



National drivers shaping citizen finance for renewables

Analytical brief and policy insights on the Baltic Sea Region

WHAT'S AT STAKE?

The accelerated diffusion of renewable energy technologies (RETs) stands as a core pillar to transition towards fully decarbonised energy systems. However, the mass-scale deployment of RETs (especially onshore wind power technology) has been facing increasing opposition from local communities concerned with what they perceive as an overly opaque and non-participatory development process, along with an unfair distribution of benefits and burdens stemming from their operability. A lack of social acceptance therefore emerges as a considerable risk for the timely diffusion of RETs, challenging to slow down the projected pace of end-user adoption necessary to realise increasingly ambitious national climate and energy targets (Cohen et al. 2016a; Cohen, Reichl, and Schmidthaler 2014; Vuichard, Stauch, and Wüstenhagen 2021).

Due to its decentralised nature and bottom-up configuration, addressing acceptance challenges around renewable energy (RE) infrastructure requires more socially innovative ways of collaboration and decision-making (Hoppe, Butenko, and Heldeweg 2018; Hoppe and de Vries 2018). Citizen-driven forms of RE generation locally embedded around participatory practices offers a promising vehicle through which to operationalise such changes. In this context, legislative efforts to catalyse citizen involvement in RE generation could benefit from an empirically-validated informational source base guiding responsive policies to broaden citizen participation in energy decarbonisation efforts.

Drawing lessons from a [survey-based study](#) conducted across all Baltic Sea Region (BSR) countries, this brief summarises a number of national socio-economic, energy culture, and demographic drivers shaping the uptake of citizen co-investment schemes in community renewable energy (CRE) across all BSR countries. It then outlines a number of policy insights for calibrating more citizen-centric support frameworks to uphold

the diffusion of community-anchored RE developments within a European context.

KEY FINDINGS

- Substantial interest expressed by BSR citizens for collectively investing in and co-owning CRE initiatives, with 74% of survey respondents considering to invest. Results are highly context-dependent and should be interpreted in light of different national socio-economic and energy-cultural characteristics.
- Collective investment schemes in CRE can facilitate low-income segments of the population with greater opportunities to co-own RE generation assets – in contrast to privately financed, single-owner RE generation systems which tend to be a comparatively more expensive investment alternative.
- Citizens in countries with a higher market concentration on electricity production are less likely to co-invest in CRE initiatives. Policy efforts that lower the market concentration of leading electricity producers and incentivise a greater number and diversity of electricity producers can therefore trigger increased citizen investments in CRE projects across the BSR.
- BSR countries with increased societal discrepancy on energy and climate issues may tend to disfavour co-investment schemes in CRE. Alternatively, citizens in countries with a more cohesive 'energy culture' are more likely to invest in CRE. This is particularly the case when citizens increasingly agree on:
 - a) the jobs created from RET deployment,
 - b) the veracity of climate change,
 - c) the environmental benefits of RE.
- Demographic characteristics play a role in shaping CRE co-investment uptake across the BSR: higher disposable incomes and younger population segments both showcase increased propensity for co-investing in CRE initiatives.

* Cover photo by Mohammad Hosein Mohebbi (2019) on Unsplash.

