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Original research article

‘Commoning practices’ for energy justice? Perspectives on the heat transition in the city of Amsterdam

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ABSTRACT

Decarbonisation of the built environment is needed to abate the use of fossil fuels and greenhouse gas emissions. In the city of Amsterdam, multiple bottom-up initiatives have been initiated to reach these goals. In this paper, we explore how energy justice is reshaped by these initiatives on an urban scale. This is done by a case study on a platform that aims to connect, support and inform community energy initiatives. Based on ethnographic fieldwork performed between 2019 and 2022 on the heat transition in Amsterdam, we describe how relations between governmental bodies, businesses and urban residents are contested through this platform. Additionally, we describe how the platform shapes the access of citizens to decision-making spaces, financial tools and information to foster new forms of local autonomy, physical heating infrastructures and decision-making procedures. By analysing the motivations and activities for increasing users' influence and ownership of resources with the notion of 'commoning practices', we show how activities of the platform do not only shape physical heating infrastructures, but also the decision-making processes for achieving low-carbon and renewable heating systems in Amsterdam. We, therefore, propose that the notion of 'commoning practices' can be used in future research to contribute to a dynamic understanding of how energy justice concerns are expressed and shaped in practice.

1. Introduction: bottom-up heating initiatives on an urban scale

The decarbonisation of space and tap water heating in the built environment is paramount to abate global climate change and reach international climate agreements in the upcoming decades. Global heat production accounted for 50% of global final energy consumption and 40% of global carbon dioxide (CO₂) emissions in 2018 [1]. Half of this thermal energy was used for space- and tap water heating in the built environment. Still in 2021, 64% of the global thermal energy demand for the built environment was met with fossil fuels [2]. In the Netherlands specifically, almost all energy for space and tap water heating, e.g. 85% in 2019, is generated with natural gas, contributing 13% to national greenhouse gas emissions [3,4]. The Dutch government has therefore set the political goal to phase out the use of natural gas and to achieve a 'carbon neutral' economy by 2050 [5,6]. The municipality of Amsterdam has set higher ambitions and aims to phase out the use of natural gas for heating by 2040 [5]. These policies

are not only formulated to decrease CO₂ emissions and fossil fuel use, but also to reduce international fuel dependency and to cease natural gas withdrawals in the province of Groningen, that caused local earthquakes and societal discontent [7].

The Dutch government has also set the ambition to make sure that half of all renewable energy production on land will be owned by local entities such as energy cooperatives [8, Chapter Electricity]. Community energy initiatives have been brought forward in literature and policy as beneficial for citizen participation, and the creation of context-specific solutions, increasing acceptance of new energy systems and fostering energy justice [9–11]. Moreover, it has been argued that collective ownership can increase the potential for environmental gains from alternative energy technologies and foster 'degrowth' societies [12,13]. Community energy initiatives are characterised by: (i) their mesoscale character, including multiple households, but being smaller than a centralised urban energy system, (ii) a set of social

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relations which are expected to influence how technologies are developed and outcomes are distributed, and (iii) a presumed sensitivity to local concerns and greater acceptance to the communities involved [10]. In Amsterdam, multiple community energy initiatives have been initiated to foster the decarbonisation of space heating. For this transition, examples of these collective heating initiatives include collective buy-in schemes for building retrofit materials, the initiation of neighbourhood-based heat networks energy cooperatives, and knowledge-sharing events [14]. They are formed through the collective action of individuals at different scales, ranging from block, neighbourhood and urban levels. They reproduce existing norms and values, and can thus change power and institutional relations, reshaping the institutional bricolage and redistributing risks, rights and responsibilities [15,16]. In this study, we interrogate how energy justice is shaped on an urban scale by collective heating initiatives.

This study is based on ethnographic fieldwork in Amsterdam, and the concepts of ‘commoning practices’ and ‘energy justice’ as analytical lenses (see [Theoretical Framework](#)). The fieldwork activities were spread over a period between 2019 and 2022 (see [Methods](#)). The research question at the start of the first phase was on how urban dwellers, professionals and decision-makers experience a (potential future with) diversity in heating systems in the city and whether these experiences could be linked with energy justice. From the interviews early in the research process, we found that energy justice concerns mostly related to the organisation of the heat transition and less to technological outcomes. We, moreover, observed a tension that space heating was perceived as both a commodity, e.g. supply of natural gas or thermal energy from a heat network as a commercial service, and as something that should be (partly) governed by the municipality or its users. Moreover, we observed a variety of community initiatives aiming to increase the influence of citizens in the transition. It is because of these two observations that it was decided to use the notion of ‘commoning practices’ to study energy justice in the context of low-carbon heating initiatives in Amsterdam. Here we define the notion of commoning practices as activities intended to increase the influence, ownership and responsibility over resources by their users.

In this paper, we present a case study on a collective energy initiative called ‘02025’ (see [Case Study](#)). The initiative can be described as a platform for low-carbon and renewable energy in the region of Amsterdam. Through the platform, people can ask questions, learn from each other, and connect to companies, the municipality and other citizen-led initiatives. We perceive this platform as a community energy initiative since it supports the heat transition beyond the realm of a singular dwelling and connects citizens who want to engage with the energy transition collectively. As a result of the fieldwork, we describe how community energy initiatives can be driven by concerns about energy justice (in [Section 5.1](#)) and how activities from community energy initiatives can be conceptualised as commoning practices (in [Section 5.2](#)). Additionally, we discuss which insights on energy justice arise from this conceptualisation (see [Discussion](#)). In our [Conclusion](#), we state that commoning practices performed in Amsterdam do not merely contest technologies applied in the city but express and provide solutions to energy justice concerns about how the transition towards low-carbon and renewable heating systems should be organised. We, therefore, argue that using the notion of commoning practices as an analytical lens can bring a more dynamic understanding of how collective energy initiatives shape energy justice on an urban scale.

2. Theoretical framework: studying energy justice through commoning practices

In this study, the role of bottom-up heating initiatives in fostering energy justice on an urban scale is interrogated. Two concepts are central to this study: energy justice and commoning practices.

2.1. Energy justice and community energy initiatives

The notion of energy justice has emerged as an analytical framework and conceptual tool to guide and analyse energy policy [17]. It is related to the notion of environmental justice that came up in the 1970s to raise awareness about socially deprived and ethnic minorities [18]. In general, the notion of energy justice is used to evaluate “(a) where injustices emerge, (b) which affected sections of society are ignored, (c) which processes exist for their remediation in order to (i) reveal, and (ii) reduce such injustices” [17, p.175]. It is often discerned into the three tenets of ‘distributional’, ‘recognition’ and ‘procedural’ justice [19]. These tenets allow scholars to describe the unequal *distribution* of the ills and benefits of energy systems, the missing *recognition* for certain groups and the use of inequitable or discriminatory *procedures* [17]. Nevertheless, energy justice is also linked with other notions of justice. Rasch and Köhne [20], for example, mention intergenerational distribution justice, which refers to distributive justice between present and future generations [21]. The notion has moreover been set apart from climate justice, which refers to the fair distribution of burdens and responsibilities related to climate change, including the charge for reducing greenhouse gas emissions and climate change adaptation measures [22]. Besides these previously used categorisations, energy justice concerns can also be described in categorisations closer aligned to perspectives found in specific research contexts. Energy justice can be discussed in the context of the rules that are embedded in institutions [23]. These rules structure actors’ behaviour, assessments of decisions and perception of the ‘fairness’ of procedures. Furthermore, these rules may give rise to contestation if societal actors come to dispute the moral legitimacy of these rules [23]. In this paper, we will structure the section on energy justice concerns (i.e. [Section 5.1](#)) on categories closer to the perspectives presented in our fieldwork and link it with the different aspects of energy justice to support the analysis.

