The Uninclusive Transition to Heating Networks in French Rural Areas

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Extended Abstract

1. Introduction

The energy transition is a key element of the sustainable transition and a subject widely considered in transition studies (Markard et al., 2012; Robertson Munro and Cairney, 2020; Zolfagharian et al., 2019).

In this sense, rural areas face specific challenges as they often lag behind in terms of access and use of low-carbon energy sources worldwide (Barnes and Floor, 1996; Suárez Roldan et al., 2023). This study will focus on heating buildings sector in France as it has significant decarbonisation potential (ECA, 2020; Santamouris and Vasilakopoulou, 2021).

Heating networks based on renewable and local energy sources help to reduce the greenhouse gas emissions in this sector. From central production units, they deliver heat to local customers through infrastructure of underground pipes. Unlike individual systems, these networks pool renewable production, making it more affordable to use.

Generally implemented in cities (Werner, 2017) due to high population density, some heating networks have nevertheless been installed in rural areas in Europe, but they are scarce (Nilsson et al., 2008). This difference might be only justified by the fact that these projects are unsuited to these areas. If it is not, then we are facing a case of uninclusive sustainable transition.

This leads us to the following research question. *Is the weak development of heating networks in rural areas in France due to an uninclusive transition?*

2. Literature review and theoretical approach

Literature on heating networks mainly focuses on urban areas in many science disciplines (Frederiksen and Werner, 2013; Busch et al., 2017; Moser and Jauschnik, 2023). However, there are specific studies on heating networks in rural areas, on challenges (Delfosse and Mothe, 2022) and innovations (Nilsson et al., 2008). The ambivalence of these objects according to whether they are urban or rural has already been identified (Carrosio and Magnani, 2020) and it would be relevant to analyse them with this distinction in mind.

An extensive body of literature deals with business models of heating networks (Lygnerud, 2018; Menghwani et al., 2023). Indeed, business models allow a better understanding of challenges faced by their development (Pardo-Bosch et al., 2023). This framework will be used even though heating networks include a wide variety of players with divergent views, giving them a strong collaborative dimension (Ayrault, 2022; Reda et al., 2021).

The sustainable transition is mainly guided by public policy decisions (Markard, 2018), although current transition studies appear to have not discussed it enough (Robertson Munro and Cairney, 2020). To do so, some authors invite us to delve into the details of its instruments (Lascoumes and Le Galès, 2004). The instruments of public policy approach have already been shown to be relevant on sustainable energy transition topics (Muller, 2023).

3. Methodology

Qualitative research has been conducted based on secondary data and 11 interviews carried out with main actors of the heating networks sector at different geographical scales (see appendix). Ten interviews were held in France and a Belgian case study was selected for comparison.

The data collected has been analysed through the business model framework and the instruments of public policy approach. This analysis allows to perform a review of all the national instruments affecting these business models and the sustainable transition.

4. Results and Discussion

Two main results are briefly presented and discussed.

Rural heating networks have a stronger collaborative dimension than urban ones.

In France, heating networks were developed in large cities, where the profits they generated attracted private operators (PI4). Rural areas, despite having seen the first network in history (Werner, 2017), now have much more fragile business models (PI2). Each project requires structuring a local supply chain, significant investment and technical competences for municipalities with fewer resources, and a sustained commitment from customers (EF1, MA1, OP1). These factors are much less restrictive in urban areas (OP2).

In general, with fewer players, long-term commitment is more crucial and less assured in rural areas (OP1, OP3, BE1). This gives a strong collaborative dimension to rural district heating network business models. This collaboration can be taken even further by setting up a residents' cooperative to carry and facilitate the project (BE1, PI1).

The French instruments of public policy on heating networks projects are reviewed.

The French government has set ambitious quantified national goals of heat delivered by heating networks (Fabre, 2020). This choice encourages public players to target urban areas where a single project sells more energy (PI2).

One of the oldest instruments used to support their development is the reduced rate of value added tax applied to heat sales (Perrin and Leyendecker, 2021). It benefits the operational expenditure of urban and rural models, without distinction (PI1).

The main policy instrument is called the Heat Fund. It has a major impact on the capital expenditure of French heating networks, reducing it between 40% (OP1) and 70% (CEREMA et al., 2020). It applies indiscriminately to urban and rural areas, which sometimes leads some public institutions to question it. Sometimes, urban operators can recover in 2 years the equivalent of the subsidy received for the whole project (PI2). The Heat Fund's eligibility criteria include two crucial public action tools (ADEME, 2021).

The first is the linear density threshold, the ratio of heat delivered to the length of the network. Different perceptions of it have been observed: economic, as a tool favouring the most profitable networks (OP1, OP2, OP3, EF1), political, favouring networks that serve the most citizens (PI1), or environmental, favouring networks with better energy efficiency (PI2, PI3, PI4). Each type of player observes this indicator from his own point of view, making it a difficult object to grasp. It is also a choice that excludes rural areas, with a historically high threshold frequently revised downwards under pressure of rural players (PI2).

The second tool imposes a strict hierarchy of renewable energy sources. This tool, affecting the resource and partnership parts of business models, has been developed in Paris' region before being national (PI2, PI4). In rural area, biomass is the most accessible and used option, and is located at the very bottom of the hierarchy (EF1, PI1).

National mapping tools also have an impact on business models, mainly to get new customers (OP3). In France, major cities are well mapped, but maps miss around 80% (PI2, PI4) of networks in certain territories.

Finally, the general policy instruments to renovate housing led to necessary reductions in consumption, which makes network development more challenging (SP1, PI1). Although they apply without distinction, reducing consumption is easier to manage in urban areas by seeking out new customers (OP2) than in rural areas (MA1, EF1).

5. Conclusions

The sustainable transition, from individual fossil-fired heating to renewable heat networks in French rural areas, is resulting in more collaborative business models. In addition, a review of the public policy instruments that affect these models shows that some seem to be biased to the detriment of rural areas. Rurality appears as an overlooked aspect of a sustainable transition.

It would be worth rethinking public action to avoid disadvantaged rural areas where heat networks are well suited and reduce the public funding for highly profitable urban networks. This would make it possible to pursue a truly inclusive transition.

Keywords

Heating networks, low heat densities, collaborative business models, instruments of public policy

Appendix: Summary table of interviews conducted

Organisation type	Organisation	Position	Number	Id
French public institutions	French Ministry of Ecological Transition	Member of the Energy Saving and Renewable Heat Department	1	PI1
	The French Agency for Ecological Transition	National heating network coordinator	1	PI2
		National biomass coordinator	1	PI3
		Regional instructor	2	PI4
Private heating network operator	Dalkia	Head of operational centre Poitou-Charentes Limousin	1	OP1
		Project Manager for heating and cooling networks in Ile-de-France	1	OP2
	CRAM	Development expert	1	OP3
Energy federation	SIEL42	Head of the energy transition division	1	EF1
Municipality	Town hall of Tramayes (71)	Mayor	1	MA1
Semi-public company	SEM SIPEnR	Deputy chief executive officer	1	SP1
Cooperative	Belgian cooperative for Malempré heating network	President	1	BE1

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