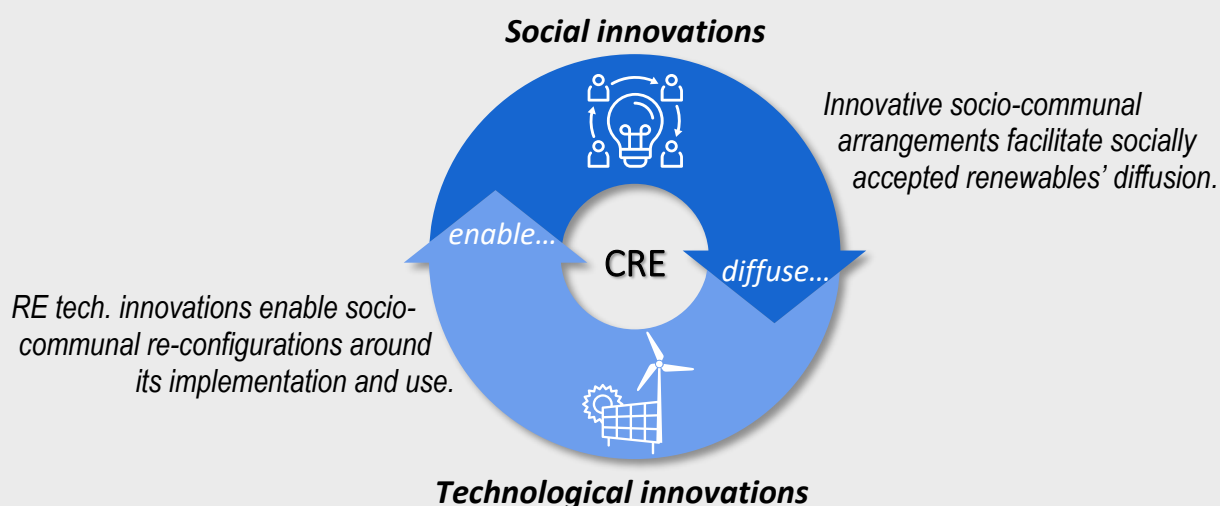


COMMUNITY RENEWABLE ENERGY & SOCIAL ACCEPTANCE: CONNECTING THE DOTS

Citizen participation in RE generation has been operationalised through various different organisational formats and business models. These are captured under the umbrella concept of 'community renewable energy' (CRE) and refer to e.g. energy cooperatives, municipality-owned utilities, community development trusts, consumer stock ownership plans, online crowdfunding platforms, etc.

This organisational versatility highlights the prominence that different socially innovative arrangements have in reconfiguring citizens' energy consumption and production practices as a means to enact RET diffusion processes, with more open and collaborative arrangements (e.g. wind energy cooperative) conducive to potentially greater participation and hence socially-accepted technology diffusion than closed and private ones (e.g. private utility wind farm). CRE therefore operates as a legitimisation vehicle through which to disrupt the locked-in role of end-users as passive energy consumers, enabling citizens to collectively finance the development of socially innovative forms of RE generation.

However, it is precisely due to the RET innovation itself (i.e. its decentralised nature and enhanced modularity) that socially innovative ways of collaboration are enabled, and more participatory socio-communal arrangements are made possible, in the first place. CRE might therefore be better understood as a citizen-centric vehicle for RE diffusion whereby novel social arrangements (e.g. cooperative) organise around technological innovations (e.g. renewables, storage) moving across a bi-dimensional continuum of process (open ↔ closed) and outcome (collective ↔ private).



Source: Pons-Seres de Brauwer and Cohen (2022).

METHODS

The data used for the analysis was collected through an international survey distributed to citizens across every BSR country: Germany, Poland, Lithuania, Latvia, Estonia, Finland, Sweden, Norway, and Denmark. Around 600 individuals completed the survey in each country, resulting in a final sample of 5,425 respondents.

These were drawn through a quota sampling procedure to ensure representativeness across national populations in term of age, gender, and income distribution.

Survey respondents were presented with eight different investment scenarios to co-finance a RE project. Each scenario displayed three different investment options with different capital requirements, financial returns, pay-back periods, RE technologies, and project administrators.



Respondents were tasked with selecting their most preferred investment option. This resulted in a final sample of 43,400 investment choices from the survey respondents.

Complementing the survey were a number of country-level variables capturing national socio-economic trends, energy culture characteristics, and demographic factors potentially shaping the investment choices of the survey participants.

Based on these variables, a probabilistic model was estimated to examine the relative influence that these country-level variables may have in shaping citizens' willingness to collectively finance CRE developments across all BSR countries.

Socio-economic trends

- Gross Domestic Product
- Income inequality
- Share of renewables in final energy use
- Market concentration of electricity producers
- Retail electricity price

'Energy culture' characteristics

Extent of disagreement across a nation-wide community of citizens...

- ...on the number of jobs created from the build out of renewables.
- ...on the veracity of climate change.
- ...on the environmental benefits related to renewable energy.

