EXTENDED ABSTRACT

Title: A spatial perspective on energy communities: What are policy implications for the energy transition?

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Abstract:
Energy communities (ECs) are gaining more attention in the EU to achieve a more sustainable energy system (see e.g., Lowitzsch et al., 2020; Heldeweg and Saintier, 2020; van Summeren et al., 2021). This is reflected in the recent Clean Energy for all Europeans Package (henceforth, CEP) offering a legislative framework acknowledging ECs, thus putting collective citizen participation at center stage in the energy transition (European Parliament & Council of the EU, 2018; EC, 2019; Caramizaru and Uihlein, 2020). This starkly contrasts previous visions of the European energy system, where industry and utilities were at the core and citizens viewed more as passive consumers. Both the 2019 Electricity Market Directive (EMD) and 2018 Renewable Energy Directive (RED II) allow ECs to engage in a variety of energy-related activities such as generation, distribution, sharing, or providing energy services related to efficiency and storage (Caramizaru and Uihlein, 2020).

Since community energy precedes the EMD and RED II definitions, ECs can be broadly defined as encompassing "a wide range of collective energy actions that involve citizens' participation in the energy system" (*ibid*, p. 4). Although there is a growing literature on ECs, regional differences within countries have been explored much less. Most studies offer insights via cases on a specific EC or ECs in a particular area, or comparative country studies (e.g., see Doci and Vasileiadou, 2015; Romero-Rubio and

Andres Diaz, 2015; van der Schoor and Scholtens, 2019; van Summeren et al., 2021). In this paper, we aim to shed more light on the spatial dimension of EC developments and relevant policies.

For our analysis we focus on the Netherlands. This makes for an interesting case due to the introduction of the 2019 National Climate Agreement (henceforth, Climate Agreement) and establishment of the Regional Energy Strategies (RES). Gaining insights at subnational level can help contribute to addressing challenges and opportunities for the development of RES, whereby ECs play an important role. Taking a spatial perspective could also be germane to undertake for other countries contemplating or already translating national targets to regional programs and projects. To analyze developments in the Netherlands, we use annual data from 1986-2020 on different types of ECs at the RES level consisting of 30 regions. In addition to the demands for a regional scope, the lagging share of energy from renewable sources compared to the EU average,[1] and the growth in ECs over especially the last decade makes the Dutch case interesting to explore (EZK, 2019; HIER and RVO, 2020).

Although the number of ECs has increased since 1986, growth has particularly taken off in the last decade. There are currently around 623 ECs with 97,000 project participants (HIER and RVO, 2020). In particular, a steady growth between 2011 and 2018 can be observed, with a drop in 2019, which most likely relates to reaching a certain satiation point as all provinces, RES regions, and 85% of municipalities now have ECs (*ibid*). The Covid-19 pandemic could have also potentially played a role in a slowdown – it remains to be seen how the trend will be in the near future.

ECs concentrate on three main kinds of projects: wind, solar and heat. The oldest of the three, wind collective projects encompass "all wind projects that citizens collectively develop, manage, own and/or financially participate in" (HIER and RVO, 2020, p. 127). ECs participate in them in three ways: by full ownership of wind turbines or a wind park, partial ownership through shares or only financial participation without judicial or economic ownership or participation right, where the latter is least common. By the end of 2020, ECs had placed 229.9 MW of wind energy, which is 5.7% of total wind energy generated in the Netherlands. There was an increase from 2019 to 2020 of 19%, where the energy generated by the new wind turbines is comparable to the energy

[1]Renewable energy accounted for around 11% of total Dutch energy consumption in 2020, while the EU-27 average was around 20% in 2019 (https://www.cbs.nl/en-gb/news/2021/22/11-percent-of-energy-consumption-from-renewable-sources-in-2020;https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_ energy_statistics).

use of about 245,000 average Dutch households (HIER and RVO, 2020; Bosch en van Rijn, 2022). EC wind projects are largely dominated by two ECs, namely Zeeuwind and Deltawind in Zeeland; these produce 25% of all EC wind energy (HIER and RVO, 2020).

Collective solar projects are "solar roofs, solar parks, floating solar fields or other solar energy projects, which citizens collectively develop, manage and own, and/or financially participate in and where the solar panels are placed on the roof or ground of a third party[2]" (*ibid*, p. 127). In 2020, 70% of ECs participated in solar projects, with a national total of 814 solar projects and 166.4 collectively-owned MW solar power – the equivalent of the energy use of almost 50,000 average Dutch households. This is over 4.5 times the amount of solar power raised in 2017 (36.6 MW) and about a 40% increase compared to 2019 (119 MW) (HIER and RVO, 2017, 2018, 2019, 2020).

