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Co-creation as a social process for unlocking sustainable heating transitions in Europe

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ABSTRACT

Providing heat is a key aspect of social life and a necessity for comfort and health in cold climates. Even though heat accounts for a large proportion of worldwide carbon emissions and is the largest energy end-use, it has remained largely untouched by efforts to decarbonize. Efforts to do so meet significant economic, social-psychological, technical and political challenges. Much is at stake. But what can make a difference? One increasingly discussed potential solution is co-creation. It provides spaces for citizens to share what heating means to them and for stakeholders to build these insights into their programmes for change. However, while local authorities, grassroots, and community organisations are already implementing co-creation with homeowners and groups of citizens, there is a dearth of academic research focusing on the value of co-creating sustainable heating transitions. This indicates a lack of evidence on how these new forms of collaboration perform under which conditions and how they are embedded in the policy cycle. Drawing on European sustainable heating case studies where co-creation has been applied, we outline future areas where critical, engaged research could help us to understand how to unlock sustainable heating transitions.

1. Introduction

Limiting global warming to 1.5 °C implies reaching global net zero CO2 emissions around 2050 [1]. This can only be achieved by deep and rapid decarbonization of energy systems, including heating. Although sustainable heat consumption is expected to grow by 20% between 2018 and 2023, this growth would only increase the share of renewables in the heating sector to 12% in 2023 [2], leaving countries urgently needing to accelerate heat sector decarbonization to meet their climate change commitments [3].

Heating is a fundamental aspect of the human need for shelter in temperate climates and is a deeply embedded sociocultural and psychological as much as economic and technological phenomenon. Providing heat is a key aspect of social life (e.g. entertaining guests) and seasonal cultural practices (e.g. wintertime cosiness) [4]. Multiple factors make the transitions to sustainable heat challenging: heat demand in buildings varies immensely according to climate, building fabric, occupancy, and behaviour as well as issues around health, comfort, cost, control, convenience, and hospitality [5,6]. New heating technologies are perceived to offer no, or limited, additional consumer benefits compared to natural gas heating systems [7]. Residents, including tenants and homeowners are generally considered hard to reach and persuade [8,9]. Hesselink and Chappin [10] note that potential adopters of sustainable heating face barriers including high up-front costs, regulations, lack of information, as well as social and behavioural barriers such as trust, risk averse ness, social comparison, and opinion dynamics. It goes without saying that those who are renting have no control over the building fabric.

At the international level, sustainable heating is absent from the United Nations’ report on progress towards achieving the Sustainable Development Goals [11]. On the supply side, energy providers, national and local governments, local communities, resident associations, and individual homeowners (e.g. also in the form of ‘prosumers’) can all mix it up. Hence, heat markets are complex and fragmented, and generally less well understood than electricity markets [2]. As long as these markets are lucrative, path dependencies will complicate the transitions. Utility companies emphasize that they have to operate within the current regulatory and contractual framework, with an acceptable profit
margin, giving them little space for deep transformations [12]. Over the last two decades, experiments actively involving citizens and stakeholders in the work of governments have become widespread. They have been accompanied by renewed academic interest in the concept of co-creation, building on work pioneered by Parks et al. [13] and Ostrom [14,15]. Yet despite its popularity in various disciplines, there is a lack of critical research that demonstrates or reflects on the connection between engagement and/or co-creation and its outcomes [16–18]. While the fields of participatory methods, citizen participation in sustainable heating, and the methodology of co-creation are growing [19–23], thus far there is little scholarly attention to the practice of co-creation with regard to sustainable heating systems.

This Perspective reviews the current literature on co-creation and sustainable heating transitions, and highlights the diversity of contexts, objectives, and practices of co-creation by presenting three illustrative case studies. A research agenda into co-creation in the specific context of sustainable heating is suggested. This addresses the need for critical research to better understand what heating means to local communities, tenants and homeowners, how that meaning changes over time, and how practices of co-creation might build these insights into programmes of sustainable change. This will help us glean insights, facilitate our understanding, and explore the various promises and pitfalls of co-creation. Moreover, it could help unlock important mechanisms in the transitions to sustainable heating.

