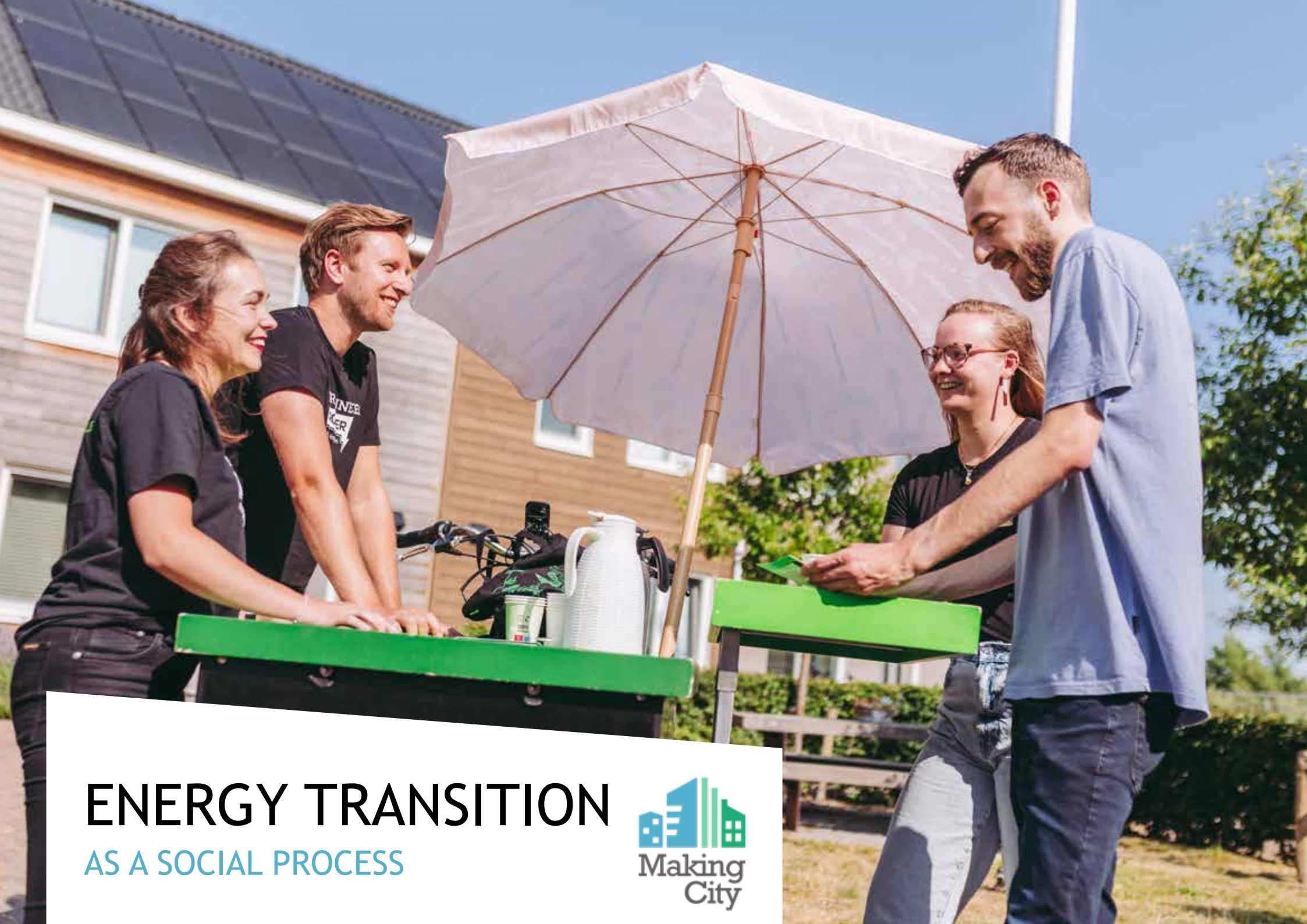


ENERGY TRANSITION

AS A SOCIAL PROCESS

Making City

Table of contents

Why this publication?

As a designated 'lighthouse city' within the EU MAKING-CITY project, Groningen sets an example for other European cities regarding the energy transition and the way in which it involves its citizens in this transition. Since the birth of the project in 2018 several partners from the Groningen Consortium have been collaborating on the subject of citizen participation because, however carefully we work things out from a technical point of view, the success of the energy transition depends on the involvement of citizens. And this leads to the crucial question of how to involve citizens who lack financial means and are living in energy poverty – a situation exacerbated by recent geopolitical developments and the accompanying spike in energy prices.

This question prompted a number of partners in the MAKING-CITY project, namely the Netherlands Organization for Applied Scientific Research (TNO), Hanze University of Applied Sciences Groningen, the University of Groningen, the municipality of Groningen and Grunneger Power, to examine this issue from different angles under the heading of energy transition as a social process. How do we define energy poverty? What barriers do the city's inhabitants face in participating in the energy transition? How can we engage and activate people? And how should this be managed, including who is able and authorised to do what?

While one partner takes a general investigative approach to the subject, another, in contrast, opts for an elaborated case, and yet another is highly pragmatic. The result is a diverse collection of articles about a topical subject under the banner of MAKING-CITY.

Most importantly, this publication shows that there is much work to be done, and that the city of Groningen will not shy away from taking an innovative approach. At the same time, it is a source of reflection for the city itself, and of inspiration for everyone elsewhere who wants to see a more inclusive energy transition with broad public support.

Christian Zuidema and Elisabeth Koops

Foreword

Europe has ambitious climate goals which will be challenging to meet. As cities play an essential role in achieving these goals, in 2018 the European Commission initiated the MAKING-CITY project to facilitate cities in focusing on the energy transition while learning from each other.

Along with Oulu in Finland, Groningen has a prominent role in this project as a 'lighthouse city', a model European city where many innovations are tested in practice. Six other European cities have been chosen as 'follower cities' - Bassano del Grappa (Italy), Kadiköy (Turkey), León (Spain), Lublin (Poland), Trenčín (Slovakia), and Vidin (Bulgaria). The follower cities observe experiences of Groningen and Oulu and attempt to replicate them.

The lighthouse cities gain experience by creating Positive Energy Districts (PEDs). In these districts, homes and other buildings are being made energy efficient to such an extent that together they will produce more energy than they consume. Other districts in the city which are more difficult to render energy efficient will benefit from the extra energy. The city as a whole will then be able to consume as much energy as it generates.

To achieve this goal in Groningen, we work together in a consortium consisting of the municipality of Groningen, the Netherlands Organization for Applied Scientific Research (TNO), New Energy Coalition, Nijestee housing corporation, Waarborg Mediacentrale co-working and office space, Hanze University of Applied Sciences Groningen, the University of Groningen, Grunneger Power, CGI Netherlands, Sustainable Buildings and the WarmteStad heat company.

Two PEDs have been selected for Groningen: one in the north of the city (Paddepoel and Zernike) and one in the south (Europapark). These districts differ from each other with regard to existing buildings, challenges and citizenship.

In PED South we mainly work with large, energy-intensive buildings such as the Mediacentrale. Here, we have been able to reduce energy consumption significantly by implementing innovative measures. The adjacent sports complex, on the other hand, is a highly innovative, energy-positive building. Together with a number of other buildings in PED South, it is being investigated how the overall energy balance can be made positive using innovative solutions, while also looking at smart combinations with infrastructure. For example, in the spring of 2023 a solar footpath was installed, and a pilot of floating solar panels will be introduced. The ecological impact (advantages and disadvantages) of this floating solar park will be monitored.

In the north of the city, activities include work on four demo houses, two 1970s youth apartments and the Energy Academy Europe building. Various techniques that can be used to move away from natural gas have already been tested. Innovative solutions are being implemented for sustainable energy generation, for example with vertical solar panels on façades or double-sided solar panels, in order to realize a greater yield from the local environment without placing an additional burden on it. We are seeing here what is needed to transform people's lives, homes, other buildings and districts. The work and research carried out in PED North is described in our first publication: Energy positive the Groningen way.

It was clear from the start that making districts energy positive is not only about technical innovation or district scenarios; it also calls for new types of policy and the involvement of residents. Moreover, issues such as a sustainable energy transition and energy poverty have become even more topical in the face of the energy crisis. This prompted a number of partners in the MAKING-CITY project to conduct research into these phenomena and to reflect on them. We are pleased to present the results under the heading of energy transition as a social process to the MAKING-CITY consortium partners, the European follower cities, researchers and administrators, and everyone who works in the social field of the energy transition.

Katerina Radosteva
Project leader MAKING-CITY, municipality of Groningen

MAKING-CITY in brief

MAKING-CITY is a large-scale EU-subsidized project (makingcity.eu) to investigate the possibilities of Positive Energy Districts (PEDs) – parts of a city that generate more energy than they consume. Along with Oulu in Finland, Groningen was designated as one of two *lighthouse* cities that play a leading role in this project. The solutions emerging in these two cities will be replicated in six *follower* cities – Léon, Bassano del Grappa, Trencin, Lublin, Kadiköy and Vidin.

The concept of the PED - Positive Energy District

A Positive Energy District (PED) is an urban area where, on an annual basis, at least as much energy is generated as is consumed. The European Union has set itself the goal of realizing 100 PEDs across Europe by 2025. As a participant in the MAKING-CITY project, the city of Groningen has two allocated areas, PED North and PED South, where new policy, technical innovations, energy saving and local energy generation have been applied to create PEDs in a district-oriented approach.

The MAKING-CITY Consortium in Groningen

MAKING CITY GRONINGEN

Project status
On-going

Project duration
1 December 2018 – 1 December 2024

Contacts for Groningen
Katerina Radosteva (project leader)
Elisabeth Koops (project secretary)

Project website
makingcity.eu

Technology applied in buildings and public spaces
Solar footpath, PVT-panels (Photovoltaic Thermal), BIPV (building-integrated photo-voltaic), bifacial panels, green gas from organic waste, heat network on residual heat from data centres, innovative heat pumps, battery at building level.

Social interventions
Together with local initiatives and residents, we have looked at ways to achieve an energy-positive district, focusing on the districts of Noorderplantsoenbuurt, Paddepoel, Reitdiep, Oosterpoortbuurt, Oosterparkbuurt and Hoog-kerk. These interventions have been imple-mented in cooperation with the municipality of Groningen, Hanze University of Applied Sciences Groningen, TNO and Grunneger Power.

Energy transition as a social process

Christian Zuidema (University of Groningen)

The term energy transition evokes a range of responses. For some, it signifies an urgent need to curtail climate change. Others see the energy transition as bringing about undesirable changes in the landscape. And then there are those who are mainly concerned about rising energy costs and the major investments the energy transition will require. Yet others see it as a great way to save or even earn money from energy.

The energy transition is not some speculative vision. It is a reality that is endorsed by government policy from the European Union to the municipality of Groningen, and highlighted by global events. In particular, we are seeing a worldwide surge in solar and wind energy. Over the past 15 years, there has been a more than twelve-fold growth in wind energy, and solar energy has increased by a factor of as much as 170.[1] This should not be surprising. The costs of both types of electricity generation have been falling for years, and are set to continue doing so for the foreseeable future. In most countries, solar power is now the cheapest source of electricity,[2] and that will soon apply to the Netherlands as well.[3] Moreover, approximately 70% of all global investments in new electricity generation are being made in sustainable projects.[4] We will be living with this energy transition for some time.

A smart energy transition

The challenges should not be underestimated. To achieve the energy transition, we will need substantial investments in our electricity grid, ways to store electricity and heat, changes to our mobility system, and last but not least, far-reaching modifications to our homes, cities and landscape. All this requires a willingness to invest and to embrace change. The fact that the investments will only pay off in the long-term does not mean that we do not have to make them now. This is a reality that we must all face. And that presents us with considerable challenges, but also many opportunities. We just have to go about it in a smart way.

