries on community-based energy activities all over Germany tagged with the keywords *citizen energy company*, *citizen energy cooperative*, *citizen energy*⁶ (Land Nordrhein-Westfalen 2020).

The main characteristics of energy communities are their open, voluntary participation, concern for the community and democratic governance (Baasch 2016; European Union 2019).

When focusing on participation, we can find different theoretical frameworks helping us better understand community energy projects. Chilvers and Longhurst (2016: 586) define collectives of participation as "socio-material collectives of humans, non-human artefacts, and other elements through which publics engage in addressing collective public problems."

⁶ Original keywords in German: Bürgerenergiegesellschaft, Bürgerenergiegenossenschaft, Bürgerenergie.

⁷ According to Bugge et al. (2019: 51), valorisation pathways are "the trajectories through which [values] are created and distributed by and among

Based on this definition, we identify the following main aspects for characterising collectives of participation for bioenergy in the German energy transition:

- **Material resource streams:** shift from linear (traditional) to circular (new) resource streams, resources and their classification, physical processes and path dependencies
- **Immaterial artefacts:** formalised institutional processes, institutional structures, instruments and final policies
- **Actors:** groups of people, organisations and/or individuals connected through different forms of engagement, involved in knowledge creation and actor networks

In this working paper, we operationalise this framework to shed light on collectives of participation in the specific field of bioenergy. We argue that fragmentation is a significant challenge for these collectives and the German energy transition.

Fragmentation of material resource streams

The prerequisite for developing a sustainable decentralised bio-based energy system is the local availability of biogenic resources. Scrub wood, calamity wood, straw-like material and liquid manure are examples of such resources. However, the availability of these materialities and the respective bioenergy is limited due to various kinds of fragmentation.

First, there is significant variability in the energy contents of these materials. This variation implies different possible valorisation pathways⁷. Second, one may deduce a high degree of decentralisation, both spatially and in the ownership structure. Third, due to seasonal availability, timely fragmentation needs to be

actors[...]"'. The values are created through waste valorisation, which "[adds] value to residue, side-streams and by-products through changes in markets and/or [...] substances [...]. At a large spatial and temporal scale, such valorisation pathways may constitute so-called transition pathways."

considered for efficient resource use. And fourth, biogenic residual materials are often regarded as waste, for which suitable disposal routes may divert from energetic valorisation, which leads to further fragmentation of the input material.

Fragmentation of immaterial artefacts

To characterise immaterial artefacts of bioenergy in the German energy transition, formal rules, informal norms and shared understandings that constrain and prescribe political interactions (Gilad 2007) have to be considered. We find partly contradictory and regionally different policy frameworks on the structural level.

Fragmentation of policies includes variations in funding schemes across or within administrative levels. Funding schemes shape distinct possibilities (or barriers) for bioenergy collectives to participate in the sustainable energy transition. One example is funding schemes for Bioenergy Villages in Germany.

Bioenergy Villages are characterised by obtaining a significant share of energy (power and heat) from locally produced biogenic sources. Variations in the respective policy frameworks can be observed on the federal level.

While most federal states did not introduce dedicated funding schemes for Bioenergy Villages, Baden-Württemberg has funded precisely this type of collaborative participation since 2010. Hence, the federal government created additional possibilities for local involvement in community energy projects. The introduction of small scale district heating networks plays an essential role in this context.

In contrast, several bioenergy projects that had already been planned in Mecklenburg-Vorpommern could not be implemented due to a change in the national energy legislation (EEG 2012 and 2014), which led to financial disadvantages for bioenergy projects. As no other funding schemes on the federal or municipal

level were available, some bioenergy initiatives in Mecklenburg-Vorpommern could not balance out the unfavourable changes in the national policy framework for bioenergy.

For the example of Bioenergy Villages, we observe a significantly higher number of initiatives in the federal states that introduced support schemes for Bioenergy Villages (e.g. Bayern, Baden-Württemberg) (Heyder & Beer 2021). Other aspects, like the availability of biomass, certainly play a central role, but we claim that the policy framework on the federal level is decisive in this case.

Hence, we conclude that the legislation needs to recognise citizens or citizen-led collectives as actors in the energy system and support them on all administrative levels to allow for a citizen-led participation collective to contribute to the energy transition.

Besides the policy framework, we understand (available) data on biogenic resources as an immaterial artefact. Successful local bioenergy strategies need to be based on consistent data. No systematic data basis is available to estimate the local material potential. Lenz (2021) identified considerable differences between theoretically calculable and usable resource potentials in the region North Hesse. As a result, individual local data collection schemes on the local level are required.

Fragmentation of actors

Actors are persons, social groups or organisations acting in the political process (Blum & Schubert 2011: 52). Operating in the political process includes pursuing interests and gaining the power for their realisation. Thereby, political actors influence the policy process and its output (policies).

Actors are closely connected to institutions in the sense of “systems of established and prevalent social rules that structure social interactions” (Hodgson 2006: 2). Thus, both actors and institutions influence the resource streams and

the immaterial artefacts relevant for participatory collectives.

As stated above, collective participation is embedded in an already fragmented structural system (e.g., different policy frameworks) that comprises actors and institutions on the supra-national, national, federal, and regional levels. In the following paragraphs, we discuss the role of actors and institutions, for the example of Bioenergy Villages in Baden-Württemberg.

Examples for actors and institutions in the field of bioenergy relevant to collective participation are, among others, citizens, agriculture and forestry producers, municipal or regional departments on waste management, planning or environment.

In Baden-Württemberg, contrary to other federal states, important actors promoting and operating Bioenergy Villages are small-medium size enterprises (SMEs) (Heyder & Beer 2021). One such company is SolarComplex, which operates bioenergy systems in 18 Bioenergy Villages (Solar Complex 2021). In other federal states, Bioenergy Villages are often shaped by self-organised cooperatives whose members may work voluntarily.

We consider actor networks a relevant starting point for further research in bioenergy. Networks on the different components of bioenergy (e.g. biogas) already exist. Yet, to our knowledge, networks connecting participatory collectives, such as Bioenergy Villages, seem to be missing. We assume that their lack impedes the upscaling and diffusion of knowledge and, thus, mutual learning (Heyder & Beer 2021).

Current ambitions to advance the heat transition in Germany shift the scope from Bioenergy Villages to district heating networks (Heyder & Beer 2021), in which national, federal and regional centres are supposed to steer the knowledge exchange development of expert networks. This new development might change the actor landscape in the upcoming years.

Conclusion

Based on these theoretical considerations and empirical findings, we identified the fragmentation of material resource streams, immaterial artefacts and actors as starting points for further research projects and the development of new political measures.

Participation collectives are an integral part of the citizen-led energy transition. The examples above show that more substantial political support (e.g. support schemes on several political levels) allows for a more successful implementation of community-based energy initiatives. As a precondition, the legislation needs to recognise citizens or citizen collectives as actors in the energy system.

We claim that in bioenergy, networking and knowledge exchange between actors on all levels are fragmented, overlooked, and not institutionalised, still. However, it will play a decisive role in the upcoming years, especially in the heat sector.

Furthermore, change in the framework conditions and re-evaluating existing resource pathways and strategies must be considered. Using the example of bioenergy, the ideas presented above underline some challenges that fragmentation might pose to the success of the German clean energy transition as a bottom-up process. Fragmentation can be understood as a barrier – but it also implies positive effects, such as individual support schemes in the federal states that create customised windows of opportunities for local actors.

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