The newest type of EC projects are heat projects, defined as an EC project that focuses on realizing the heat transition – the movement away from natural gas to more sustainable sources of heat in the built environment (e.g., heating system renewal) – in their neighborhood, district, municipality or region. The involved ECs must be publicly visible as local heat initiatives, participate actively on heat transition plans and have projects for collective energy provision. Most heat projects flow from the Climate Agreement's requirement for a transition vision for heat at district level by the end of 2021 (EZK, 2019), and are still largely in the development phase.

The policy landscape for ECs in the Netherlands takes place in the larger climate and energy policy frameworks of the EU, as well as developments at national, regional and local levels.

EU level

The proposed European Climate Law is set to translate EU policy objectives to achieve climate neutrality by 2050 into a legal requirement.[3] Energy policies are a key component for achieving these targets. The CEP clearly illustrates the momentous shift to decentralized energy systems (European Parliament & Council of the EU, 2018; EC, 2019). To facilitate this bottom-up approach, EU legislation recognizes ECs as central actors in the revised 2019 EMD and 2018 RED II. Both directives underscore that the

[2]Other than the collective, i.e. solar panels on someone else's roof or ground.
[3]https://ec.europa.eu/clima/policies/eu-climate-action/law_en (accessed 9 July 2021).

primary purpose of ECs is to provide social, economic and environmental benefits rather than focusing on financial profits (*ibid*; Roberts et al., 2019), which resonates with the goals of especially local energy cooperatives in the Netherlands. As these are recent developments, the transposition of the EU directives into national law of the member states is in progress.[4]

National and regional levels

In the Netherlands, the different levels of governance – municipal, RES, provincial and national – cooperate within the framework of the 2019 Climate Agreement, with RES created particularly to facilitate cooperation. This agreement presents a comprehensive strategy for Dutch society to move towards the Paris Climate Agreement energy goals for 2030 with specific responsibilities for the various governance levels. One of the elements of key importance to ECs is the target of 50% ownership of the production of renewable energy in the local community by 2030. The plan places great emphasis on the participation of the local environment throughout, incorportating all levels of society in the energy transition.

Within the agreement, municipalities are made responsible for improving the sustainability of the built environment. One of their key tasks is to develop a transition vision for heat, the first draft of which was due by the end of 2021. The vision must outline a realistic time path to transition away from natural gas with the aim that all municipalities combined will make 1.5 million houses[5] sustainable by 2030. The visions will be reviewed every five years. ECs can participate in the heat transition in varying ways: ECs could be involved in an advisory role in the development of the transition vision, in gaining support for the needed changes, and in the establishment of heat projects.

At the province level, ECs are primarily supported via guidance and funding, with implementation and level of activity varying between provinces. Guidance is provided through knowledge sharing in the start-up of ECs and execution of projects in collaboration with energy workplaces, Nature and Environmental Federations, and umbrellas of ECs at the national level. Funding is provided in two forms: via subsidies and funds. Subsidies, in contrast to funds, must be payed back. Additionally, almost all

[4]Existing types of ECs vary among and within member states, and though not the focus of this paper, an interesting direction for research in the coming years is to analyze how the EU directives fit (or not) structures in place, and the potential need for adjustments due to incoherence in frameworks.

[5]Houses are measured as house equivalents to compensate for differences in building size.

provinces have a regional energy fund. These also differ between provinces in conditions and form, the most common of which are: loans with soft interest; guarantees, in order to attract other investors; and stakes, often up to 50% (HIER and RVO, 2020).

The 30 RES regions were introduced in the Climate Agreement to increase coordination among the various multi-level stakeholders within a region to achieve objectives of the 2030 climate goals; *inter alia*, municipalities, provinces, water boards, network operators, citizens and SMEs. Its role is threefold: (1) specifying energy targets to be achieved within designated time frames; (2) organizing spatial integration with community involvement; and (3) organizing long-term cooperation between all regional parties (EZK, 2019). As the RES regions have such an encompassing coordinating role, it is pivotal for ECs that Climate Agreement targets (e.g., 50% local ownership of renewable energy production by citizens and businesses) are well-anchored in the RES.

At the national level, further oversight of the plans of lower administrative levels is offered in order to ensure that the targets of the Climate Agreement are met. Additionally, various supportive instruments are made available to local levels. These are often in the form of subsidies that can be applied for by for example, municipalities, businesses or ECs. In some cases only the initial proposal is reviewed; in others, further oversight is offered for specific targets to be met.

<< Full paper is in progress >>

The setup is as follows:

First, we present background on ECs in the Netherlands. In Section 3, we provide a comprehensive overview of relevant policies and instruments related to ECs. In Section 4 we further appraise the development of ECs and key policies from a spatial perspective, and discuss their implications for RES and more broadly the energy transition. Finally, we conclude and suggest directions for further research.

Keywords: Energy transition, energy communities, energy policy, spatial distribution, the Netherlands

JEL codes: O13, O18, Q48, R10

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