A smart energy transition means much more than reducing the demand for energy or generating kilojoules and megawatts. The energy transition is, of course, also about the energy itself. In the Netherlands, we are still generating 86% of our energy from fossil fuels[5] – a reality that became starkly clear to us in 2023. Dependence on foreign oil, gas and coal, combined with shifts in geopolitics, has led to soaring price increases. These costs show up on the energy bills of households and businesses, forcing the government to make extra funds available. But the energy transition is far more than that.

1 BP (2021). *Statistical Review of World Energy 2021*. BP: London.
2 IEA (2020). *World Energy Outlook 2020*, IEA Publications: Paris.
3 NVDE (2018). Kosten van stroom uit wind en zon gaan richting die van kolen en gas
4 IEA (2021). *World Energy Investment 2021*. IEA Publications: Paris.
5 CBS (2021). Samenvatting - Hernieuwbare energie in Nederland 2021.

It is closely intertwined with numerous other social challenges, and calls for broad-based social involvement.

Intertwined and connected

Firstly, the energy transition cannot be seen as separate from many other processes such as district renewal, poverty, employment and mobility, just to mention a few examples. For instance, installing a heat network requires that homes are adequately insulated and involves considerable modifications to infrastructure, which soon paves the way for broader district renewal. This leads directly to considerations such as reinforcement of the electricity grid, the installation of charging stations for electric vehicles and the implementation of climate-proof measures. Further, making homes sustainable is also about enhancing residential comfort, improving the health of residents and reducing energy bills. The energy transition therefore touches on a broad chain of social aspects, and entails considerable secondary effects. We can therefore expect investment in the energy transition to have a wide-ranging impact across society.

The investments will not only be on the part of the government. For instance, rendering the built environment more sustainable requires a great many adjustments that ask a lot from housing cooperatives, businesses, lessors and home owners. A few straightforward examples are roof-mounted solar panels, heat pumps, connections to a heat network and building insulation. Larger-scale projects such as solar farms and wind energy also require investments – from the market and in some cases also from corporations and private participants. Meanwhile, society can contribute significantly to the sustainability of mobility through behavioural adjustments and by purchasing electric modes of transport, for instance. It is clear from these examples that lessors, households and businesses must be both willing and able to participate. And that calls for knowledge, capital and trust.

Broad-based investment

In 2023, soaring energy costs made it painfully clear that many households and also businesses are not well-positioned to invest in the energy transition. Even before this rise in energy costs, a significant number of Dutch citizens were struggling to pay their energy bills. Investigations show that more than 5-10% of Dutch households may be affected,[6] while further research in Groningen reveals that in some districts more than 20% of households are at risk.[7] Moreover, many households are dependent on landlords and housing cooperatives, or simply have no roof to install solar panels on. In such situations, it is not realistic to expect widespread social participation. Financial participation in large-scale solar projects, making one's home sustainable, and purchasing an electric car are options that are only open to a section of society: home owners with sufficient investment capacity.

For a whole-of-society energy transition to succeed, there needs to be a broad-based understanding that additional efforts by the government and its partners are needed to assist society. Such efforts are necessary on the one hand to accelerate the energy transition by activating and helping those sectors of society that are currently unable to participate adequately. On the other hand, there is a need for action because, due to the interconnectedness of the energy transition with other social processes, the inability to participate of a sizeable portion of society will engender new problems.

Rising energy costs can be a considerable burden. Some households and businesses are able to cover these costs fairly easily, with the rising costs mainly impacting savings or profit, but the situation for most households and businesses is another

[6] Mulder, P, F. Dalla Longa, K. Straver (2021). *De feiten over energiearmoede in Nederland: Inzicht op nationaal en lokaal niveau*. TNO: Amsterdam.

[7] Baardink, T. (2020). Energiearmoede in Groningen, Een onderzoek naar de omvang en effecten van energiearmoede in de gemeente Groningen, Masterthesis, Universiteit Groningen: Groningen.

story. Some will perhaps manage to pay the costs, but will have to scrimp on other activities. Others will struggle to pay the costs, if they manage at all. They will have to economize substantially, and not only on energy. And some will simply fail to make ends meet. Poverty-related problems will inevitably ensue. Later in this publication, we elaborate on the possible consequences in the form of some calculation examples (see p.14). Bearing in mind the considerable uncertainty surrounding precise price movements, in 2023 energy for an average household cost roughly €1,000 more than in 2021 – and that includes assistance from the government. Without that government assistance, we are talking about figures between €2,000 and €7,000, depending on whether we apply the prices of February or September 2023. Many households can hardly afford such prices, if at all – and this has ramifications.

What if we do nothing?

First of all, we have to consider the effects on the people who run into these problems. It starts with turning the heating down, taking fewer showers, and cutting back on holidays or eating out. But that is only a tentative start. Research by Nibud (National Institute for Family Finance Information)[8] has revealed that higher fixed charges result in lower spending on leisure activities, transport, contributions and subscriptions. And then things only get more painful. Poverty, and therefore also energy poverty, has a proven impact on people's mental and physical health. And that can have serious consequences. For example, the 2020 CPB-SCP (Netherlands Bureau for Economic Policy Analysis/Netherlands Institute for Social Research) analysis refers to the increasing risk of social isolation, reduced cognitive levels, and negative impact on the educational level of children.[9] People get into debt, suffer from stress, are uncertain about their future, and eat poorly. This brings us to the 'heat or eat dilemma'. Increasing energy costs are more than just a bothersome cost item.

[8] Verberk, M. Warnaar, M. Bos, J. (2019). *Hoe gaan mensen om met hoge woonlasten?* NIBUD: Utrecht.
[9] CPB-SCP (2020). *Kansrijk Armoedebeleid*. CPB-SCP: Den Haag.

Secondly, there is a considerable impact that goes beyond individual households. All that economizing has repercussions for the wider environment. Clubs and associations see a drop in their income, while people spend less on catering and clothes and stop investing in their homes and gardens. Inevitably, this also has repercussions on the urban economy. Furthermore, it will lead to additional requests for assistance from clubs and associations, individual households or simply extra budget for matters such as poverty reduction, health and youth care. It is difficult to establish precise figures, but it is clear that substantial sums of money can be involved.

Energy poverty has a proven impact on people's mental and physical health

Groningen has 121,000 households. Every additional €1,000 per year they have to spend on energy adds up to €121 million. And if we speak of €2,000 to €7,000… All that money will not then be spent on other things.

And we have not yet mentioned the business community. Regarding energy-intensive businesses in particular, varying from heavy industry to the local bakery or a damage and repair company, their high energy consumption puts them under pressure as well. Once again, government assistance is crucial in order to keep businesses, and therefore also the economy, afloat. A similar logic applies to educational institutions, clubs and associations and the government itself. It is quite simple, really. Sustainability pays off. It already did, but the current energy crisis is heightening the urgency.

So what approach should we take?

In this publication, we discuss how investing in the energy transition involves a broad social investment strategy. Investments that will prevent millions of euros

from evaporating like CO_2 from a coal-fired power station. Investments that lead to better, healthier and more affordable housing conditions for people, to numerous savings ranging from poverty reduction to youth care and sport subsidies, and that yield benefits in the form of an urban economy that stays strong and can continue to develop thanks to an increasing spending capacity of our citizens. This is therefore a matter of comprehensive investments in cities.

To get a grip on this kind of investment, we discuss a number of challenges ranging from the risk of rising poverty, citizens' reservations about investing in a connection to a heat network, and the difficulties of involving citizens in collective projects and decision-making. But apart from challenges we also look at the current possibilities – the role of an energy transition fund as an accelerator, reducing the burden on citizens by providing good coaching and support, and ways in which collective energy projects can be effected. Above all, we want to show how investment in the energy transition based on diverse policy agendas will pay off. And we emphasize yet again, the energy transition is about much more than energy; it is a gateway to envisioning societies and cities of the future.

Introduction to energy poverty

Christian Zuidema (University of Groningen)

Energy poverty is a situation in which households have insufficient money available for the energy required for heating, cooking, taking a shower, or using electrical appliances. However, despite the fact that energy poverty has a clear definition, it is difficult to operationalize. Firstly, energy poverty often arises from a combination of factors, such as poor energy performance of a building, a low income, high housing expenses and rising energy prices.

Operationalizing energy poverty

One of the first and most frequently used operationalizations is the energy quote, which expresses the ratio between the energy costs and the disposable income of a household. Internationally, an energy quote of 10 is commonly applied, where a household is assumed to be at risk of energy poverty if 10 per cent or more of the disposable household income is spent on essential energy supplies.[1] In the Netherlands, an energy quote of 8[2] is typically used. The energy quote has significant limitations. Households with a high energy quote are not necessarily at risk of energy poverty if they also have a high income. Conversely, in cases of low income, the risk may be present even if the energy quote is quite low. An alternative for the energy quote is the 'Low Income & High Energy Costs Indicator (LIHC). This indicator only includes households that have both a low income and high energy costs. The crux of the matter is therefore that we need to interpret energy costs in the context of the household finances as a whole. In other words, energy poverty is best understood as part of a broader poverty problem.

[1] Romero et al. (2018); Romero, J.C. Linares, P. López, X. (2018). The policy implications of energy poverty indicators. *Energy Policy*, 115, 98-108.

[2] CBS (2021). Energieindicatoren naar Regio.
Mulder, P, F. Dalla Longa, K. Straver (2021). *De feiten over energiearmoede in Nederland: Inzicht op nationaal en lokaal niveau*. TNO: Amsterdam.

Consequences

When money is tight, tough choices have to be made when it comes to spending. The impact of high fixed charges on savings behaviour was recently investigated by the Netherlands Environmental Assessment Agency (PBL) (Table 1).[3] By comparing the spending patterns of households with and without high housing expenses, it is possible to deduce what households are saving money on to cover other expenses. This particularly concerns savings on expenditure where there is a more explicit element of choice – leisure expenditure, transport, membership fees and subscriptions. In addition, people economize on clothing, personal care and food, for example, with possible negative repercussions on health.

Other research into the consequences of energy poverty also reveals that the effects extend beyond savings behaviour. More people may resort to debt restructuring, live with a lower level of residential comfort, and struggle to afford sufficient energy supplies in the home. Meanwhile, research also shows a connection between energy poverty, increasing social isolation and poorer physical and mental health.[4]

From blind spot to spotlights

Apart from the urgent problem of being able to pay energy bills, there is also the question of whether households are in a position to invest in sustainability in the home. Generally, measures to increase sustainability such as insulation, heat pumps and solar panels tend to have a favourable payback time and can reduce the risk of energy poverty, with energy bills being cut substantially. This is a good incentive for households to invest in sustainability. However, this option is not open to everyone, particularly if people rent their house, have no access to roof space, or lack the financial leeway. Unlike homeowners with capital, they may then find themselves stuck

	High rent in relation to basic amounts (€)	High rent in relation to standard amounts (€)	High mortgage costs in relation to standard amounts (€)
Fixed charges			
Rent/mortgage costs	46	72	76
Gas	-1	-1	2
Electricity	0	-1	1
Water	0	0	0
Local charges	-8	-3	0
Telephone/TV/internet	-10	-1	-6
Insurance	-7	-4	-4
Education	-3	1	3
Contributions and subscriptions	-8	-25	-21
Transport	-54	-28	-92
Reserve expenditure			
Clothing	-27	-22	-28
Furniture and fittings	-23	11	-32
House and garden maintenance	-6	-15	-51
Unreimbursed medical expenses	0	-2	11
Leisure expenditure	-20	-68	-95
Household expenditure			
Food	-33	-10	-21
Washing and cleaning supplies	-1	0	-1
Personal care	-8	-5	-12
Home help	1	-2	-2
Pets	-2	1	1
Miscellaneous	-2	-13	-8

Table 1: Differences in expenditure between households with and without high housing costs (€ per month). Source: Verberk, M. Warnaar, M. Bos, J. (2019). Hoe gaan mensen om met hoge woninglasten? (How do people deal with high housing costs?) PBL Netherlands Environmental Assessment Agency, The Hague.

with rising energy costs from which they cannot escape by investing in their homes. This concerns, for instance, households with relatively high housing expenses due to private renting or which have a relatively large mortgage in relation to their income. This not only increases the risk of energy poverty, but can also promote financial inequality between households and hinder the energy transition because a portion of households will be left behind.