The meaning of energy justice is not static but is continuously being co-constructed by activists, policymakers and scholars [20]. In recent years, multiple studies have been performed that call out for research on how energy justice is negotiated and contested at the community scale [20,24,25]. Rasch and Köhne [20], for example, discuss how ‘renewable energy practices’ produce new imaginations and normativities of energy justice concerning shale gas extraction and renewable electricity infrastructures in the Noordoostpolder (the Netherlands). Moreover, it is studied in Astola et al. [26] how the three tenets of energy justice are interdependent and negotiated within energy communities.

However, based on a systemic literature review, it is stated that limited research has been done on how energy is shaped between and beyond community initiatives and related actors [11]. Lacey-Barnacle and Bird [25] offer a perspective on how energy justice can be applied to civic energy networks, including ‘local’, ‘community’ and ‘municipal’ organisations. Nevertheless, although citizen-driven, collective forms of organisation for electricity projects have been well studied, citizen-driven initiatives for heating have received less attention in academic literature, leading to an inadequate understanding of general motivations and concerns, such as financial benefits and environmental concerns, driving individuals constituting these initiatives [15]. The novelty of this study is, therefore, that it explores how energy justice is shaped at an urban level by community heating initiatives for the decarbonisation of heating in the built environment.

2.2. Studying energy justice by analysing commoning practices

We propose in this paper to use the concept of ‘commoning practices’ as a lens to analyse community energy initiatives and study how they shape energy justice at an urban level. The concept of ‘commoning’ is popularised by the historian Peter Linebaugh to “describe the social practices used by commoners in the course of managing shared resources and reclaiming the commons” [27,28, p. 302]. Traditionally the commons

are used to describe natural resources and the notion became mostly known by Ostrom's work on common pool resources [29–31]. However, the understanding of what the notion of the commons refers to has broadened. Based on [32], we view a commons as a system consisting of shared material and symbolic resources with the characteristic that their users have input in the management of resources, the institutions binding them, and the associated processes. Because the notion of the commons relates to the role of users, research uses *“the concept to analyse alternative forms of collective (re-)production”* [33, p.64].

The ‘urban commons’ are characterised by (parts of) its governance, production, distribution of resources or infrastructure being performed by a group of users in an urban context. The urban commons in relation to space heating can therefore not only refer to thermal energy sources, but also spaces and tools to transform heating systems. Local claims of urban resources and city spaces as a commons can consist not only of assertions of a ‘right’ to a particular resource but can also be the expression of a *“common stake or common interest in resources shared with other urban inhabitants as a way of resisting the privatisation and/or commodification of those resources”* [28, p.284]. Especially in the case of urban community energy initiatives, the notion of the commons can enhance the analysis of *“new grassroots energy initiatives and the politics that unfold in remunicipalisation conflicts, offering a new avenue for enriching research on the co-production of energy”* [33, p.63].

As such, commons can be conceptualised as the social form of (in)tangible matter that is determined by commoning [31]. The verb ‘commoning’ refers to the practice of connecting resources to a community of users with access to them [32,34]. Commons are *“shaped by the social practices, the ways of doing things and relating to each other. The social form is what people perceive when they see, feel, and think about that matter”* [31, p.11]. We thus understand ‘commoning practices’ to be those ways of thinking, doing and organising related to increasing users’ decision-making liberties, ownership, or responsibilities over (im)material resources [31,35]. Some authors use the term to indicate practices which challenge existing power relations and ownership structures and are purposefully directed against logics of commodification, marketisation and privatisation [33,36]. This is aligned with Harvey’s idea of commoning practices, and movements as *“counterattack the commoditization of the urban fabric by collectively creating urban commons”* [37,38, p.1151]. Commoning practices can therefore refer to the interaction of different communities and institutions. It is through this interaction that we argue that the notion enhances a dynamic understanding of how energy justice is expressed and shaped by different activities at an urban scale. Moreover, the focus on practices allows us to analyse (im)material resources other than physical energy generation technologies or fully developed ‘commons’ without commodities [31]. In this study, we will apply the two concepts by describing (i) how community energy initiatives can be driven by concerns about energy justice (Section 5.1), (ii) how community energy initiatives can be conceptualised with commoning practices (Section 5.2), and (iii) which insights on energy justice arise from these commoning practices (Section 6).

3. Methods: semi-structured interviews and participant observation

In this study, we have applied ethnographic research methods in an urban setting. Ethnographic approaches deepen an understanding of energy justice as a process of construction of multiple societal entities [20]. The research is based on semi-structured interviews and participant observation. In total 19 interviews were collected of which six were performed by the first two authors of this paper and the rest by the corresponding author alone. The first author has also analysed historical heating accounts of Amsterdam, 02025 newsletters, municipal policy documents, and newspaper articles about the heat transition in Amsterdam [39]. The first author performed participant observation at 13 events of which 10 were connected with the 02025

platform. In this paper, we refer to the individuals that we have talked to during the fieldwork as ‘participants’. All methods were performed in accordance with the relevant guidelines and regulations of social research at TU Delft. The research had the approval of the ethics committee of TU Delft. All participants have given informed consent for the data collected during the interviews being processed for this article.

All authors of this paper have contributed to the conceptualisation and writing process of this paper. The first author grew up in Amsterdam and has already been researching the heat transition in Amsterdam since 2018. This author was therefore already familiar with the language, norms and ideas of urban professionals working on the energy transition in Amsterdam. Within the research team, there was a diversity of nationalities and research backgrounds. Through this collaboration, we have been able to combine different perspectives on levels of trust in governmental bodies, engineering approaches and ethical reflections.

The fieldwork for this paper took place from autumn 2019 till summer 2022. To understand the narratives presented in this paper, it is important to note that this period falls before actions targeted to reduce the reliance of European Union nations on Russian fossil fuels, such as the ‘REPowerEU’ strategy of May 2022, during the COVID-19 pandemic, and after the decision in 2018 to stop natural gas withdrawal in the province of Groningen [7,40]. Due to the COVID-19 pandemic and the related distancing measures, the research was split into two phases. The first phase of the research was intended to be an orientation phase and took place between October 2019 and December 2021. During this phase, we performed interviews with ten participants: a teacher in a neighbourhood, two homeowners, an employee at a water utility company, two employees from the municipality, an environmental policy researcher, a research coordinator on the topic of energy in Amsterdam, and two employees at the municipality. These participants were approached because of their diversity in professional roles and living situations in Amsterdam. Seven of the interviews during this phase were held online, due to distancing measures related to the COVID-19 pandemic. The second part of the research took place from January 2022 to April 2022. During this period the policy around the COVID-19 measures allowed for in-person fieldwork.