This Perspective uses a broad conceptual approach: heat transitions are conceived as an interdisciplinary problem involving sociotechnical processes. We focus on heat transitions in domestic settings in Europe. Sustainable heating here refers to the provision of heat from renewable sources, such as biomass, solar thermal, and green hydrogen; standalone technologies such as air- or ground-source heat pumps; and large-scale technologies such as district heating (DH) [24].

2. Socio-technical challenges

Sustainable heating transitions can be perceived through the lens of system innovation, i.e., the multi-level perspective [25]. Sustainable heating innovations develop and emerge from experiments at the niche level and are supported by various citizen movements that have mobilized and protest against the continued use of fossil fuel heating technologies [26]. Yet, such innovation movements may be confronted with regime barriers and incumbents who see their taken-for-granted position in the energy system as challenged, and who may seek to co-opt or eliminate the innovations [27,28]. Niche and regime, and their interactions, are subject to events at the level of sociotechnical landscapes (e.g., climate change, new government directives, major economic or political events) [25]. Sustainable transitions are not merely about the diffusion of new technologies, but also require change and eventual systematic breakdown of sociotechnical regimes. This requires change in user practices and cultural discourses that may cause broader political struggles [29].

Like other sociotechnical transitions, heating transitions will be disruptive, contested, and non-linear [30]. Implementing DH, for example, manifests a major change for the local energy market and related systemic elements like energy prices, user behaviour, and value chains. Moreover, DH reduces the autonomy of property owners and tenants, and binds them to a new, shared system. Setting up a sustainable DH system involves citizens not only as consumers, but as regulators and planners [22]. While conventional systems run on fossil fuels that are typically imported, sustainable systems run on locally provided heat and fuels. Table 1 provides a summary of the current literature on SH technology in domestic buildings alongside information on system barriers. This includes both electrical options to decarbonize heating [31] and other non-electric alternatives. Whereas electric options – using wind and solar PV-generated electricity – are considered by some as realistic, others hold that these scarce renewable energy sources can better be allocated to other sectors where they can yield more in terms of CO₂ reduction [32]. Table 1 presents stakeholder barriers that arise, which can potentially be addressed through co-creation.

3. Co-creation

The rationale for applying co-creation to sustainable heat transitions stems from the limited ability of authorities to cope with the increasing complexity of policy demands [46,47], disruptions in local heating markets [22], limited use of enforceable government policies in homes [9], increasing and relatively autonomous energy community movements [48], and the lack of progress in heat decarbonization compared to that made in decarbonizing electricity [2].

Co-creation starts from a fundamentally different place to the linear ‘decide-announce-defend’ practices of environmental policy change [50]. It is an iterative, reflexive approach that can be useful in mitigating climate change as it encourages interaction between citizens and stakeholders potentially providing a means of facilitating rapid and extensive transitions [51,52]. Fig. 1 illustrates how co-creation can be subdivided into process, community, level of application, and methods used. For example, co-creation can be perceived as a new social contract, where public officials take over civic roles and ‘ordinary’ citizens (community) take over public tasks, such as co-initiating, co-designing, or co-producing (process) public policies, services, communications, or infrastructures (levels) [18], by applying a range of tools or methods fit for purpose (methods).

Using co-creation can deepen understanding of how heat is used in-home [17,53] and prevent fragmented or suboptimal heating systems from happening [12]. Through exploring and exposing connected issues, knowledge, and ideas, co-creation can ultimately improve the quality of sustainable heating policy decisions [54–56]. Expanding the focus beyond carbon emissions, and adopting co-creation at scales ranging from street to neighbourhood and even municipality, may encourage better and mutually beneficial solutions that are considered more socially legitimate, more likely to be adopted, and more effective at meeting policy goals [57,58].