Against the backdrop of the 2022 energy crisis, particular attention has been paid to energy poverty. Energy poverty was already indicated in the aforementioned studies,

[3] Verberk, M. Warnaar, M. Bos, J. (2019) *Hoe gaan mensen om met hoge woonlasten?* NIBUD, Utrecht.

[4] Middlemiss, L. Gillard, R. Pellicer, V. Straver, K. (2018). Plugging the Gap Between Energy Policy and the Lived Experience of Energy Poverty: Five Principles for a Multidisciplinary Approach. In C. Foulds, R. Robison (Red). *Advancing Energy Policy* (pp 15-39). Palgrave Pivot: Cham

while the variable prices of gas and electricity were respectively at the levels of €0.70 per m^3 and €0.20 per KWh. 2021 PBL estimates for gas[5] were still based on an increase until 2030 of these costs of around 15-40% for gas, while for electricity a slight decrease or a limited increase of up to no more than 5% was assumed. The current energy crisis reveals a very different reality that we would not have thought possible until recently. This brings us to a very different picture of the issue of energy poverty, or at any rate, the possibility that, without measures to render their homes more sustainable, and if they do not receive government assistance, many Dutch households will end up in financial difficulties due to their energy bills. Moreover, geopolitical developments have led to a high level of uncertainty.

Exploring the uncertainties

The uncertainties are considerable, but it is certainly conceivable that we will continue to face relatively high energy prices in the coming years. The international energy market will doubtless adapt to the new situation, with Russian gas and oil at any rate playing a lesser role, but we cannot be sure how successful this will be, or whether we will encounter new crises in the future. Given this uncertainty, it is wise to at least get some idea of the problems and potential consequences. To this end, we have made an initial provisional assessment with a simple calculation example.

For the sake of convenience, we will assume that households that get into difficulties rarely reside in mansion-sized houses with a correspondingly high energy consumption; this tends to affect people living in average-sized to small homes. Also for the sake of convenience, we apply an average energy consumption for Dutch households, which comes down to 2,479 kWh in electricity and 1,169 m^3 in gas.[6] We then base our calculations on average fixed charges of €145 per year from the energy supplier,[7] as well as a tax refund of up to €785 per year.[8]

We include all other costs in the variable costs that consist of the market price, taxes and allowances as well as possible government assistance. These are described in six scenarios (see Table 2). The first scenario is based on the average variable prices of 2021 including taxes according to CBS (Statistics Netherlands) data. The second scenario is based on the situation as in early 2023, with government assistance as a starting point. Scenarios 3 to 6 correspond to the situation in late 2022, with amounts that appeared on bills in 2023.[9]

Costs (€)	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Electricity per kWh	0.26	0.40	0.55	0.75	1.00	1.25
Gas per m³	0.94	1.45	2.00	3.00	4.00	5.00
Tax allowance	785	785	785	785	785	785
Fixed costs	145	145	145	145	145	145
Yearly total	1103	2047	3061	4726	6515	8304
Monthly total	92	171	255	394	543	692

Table 2: Energy cost scenarios

Disposable monthly income	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
€1,000	9%	17%	26%	39%	54%	69%
€1,500	6%	11%	17%	26%	36%	46%
€1,667	6%	10%	15%	24%	33%	42%
€2,000	5%	9%	13%	20%	27%	35%
€2,500	4%	7%	10%	16%	22%	28%
€3,333	3%	5%	8%	12%	16%	21%
€5,000	2%	3%	5%	8%	11%	14%

Table 3: Estimate of energy costs as a percentage of disposable household income per scenario.

[5] Luteijn, G., K. Bik, S. van Polen (2021) *Ontwikkelingen in de energierekening tot en met 2030: Achtergrondrapport bij de Klimaat- en Energieverkenning 2021*. PBL: Den Haag.

[6] Milieucentraal (2023). Energierekening Uitgelegd.

[7] Milieucentraal (2023). Energierekening Uitgelegd.

[8] Rijksoverheid (2023) Stijgende energierekening deels gecompenseerd.

[9] Grouw, M. (2023). Energieprijzen 2023. Slimster.

We then link these scenarios to various incomes, calculating the total percentage of energy costs of the CBS disposable income (Table 3). To interpret the results of this calculation example, it is important to know that 15.5% of Dutch households have a disposable monthly income of under €1,667, while 36.5%, 55.5% and 76% have an income of under €2,500, €3,333 or €5,000.[10], respectively.

Some estimates

In our calculation example, on average, households would be paying almost €1,000 per year (€80 per month) more compared to 2021 if they paid the price cap tariff of 2023 (scenario 2). In other scenarios this figure quickly rises to €2,000 (€160 per month), up to a possible €7,200 (€600 per month). For households with an income of less than €1,667 per month, an extra €80 per month will highly probably force them to economize substantially on expenses. They will probably hardly be able to afford higher prices than that, if at all. And even for households with an income of up to €3,333, additional monthly expenses of €250 to €600 will be challenging to cover. We are now talking about the situation we already observed in 2022 (scenarios 3 to 6). On the other hand, it is noteworthy that in our calculation example many households spend more than 8 or 10% of their disposable income on energy. In scenario 2, with the price cap set by the government, a monthly income is needed of €2,138 in order to remain under an energy quote of 8. That applies to 28% of Dutch households. Scenarios 3 to 6 show a further increase. As from scenario 3 everyone with an income under €3,188 has an energy quote of 8 or more, which applies to approximately 44% of all Dutch households, while in scenario 4 this increases to €4,923 and 67% (see Figure 1).

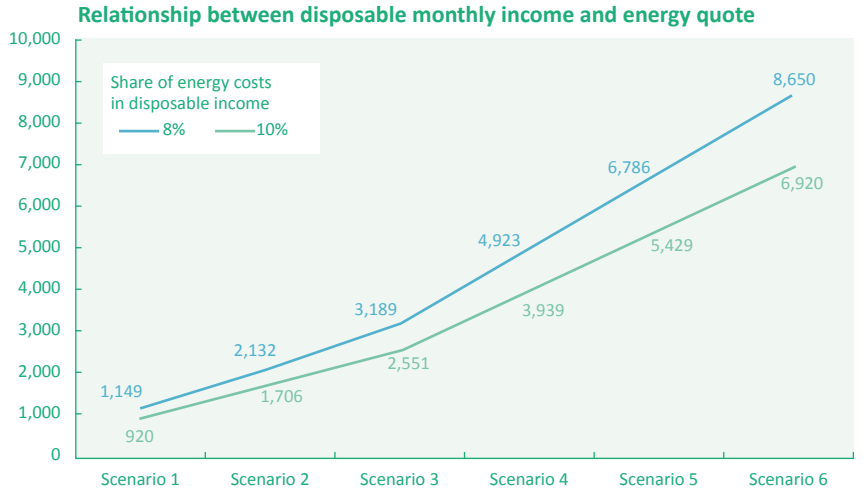


Figure 1: Disposable monthly income and energy quote. The two curves express the minimum disposable income in euros needed to avoid the risk of energy poverty in the case of average energy consumption. We distinguish between 8% or 10% respectively of the energy costs as part of the disposable income.

What this means

The future is uncertain and our calculation example is rough. Hopefully, the kinds of prices we saw in late 2022 will remain exceptional. But the conclusion is clear: if we do not move towards sustainability quickly and/or if energy costs do not drop substantially, many Dutch households will become dependent on government assistance in order to avoid serious if not impossible financial challenges. And even with such assistance, many will face difficulties. The message is therefore “sustainability pays off”.

[10] CBS (2023). Inkomensverdeling Nederland.

A crash course on energy poverty

Caroline van Ooij (Netherlands Organization for Applied Scientific Research – TNO)

The term "energy poverty" has been in the news a lot lately, and has even been chosen as word of the year.[1] The war in Ukraine and the resultant spikes in energy prices have led to an increasing attention for households that are struggling to pay their energy bills.

Energy poverty is not a new phenomenon. Even before the energy crisis there were households that had difficulty paying energy bills and were living in poorly insulated homes plagued with damp, draughts and mould. This article gives a crash course on energy poverty. What exactly is energy poverty? What does it have to do with the energy transition? And how can energy-poor households be assisted?

The number of energy-poor households is growing

One specific group of households is finding itself especially hard hit in the energy crisis and the energy transition: those that live in energy poverty. These households have insufficient access to adequate energy supplies in the home. There are various reasons for this, such as not having enough money to pay the energy bills, or living in a poorly insulated home with low energy quality. Energy poverty is therefore not only a matter of affordable energy bills; it is also about the energy quality of a home. Before the energy crisis, there were approximately 500,000 energy-poor households in the Netherlands. This number has now risen to 602,000.[2]

The energy transition and the energy crisis appear to be exacerbating the number of energy-poor households

One of the reasons energy-poor households are particularly vulnerable in the energy transition is that they are unable to invest financially in making their homes more sustainable. For instance, although purchasing a heat pump can make energy costs more affordable in the long run,[3] such measures entail advance investments and are therefore only, or more easily, accessible to high-income households.[4] In addition, the energy crisis caused energy prices to soar. As a result, more people, including those with an average income, are struggling to pay their energy bills and facing payment problems. Moreover, those that already had payment problems will probably sink even further into debt.

Living in energy poverty has a range of adverse consequences

Research shows that energy-poor households are more likely to suffer from physical and mental health problems, including respiratory complaints, cardiovascular disease, anxiety, despondency and depression.[5] Recent research by TNO reveals that the worse the energy quality of a Dutch household, the higher the medical

[1] See Woord van het jaar 2022 | Genootschap Onze Taal.
[2] Mulder et al., 2023. TNO-onderzoek: Compensatie remt groei energiearmoede.
[3] Faaij, A.P.C., & Van den Brink, R. (2019). Energie wordt goedkoper.
[4] Borenstein, S. & Davis, L. W. (2016). The distributional effects of U.S. clean energy tax credits. *Tax Policy and the Economy*, 30, 191–234. https://doi.org/10.1086/685597.
[5] Carley, S., & Konisky, D. M. (2020). The justice and equity implications of the clean energy transition. *Nature Energy*, 5, 569–577. https://doi.org/10.1038/s41560-020-0641-6.