In the second part, we chose the platform 02025 as a case study to study commoning practices. The platform is a bottom-up initiative, started by citizens, for the decarbonisation of the built environment. At the time of the research, it was financially supported by the municipality and collaborated with multiple partners. It can therefore be conceptualised as an intermediary organisation connecting local innovation projects [41]. By connecting with this platform, attending its events, and focusing on its activities related to sustainable heating, we were able to interview multiple individuals engaged with the heat transition in Amsterdam and perform participant observation. Because intermediaries *“are able to identify common issues and problems encountered across multiple local projects”*, the platform enabled us to connect to a large network of actors involved with the heat transition in Amsterdam. These actors represented multiple citizen-driven initiatives, which shaped our understanding of the urban dynamics between commoning practices and energy justice beyond the neighbourhood level [41, p.869]. We got access to the platform by interviewing one of the consortium members twice and attending an online networking event. After that, an interview was held with the founder of the platform who permitted us to visit its office a couple of times for participant observation.

In total, the first author did participant observation during three office days and two other events to which consortium members were invited. She also attended one online and three in-person ‘energy breakfasts’. Energy breakfasts are monthly networking and knowledge-sharing events organised by the platform and visited by 20 to 150 people. At the start of the energy breakfasts, the first author introduced herself to everybody in the room stating that she was there as part

Table 1
Eight ‘spheres’ around 02025.

Spheres	Description
Front-runners (Dutch: <i>koplopers</i>)	Front-runners can be typified as people who strive to create more clean energy use in the neighbourhood. The 02025 states that: “02025 connects a community of front-runners in the Amsterdam Energy Transition who help each other to make their city sustainable in a more effective way”.
Energy collectives (Dutch: <i>Energie coöperaties</i>)	Based on the information from 02025 there are around 50 energy collectives in the city including collectives focused on renewable heat and electricity production.
Local hubs	Places where people work and come together. During the energy breakfasts, these hubs are discussed and promoted. Events of 02025 are organised at these hubs, which are also being promoted through the 02025 website.
Energy commissioners (Dutch: <i>energie commissarissen</i>)	Volunteers who act as a contact point per neighbourhood (often divided by postcode level).
OranjeEnergie	A cooperative of entrepreneurs, owner of the brand 02025.
Partners	Organisations that support the goal of clean energy.
Young02025 (Dutch: <i>Jong02025</i>)	Students, young professionals who collaborate for clean energy.
Supporters	Individuals who support the goal of clean energy but are not yet actively engaging with the transition.

of her research. In this second phase of the research, nine interviews were taken in total with: a founder of the consortium, a consultant on the energy transition, a municipal worker on participation in the heat transition, a member of a neighbourhood-based energy committee, a resident who took part in a participatory programme for the heat transition in her neighbourhood, a consultant working as consortium member and an employee of a tenant support agency. Two interviews were held with the latter two to get more information about their viewpoints. These participants were approached because of their role within the platform or because they solicited to be interviewed based on our call during one knowledge session or our advert on the platform’s website. Only people connected to an initiative targeting more than one household were included in this part of the research.

The field notes and transcriptions of the interviews were analysed with a heuristic approach. The interviews were transcribed with software and uploaded in Atlas.ti. Quotes were analysed from the transcriptions following an iterative process. At the start, quotes were clustered interrogating how the current heat transition is problematised by the participants, and how community energy initiatives were legitimised and operationalised. At last, to study the link between commoning practices and energy justice, we went through the transcriptions and field notes interrogating (i) how community energy initiatives can be seen as a way to ‘common’ urban heating systems, and (ii) how commoning practices relate to claims and activities for energy justice. In order to answer the first question we concerned only those activities which were aimed at increasing users’ ownership or input over urban heating systems and the heat transition itself. We did not seek to provide a general representation of all observed activities and narratives concerning the energy transition in Amsterdam. What we did aim for, is to reflect on how energy justice is linked with urban community heating initiatives. In order to answer the second question, we used either excerpts from the interviews in which the participants explicitly used the terminology of climate and energy justice, or when the concerns raised could be linked to distributional, procedural or recognition justice. The participants were made aware before the interviews that energy justice was a theme in this research.

4. Case study: the heat transition in Amsterdam

4.1. Intermediatory platform on an urban scale

The name of the platform is 02025 and stands for zero emissions (first 0) in the region where landline telephone numbers start with 020, often indicating Amsterdam, by 2025. There are different ideas on what 02025 is, for example, a brand, movement, website, platform, or learning circuit. The platform started in January 2018 and came forth from another citizen-led initiative that had started in 2011. Since 2018, 02025 is not the name of only an initiative but also of a consortium. The consortium consists of six to seven individuals affiliated

with consultancies, non-governmental organisations, and engineering companies. The consortium aims to help neighbourhood-based initiatives and urban dwellers by answering technical questions, supporting communication with entities such as the municipality, helping to get projects funded, and connecting individuals with others in their social network of around 8,000 people. Knowledge is spread through events but also individually, i.e. people can contact people from the consortium itself, find each other through the website of the platform, or meet at the organised knowledge sessions. The ‘energy breakfasts’ organised by the platform were described by a consortium member as one of the stable pillars of the organisation. The energy breakfasts are open to all visitors and are promoted through different channels of the platform such as the newsletter and the website. The energy breakfasts are attended by multiple stakeholders in the energy transition, which were classified into eight ‘spheres’ (Dutch: *kringen*) by the founder of 02025 (see Table 1).

4.2. Technologies and organisations in the heat transition

Buildings in Amsterdam are predominately heated by individual heat boilers using natural gas bought from energy companies and distributed through the national gas grid. Different technological interventions are possible to lower natural gas use and decrease carbon emissions. Technological strategies which can be applied at the building level are insulation, adjustment of heat delivery systems such as radiators and floor heating systems, and (partially) replacing heat boilers with alternative heat sources, such as heat pumps, electric heaters and connection to a heat network. The expansion of the heat network is a technological measure that takes place at the neighbourhood level. It consists of a piped network distributing gasses or liquids at a certain temperature. Heat networks which distribute water at 90 °C are referred to as ‘high-temperature’ heat networks by the municipality of Amsterdam [42]. Similarly, the thermal regimes of heat networks distributing water at 70 °C and 40 °C are referred to as ‘middle-temperature’ and ‘low-temperature’ respectively [42]. Examples of thermal energy sources for heat networks are combined heat and power plants (CHP), industrial-sized heat boilers, geothermal energy wells, and thermal energy from water bodies. In 2020, more than 15% of the heat demand in the built environment in Amsterdam was delivered by the two major high-temperature heat networks [5]. These two networks were connected in 2020 [43]. One of the networks is owned by the company Vattenfall and delivers thermal energy generated mostly at a gas-fired CHP [4]. The other heat network is exploited by the heat company called *Westpoort Warmte* (Dutch for ‘Westpoort Heat’). This company is a joint venture between the waste-to-energy company, the AEB (Dutch abbreviation for *Afval Energie Bedrijf Amsterdam*), which is owned by the municipality of Amsterdam and Vattenfall [4]. Next to bigger energy companies, many other