Co-creation draws on the concept of polycentric governance systems in which there are ‘multiple, semi-autonomous decision-making centers’ (p.928) [13,59] held together with effective mechanisms of coordination which resist fragmentation or centralization and which have the capacity to self-correct [60]. Co-creation originates from the business administration domain; however, important distinctions have to be made to apply the concept in the public sector context [49]. Within the process of co-creation, formal and informal rules, norms, values, strategies, and political values governing interactions are explored in supportive systems [14,61] which take processes of cooperation, competition, and conflict resolution into account in their communications [59]. Results from successful, deep sustainable heat transformations [61] show commonalities with co-creation approaches being rooted in: (1) equity and the dissemination of co-benefits, (2) inclusivity and local involvement, (3) information and innovation, (4) ownership and accountability, (5) organizational multiplicity, and (6) experimentation and flexibility. Other contextual factors can be expected to significantly influence possibilities for developing co-creation in sustainable heating transitions, such as formal institutions (e.g., grants, subsidies, or loans), informal institutions (e.g., tradition of cooperatives, civic engagement, or social capital), and other factors such as visions, narratives, and environmental education, can mobilize further resources and are supported through ambitious policy goals, regional planning, or social entrepreneurship [62]. These factors give co-creation in heat
transitions a more Western European research focus, yet co-creation in general is increasingly receiving attention in Central and Eastern European countries [63,64].

Under the banner of co-creation, multiple and diverse methods have been adopted and deployed (see Table 2 and [54,65,66]). Table 2 illustrates the diversity of objectives, stakeholders, and methods, taken from real-world case studies, that have been used as co-creation in sustainable heating transitions. The role and value of including technical outcomes (e.g. CO₂ reduction), depends on the context and objectives of the project. Given the diversity of context, objectives, practices, and outcomes, evaluating ‘successful’ co-creation requires deeper understanding of the relationships between these elements. Without this, knowledge gaps will occur, pertaining not only to what counts as co-creation but also which methods work best and under which conditions.

4. Effective co-creation?

As seen in the case studies, there is much potential for infusing sustainable heating transitions with active residents and energy communities to cooperatively develop large- and small-scale sustainable heating projects. Co-creation approaches have potential to unlock sustainable heating transitions in Europe by providing spaces and collaborative partnerships that bring about necessary confrontations with local issues and co-benefits. In doing so, they are likely to unravel many of the supply and demand side complexities of sustainable heat that are currently locked-in. Yet co-creation is no panacea: nor is it tension free [72]. For it to be an effective process, a number of critical considerations are required.

For example, there is a danger of co-creation being used by policy-makers as window dressing rather than as a shift to sharing power and responsibility; powerful actors might embrace co-creation as long as it does not challenge the status quo. If critical political or business stakeholders are absent in co-creation, any results obtained might not be adopted in policy or planning procedures [73]. For example, many utility managers have expressed concerns and risks associated with co-creation, such as the additional work required to analyse and interpret the data, or the exposure to special interest activism which is not aligned with the service mandate of the utility firm. Moreover, they expressed a strong fear that initiatives resulting from co-creation activities would not simply displace market leaders as disruption will also affect social housing, public services, and neighbourhoods [75]. Effective co-creation must strike a balance. It must allow transformation of existing heat systems to happen by minimizing any negative social effects.

Co-creation processes are further subject to self-regulation or self-made rules that influence issue selection, participants, information flow, or decision-mechanisms [76]. Therefore, the need for caution emerges around the risk of disenfranchising groups or segments of society. Co-creation processes are not exempt from attracting the ‘usual suspects’, that is, groups who have sufficient resources of their own and access to and experience with governmental collaborations. Attracting a motivated, self-interested, and unrepresentative elite might lead to unequal distribution of the costs and profits of sustainable heat. Moreover,
co-creation has, in some cases, led to fuzzy outcomes or hijacking of the process [77].

These tensions make a current misfit for effective co-creation obvious: on the one hand policy-makers struggle with integrating social issues that flow upstream into policy cycles before they have become of broad public concern. Without a significant push or demand in society to replace outdated fossil fuel heating systems, politicians are unlikely to act [67,68]. On the other hand, citizens struggle with institutions that seek to predefine or modify topics to achieve instrumental ends. For example, citizen initiatives which focus on a different approach for achieving sustainable heating than a governmental approach, might be sceptical to engage in co-creation [72]. Or, as shown in another case, the enactment of co-creation showed that people resisted being forced to change their habits if they felt it was being pushed onto them [78]. Policy-makers often prefer structured citizen participation in order to further their mandates, gain popular support, achieve high levels of adoption, or enhance legitimacy for technological advance [79]. On top of that, public administrations may have concerns that they lack capacity or would have to abandon some degree of control of the process leading to procedural mistakes or unwilling precedents [80].