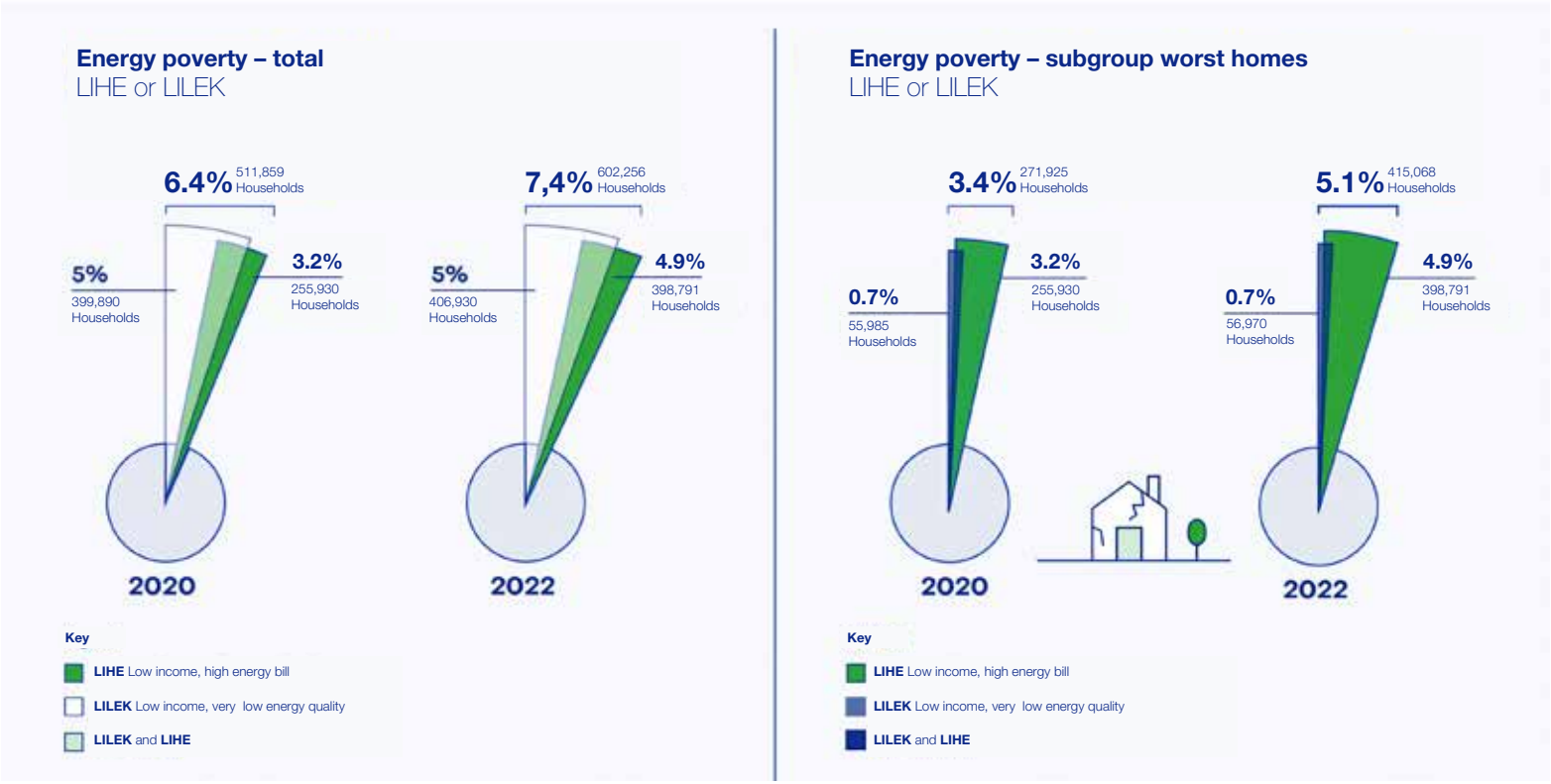


Figure 1: Increase in number of energy-poor households. Source: Mulder et al., 2023. TNO research study: TNO-onderzoek: Compensatie remt groei energiearmoede

expenses.[6] This correlation is particularly strong in the case of children under 18 who live in a home with very low energy quality and where the heating is either on low or turned off. This points not only to adverse consequences for the households directly involved, but also to substantial societal costs.

An increase in the number of energy-poor households is not only of concern for the households affected but also for the energy transition. An increase in social inequality could undermine general public support for the transition.[7] This must be avoided because the success and acceleration of the energy transition depends heavily on society and not only on sustainable technologies and innovations. For effective policy on the energy transition, the approval of society and a willingness on the part of households to invest in sustainable measures are both crucial.

Housing renovation can help to improve inhabitants' health

One type of measure that can be taken to help energy-poor households improve their living conditions is insulation. Various studies on housing renovation show

[6] Sunter, D., Castellanos, S. & Kammen, D. M. (2019). Disparities in rooftop photovoltaics deployment in the United States by race and ethnicity. *Nature Sustainability*, 2, 71–76. https://doi.org/10.1038/s41893-018-0204-z

[7] Straver, K., Mulder, P., Middlemiss, L., Hesselman, M., & Tirado Herrero, S. (2020). Energiearmoede en de energietransitie.

positive results.[8] In particular, renovation appears to improve the mental well-being of households, although physical effects are also observed. Positive results are more evident when several renovation measures are implemented, the inhabitants are in poor health, and they live in housing with poor energy quality. Studies also show how important it is that inhabitants are supported during the process, as people can find renovations very stressful.[9] In some cases, the effects of a renovation also depend on the advice that is given – and followed.[10] For instance, households whose homes have recently been insulated should be given advice on adequate ventilation.

Small-scale energy-saving measures and advice can also be helpful

Many municipalities are currently implementing small energy-saving measures in combination with advice on energy saving. Such energy-saving measures involve products such as reflective radiator foil, LED lamps and draught strips. Advice about this is often provided by an energy coach – someone who visits households and explains what can be done to save on energy. In addition, an energy coach can often help with implementing small energy-saving measures.

National Energy Poverty Research Programme – TNO

This programme, initiated by TNO, supports local, regional and national policymakers and implementers regarding energy poverty. The programme develops current, targeted knowledge about energy-poor households and the effectiveness of measures that are being taken. In addition, we are accelerating the implementation of effective measures by exchanging knowledge and experience: National Energy Poverty Research Programme — Energy.nl

Studies on the effectiveness of energy coaching[11] show that energy coaches can contribute towards changes in energy-related behaviour, such as the efficient use of heating, savings on energy and energy costs, and reducing financial burdens. The results also show that small-scale measures like these can contribute to a beneficial perception of control over the indoor climate. As each household has its own consumption patterns, the effects of advice on energy savings improve when the advice is tailored to the specific situation of the household. Furthermore, advice is also more effective when an energy coach visits the household several times. Few independent effect measurements have been conducted in the Netherlands thus far, but with the national research programme, this is set to change. (See blue text box above).

Municipalities experience bottlenecks in dealing with energy poverty

Municipalities play a central role in supporting energy-poor households. They are responsible for the implementation of policy, and generally ensure that households receive assistance. In late 2022, the Netherlands Organization for Applied Scientific Research (TNO) conducted research among municipal policymakers to find out how

[8] Thomson, H., Thomas, S., Sellstrom, E., & Petticrew, M. (2013). Housing improvements for health and associated socio-economic outcomes. *The Cochrane Database for Systematic Reviews*, 2, CD008657. doi:10.1002/14651858.CD008657.pub2;
Liddell, C., & Guiney, C. (2015). Living in a cold and damp home: Frameworks for understanding impacts on mental well-being. *Public Health*, 129, 191-199. doi:10.1016/j.puhe.2014.11.007;
Sharpe, R. A., Williams, A. J., Simpson, B., Finnegan, G., & Jones, T. (2020). A pilot study on the impact of a first-time central heating intervention on resident mental wellbeing. *Indoor and Built Environment*, 31, 31-44. doi:10.1177/1420326X20975468.

[9] Grey, C. N., Jiang, S., Nascimento, C., Rodgers, S. E., Johnson, R., Lyons, R. A., & Poortinga, W. (2017). The short-term health and psychosocial impacts of domestic energy efficiency investments in low-income areas: A controlled before and after study. *BMC Public Health*, 17, 140. doi:10.1186/s12889-017-4075-4.

[10] Sharpe, R. A., Williams, A. J., Simpson, B., Finnegan, G., & Jones, T. (2020). A pilot study on the impact of a first-time central heating intervention on resident mental wellbeing. *Indoor and Built Environment*, 31, 31-44. doi:10.1177/1420326X20975468.

[11] Straver, K., Siebenga, A., Mastop, J., Van Lidth de Jeude, M., Vethman, P., & Uyterlinde, M. (2017). Effectieve interventies om energie efficiëntie te vergroten en energiearmoede te verlagen. Opgehaald van https://www.researchgate.net/publication/315816103_Effectieve_interventies_om_energie_efficientie_te_vergroten_en_energiearmoede_te_verlagen;
Bashir, N., Cronin De Chavez, A., Gilbertson, J., Tod, A., Sanderson, E., & Wilson, I. (2013). An evaluation of the FILT Warm Homes Service;
Taylor, N. W., Jones, P. H., & Kipp, M. J. (2014). Targeting utility customers to improve energy savings from conservation and efficiency programs. *Applied Energy*, 115, 25-36. doi:10.1016/j.apenergy.2013.10.012.

they experience the way energy poverty is approached. What obstacles do they encounter? What are their plans? What do they need? A total of 201 respondents from 149 different municipalities were questioned in an online survey. The results of the survey show that:

- municipalities are doing all they can to assist households, but feel that they are currently only ''sticking plasters on the problems'';
- the financial means they receive from the Dutch government to assist households are insufficient to help all households adequately;
- due to the many GDPR rules that municipalities are obliged to observe, it is difficult to identify and reach the right target group.
- the funds that municipalities currently receive from the Dutch government are aimed at short-term assistance. Municipalities need a long-term vision on how to help households on a structural basis.

In June 2023 the second survey round was published among municipalities. This time, municipalities were asked about their experiences relating to energy poverty policy for the medium term. The results can be found in the report entitled Energiearmoede: de stap naar middellange-termijnbeleid. You can find more information (in Dutch) about where municipalities obtain knowledge, and approaches to issues relating to energy poverty, at: https://energy.nl/publications/energiearmoedebeleid/

What does the future hold in store?

We recently learned that that the energy crisis led to around 90,000 additional energy-poor households in the Netherlands.[12] This was established by TNO using CBS data. The number of energy-poor households is measured based on the number of

Figure 2: Energy poverty is linked to other problems. Image source: Straver et al., 2020

households with a low income and high energy bills or low-quality housing. The study showed that this number would have been even higher if there had been no financial compensation available to help households pay their energy bills. Without compensation, the number of energy-poor households would have risen to around 1 million. This means that some 400,000 households were saved from energy poverty. This is good news, but it also indicates that we need to think about ways to help households on a structural basis.

[12] Mulder, P., Batenburg, A., & Dalla Longa, F. (2023). Energiearmoede in Nederland 2022.

Energy poverty and municipal expenditure

Marijn van Geet (University of Groningen)

Although energy poverty is a problem that affects individual households, the magnitude of the problem – an estimated 602,000 Dutch households were living in energy poverty in 2022 – means that it has a broader social impact. Energy poverty is strongly intertwined with other social issues such as poverty, social participation, physical health, mental well-being and climate emissions. As a result, measures to combat energy poverty often have a wider social return. However, it remains difficult to express this return in euros.

Professor Christine Liddell has calculated that every euro that is invested in affordable energy can save 42 cents in health costs but, for the rest, little is known about the financial return of investments in energy poverty. In order to encourage government investments in this area, research is needed into how investments to combat energy poverty through cost savings in other areas can pay off in the long run. This essay explores the relationship between energy poverty and municipal charges in order to gain insight into the municipal areas of responsibility on which energy poverty has a financial impact. This analysis represents a first step towards understanding how tackling energy poverty can lead to financial benefits in municipal areas of responsibility.

Energy poverty

In this study, energy poverty is defined as the share of low-income households with high energy costs (LIHC indicator) or those with a low income and a home with relatively low energy quality (LILEC indicator).