Demographic factors

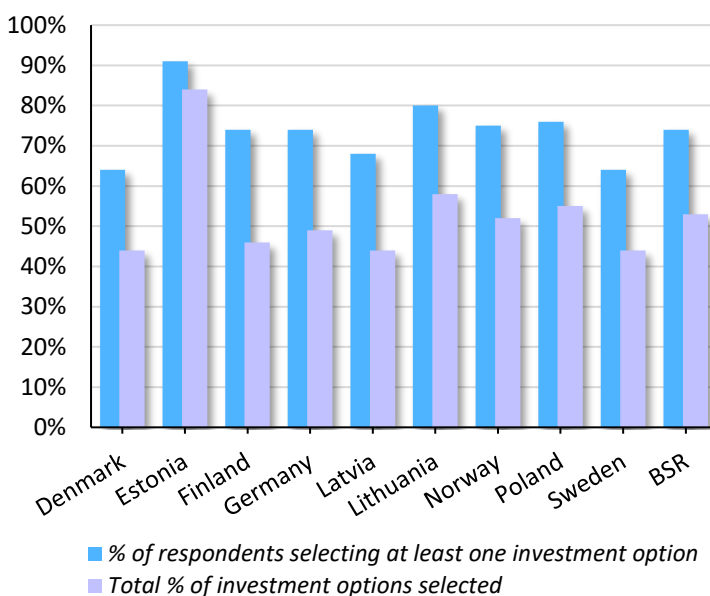
- Gender
- Disposable income
- Age

RESULTS

High interest for co-investing in CRE projects via collective finance and co-ownership schemes

Up to 74% of survey participants selected at least one investment option, and further chose to co-

invest in 53% of all investment options presented to them.



Specifically, BSR countries with a low or non-existent tradition on cooperative association (i.e. low CRE culture) and showcasing high acceptance rates (i.e. Estonia, Lithuania, Norway, Poland) may be indicative of citizens' predisposition to partake in novel co-investment schemes on CRE initiatives. This may be particularly the case for countries with acutely low RES installed capacities per capita (i.e. Estonia, Lithuania and Poland), where acceptance concerns stemming from new RE infrastructure development might not yet be consolidated (Cohen et al. 2016b).

Further, countries with an emerging or robust track-record on cooperative association yet manifesting low acceptance rates (i.e. Denmark, Finland, Germany and Sweden) may be illustrative of a more cautious co-investment behaviour due to perceived small-scale energy investment risks derived from a combination of prohibitive capital investment requirements (Bauwens, Gotchev, and Holstenkamp 2016; Laybourn-Langton 2016), strict spatial planning criteria (McLaren Loring 2007), lengthy permitting procedures (Hildebrandt 2019), unaffordable grid access fees (Ruggiero, Martiskainen, and Onkila 2018), and increasingly stringent RE compensation mechanisms (Wierling et al. 2018), among others.



Collective investment schemes in CRE can facilitate low-income segments of the population with greater opportunities to co-own RE generation assets.

Paradoxically, citizens in BSR countries with a higher Gross Domestic Product (GDP) per capita are less likely to co invest in CRE initiatives. Furthermore, BSR countries with greater income inequality show higher acceptance of CRE schemes, with every unit increase in income inequality leading to a 9.7% increase in the willingness of BSR citizens to co-invest in CRE initiatives.

These two observations suggests that it is not simply a country's aggregated wealth – but rather its distribution – what prominently associates with the propensity of its citizens to collectively invest in community-based forms of RE generation. Importantly, both GDP and income inequality findings point to the fact that, since CRE schemes typically require a lower investment for co-owning a RE generation facility, population segments with a lower disposable income may have greater opportunities to partake in collective investment and co-ownership schemes – in contrast to privately financed, single-owner RE generation systems which tend to be a comparatively more expensive investment alternative (Haggett and Aitken 2015; Pons-Seres de Brauwier and Cohen 2020).

Citizens in countries with more restrictive energy markets – either in the form of higher market concentration on electricity generation or higher electricity prices – are less likely to co-invest in CRE initiatives.

In addition, citizens in countries with a higher market concentration on electricity production are less likely to co-invest in CRE initiatives: every additional percentage point increase in the market share of the largest electricity producer triggers a 50% decrease in the average BSR citizen's probability to co-invest in CRE.

Finally, citizens in countries with higher electricity prices are also less likely to co-invest, with every €ct.1 increase in price triggering a 6.1% decrease in

the average BSR citizen's likelihood to collectively invest in a CRE project.