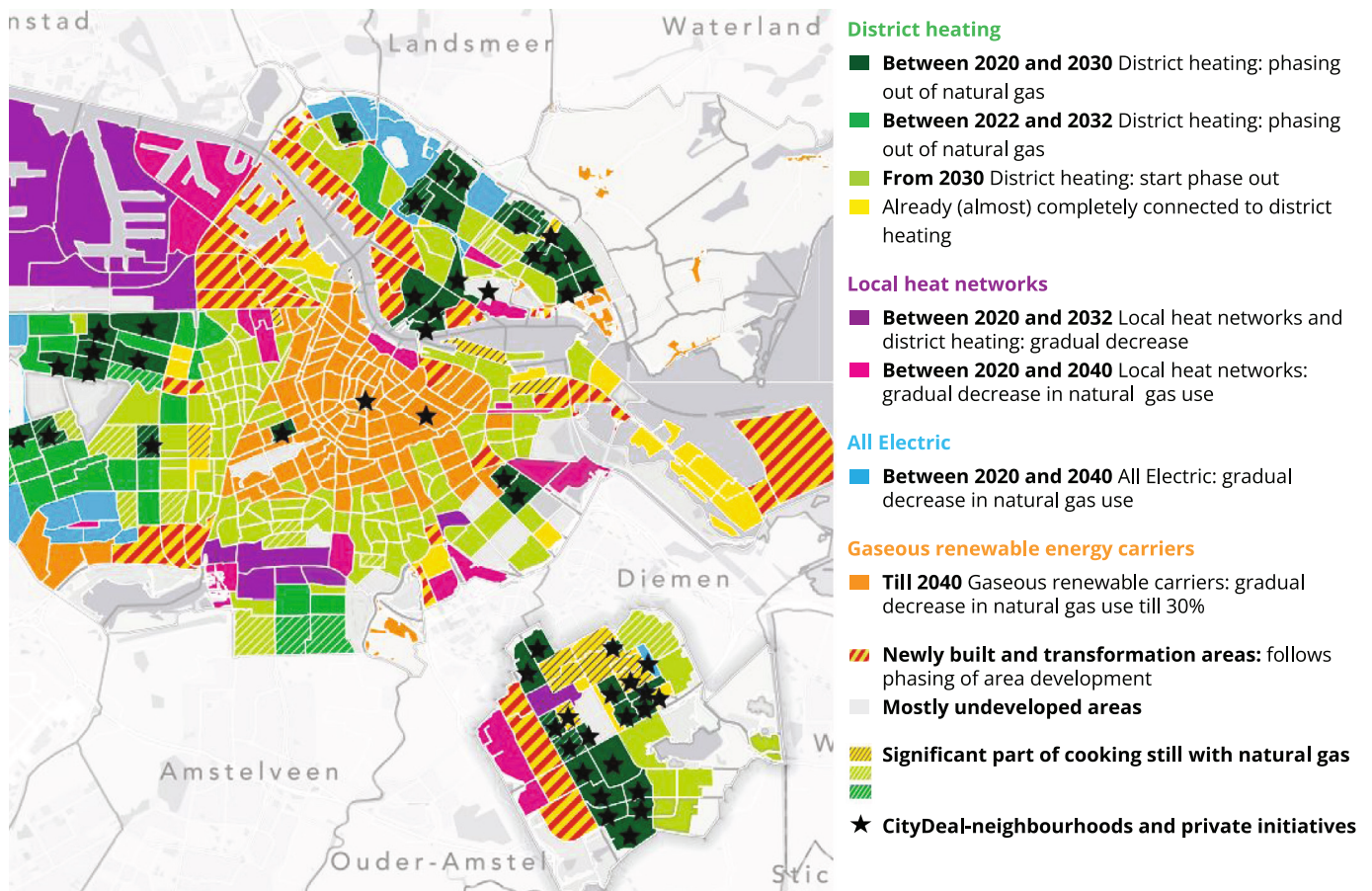


Fig. 1. Envisioned geographical distribution of urban heating systems in Amsterdam.
Source: Edited and translated map from the Heat Transition Vision (dutch: 'Transitievisie Warmte') from the Municipality of Amsterdam [5].

smaller companies are involved in the heat transition in Amsterdam, such as consultancies, contractors, and technological, communication or installation companies. Moreover, there are non-profit organisations, such as seven energy cooperatives in the city. Finally, owners, tenants and neighbourhood associations organise themselves to decide on how to reduce natural gas use for heating.

In the report 'Heat Transition Vision' (Dutch: *Transitievisie Warmte*), the municipality presented its vision for the spatial distribution of heating infrastructures based on the expected costs of different infrastructures (see Fig. 1) [5]. The orange area indicates that buildings in the historical city centre are expected to be heated by the incineration of gaseous energy carriers, such as biogas and hydrogen. The areas surrounding the city centre, the green and yellow areas, are expected to be connected to district heating. The district heating systems consist of middle and high-temperature heat networks. In terms of heat demand, 50 to 60% of the heat demand is expected to be met in 2040 with district heating, 35%–40% with all-electric solutions in combination with low-temperature and 'very low-temperature' heat networks, and 15% with hybrid solutions using gaseous energy carriers to secure heat supply during peak demand [5].

5. Findings: energy justice concerns and commoning practices for changing the heat transition

In this paper, we study how collective heating initiatives shape energy justice concerns at an urban scale. We do this by applying the concepts of energy justice and commoning practices as analytical lenses. In this section, we first apply the concept of energy justice to

discuss how current processes in the heat transition can drive community energy initiatives. Secondly, we describe activities from the 02025 initiative in terms of commoning practices to show how processes in the heat transition are shaped.

5.1. Energy justice concerns behind collective heating initiatives

The vignette below illustrates how a house was retrofitted because of concerns about future carbon emissions, the expansion of the major heat networks, a monopoly position for the company providing the thermal energy for the heat network, a lack of transparency on the heat transition, and limited influence in decision-making and participatory processes (see Fig. 2). To understand how community energy initiatives can be driven by energy justice concerns, we give an overview of energy justice concerns raised by the participants. These concerns were mostly related to public–private partnerships, and processes of commodification, marketization and privatisation of heating. These processes are perceived to stimulate: (i) hindrance of the abatement of carbon emissions, (ii) 'unjust' distribution of costs and benefits, and (iii) procedures that are top-down, technocratic and with agreements with incumbent companies and organisations that are perceived to hinder participatory processes.

We went upstairs. I got a tour of the house to see the adaptations that were made to lower the gas demand for heating. The view from the attic was partially blocked by a heat pump and a solar boiler which were standing next to the sedum roof cover. A mechanical ventilation system was hidden behind panels next to the desks of the home office. Downstairs, it was also noticeable that more retro-fitting measures were taken. A heat unit of the size of a tall



Fig. 2. View from the roof of the retrofitted house. From left to right: solar boiler, heat pump and sedum roof cover (picture by first author).

fridge was installed and the light reflected in the triple glass windows. On the couch in the living room, she told me that she had been active for years in the participatory processes of the municipality in her neighbourhood. She said: “In the beginning, a couple of people had a feeling of ‘something is not right, you say you want to have a discussion with us, but you want something’. And that feeling has never faded away”. Of course, she and her husband had gone far in retrofitting the house to use less energy and have a more sustainable house, but also to avoid they could ever being forced to be connected to the heat network in the city: “I was also following the legislative agenda. Like, what is going to happen and when? Because the point was continuously brought forward of being forced [to connect to the heat network]”.