According to the LIHC indicator, a household is energy poor if the net disposable income is below 130% of the statutory social minimum, the financial assets are among the lowest 10% in the Netherlands, and the energy costs are among the highest 50%


gaan we de nieuwe
ngebouwen noemen?
ENERGIE
ADVIES

in the Netherlands. According to the LILEC indicator, a household is energy poor if the net disposable income is below 130% of the legal social minimum, the financial assets are among the lowest 10% in the Netherlands, and the home has an energy label of D or lower. See Mulder et al. (2021)1 for a detailed definition of the indicators.

Municipal expenditure

Municipal budgets are allocated to various areas of responsibility. Statistics Netherlands (CBS) collects these financial data from all Dutch municipalities. To ensure uniformity of the data, the Information for Third Parties (Iv3) Information System has been established, which specifies what financial data municipalities must provide, and in what manner. The adjacent table provides an overview of municipal areas of responsibility according to the Iv3 information requirement. We adhere to this delineation in this analysis.

Analysis

For the analysis, use was made of data from 2019 for all 355 Dutch municipalities. The relationship between energy poverty and municipal expenditure was investigated using the Spearman rank correlation. This statistical test affords insight into the direction of the correlation (negative or positive) and the strength of the correlation (0.00-0.19 very weak or no correlation, 0.20-0.39 weak correlation, 0.40-0.69 moderate correlation, 0.70-0.89 strong correlation, 0.90-10 very strong correlation), the significance of the correlation and the reliability of the correlation found. Based on these indicators, an estimate is made of how energy poverty and municipal expenditure correlate in various areas of responsibility.

[1] Mulder, P., Dalla Longa, F., & Straver, K. (2021). *De feiten over energiearmoede in Nederland Inzicht op nationaal en lokaal niveau*. TNO.

Area of responsibility	Subjects
1. Security	Crisis control and fire service, law and order
2. Traffic, transport and water management	Traffic and transport, parking, recreational ports, economic ports and waterways
3. Economy	Economic development, physical business infrastructure, business advice centre and sectoral regulations, economic promotion
4. Education	Public primary education, educational premises, educational policy and student matters
5. Sports, culture and recreation	Sports policy and activation, sports facilities, cultural presentation, cultural production and cultural participation, museums, cultural heritage, media, public green spaces and recreation
6. Social domain	Collaborative power and citizen participation, community teams, income schemes, assisted participation, labour participation, tailored provisions, customised services, escalated care
7. Public health and environment	Public health, sewers, waste, environmental management, cemetaries and crematoriums
8. Public housing, spatial planning and urban renewal	Spatial planning, land exploitation (not business parks), living and building

Table 1: Municipal areas of responsibility

Results

The results of the Spearman rank correlation are shown in Table 2. The column containing correlation coefficients reveals that the correlation between energy poverty and the expenditure in most of the areas of responsibility ranges from weak to very weak. A moderately positive correlation was only found between energy poverty and municipal charges in area of responsibility 6. For five of the areas of responsibility that were analysed, including the social domain, the correlation found between energy poverty and municipal charges was significant. However, this says nothing about the strength of the relationship between energy poverty and municipal charges. The confidence interval and the R2 can be used for this. The confidence interval for the social domain indicates that it can be said with 95% certainty that a weak correlation exists between energy poverty and municipal charges. The R2 indicates that approximately 40% of the variation in charges can be explained by the energy poverty share in a municipality. This points to several other factors that influence municipal expenditure within the social domain.

Possible win-win situations between social domain and energy poverty

The above analysis provides an initial impression of the degree to which energy poverty and municipal expenditure in various areas of responsibility correlate. Based on the results, the financial impact of energy poverty on the social domain in particular appears to warrant further investigation. The results point to possible financial synergies between energy poverty policy and policy in the social domain. Investments to reduce energy poverty could possibly be partly recouped through cost savings in the social domain. However, the correlation found does not necessarily mean that there is causality. More research is needed to further investigate the causality of the correlation found.

Expenditure per area of responsibility	Energy poverty			
	Spearman correlation co coefficent	Sig. (2-tailed)	Confidence interval R^2	
1. Security	.084	.113	-0.020 – 0.187	0.007
2. Traffic, transport, water management	.156**	.003	0.053-0.256	0.024
3. Economy	.187**	<.001	0.085 – 0.286	0.0350
4. Education	.239**	<.001	0.138 – 0.335	0.057
5. Sports, recreation, culture	.213**	<.001	0.111 – 0.310	0.045
6.Social domain	.629**	<.001	0.562 – 0.688	0.396
7. Public health and environment	-.003	.961	-0.107 – 0.101	-0.001
8. Public housing, spatial planning and urban renewal	-,219**	<.001	-0.316 - -0.118	-0.0480

*Correlation is significant with a p-value of < 0,05 **Correlation is significant with a p-value of < 0,01, N=355

Table 2: Correlation between energy poverty and municipal expenditure per area of responsibility

Energy poverty and the role of municipalities on a European level

Cyril Tjahja, Joke Kort and Rachel Boyce (TNO)

One of the activities within the citizen engagement approach in the MAKING-CITY project was conducting a social research study in the six *follower cities*.[1] In this study, citizens were asked about different aspects regarding sustainable energy and the energy transition, which included questions that were (in)directly related to energy poverty. For this purpose, a questionnaire was distributed between May and September 2021 (before the European energy crisis and subsequent price hikes) among citizens of the respective municipalities.

The first part of the questionnaire consisted of a general section with mostly demographic questions. In addition, six modules were offered containing questions regarding energy consumption, energy efficiency of the building, energy production, energy flexibility, mobility and (local) energy communities, respectively.

In order to keep the number of questions in the questionnaire reasonable for the respondents, the follower cities could choose a maximum of three out of the six modules, depending on their own interests, which would then be included in their own local version of the questionnaire. The questionnaires were distributed both in print as well as digitally, according to the cities' preferences. Digital versions of the questionnaire made use of the Google Forms platform.

All six follower cities participated in the study and translated their chosen modules in their own respective languages. The city of Trenčín, however, did not choose any modules which contained questions on energy poverty, and for this reason its results are not discussed in this article.

[1] The six follower cities are Kadiköy (Turkey), Léon (Spain), Bassano del Grappa (Italy), Lublin (Poland), Vidin (Bulgaria) and Trenčin (Slowakia).

Results and analysis per follower city

Bassano del Grappa

In the Italian city Bassano del Grappa, almost one third of respondents (32%) indicated that they spent 10-30% of their nett income on energy. 21% even indicated that they spent 30-50% of their income in energy, which means that these groups could be considered as energy poor (see Figure 1). The trust that respondents have in their municipality was average, but almost all respondents (93%) felt that their muncipality should do more to improve their well-being. Furthermore, respondents indicated that they have limited insight into their energy usage and are not familiar with the sustainable solutions that are available, which makes it difficult for them to change their behaviour. First, citizens need to gain more insight into their energy usage, only then the municipality can play a role in the process. For example, by providing information on potential (technical) solutions or available subsidies, it becomes easier for citizens to make well-informed decisions.

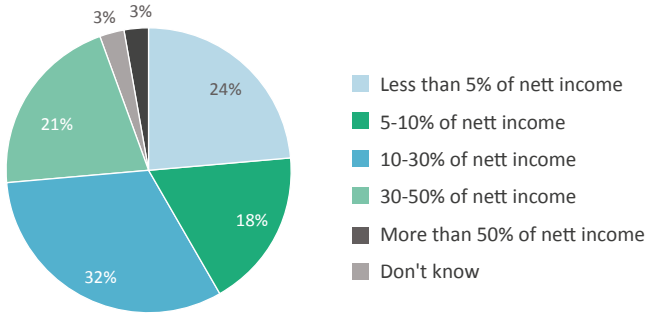


Figure 1: Percentage of nett income spent on energy (Bassano del Grappa)

Vidin

The proportion of respondents in Vidin, Bulgaria that could be considered as energy poor was high: 40% of respondents indicated that 10-30% of their nett income is spent on energy. 14% spent 30-50% , and 13% of respondents even spent 50% of their nett income on their energy bills (see Figure 2). It might therefore not come as a surprise that almost all respondents (95%) were interested in sustainable measures for their home, and more than half (52%) was interested in monitoring their energy consumption. 77% of respondents indicated to be interested in collectively saving or producing energy with people from their neighbourhood.

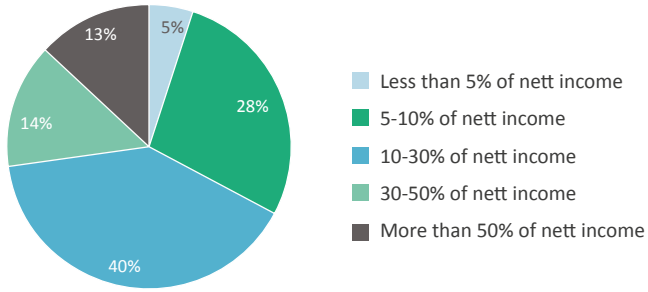


Figure 2: Percentage of nett income spent on energy (Vidin)

At the same time, most respondents (86%) indicated not to be well-informed regarding which types of sustainable measures would be suitable for their home; the municipality could inform their citizens more or better regarding this issue.

In addition, more than half of the respondents felt that the muncipality should do more to improve their well-being. Trust in the muncipality was significantly high: 72% rated the muncipality 5/10 or higher, and 22% even gave a rating of 10/10. For Vidin, this could be an opportunity to facilitate or stimulate the development of local energy communities. In this way, the municipality could simultaneously improve well-being and address citizens' financial expenditure for energy.

Léon

In the Spanish city Léon, two-thirds of respondents indicated that their energy expenditure influenced their quality of life (48% a little, 20% significantly). A large proportion (86%) of respondents indicated to be interested in collectively saving and producing energy with their neighbours or other neighbourhood residents. Contrary to the findings in Bassano del Grappa and Vidin, respondents in Léon were quite well-informed on sustainable measures, and also see its benefits. Technical knowledge regarding sustainable energy fell behind in Léon, however, although around three-quarters of respondents was interested in them, in particular measuring and monitoring of energy consumption, AI, power control systems, smart lighting/LED, and PV-panels on the roofs.

In Léon, too, there is much to be gained by the muncipality in terms of raising awareness, providing information, and creating a favourable environment for local energy initiatives. However, the muncipality does need to work on their citizen's level of trust, which was quite low (on average around 2/10). The availability of environmental data provided by the municipality was also deemed to be insufficient, with 78% of respondents indicating that they were not receiving sufficient data.

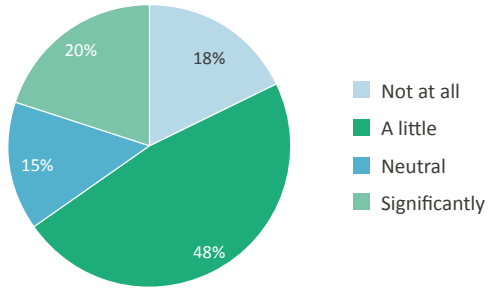


Figure 3: To what extent energy expenditure influences quality of life (Léon)

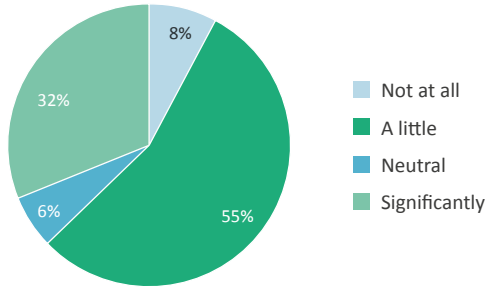


Figure 4: To what extent energy expenditure influences quality of life (Kadiköy)

Kadiköy

In Kadiköy (Turkey) it was noticeable that tho-thirds of respondents (66%) spent less than 10% of their nett income on energy. Nevertheless, 87% of respondents found that their expenditure on energy had a negative influence on their quality of life (56% a little, 32% significantly). Interestingly, even though a relatively small proportion of the total income was spent on energy, it was perceived by citizens as a burden. Almost all respondents (98%) were interested in energy saving measures, with an almost equally high proportion (90%) indicating to be interested in collective energy saving and -production. However, only a very small proportion of respondents (3%) was a member of an energy initiative or -cooperation. More than three-quarters (76%) of respondents rated their municipality 7 or higher in terms of trust. However, 39% felt that the muncipality should do more to promote a healthy lifestyle, and 52% thought the municipality should do better in this context.