Citizens in countries with more cohesive energy cultures are more likely to invest in CRE.

Turning to national energy culture characteristics, individual dissonance with the energy culture in a country negatively drives the probability to co-vest in CRE developments across the BSR. Specifically, individual dissonance regarding the impact of RES uptake on job creation showcases the strongest negative effect on co-investor acceptance for CRE, with a 0.01 unit increase in dissonance associated with a 6% point reduction in the probability of CRE co-investing. Similar findings are observed for individual dissonance on the veracity of climate change (-3.8% points) and on the environmental benefits from increased RES adoption (-3.7% points).

Consequently, BSR countries with increased societal discrepancy on energy and climate issues may tend to disfavour co-investment schemes on CRE, while BSR countries with reduced discrepancy may tend to favour them.

Individual demographic characteristics.

As expected, households with a higher disposable income are more willing to invest in CRE across the BSR. Specifically, for every €100 increase in household disposable income the probability to invest in CRE increases by 2.4% points.

Additionally, older respondents are more reluctant to co-invest in CRE, suggesting a reduced risk aversion from younger population segments, who are more inclined to the possibility of co-investing in socio-technically innovative forms of RES diffusion.

Finally, female respondents on average are 8.6% less likely to co-invest in CRE schemes.

LESSONS FOR POLICYMAKERS

In light of the substantial interest manifested by survey respondents for citizen-financed CRE schemes across the BSR, legislative efforts should attempt to calibrate stable regulatory frameworks



that minimise investment risk for citizen investments while ensure profit-guaranteed financial returns for more socially innovative but also risk exposed RE initiatives. To this end, relevant measures could include:

- Facilitating easy access to government-backed finance by means of e.g. low interest or interest-free public loans, capital subsidies, or loan guarantees, among others.
- Establish harmonised fiscal incentives for community-based formats of RE generation, for instance via production tax exemptions for clean fuel commodities commensurate with their CO₂ emissions abatement potentials and in consonance with domestic carbon taxes.
- Guarantee long-term remuneration schemes for CRE generation based on differentiated e.g. feed-in-tariff schemes.

Furthermore, given the findings reported in this brief, policymaking efforts across BSR countries could focus on the following measures to increase citizen investments in CRE projects across the region. These could include:

- Lower the market concentration of leading electricity producers by incentivising the market participation of a greater number and diversity of electricity producers including those captured under the CRE umbrella concept described above.
- Particularly for countries hosting younger populations, establish a more versatile economic incentive structure for CRE co-investment platforms differentiated in function of age and income levels. This could include tailoring specific economic offerings targeting different age groups with different socio-economic characteristics and financial endowments with different sets of attributes related to CRE co-investments.
- Undertake national information, communication & education campaigns disseminating easily accessible, factual information on the potential of RE infrastructure development for job creation and industrial development, along with the aggregated environmental benefits

stemming from RET diffusion. This should go in tandem with long-term strategies to combat misinformation on climate change through the dissemination of science-based information on its bio-physical dynamics and socio-economic/environmental impacts

When pursued simultaneously and coordinated across multiple levels of governance (i.e. municipal, provincial, regional, and state-level administrative divisions), these and other policy measures could all contribute to transpose the EU's Clean Energy Package into national regulatory frameworks enabling a greater participation of European citizens in climate mitigation efforts by means of, in this case, collective investment and shared ownership schemes for community-based RE generation initiatives. Doing so would in turn enable BSR countries to realise EU-wide ambitions to have European citizens "take ownership of the energy transition, benefit from new technologies to reduce their bills, [and] participate actively in the market" (European Commission 2015, p. 2).