Fig. 1. Co-creation unravelled: process, community, levels, and methods [49].
Creating a recognisable signature for co-creation, which integrates divergent visions and promotes equity and integrity between citizens and authorities, requires that co-creation seeks to bring together citizens and stakeholders with diverse perspectives [81] at an early stage of developing sustainable heating policies or projects, to provide inclusive spaces where all perspectives are welcome. Moreover, it requires a just distribution of co-benefits [61] to prevent co-creation being a process reserved for the ‘happy few’ and to allow disadvantaged communities to profit equally from sustainable heating transitions. By ‘taking a step back’ and letting citizens define what is important to them [82], public officials can create opportunities for building trust [56]. Lastly, co-creation needs to connect to the ‘political stream’ [83] and be supported by clear political commitment without which it may be difficult for individual members of the community to step up to leadership roles. This in turn needs an environment in which inevitable disruptions and conflicts can be managed and facilitated [84].

5. Conclusion and suggestions for future research

Although heat accounts for a large proportion of worldwide carbon emissions, to date it has remained largely untouched by efforts to decarbonize [85]. Reaching global net zero CO₂ emissions can only be achieved by deep and rapid transitions to sustainable heating. Yet the transformation to sustainable heat constitutes a wicked problem [1]. While local authorities, grassroots, and community organisations have begun to tackle this problem through co-creation, academic research has been slow to focus on this topic. Co-creation should not be seen as a cure-all approach, and is only one option to foster sustainable heating. Strong political–administrative interventions with the pursuit of efficiency at all costs might also achieve cleaner heating [86], but it is doubtful if such approaches centrally focus on renewable energy sources in heating systems, or just replace heating energy from coal with natural gas. Moreover, in light of previous findings on sustainable heating transitions [61], such rigid top-down approaches might fail in the long run since they do not place much trust in achieving co-benefits, involving citizens, or promoting shared ownership. Hence, such approaches are not the focus of this Perspective.

Co-creation requires handling with great care when implemented. It entails a complex process with many caveats and possible pitfalls. Given that there has been very little critical developmental and evaluative research on co-creation thus far [16,18], we begin to formulate a research agenda for the use of co-creation in sustainable heating by specifying the following research questions (without claiming completeness):

- As a basic start, we suggest tracking what is happening around the world under the name of co-creation and sustainable heating.
co-creation constructed? Which actors are involved and in which roles? What outcomes have been achieved?
- Research could tackle how co-creation, and its various methods, have been and can be deployed in sustainable heating transitions, with suggestions on how to conceptualize, operationalize, monitor, and evaluate specific case studies.
- Comparison of different sustainable heating case studies could identify contextual variables that accelerate or slow co-creation processes. Comparative studies would also allow better visualization of the critical junctures of change as well as rebound effects.
- While observing heat transitions over time, not only the increasing diversity and variety of approaches, including their pros and cons, should be researched, but also their eventual consolidation and decline. Will co-creation disappear or succumb to external forces? This should be traced and observed.
- Observation over time would also enable better understanding of the evolution or path dependency of co-creation. Questions could be asked on how power relations between authorities, businesses, or citizens change, or if one stakeholder predominates.
- Agents of change may act to facilitate sustainable heating transitions. Here, besides studying grassroots organisations and energy collectives engaged in sustainable heat, we suggest analysing the role of researchers in co-creation. If citizens and local authorities change their roles once they become involved in co-creation, do researchers change as well? With what outcomes?
- There has been an increase in studies on online participation and deliberation as democratic innovations, and not only since Covid-19. However, since co-creation is substantially different, and predominantly exercised through physical practices, it is crucial to study the potential and pitfalls of digital co-creation for sustainable heating.