Lublin

The respondents in the Polish city of Lublin consisted of a high proportion of young people, with many households comprising two people. 60% indicated to spend less than 10% of their nett income on energy, but almost half (49%) found that this influenced their quality of life in a negative way (28% somewhat and 20% too much). Similar to Kadiköy, even though citizens in Lublin spent a relative small proportion of their income on energy, this was nonetheless being perceived as a burden.

Respondents in Lublin appeared to be largely familiar with common sustainable technologies, of which knowledge regarding the integration of sustainable energy, and monitoring and measuring technology was the most limited. The respondents indicated to be interested in the technologies of which they knew little about. Interestingly, less than half monitored their monthly energy consumption, but also saw a role for the municipality in supplying them with the data. Trust in the muncipality was indicated by 35% to be high (7/10 or higher). However, 13% or respondents rated the municipality 1/10.

In general, the municipality's efforts to improve the quality of life for citizens was perceived as positive, with 55% rating the efforts as 'good' or 'very good'. 33% indicated that the municipality did not (sufficiently) promote a healthy lifestyle among citizens.

Concluding remarks

The social research study that was conducted in the MAKING-CITY project's European follower cities shows that in almost all cities a significant proportion of respondents could be considered as energy poor. Interestingly, in cities in which the percentage of nett income that is spent on energy was below 10%, people still had the feeling that this impacted their quality of life. Since this study was conducted before the energy price hikes, which occurred in many European countries due to, among others, the war in Ukraine, in some municipalities the situation could have deteriorated by now.

A large proportion of citizens indicated that they would like to have more insight in their own energy consumption in order for them to take appropriate measures. In this context, citizens see a more significant role for municipalities in the energy transition. For almost all municipalities in this study, there is much to gain in terms of raising awareness and providing information. In addition, there appears to be significant interest among respondents in solutions regarding the collective saving and production of sustainable energy. However, in contrast, very few respondents are members of energy initiatives. Therefore, municipalities could also play a more significant role in facilitating and stimulating local energy initiatives and/or communities.

Energy poverty: a potential role for community centres

Ifigenia Psarra, Rachael Tillotson, Adrian Figueroa and Kim van Dam (NoorderRuimte Research Centre, Hanze University of Applied Sciences Groningen)

According to the European Commission's Green Deal, tackling energy poverty is a prerequisite for a fair and equitable energy transition. For many households, heating the home is the largest cost item, and the possibility of energy poverty looms larger as energy costs rise. Policymakers are making efforts to address this problem with measures that lead to a direct drop in energy prices, as well as by providing subsidies for improving the energy efficiency of homes.

The impact of such policy, however, is not immediately visible or measurable. In addition, for various reasons many households are not in a position to take action because they lack the financial means to do so or live in rented homes or in apartment complexes where decisions have to be taken collectively. Meanwhile, energy prices are expected to continue rising. In a word, until long-term solutions start taking effect, solutions are needed to alleviate the consequences of energy poverty for vulnerable households right now.

Community centres may be able to play a role here, by offering rooms and services or by hosting activities, thus giving people respite from underheated homes. In addition, they can play a role in raising awareness with regard to affordable sustainable lifestyle changes – for instance, how small steps can be taken to reduce energy consumption in private homes.

The Oosterparkwijk district is an ideal place to investigate these possibilities. The indicators for energy poverty there are above the national average – in other words, a relatively high number of residents are suffering from energy poverty. In this district, the former Van Houten school is currently being converted into a community centre named Bij Van Houten. The building, which was designed in 1932 by the Dutch architect Siebe Jan Bouma, is nationally listed and is owned by the municipality of Groningen.

Based on design research, researchers and students from the NoorderRuimte Research Centre and the Academy of Architecture of the Hanze University of

Applied Sciences Groningen have examined the role the new community centre could play in combating energy poverty. Could energy-efficient interventions be carried out without harming the significance of the building? If so, not only would the new community centre itself become more sustainable – it could also serve as a source of education and inspiration for the local community, for example by also inspiring residents to take measures towards sustainability. Another aim of the study was to identify spatial interventions and solutions for the building which could alleviate the consequences of energy poverty for the district's residents. The study was conducted in collaboration with the municipality of Groningen and the local citizens' initiative *Duurzaam Oosterpark* (Sustainable Oosterpark), and several participation meetings were organised.

Van Houten building in Oosterpark district

The Van Houten building is a modernist brick building (Figure 1) typified by its form of early 1930s cubist and expressionist architecture. The school was designed according to the perceptions of the times regarding school buildings: schools were commonly constructed around a courtyard, and featured high windows so that pupils would not be distracted.

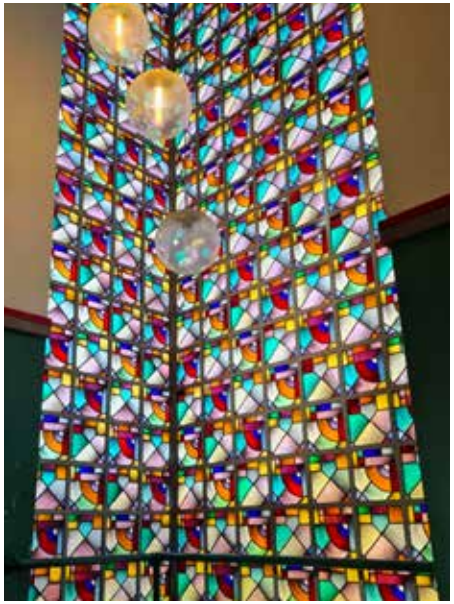
Most of the structural and morphological elements of the current building are original, such as the interior doors, windows, floor tiles, stairs and some lamps (Figure 2), and, in the stairwell, the extensive brightly coloured stained-glass window with a geometrical design language (Figure 3).

Rendering a heritage building sustainable

The first step of the study was to investigate the possibilities of rendering the building sustainable while taking account of its heritage status. The initial situation is that the building has energy label "G", which is the lowest.

Figure 1: the Van Houten building in de Oosterpark neighbourhood in Groningen.

Figure 2: the original elements in the building.



Figuur 3: stained glass windows.

With regard to the measures proposed, in accordance with the principles of the Trias Energetica strategy, proper insulation and ventilation are essential steps in achieving zero emissions. Subsequently, it was investigated what measures could be taken to generate sustainable energy. The design proposes biodigester technology, which can ultilise organic waste or, preferably, residual streams in the district. Apart from energy, a biodigester also yields liquid manure, which could become a source of income for the community centre and the community. In addition, this technology could also serve as a source of inspiration and education because it is easy to use and encourages people to collect their organic waste. Further, local restaurants could also contribute towards the collection of organic waste.

Another measure suggested for the generation of sustainable energy is the use of solar water heaters, although they have the potential disadvantage of being too heavy for the roof. For this reason, Q-roof solar collection technology is being proposed. This technology is suitable for all kinds of roofs, and is invisible since it can be installed underneath the roof or under solar panels. It is estimated that 50 solar panels can be installed on the roof alongside it. Furthermore, an idea has been elaborated to set up a small floating solar park in the pond next to the building, covering a maximum of 2% of the surface area of the pond. These measures can be combined with a hybrid water-water heat pump to heat the building. Implemented together, these sustainable measures could meet the energy needs of the building. Supplementary energy-generating measures were then examined which can be used exclusively for awareness raising and educational purposes, such as energy-generating fitness and playground equipment and sunbeds. In the case of all these measures, much attention was paid in the design to the integration of the proposed technologies into and around the existing building. For example, the roof-mounted solar panels are invisible from the street, thus preserving the appearance of the listed building, and the coloured panels used in the design for the floating solar panels were inspired by the building's stained-glass windows (Figure 4).

Figure 4: floating sola panels inspired by the stained glass windows in the building.

The potential role of a community centre in combating energy poverty

The second purpose of the study was to investigate whether a community centre could also play a role in mitigating the consequences of energy poverty, considering that energy poverty has an adverse effect on health. Investigations into the adverse health effects of underheated homes and energy poverty have revealed a strong correlation between low temperatures and cardiovascular and respiratory disease, as well as less serious illnesses such as colds and flu. In addition, the literature emphasizes the relationship between experiencing energy poverty and poor mental health, which commonly manifests as anxiety and depression associated with living in poor quality accommodation, an inability to pay bills, the need for heating in the home and the accumulation of debt. It also appears that people living in energy poverty are less inclined to invite guests to their homes, thus increasing the risk of social isolation. Finally, education statistics show that population groups with better access to electricity and a comfortable environment in which to study have higher literacy rates, lower school dropout rates, and spend more time on educational pursuits.

Various interventions could potentially mitigate a number of consequences of energy poverty and related problems. To help children in the district concentrate on their

Figure 5: silent study cabines.

Figure 6: garden activities for the residents in the communal garden.

studies and to boost their educational performance, the design proposes the creation of quiet study booths (Figure 4) where children can do their homework after school – for example, if it is too cold at home. During the day, adults can use the booths to work on the computer, making the booths multifunctional. The design incorporates glass walls that divide the rooms on the first floor into separate offices. The walls leave the interior of the heritage building intact and help to store passive solar heat, retain existing heat and allow natural light to enter, thus helping to reduce the overall energy costs of the building.

A shared garden offers space to grow seasonal crops that people can take home with them, or which can be used in the communal kitchen for weekly cooking activities and events. This kind of shared cooking facility offers residents an opportunity to meet other people and share knowledge, and can also help to minimise individual costs of energy for cooking and promote healthy eating. Finally, the garden activities teach residents and children about affordable, local food production and healthy eating habits, inspiring them to apply the knowledge and skills in their own gardens and kitchens. (Figure 6). Shiitake mushrooms, for example, are highly nutritious and fast-growing, and can be lucrative to sell. By cultivating shiitake on the grounds and selling the yield to local restaurants and specialist shops, income can be generated that can be used for the benefit of the community centre.

Conclusie

This study focused on the Oosterpark district in Groningen, a district relatively heavily affected by energy poverty compared to the rest of the city. The proposed sustainable measures and design suggestions could potentially render the building of the future Van Houten community centre CO_2 neutral. At the same time, the building can play an educational role and be a source of inspiration for the local community with regard to sustainable habits and lifestyles. Finally, interventions have been proposed to help alleviate the consequences of energy poverty. It is not yet clear whether all of the ideas will be realised, but it can be said that the design was very well received by a delegation of residents.

The role of heat networks

Christian Zuidema and Tess van Have (University of Groningen)

Groningen is one of a number of Dutch municipalities working on the installation of a heat network. The northwest of the city has been particularly active in this regard in recent years. The heat network, which aims to provide residual heat and sustainably generated heat, is ultimately envisaged to serve no fewer than 10,000 households, and the municipality identifies even more potential for heat networks in its heating plan (*Warmteplan*).