The first theme of concern is the rate of carbon emission reduction. These concerns can be typified as concerns about climate injustice or intergenerational distribution justice. Most participants in the interviews mentioned their motivation to abate CO₂ emissions and climate change as a primary reason to engage with the heat transition. One participant, an environmental policy researcher, even explicitly associated the transition towards low-carbon heating with climate justice. Reduction of CO₂ emissions can go hand-in-hand with the ambition to eliminate natural gas use for space heating, but can also be hindered by it. The replacement of gas boilers at the household level with a heat network distributing thermal energy from the incineration of gas, waste or biomass is, for example, contested in Amsterdam. This is because such a heat network can be considered less sustainable given the associated CO₂ emissions and material flows. Additionally, the majority of participants showed concerns about a potential ‘carbon lock-in’ when implementing a high-temperature heat network. A carbon lock-in means that possibilities to reduce CO₂ emissions in the upcoming decades may be limited due to the dependency of these networks on high-temperature energy sources such as the incineration of fuels.

Besides concerns about specific heating technologies, we found different ideas on which order of technological interventions would best support carbon emission reduction. The ‘Heat Motor’ (Dutch: *Warmtemotor*) project is an agreement between the municipality of Amsterdam, heat companies, and housing corporations to connect areas with predominantly social housing to the heat network. It aims to support families with lower incomes and to create jobs in those areas. District heating can be seen as a good heat option for smaller dwellings because individual heat pumps, which are another low-carbon alternative, often need a lot of space indoors and a connection with outdoor spaces. A heat network, which has the potential to become carbon

neutral in the future, is therefore often preferred by social housing corporations and the municipality. From the perspective of a municipal worker, the further expansion of the major heat networks in Amsterdam instead of other decarbonisation measures, such as insulation, was perceived as a rapid way to transition towards renewable heating systems, because expanding the heat network and working together with housing corporations is momentarily a straightforward thing to do for the municipality. The logic presented to us by the participant was that heating systems could be first changed followed by the further insulation of buildings at “natural moments” lowering the thermal regime of the heat supply system at a later stage. This is however sometimes contradictory to what participants not working at the municipality believed to be the cheapest solution with the lower carbon intensity, i.e. insulating first and then installing a heating system at a low thermal regime.

The second theme of concern is on the distribution of costs and benefits of heating systems and therefore relates to distributional justice. These concerns are related mostly to the expansion of the major heat networks. Participants contested that one international company exploits the network. Multiple media outlets and participants referred to this construction as a ‘monopoly’, leaving less room for alternative providers of thermal energy.¹ Moreover, the audit office of the city of Amsterdam advised re-evaluating the joint venture *Westpoort Warmte* because this had not structurally been done in the past [44]. Additionally, one participant, a neighbourhood-based, energy committee member, questioned why the money residents pay for heating should go to an international company, instead of keeping funds within the neighbourhood. An urban professional argued that space heating should be organised locally to limit long-term insecurity caused by non-transparent companies. This idea overlapped with the notion from multiple participants that heat should be provided by a utility company that is transparent about its finances and has limited profits.

The third theme of concern is procedures that are top-down, technocratic, and with agreements with incumbent companies and organisations that are perceived to hinder participatory processes. These concerns can be conceptualised as both procedural and recognition justice. Considering procedural justice, participants often perceived decision-making processes in the city as rather top-down than bottom-up. The majority of the participants perceived that the agreements between the municipality and energy companies to expand the heat network obstructed the participatory processes of the municipality. Because of existing agreements, the municipality was perceived to be limited by its options. One participant, an urban professional on energy in Amsterdam, said there was a struggle within the municipality because they had a contract with the company Vattenfall but at the same time wanted to be “a social and democratic city, which is absolutely contradictory to what they are doing”. The participant also said: “Everything is already decided and we have nothing to choose and you are forcing this on us and we don’t want it and you’re not listening to what we want. [...] But it doesn’t seem to be transparent or make any logical sense, right, to get this newly built environment of Sluisbuurt on the heat grid. Nobody ever would imagine they would make such a decision in this city. And so it feels like Mafiosi to me.”. A participant who took part in a participatory programme for the heat transition stated: “The municipality seems to give the power of choice to the residents, but it is clear that the municipality has a preference for the implementation of district heating at high temperature. It, therefore, feels like a little play, those consultation rounds”. An environmental policy researcher also linked the agreements explicitly with energy justice by saying during an interview: “And in my view: as long as this entanglement between municipality interest and

¹ For example: ‘Stadsverwarming in Amsterdam-Noord: plan lag er al’. Episode political series ‘De Hofbar’, broadcast on 30-09-2020 on the Dutch public broadcasting system, and ‘Zondag met Lubach: Nederland gasvrij’. Season 12, episode 8. Broadcasted Sunday 8-11-2020.

the interest of Vattenfall exists, you cannot do anything about participation and about justness. It is just undoable". Participants therefore expressed perceiving limited agency in participatory processes as is also observed in other case studies [45].

Nevertheless, from interviews with municipal officials and urban professionals we found that participation was seen as a tool to create and increase public acceptance (Dutch: *draagvlak*). Additionally, participation was seen as a way to listen to what people want and create a plan which suits most people. The team ‘natural gas free’ (Dutch: *aardgasvrij*) of the municipality asked people whether they believed that the ‘preferred’ heating strategy stated in the Transition Vision Amsterdam was also the best solution for their neighbourhood (see map in Fig. 1) [5]. A participant working at the municipality said that they are still searching for good ways to make decisions based on a good representation of what the minority and majority in the neighbourhoods want. The challenge was that people involved in participatory processes could never be a full representation of the whole neighbourhood, leading to concerns about recognition justice. Another municipal civil servant changed from saying “*participation with inhabitants*” to “*participation with homeowners*” because the municipality can mostly only talk to building- or homeowners since those make the decisions. In 2020, an employee from the municipality told us that the municipality often starts the conversation with housing corporations because they own a lot of houses in the neighbourhoods. However, tenants sometimes also want to talk directly to the municipality instead of through the housing corporation. The participant said that participation often is in the format of informing or asking questions to inhabitants of a neighbourhood and that most ‘co-creation’ happens with housing corporations. However, the civil servant did not like to use the term ‘co-creation’ in that case, because the civil servant considered co-creation normally to refer to collaboration with residents. In two neighbourhoods there was real co-creation happening, according to the municipal civil servant.

5.2. Describing a collective heating initiative with commoning practices

The energy justice concerns in the previous section are motivations that participants gave for trying to shape the organisation of the heat transition in Amsterdam. In this section, we discuss how the activities from the case study, i.e. the 02025 platform, can be conceptualised as commoning practices. From the fieldwork, we discern different ways in which the platform aims to increase the influence and ownership of urban residents on urban heating systems. In the following, multiple examples are given of how (im)material resources can be viewed as a ‘commons’ and how the platform aims to increase users’ influence and ownership over these resources (see Table 2).