We invite stakeholders, citizens, and researchers from other disciplines to adopt these research questions, develop research projects, and particularly encourage research into co-creation with diverse communities [23].

Declaration of Competing Interest

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

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.erss.2021.101956.

References

[1] Global Warming of 1.5°C, An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to ERADICATE Poverty, IPCC, 2018 (accessed August 7, 2020).
[2] IEA, Renewable Heat Policies - Analysis and key findings. A report by the International Energy Agency. <https://www.iea.org/reports/renewable-heat-policies> (accessed August 7, 2020).
[3] U. Collier, Renewable Heat Policies, 2018, pp. 57.

[4] P. Devine-Wright, W. Wrappson, V. Henshaw, S. Guy, Low carbon heating and older adults: comfort, cosiness and glow, Build. Res. Des. Inf. 42 (2014) 288–299, https://doi.org/10.1177/1463523114528957.
[5] B. Mallaiband, M. Lipson, From health to harmony: uncovering the range of heating needs in British households, Energy Res. Soc. Sci. 69 (2020), https://doi.org/10.1016/j.erss.2020.101590.
[6] E. Stowe, H. Chappells, L. Lutzenhiser, B. Hackett, Comfort in a lower carbon society, Build. Res. Inf. 36 (2008) 307–311, https://doi.org/10.1080/09613218.2007.993804.
[7] H. Williams, T. Lohmann, S. Foster, G. Morrell, Public acceptability of the use of hydrogen for heating and cooking in the home. Results from a qualitative and quantitative research in the UK. Madano, London. <https://www.theecc.org.uk/wp-content/uploads/2018/11/Public-acceptability-of-hydrogen-in-the-home-Full-report.pdf>, 2018.
[8] I. Stieel, E. Dunkelberg, Objectives, barriers and occasions for energy efficient refurbishment by private homeowners, J. Cleaner Prod. 48 (2013) 250–259, https://doi.org/10.1016/j.jclepro.2012.09.041.
[9] G. Trencher, M. Marine, K.B. McCormick, C.N.H. Doll, S.B. Kraknes, Beyond the third mission: exploring the emerging university function of co-creation for sustainability, Sci. Publ. Policy 41 (2014) 151–179, https://doi.org/10.1093/scipol/scot044.
[10] L.W. Hesselink, E.J.L. Chappin, Adoption of energy efficient technologies by households – Barriers, policies and agent-based modelling studies, Renewable Sustainable Energy Rev. 99 (2019) 29–41, https://doi.org/10.1016/j.rser.2018.09.031.
[11] United Nations, Special edition: progress towards the Sustainable Development Goals, Report of the Secretary General, <https://undocs.org/pdf?symbol=S dybm-En-E.2019.68>, 2019 (accessed November 27, 2020).
[12] T. Vadén, A. Mjäva, T. Toivainen, P. Jarvenšteini, E. Hakala, J.T. Eronen, To continue to burn something? Technological, economic and political pathways and dependencies in district heating in Helsinki, Finland, Energy Res. Soc. Sci. 58 (2019), https://doi.org/10.1016/j.erss.2019.101270.
[13] R.B. Parks, P.C. Baker, L. Kiser, R. Oakerson, E. Ostrom, V. Ostrom, S.L. Percy, M. B. Vanclay, G.P. Whittington, K. Brown, Consumers as coproducers of public services: some economic and institutional considerations, Policy Stud. J. 9 (1981) 1001–1011, https://doi.org/10.1111/1541-0072.1981.tb01208.x.
[14] E. Ostrom, Coping with tragedies of the commons, Annu. Rev. Polit. Sci. 2 (1999) 493–535, https://doi.org/10.1146/annurev.polisci.2.1.493.
[15] E. Ostrom, Beyond markets and states: polycentric governance of complex economic systems, Am. Econ. Rev. 100 (2010) 641–672, https://doi.org/10.1257/aer.20100364.