As in many other municipalities, for the time being, it is mainly large buildings that are being connected to the heat network. This makes sense because heat density – the heat demand per hectare – is higher in large buildings, making it easier and less expensive to connect them first. Furthermore, many large buildings have a single owner, such as a business, the government or a housing cooperative. This is an important factor. Individual home owners can decide for themselves whether or not to connect their home to a heat network; as yet, the government cannot force them to do so. Consequently, it is by no means easy to get a heat network up and running in a street with many owner-occupied homes. It is financially barely feasible to install a heat network and replace a gas network unless all the homes in the street switch to the heat network. This is therefore the first hurdle to overcome when constructing a heat network.

The role of home owners

Getting individual home owners to connect to the heat network remains a challenge. After all, a natural gas-free district requires that home owners stop using gas. When a heat network is installed in a district, as many homes should be connected as possible, including those owned by individual owners. A heat network requires substantial investments in infrastructure, and for the investments to be cost-effective, the more connections per hectare the better. More heat can then be supplied per metre of piping, which means a higher return per metre of piping. This not only makes the heat network financially more attractive, but also feasible.

At the same time, it cannot be taken for granted that individual home owners will be able or willing to connect to a heat network. There are various reasons for this. For instance, a connection to a heat network costs money, it will often involve substantial adjustments to the home, it will no longer be possible to cook with gas, and options for choosing a heating energy supplier will be limited. Not all home owners are ready to embrace such changes, and this raises various questions. To what extent do individual home owners actually want a heat network? What are their reasons for and against? And also, what can the government do about it?

What do home owners want

Citizens, and therefore also home owners, may have various reasons for not being motivated or able to connect to a heat network. Within the framework of the MAKING-CITY project, we conducted a series of interviews and surveys that shed much light on this issue.[1] First, it appears that the investment costs constitute one of the main barriers for citizens. Naturally, home owners tend to be cost-conscious, and the costs of transitioning to a heat network can be considerable. For example, a connection to a heat network can easily cost around €5,000,[2] a heat exchanger will be needed, and an existing central heating boiler will need replacing. In addition, it will often be necessary to replace the gas stove with an electric one, and partly depending on the temperature of the heat supplied, additional measures will be needed in many dwellings in the form of insulation and new radiators. The costs are liable to exceed €10,000 or even €20,000 euros – sums that households cannot

[1] Ten Have, T. (2022) Making heat networks hot; Understanding the barriers to connecting to heat networks as perceived by homeowners and how to overcome them. Master thesis, Universiteit Groningen, Groningen.
[2] ACM Consuwijzer (2023). Hoeveel betaal ik voor mijn warmte?

easily recoup. In the Netherlands, we know that the price of heat from a heat network may not exceed that of gas, in accordance with the 'not more than otherwise' (*niet meer dan anders*) principle, and the price will often be somewhat lower. If the extra investments are limited, they can be quite attractive financially, but it can take up to 20 years or more before the costs of the investments pay for themselves. This can put many households off, particularly if they are not planning to stay in the home for very long. What is more, we can see from our data that many households lose interest even with a payback time of ten years.

Another factor is that heat networks do not exactly have a great image.[3] This has to do with matters such as trust, knowledge and expected comfort. In the Netherlands, heat networks are currently only being developed with a single heating supplier. This creates a monopoly – switching to another supplier is not an option. A household must therefore be confident that the heating company will charge a fair price, or that the government will ensure this. We are seeing that such confidence is not self-evident, not least because the energy bills look different than in the case of a gas connection. This is partly because the network costs are relatively high compared to those for gas, and partly because the price of heat is sometimes liable to change due to changes in the costs of the heat source. This makes it more difficult to ascertain what is fair and justified. Accordingly, our data shows that apart from investment expenses, doubts about the energy rate and the monopoly position of heating companies are the main barriers for home owners.

Switching to a heat network also entails changes that can engender doubts. There may be a lack of confidence in the technology, such as whether it will be possible to adequately regulate the temperature in a home. Some people dislike the idea of electric cooking. And sometimes, there is a lack of faith in the heat source.

[3] Beauchampet, I., Walsh, B., (2021). Energy citizenship in the netherlands: the complexities of public engagement in a large-scale energy transition. *Energy Research & Social Science*, 76, 1 - 9.

This could be, for example, because the source does not provide sustainable energy, as in the case of natural gas or residual heat from a company that uses fossil energy sources, or due to the risk that an industry or company that provides residual heat will no longer be able to provide the heat adequately or may even disappear. And sometimes there is simply confusion about all the arrangements that have to be made before connecting to a heat network, and how to go about it. Doubt thus arises from uncertainty.

We have to look further than simply providing sustainable energy. This is also about people's participation in the energy transition.

Installing a heat network also involves quite a bit of initial upheaval in and around the house – not something most people will look forward to. Nearly all these aspects are reported by citizens in our survey, although the transition to electric cooking and the inconvenience of conversions in an around the house are not seen as the biggest obstacles.

What can we do?

Of course, subsidies are useful in reducing investment costs. However, when it comes to heat networks, the discussion is complex. It is about whether we can socialise the costs of a heat network. The gas network is paid for by all the users together, therefore at the national level. A gas connection in a densely populated city district costs the same as in an open rural area, even though the costs are obviously not the same. Each individual heat network must be able to keep itself afloat; the consumers of that particular network have to bear the costs together. Socialisation can facilitate this. This means having the investments in all the heat networks paid jointly by all national users or everyone who uses energy. An intermediate form

could be to have a fund make the initial investment in a heat network, with, for example, a pre-investment or guarantee on a government loan. That way, users do not have to pay for the investment, as this is done by the external fund. Users simply pay a rate for their network and consumption that is used to pay off the incurred costs or loan. In other words, the heat network and the connection are effected without burdening the citizens with the initial investment. In Groningen the *Buurtwarmte*[4] project is a good example of this, where the first concrete recommendations are currently ready for applying a comparable intermediate form.

When it comes to trust, it would appear logical to enhance information provision, particularly because citizens are perfectly capable of regulating the temperature themselves with a heat network, electric cooking is not so difficult, and there are ample legal and technical possibilities for guaranteeing the heat supply. However, knowledge alone is not sufficient. Trust is a tricky issue. Trust in a heating company or in a government that provides guarantees and information also determines whether the information will be trusted. Energy cooperatives, households that have already taken the step, and energy coaches can play an important role here because they are sometimes more likely to inspire trust.

What is particularly needed is a learning process, while the national government also intends to make other instruments possible with its new Heating Supply Act (*Warmtewet*). On the one hand, there is an intention to provide authorities with instruments to force households to connect to the heat network. On the other, the intention is to disconnect rates for heat from the gas price and preferably even lower them. The learning process is also about the possible establishment of more collective and cooperative heat networks, with citizens themselves being co-owners of heating companies. This is not a new model; countries such as Sweden and Denmark already have decades of experience with it. In the Netherlands, however, it is new, and possibly highly relevant. When it comes to trust, these are very promising models. And it is no coincidence that they are being considered in Groningen. The aforementioned Buurtwarmte project has precisely these ambitions. In conclusion, when it comes to heat networks we need to look further than merely providing sustainable energy. This is also about people and offering them opportunities to participate in the energy transition.

[4] Grunneger Power (2022). Verkenning en advies: Duurzame Buurtwarmte Selwerd, Paddepoel en Vinkhuizen.

Local citizens' initiatives and the municipality of Groningen

United or divided?

Ifigenia Psarra, Bas Oldenbroek, Kim van Dam and Tineke van der Schoor (NoorderRuimte Research Centre, Hanze University of Applied Sciences Groningen)

There is now a broad consensus that if we are to accelerate the energy transition a strict top-down approach is not going to work. On the contrary. To accelerate the process, initiatives from the bottom up – from local authorities, businesspeople and citizens – are essential. Fortunately, local energy initiatives have sprung up in numerous places in recent years: in 2020, for example, 600 energy cooperatives were active in the Netherlands, and the number is increasing annually.

However, the international scientific literature reveals that local energy initiatives and local energy policy are not always well aligned. In order to increase the involvement of citizens and to give local projects a chance of succeeding, a more balanced approach is needed, taking into account the needs and interests of local energy initiatives. In addition, it is necessary to examine potential barriers to good relations between local energy initiatives (LEIs) and the municipality. NoorderRuimte Research Centre of the Hanze University of Applied Sciences Groningen has conducted a preliminary survey to investigate the possible divide between local energy initiatives and the municipality of Groningen.

To this end, the researchers interviewed representatives from the municipality of Groningen, the local energy cooperative Grunneger Power, and four local energy initiatives. On this basis, existing gaps have been identified and it has been investigated how they can be bridged. The main findings are presented in this article.

The need of local energy initiatives for professional support

Local energy initiatives generally consist of volunteers with varying degrees of knowledge and experience. There is therefore a great need for professional support, both on an organizational and a practical level. In the words of a municipal council member, “Citizens do not have the authority, the time or the expertise to implement collective projects. They need support from the municipality or another party such as Grunneger Power in order to develop ideas for such projects. Citizens are hoping for more guidance from the municipality or even the national government with regard to legislation.” Particularly in the early stages of an initiative, LEIs

struggle with organizational and practical matters. One LEI states that, “in order to encourage initiatives, ideally there should be some kind of plan, guide or road map showing the steps needed to set up an initiative – things that you need to take into account, for example. In other words, some kind of manual for local initiatives.”

Some LEIs express a need for a facilitating party such as Grunneger Power, the Groningen environmental federation or the Groningen Energy Cooperation (GrEK). These umbrella organizations have experience with supporting previous initiatives in the province of Groningen and can contribute organizational knowledge. And there is also a need for practical and technical support – from contractors and installers, for example. Finally, many LEIs emphasize that financial support is crucial for LEIs. With regard to their relationship with the municipality, the LEIs indicate a need for a suitable municipal project leader who understands their vision and with whom they can cooperate, although it is important to note that not all initiatives have the same expectations of the municipality. Or, as one municipal representative puts it, "The municipality is in contact with many initiatives and organizations. Some want as little involvement from the municipality as possible, while others are coping well enough by themselves for the time being. If they feel a need to discuss something at a certain point, they can always get in touch with us and then we can come up with a solid plan together."

A lack of mutual understanding can lead to conflicting expectations

Although both parties appear to be aiming for the same objective, the survey reveals that the municipality and the LEIs are not always aware of each other's precise ambitions and expectations. This can mean that expectations are not aligned, which will ultimately cause delays in the local transition process. For instance, municipalities set certain goals, such as becoming CO_2-neutral by 2035, and they aim to achieve these goals within a certain time frame. LEIs, on the other hand, often focus on fostering citizen involvement at the district level, and are less concerned with specific schedules. The two cultures do not always dovetail.

Another example is that LEIs often expect the municipality to be transparent and to lead the way, for instance by giving them a clearcut role to play in the transition process and by facilitating them actively. The municipality, however, often assumes a wait-and-see approach regarding LEIs, expecting them to professionalize before transferring specific responsibilities to them. A municipal representative has the following to say about this: “If they come to us with specific questions, we will help them with those questions. If it is a matter of energy infrastructure (pipes, etc. ed), the LEIs will not be able to deal with that themselves, and will be dependent on the municipality to decide when action should be taken. If LEIs have initiatives concerning the purchase of solar panels, they can collaborate with Grunneger Power and the municipality or with another company.” The municipality therefore assumes a predominantly reactive role whereas LEIs perhaps expect a more proactive role.