The first type of commons that can be conceptualised is shared spaces to network and create collaborations. One of the founders of the platform conceptualised the commons as a space where people leave behind their own interests and collaborate for one common goal. This participant described a commons can be something that is shared, but with rules. To illustrate this point, the participant presented Fig. 3 during an online conference on ‘Cooperatives make the city’ in Amsterdam. The commons is depicted in this figure as a space where different ‘stakeholders’ come together for a common goal. We conceptualise the organisation of events aimed at creating such common spaces, such

as energy breakfasts, as commoning practices since they are aimed at increasing users’ influence in the heat transition.

To illustrate how the platform contributes to such shared spaces: multiple participants described 02025 mostly as a place to network and connect with like-minded people who are doing similar things in the energy transition. One consortium member described the case study initiatives as an alliance between front-runners and additionally an enjoyable (Dutch: *gezellige*) meeting place for everybody who wants to collect some “*feel good*” energy about the energy transition. One participant who worked on forming an energy committee in his neighbourhood described how these events supported him with information and a network of people in the city with similar experiences. Another participant, a resident who took part in a neighbourhood-based participatory programme of the municipality, did not go to many events due to limited time, but followed the newsletter and blogs for information. She thought that it was a nice platform to share the findings of the project which she was involved with. Multiple participants could not exactly describe what the 02025 does in the city, but one of the founders suggested that this may be something positive, because it creates a space where people can interact without the formal roles between citizens and formal entities. As such, collaborations among parties can be created, which can foster collaboration between citizen-driven initiatives and urban professionals. It is good to note here, that citizen-driven initiatives do not always want to professionalise, but want to outsource parts of their projects.

Other commoning practices that can be conceptualised from activities aimed at fostering collaboration, is that the platform aims to facilitate the collaboration between citizen-driven heating initiatives and the municipality by working on a common storyline on the heat transition and communicating hurdles for community energy initiatives. For example, plans of neighbourhood-based initiatives can differ from plans of the municipality. This does not directly imply a disagreement in the ideas between local heating initiatives and the municipality, but it may cause initiatives to feel hampered in their activities for local heating initiatives.

Other activities for creating collaboration that can be conceptualised as commoning practices is lobbying for increasing the status, resources and capacity for bottom-up heating initiatives. According to a consortium member, citizen initiatives are picking up but experiencing a lack of institutional support. The participant stated that the collaboration between government and industry, often in contrast to community energy initiatives, is well established. This is represented in the language and procedures used for reporting and writing grants. Because of such contracts individuals in citizen-driven heating initiatives can have the perception that they are not being taken seriously, when proposing local heat provision projects by energy suppliers. The consortium, therefore, aims to organise a bigger entity to lobby for more status, resources and capacity. Such an entity can communicate to the municipality how much work is needed for the decarbonisation of the built environment, and to give cooperatives and volunteering work more status. A consortium member stated that the total sum of buildings that fall under energy cooperatives is significant and the cooperatives should therefore be given more status. By organising a bigger entity, it can become easier for community heating initiatives to convey themselves as trustworthy and long-term partners for the municipality. It can also become easier to develop ‘blueprints’ for

Table 2
Examples of common resources established by 02025 through commoning practices.

Examples of a commons	Examples of commoning practices
Shared spaces to collaborate	Creating events which are accessible for multiple parties Lobbying for more status of collective heating initiatives
Financial tools	Contesting current funding logic Creating shared funds
Knowledge about (the organisation of) renewable and low-carbon heating systems	Organising knowledge sharing events Providing free consultancy service Connecting people with a network of experts

DESIGN COMMONS 02025

Goal: Amsterdam frontrunner clean energy in 2025

1. This goal is leading (not money, politics or other ideals)
2. We work area-specific
3. We are trustworthy
4. We are radically open
5. We work with all stakeholders
6. And on equal footing

Companies

Government

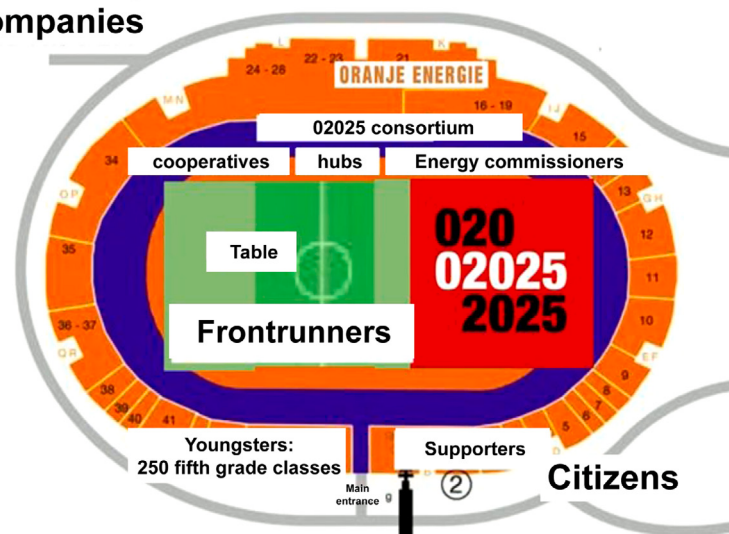


Fig. 3. Translated slide from a presentation by one of the founders of 02025 envisioning 02025 as a commons with different players in the stadium. Source: Edited picture from 02025.

heating cooperatives, which was needed according to an employee at a utility company, because now it takes a lot of time to start and get them funded by banks.

Financial means can be conceptualised as a second type of commons that can be conceptualised from the fieldwork data. One participant, an energy transition consultant, thought it was good that neighbourhood initiatives are supported by government grants because it takes time to do research, meet and organise. The participant added that giving money to volunteers in a neighbourhood can enable people to spend time on the project, create a more equal footing with other professionals, and stimulate a sense of duty for attending meetings. One consortium member found it unfair that some projects get millions of euros of funding from governmental bodies whereas others do not, or only get 5,000 euros with a lot of effort. The participant argued for a fund which is accessible for multiple initiatives and in which financial means for renewable energy initiatives are managed collectively and distributed based on mutual trust. The participant argued that in this way energy collectives themselves can allocate funding based on needs. In this sense, activities aimed at restructuring schemes for subsidies can be conceptualised as commoning practices.

Finally, information can be conceptualised as a commons. A consortium member stressed that the space to work on the energy transition should be accessible to all and that knowledge should be shared for free. Because the consortium members of 02025 do not sell energy technologies nor work directly for the municipality, they argued that they could function as independent advisers for citizens who want to engage with the energy transition. Sharing knowledge for free was in one interview also connected with the notion of justice: “We also find it important that the energy transition is accessible for everybody. You know, this is why our energy breakfasts and knowledge sessions. It is always free. If you call us with: ‘Could you please help me?’. You never need to pay for that. And that is of course because we work, you know, with other volunteers. People from energy cooperatives who gladly want to share their knowledge. That is justice in the city”.

To conclude, the outcome of commoning practices related to platform are not necessarily performed by urban residents alone, but are in engagement with urban professionals and municipal officials. Through its networking events, the platform may therefore be viewed as an

intermediary in the development of “consolidating, growing, and diffusing novel [grassroots] innovations” [41, p.868]. In other words, rather than fully transferring the input and ownership of urban heating systems to users of the system, commoning practices can open up spaces for collaboration between different actors including the municipality and businesses, and therefore reshape the interaction, spaces and rules between urban dwellers, professionals and municipal officials [25]. The commoning practices of the platform, therefore, do not only stimulate community-owned energy systems but also create more ownership and influence on resources needed for shaping the heat transition itself.