[16] A. Dadau, R. Glennon, B. Verschuere, Following the yellow brick road? (Dis) enchantment with co-design, co-production and value co-creation in public services, Publ. Manag. Rev. 21 (2019) 1577–1594, https://doi.org/10.1080/1479175X.2019.1653604.
[17] B.K. Sovacool, What are we doing here? Analyzing fifteen years of energy scholarship and proposing a social science research agenda, Energy Res. Soc. Sci. 1 (2014) 1–29, https://doi.org/10.1016/j.erss.2014.02.003.
[18] W.H. Voorberg, V.J.J.M. Bekkers, L.G. Tummers, A systematic review of co-creation and co-production: embarking on the social innovation journey, Publ. Manag. Rev. 17 (2015) 1333–1357, https://doi.org/10.1080/14791037.2014.930505.
[19] A. Boss, J. Garrido, B. Alvarez, C. Oltra, Á. Hofflinger, G. Galvez, Narratives of resistance to technological change: drawing lessons for urban energy transitions in southern Chile, Energy Res. Soc. Sci. 65 (2020), https://doi.org/10.1016/j.erss.2020.101472.
[20] T. Artizia, F. Fonseca, O. Bernasconi, Heating ecologies: resituating stocking and maintenance in domestic heating, Energy Res. Soc. Sci. 47 (2019) 128–136, https://doi.org/10.1016/j.erss.2018.08.023.
[21] E. López-Bernabé, S. Foudi, I. Galaragga, Mind the map? Mapping the academic, citizen and professional stakeholder views on buildings and heating behaviour in Spain, Energy Res. Soc. Sci. 69 (2020), https://doi.org/10.1016/j.erss.2019.101587.
[22] E. Dütschke, J.P. Nesche, The energy transformation as a disruptive development at community level, Energy Res. Soc. Sci. 37 (2018) 251–254, https://doi.org/10.1016/j.erss.2017.10.030.
[23] B.K. Sovacool, D.J. Hess, S. Amir, F.W. Geels, R. Hirsh, L. Rodriguez Medina, C. Miller, C. Alviai Palavicini, R. Phadke, M. Ryghaug, J. Schot, A. Silvast, M. Vandivort, G.P. Whitaker, R. Wilson, Consumers as coproducers of public services: some economic and institutional considerations, Policy Stud. J. 31 (2019), https://doi.org/10.1111/pmsj.12109.
[24] I. Stieel, E. Dunkelberg, Objectives, barriers and occasions for energy efficient refurbishment by private homeowners, J. Cleaner Prod. 48 (2013) 250–259, https://doi.org/10.1016/j.jclepro.2012.09.041.
[25] F.W. Geels, Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study, Res. Policy 31 (2002) 1257–1274, https://doi.org/10.1016/S0048-7333(02)00062-8.
[26] G. Piggot, The influence of social movements on policies that constrain fossil fuel supply, Clim. Policy 18 (2018) 942–954, https://doi.org/10.1080/14693062.2017.1394255.
[27] F.W. Geels, Regime resistance against low-carbon transitions: introducing politics and power into the multi-level perspective, Theory, Culture Soc. (2014), https://doi.org/10.1177/0263276414531627.
7
[82] A. Horsbol, Co-creating green transition: how municipality employees negotiate their professional identities as agents of citizen involvement in a cross-local setting, Environ. Commun. 12 (2018) 701–714, https://doi.org/10.1080/17524032.2018.1436580.

[83] J.W. Kingdon, Agendas, alternatives, and public policies, Little, Brown, Boston, <http://catalog.hathitrust.org/api/volumes/oclc/10277820.html>, 1984 (accessed August 7, 2020).

[84] L. Susskind, J. Gordon, Y. Zaerpoor, Deliberative democracy and public dispute resolution, in: A. Bachtiger, J.S. Dryzek, J. Mansbridge, M.E. Warren (Eds.), The Oxford Handbook of Deliberative Democracy, Oxford University Press, Oxford, New York, 2018.

[85] T. Abergel, C. Delmastro, Heating Tracking Report, International Energy Agency, 2020 (accessed December 2, 2020).

[86] Z. Hu, When energy justice encounters authoritarian environmentalism: the case of clean heating energy transitions in rural China, Energy Res. Social Sci. 70 (2020), https://doi.org/10.1016/j.erss.2020.101771.