REFERENCES

- Bauwens, Thomas, Boris Gotchev, and Lars Holstenkamp. 2016. 'What Drives the Development of Community Energy in Europe? The Case of Wind Power Cooperatives'. *Energy Research and Social Science* 13:136–47.
- Cohen, Jed J., Klaus Moeltner, Johannes Reichl, and Michael Schmidthaler. 2016a. 'An Empirical Analysis of Local Opposition to New Transmission Lines Across the EU-27'. *The Energy Journal* 37(3).
- Cohen, Jed J., Klaus Moeltner, Johannes Reichl, and Michael Schmidthaler. 2016b. 'Linking the Value of Energy Reliability to the Acceptance of Energy Infrastructure: Evidence from the EU'. *Resource and Energy Economics* 45:124–43.
- Cohen, Jed J., Johannes Reichl, and Michael Schmidthaler. 2014. 'Re-Focussing Research Efforts on the Public Acceptance of Energy Infrastructure: A Critical Review'. *Energy* 76:4–9.
- European Commission. 2015. *ENERGY UNION PACKAGE. COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK. A Framework Strategy for a Resilient Energy Union W*. 52015DC0080. Brussels.
- Haggett, Claire and Mhairi Aitken. 2015. 'Grassroots Energy Innovations: The Role of Community Ownership and Investment'. *Current Sustainable/Renewable Energy Reports* 2(3):98–104.
- Hildebrandt, Margit. 2019. 'Hard Times for Wind Power'. *New Energy*, August.
- Hoppe, Thomas, Anna Butenko, and Michiel Heldeweg. 2018. 'Innovation in the European Energy Sector and Regulatory Responses to It: Guest Editorial Note'. *Sustainability* 10(2):416.
- Hoppe, Thomas and Gerdien de Vries. 2018. 'Social Innovation and the Energy Transition'. *Sustainability* 11(1):141.
- Laybourn-Langton, Laurie. 2016. *Community and Local Energy Challenges and Opportunities*.
- McLaren Loring, Joyce. 2007. 'Wind Energy Planning in England, Wales and Denmark: Factors Influencing Project Success'. *Energy Policy* 35(4):2648–60.
- Pons-Seres de Brauwer, Cristian and Jed J. Cohen. 2020. 'Analysing the Potential of Citizen-Financed Community Renewable Energy to Drive Europe's Low-Carbon Energy Transition'. *Renewable and Sustainable Energy Reviews* 133:110300.
- Pons-Seres de Brauwer, Cristian and Jed J. Cohen. 2022. 'Citizen Preferences for Co-Investing in Renewable Energy: An Empirical Exploration of the "Community-as-Investor" Acceptance of Renewables' Innovation'. Pp. 61–89 in *Energy Transition in the Baltic Sea Region: Understanding Stakeholder Engagement and Community Acceptance*, edited by F. Karimi and M. Rodi. London: Routledge.
- Ruggiero, Salvatore, Mari Martiskainen, and Tiina Onkila. 2018. 'Understanding the Scaling-up of Community Energy Niches through Strategic Niche Management Theory: Insights from Finland'. *Journal of Cleaner Production* 170:581–90.
- Vuichard, Pascal, Alexander Stauch, and Rolf Wüstenhagen. 2021. 'Keep It Local and Low-Key: Social Acceptance of Alpine Solar Power Projects'. *Renewable and Sustainable Energy Reviews* 138:110516.
- Wierling, August, Valeria Jana Schwanitz, Jan Pedro Zeiß, Celine Bout, Chiara Candelise, Winston Gilcrease, and Jay Sterling Gregg. 2018. 'Statistical Evidence on the Role of Energy Cooperatives for the Energy Transition in European Countries'. *Sustainability (Switzerland)* 10(9):3339.





ABOUT THE AUTHOR

Cristian Pons-Seres de Brauwer

Cris is a PhD student in the Department of Wind Energy at the Technical University of Denmark (DTU), where he investigates the socio-politics of market-based renewable energy diffusion processes and its implications for a societally just clean energy transition.



He is particularly interested in the role of citizen-led renewable energy initiatives within Europe's energy decarbonisation efforts, as well as on the suitability of different support schemes to facilitate their market participation and expedite their diffusion.

MISTRAL is a European Innovative Training Network aiming to develop a new generation of researchers equipped to evaluate the complexity of social acceptance issues facing the deployment of renewable energy infrastructure, and propose innovative solutions in a variety of research, government and business contexts.

MISTRAL provides a world-class training environment where Early-Stage Researchers (ESRs) benefit from a robust academic network and solid policy-industry relationships in Portugal, the United Kingdom, Denmark, Germany, Switzerland, and Ireland. These are mobilised for the development of advanced research techniques and a transferable skillset to further the academic and professional trajectories of the ESRs.



<https://mistral-itn.eu/>