6. Discussion: questioning commoning practices for energy justice

In this study, we use the notion of commoning practices to study how bottom-up heating initiatives shape and are shaped by energy justice arrangements at an urban scale. As a case study, we focused on a platform acting as an intermediary for community energy initiatives. The energy justice concerns regarding processes of commodification, marketization, and privatisation of space and tap water heating in Amsterdam described in Section 5.1 provide context for the motivations behind bottom-up heating initiatives. Furthermore, in Section 5.2, we described the practices in which the platform aims to support citizen-driven initiatives by increasing users’ ownership and control over spaces and resources. By conceptualising the platform’s ways of thinking, doing and organising with the notion of ‘commoning practices’, we present insights into how energy justice concerns are addressed. We described how the platform performs commoning practices that change how community energy initiatives (i) interact with governmental and private parties, (ii) finance projects, and (iii) exchange knowledge. In this way, the activities of the platform address energy justice arrangements related to the distribution of financial resources and information, the recognition of citizen-driven initiatives, and their role in procedures which shape the heat transition in Amsterdam. We, therefore, find that the commoning practices of the platform are not only aimed at pursuing more ‘just’ heating systems, but also at addressing energy justice concerns regarding the organisation of the transition towards low-carbon and renewable heating systems itself.

Nevertheless, commoning practices may also give rise to new energy justice concerns and be motivated by reasons other than energy justice. In the following, we discuss tensions between community heating initiatives and energy justice which were found in our fieldwork and the academic literature on community initiatives for renewable electricity.

6.1. Potential energy justice concerns from commoning practices

It is not a given that community energy initiatives always lead to more ‘just’ heating systems [11]. Such initiatives can shape or create new structures of marginalisation. Inequalities of power can for example occur within energy communities or places without such initiatives [10,26]. Increased agency for community energy initiatives can also amplify social inequalities in case of unequal opportunities to initiate and participate in such projects [11,46]. Furthermore, relying on localism to solve big environmental problems that require collective action has been proven to be challenging because it neglects how inequality undermines the development of an associational society [47].

Community energy initiatives require time, money and the ability to go through complex documents from its members [46]. Activities of such initiatives include performing feasibility studies, fundraising and understanding legal frameworks [46,48]. The socioeconomic status of residents may therefore affect who has more influence or can engage more with community energy initiatives, potentially creating disparities in the city. These disparities can be avenues for further energy justice research because they indicate potential inequalities in access to procedures of decision-making, institutionalised patterns of cultural value which prevent participatory parity, and unequal access to energy sources on an urban scale. By looking at commoning practices of community energy initiatives, in this section, we explore how inequalities in the city may potentially be (re)produced.

The first disparity is a perceived lack of diversity among people who (can) organise or actively engage with community energy initiatives. Multiple studies have highlighted that within Europe these initiatives often take place in affluent communities and have a high representation of white, middle-class men [48–52]. This disparity was also mentioned during multiple interviews or events. One participant, an employee at the municipality, characterised people who often actively engage in community energy initiatives as ‘dark green’ by which the participant wanted to indicate that there is a specific group in society who want the transition towards low-carbon heating to take place at a higher pace and have the capability to free up time, are mentally available for the task, have a good social network and possess technological know-how. The participant, together with other participants, also described that people who do actively engage with community energy initiatives are often white, theoretically educated, male and retired. On an urban scale, an interviewee questioned how the municipality can make sure to not only engage with the ‘front-runners’ and people who are protesting against things but also with the majority of people.

To create more diversity in the people actively engaging with community energy initiatives, a consortium member of the platform said that they were working hard to reach a more diverse group of people, especially to make sure that people who live on a smaller daily budget can come to ask for advice. Multiple strategies for engaging with people were mentioned in the interviews: energy-related organising job markets, counselling on insulation strategies on city squares and visiting homes to offer low-cost energy-saving measures. Another strategy mentioned by a member of a neighbourhood energy committee in an interview was to create diversity of projects to engage with a diverse group of people. During a knowledge session on ‘how to engage with the neighbourhood’ the participant reasoned that residents in a neighbourhood can have different affinities, maybe typical ‘doers’ engage more with activities such as cleaning up the streets, and ‘thinkers’ go more to the energy committee.

A second disparity is representation within the membership of community energy initiatives. This is aligned with the debate around the challenges of justice and trust over the representation capacity of local initiatives, especially when connected to larger societal challenges, like the energy transition, that impact a more diverse group [47,53,54]. Community energy initiatives may not be representative of the residents of the region or buildings within their spatial boundaries since not everybody is or wants to be equally engaged. Residents may, for example, not identify themselves with that specific neighbourhood, but rather like the anonymity of the city. Moreover, there can be multiple buildings within the neighbourhood that people of the committee may not inhabit. Residents of the neighbourhood may also perceive that their individual wishes may not be incorporated or pursued by the neighbourhood initiative. They can, for example, have the feeling that the group organising neighbourhood events can already have prefixed ideas. Alternatively, residents may find it hard to be sceptical or critical because they do not want to be excluded from the project. A consortium member thought that the core group of a neighbourhood-based heating initiative was motivated to abate CO₂ emissions for climate as soon as possible and was therefore not critical towards the technical options or “*blinded by the idea of free heat*”. The participant described the situation in another neighbourhood as a movement in which people who did not follow the line of thinking of the local heat initiative were excluded from the project and frowned upon in the streets.

A third concern is the potentially uneven spatial development of community-based heating initiatives, considering that active energy communities do not arise and continue to exist in every neighbourhood [46]. To foster energy justice across spaces, attention needs to be paid to the embedding of new energy infrastructures within landscapes of social inequality and material deprivation [55,56]. Spatial inequalities can create uneven spatial development of community-based heating initiatives [56]. One participant told us the story of how the multiple owners of the multi-family building the participant lived in, i.e. a four-story-high building with approximately eight apartments, went through the process of deciding what to do when the boiler needed an update. Similarly to other homeowners in the Netherlands, they experienced the costs of retrofitting of the building and insecurity about the plans of the municipality as barriers to taking action and so decided to wait [14]. Uneven spatial development goes however further than the financial situation of residents. More affluent communities with the resources and capacity are typically more likely to “*engage in, benefit from and develop their own local low-carbon energy schemes*” considering the significant difficulties for grassroots innovations like community energy to survive [41,55, p.2]. To illustrate this risk, we present the answer of an energy consultant during one of our interviews on the question of whether every neighbourhood should have a neighbourhood initiative: “*No, for sure not, [in those neighbourhoods] there are people who live there for 40, 30 years, who are well, highly educated, in the work field itself, they can organise it in this way with each other. A couple of retired people [live there] who have a lot of time and are smart and still have a good network. In [the other neighbourhood] you have that as well. People who are well established in the network related to ‘energy world’ and local politics and, yes, I think that it is something for the highly educated neighbourhood*”.

Fourth, neighbourhood-based heating initiatives are influenced by the physical situation which varies between different areas in the city. For example, a neighbourhood-based energy committee member described how community centres (Dutch: “*buurthuis*”) in neighbourhoods can facilitate neighbourhood initiatives, since efforts can be made more visible and known. Such centres are however not located in all neighbourhoods. The participant stated additionally that his neighbourhood had clear boundaries because it was surrounded by water. The identity of that neighbourhood was shaped by the redevelopment of the area three decades ago, shaping the demography of its inhabitants. The physical features of neighbourhoods can also impede collaboration. A participant, a homeowner, for example, did not think a neighbourhood

initiative would work in their neighbourhoods because it contained too few households for an efficient collective solar power or heating system. Another reason mentioned was that nearby buildings were in different states of maintenance. Nevertheless, uneven spatial development of collective heating initiatives may, according to the interviewed energy consultant, not necessarily be negative, because they can be a good inspiration for other neighbourhoods. Municipality or housing corporations can learn from citizen-driven initiatives about “*how it is organised from a resident perspective*”, and therefore inspire how energy justice concerns may be solved.

To inhibit uneven spatial developments caused by the decarbonisation of the built environment, policy should be based on research on how to create opportunities for procedural engagement of local communities and recognition of their lived experiences and knowledge fostering distributional, procedural and recognition justice arrangements. This means that civic entities should go beyond planning projects in economically disadvantaged neighbourhoods, and include perceiving its inhabitants as active participants in democracy [55]. Moreover, wider participation can be stimulated, according to [46], by encouraging networking between established communities, starting initiatives and other partners to share skills and resources. In [25], it is found that intermediaries can act as a critical bridge between local low-carbon energy initiatives and deprived communities because they can create better access to funding opportunities and help localise emerging economic benefits from low-carbon transitions. In our findings, we describe how an intermediary platform in Amsterdam aims to do so lowering the barriers to collaboration, funding, and information for community energy initiatives.

6.2. Commoning practices beyond energy justice

In this research, we argue that the concept of commoning practices can be used to gain insights into how collective heating initiatives are shaped by and shaping energy justice arrangements. Nevertheless, research shows that community energy is often involved with local objectives beyond energy justice, providing widespread equity gains [24]. Community energy initiatives have a presumed sensitivity for local concerns and greater acceptance to the communities [10]. Practices aimed at increasing users' ownership and responsibility over resources are thus also motivated by reasons which do not relate to energy justice concerns. The notion of commoning practices can therefore also be used to investigate the values other than energy justice which drive people to engage with collective energy initiatives. Based on our fieldwork, we found that participants expressed the benefits of collective action by the residents not only as creating more ‘just’ systems, but mentioned more benefits of collaboration among residents.

One benefit that multiple participants mentioned is the belief that bottom-up heating initiatives can help accelerate the energy transition. One reason for this is that there can be more trust in or inspiration from local peers instead of the municipality or parties that have an interest in certain heat technologies. Moreover, participants believed that neighbourhood initiatives are often good platforms to reach out to people and connect with people. This is because they make use of other networks and communication channels than the municipality. Additionally, people in the same neighbourhood can feel more related to a person in the energy cooperative of that neighbourhood and their interests may be more aligned. Residents themselves can have more knowledge and feel for what people in the neighbourhood find interesting or not and therefore whether a plan will catch on. This point is reflected in the following quote by a consortium member: “*Of course, there have to be professional parties who run that network [...] But I think as a citizen of Amsterdam, you should be one of the stakeholders of the network [...] The role of the commons is important because you need to trust the system, and if you own a part of it, you have to trust it. You also trust your own car because it's yours. [...] If you own it, you probably trust it, so that's going to accelerate the spreading of these kinds of networks*”.

Moreover, other benefits were associated with local energy systems, such as self-sufficiency in energy supply. An energy consultant for local initiatives thought that having local heat sources would be good because this may increase awareness of where the energy comes from potentially resulting in a decrease in energy usage. Finally, benefits which were not related to energy supply were mentioned. Locally organised initiatives can “*stay with the trouble*”, such as rats, rising house prices or windmills, “*optimise for ‘societal value’*” (Dutch: *maatschappelijke waarden*), and make use of the “*local intelligence*” present in neighbourhoods. Creating neighbourhood projects can also enhance that people come together, talk about their neighbourhood, and enlarge citizen engagement. Moreover, the implementation of smart local energy systems can improve distributional justice [57].

To conclude, citizen-driven heating initiatives were brought forward by the participants as presenting alternative forms for organising (the transition towards) low-carbon heating systems, such that the influence on decision-making processes and ownership of urban heating systems of the users themselves is increased.

7. Conclusion

In this paper, we present a study on the relationship between bottom-up heating initiatives and energy justice on an urban scale. We argue that the notion of commoning practices can be applied as a lens to enhance a dynamic understanding of how energy justice shapes and is shaped by community heating initiatives at an urban scale. As a case study, we have performed ethnographic fieldwork focusing on a platform that aims to connect, support and inform multiple community energy initiatives in Amsterdam. The contribution of this paper is that it offers a heuristic approach for advancing conceptual and practical understanding of energy justice and commoning practices in the context of urban energy transitions.

Based on the fieldwork, it is described in Section 5.1 how participants perceived current processes in the heat transition to be stimulating energy technologies that are susceptible to (i) hindering abatement of carbon emissions, (ii) ‘unjust’ distribution of costs and benefits, and (iii) procedures that are top-down, technocratic, and with agreements that hinder participatory processes. Moreover, in Section 5.2, we describe multiple ways in which the organisers and the participants of the platform aim to increase the influence of urban residents on the heat transition and relate those efforts to notions of energy justice. We provide an analysis of how the activities of the platform can be seen as ‘commoning practices’ through which current relations between governmental bodies, businesses and urban residents are being contested, and new forms of local autonomy, physical heating infrastructures and decision-making procedures are being pursued. We find that commoning practices of the platform in Amsterdam do not necessarily contest technologies applied in the city, but rather express and provide solutions to energy justice concerns about the organisation of the transition towards low-carbon and renewable heating systems.

To conclude, the findings show how commoning practices can open up and potentially close down spaces for collaboration between urban dwellers, urban professionals, and government officials for addressing energy justice concerns. We therefore argue that the notion of commoning practices can be used to explore the energy justice concerns addressed by bottom-up initiatives at an urban scale and the solutions they provide. In this way, strategies can be developed to create space for the benefits brought by collective heating initiatives while reducing the use of fossil fuels and greenhouse gas emissions. For future research, we propose that the notion of commoning practices and its relation to justice issues can be applied in other contexts. Furthermore, this study only considers local perceptions of energy justice. To study the potential injustices that may occur through commoning practices, experienced injustices arising across scales, for example through the extraction, processing, transportation and disposal of energy resources in other parts of the world outside the Netherlands, should also be included [58].

CRediT authorship contribution statement

Chelsea Kaandorp: Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing. **Igor T. Moreno Pessoa:** Conceptualization, Formal analysis, Investigation, Methodology, Resources, Supervision, Writing – review & editing. **Udo Pesch:** Conceptualization, Supervision, Writing – review & editing. **Nick van de Giesen:** Funding acquisition, Supervision, Writing – review & editing. **Edo Abraham:** Conceptualization, Funding acquisition, Project administration, Supervision, Writing – review & editing.

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.

Data availability

The data that has been used is confidential.

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