The need on the part of local energy initiatives for clarity

It is important for LEIs to have a clear picture of the tasks and responsibilities allocated to them. For example, LEIs indicate that they need to know, in good time, whether the municipality deems their project ideas to be feasible. They also say that there is a need for a more detailed municipal plan for the various districts, which would make it clearer how the LEIs can contribute towards the municipal objectives for the districts. In general, the LEIs wish to be regarded as a serious partner in the energy transition at the local level, for example by being involved in the creation of municipal district energy plans. It is currently often unclear what LEIs can and cannot do. An LEI representative describes this lack of clarity: “Does this mean that we, as citizens, have to make our own plans, or come up with our own local heat storage solutions? Or does it mean that it is still possible for us to get municipal support for this?”

Professionalization

Various LEIs express an ambition to further professionalize, particularly regarding matters such as communication and cooperation. In this context, they often refer to maintaining relations with various parties, publishing a newsletter or the possibility to train someone within the LEI with a view to achieving the desired level of professionalization. Some LEIs perceive an implicit requirement from the municipality to professionalize, while others emphasize the voluntary nature of their work: “We just do the work as volunteers; often in the evenings, and sometimes at the end of a working day. In our group, everyone works full-time or almost full-time, so this is extra work alongside our regular jobs. That makes us very vulnerable.”

The need for proper communication with the municipality

Maintaining effective communication with the municipality is critical. Various LEIs expressed a need for a dedicated municipal representative with whom they can forge

Maintaining effective communication with the municipality is critical.

a trusted, long-term relationship. One representative of an LEI who was interviewed said, "What we actually need is a project leader with good social skills. Some project leaders are better in that respect than others, but I think the municipality underestimates this aspect, as well as the time needed to gain the trust of residents’ initiatives and to communicate properly." Further, there is a need for a platform on which information is available at the district level – about energy consumption, for example. In addition, there is a need for communication and cooperation between LEIs, considering that they are often involved in similar activities or encounter similar problems, particularly in the initial stage. According to one of the LEIs interviewed,

"It is important to find a way for neighbourhood initiatives to get in touch and learn from each other so that the wheel doesn't have to keep being reinvented."

Conclusion

From discussions with representatives of LEIs, the municipality of Groningen and Grunneger Power, it appears that expectations and needs do not always coincide. With regard to professional support in particular there is room for improvement. For instance, there could be a clear municipal point of contact for LEIs, linked to professional support, with the municipal project leader or intermediary playing a significant role. As the various LEIs have different requirements in each case, such support must be sufficiently flexible.

In addition, it is essential that the municipality and the LEIs understand each other's roles in the context of the local energy transition. This is two-way traffic, and requires clear communication of the vision and mission of the LEIs to the municipality, and vice versa. Intermediaries can help shape the ambitions of the LEIs, as well as the ensuing needs regarding municipal support. LEIs also need clarity regarding their role in the district energy plans. Particular attention is needed for the role that LEIs are able and willing to play in further involving residents in setting up district energy plans. In all cases, a tailored approach is essential. Accordingly, mutual agreements should be made between LEIs and the municipality so that it is clear what the parties can expect from each other. Finally, the municipality has an important role to play in promoting and coordinating collaboration and knowledge exchange between LEIs and with the municipality.

The Unified Citizen Engagement Approach as a framework to address energy poverty

Cyril Tjahja, Joke Kort and Nicole de Koning (TNO)

The energy transition is a complex process in which multiple parties jointly have to come to solutions that are acceptable for all those involved. Although the government is often assumed to be in charge, it is the citizens who will eventually have to implement these (technical) solutions and will (mainly) be responsible for the financial burden.

For this reason, a new approach to citizen engagement has been developed within the MAKING-CITY project: the *Unified Citizen Engagement Approach* (UCEA). It combines the perspectives of the three most relevant stakeholders in the energy transition within this project: the citizen / individual (I), the energy cooperation or initiative (C), and the municipality (M).

The UCEA consists of five phases or spaces: 1) *Discovering*, 2) *Initiating Action*, (3) *Exploring & Analysing*, (4) *Execution, planning & implementing* en (5) *Exploiting & Sustaining* (zie Figuur 1). Within each phase activities are connected to different tools (see Figure 2), which can be used by a particular stakeholder in order to reach the final goal of each phase. Due to the participative nature of the framework, the majority of the tools are based on a co-creation or co-design approach.

	Activity			
Tools	Proactively stimulating citizens and/or initiatives	Becoming aware	Forming a core team with shared vision	Gathering continuous insights
Communication strategy	C M	C M		
Community gatherings	C M	I	I C	C M
Energy coaches	C M	I		C M
Incentives & give-aways	C M			
Kitchen table talks	C M			C M

Figure 2: example of tools connected to Phase 1: *Exploring.*

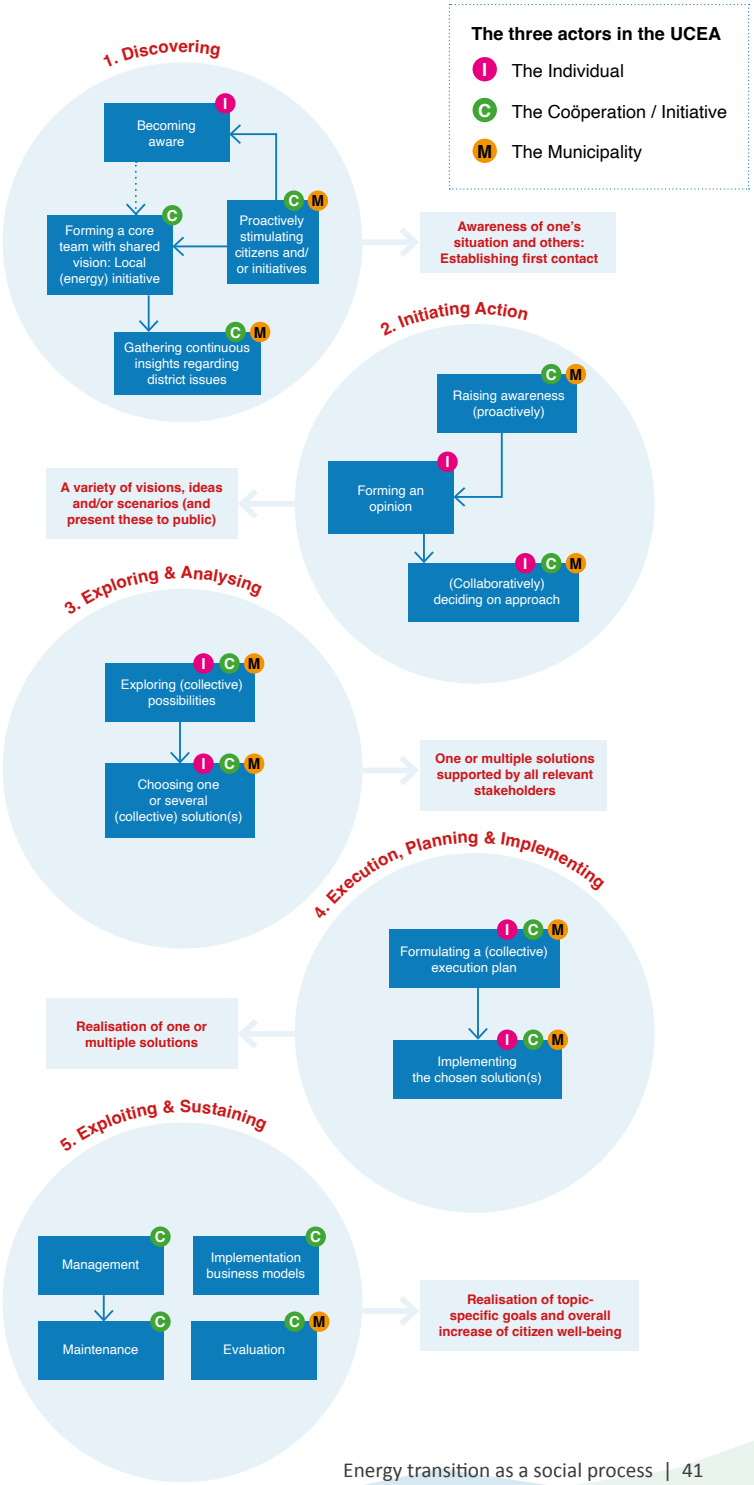


Figure 1:
the five phases of the UCEA.

In addition, the framework has explicitly been designed to be flexible, which means that even though certain 'routes' could be taken, these do not necessarily need to be followed in a particular order; the routes can be seen as suggestions. It is also possible to go back and forth between different activities or make a custom path through the framework. Alhough the phases and activities have been placed in a certain order, the framework gives opportunity to take a step back at times or to implement certain activities at the same time, depending on the local context.

The UCEA offers flexibility for municipalities and local energy initiatives to develop concrete activities in a structured manner

Although the UCEA was not specifically developed to address energy poverty, its flexibility offers opportunities to both municipalities and local energy initiatives to develop concrete activities in a structured manner, with the help of the tools that are connected to the framework.

In this way, citizens who experience energy poverty can be supported and/or engaged with from different perspectives. The next case describes a UCEA route with a focus on energy poverty, which could be followed by a municipality.

Case: an awareness campaign aimed at social tenants

If we would imagine a scenario in which a municipality's aim is to combat energy poverty among social tenants by developing an awareness campaign in which residents would get information how they can save energy in ways that do not significantly impact their daily lives. Using the UCEA, a route could be devised (see Figure 3) which comes with concrete tools that can be applied to achieve this goal. Figure 4 shows an example which describes of one the tools (Kitchen Table Talks).

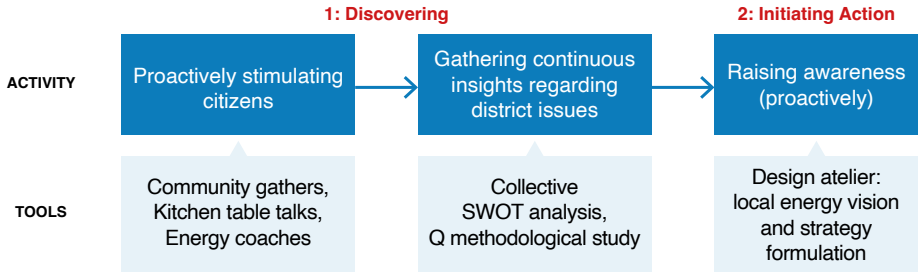


Figure 3: example of a route which could be taken through the UCEA for an awaress campaign for social tenants.

Kitchen table talks

- ***Purpose:*** Gathering information from residents, entrepreneurs and social organisations, which will increase support for plans or interventions in the neighbourhood.
- ***Characteristics:*** Kitchen table talks involves visiting and talking to local stakeholders, preferably in the comfort of their own environment, such as the kitchen table at home (hence the name). Alternatively, this can also be organised online. The ideal composition would be between 2-4 people.
- ***Further reading:*** Energieparticipatie – Keukentafelgesprekken (in Dutch)
- ***Jump back to:*** Phase 1: Discovering

Figure 4: description of the tool *Kitchen table talks.*

When we translate this to a real-life scenario, a municipality could develop a communication strategy, in which they communicate with their target audience at specific times and in specific ways. At certain spots in the neighbourhood (for example, in front of a street or apartment building), a coffee cart could be placed, where residents could meet an energy coach or a municipality representative in person. A resident could then make an appointment for an energy scan, a more in-depth

consultation as well as advice on their specific situation. Or an appointment could be made with someone from the municipality for a kitchen table talk, providing an opportunity for residents to elaborate on their personal situation in the comfort of their own homes. Possible topics could be energy (poverty), health, finances and how they experience their environment.

In addition, the municipality could organise neighbourhood meetings specifically aimed at social tenants, inviting them using targeted communication and using channels that are the most suitable for approaching this particular audience. For example, local newspapers, a poster or flyer in multiple languages or certain social media. Incentives, such as offering free advice or sustainable gadgets, might also be used for this purpose.

These meetings should also discuss topics or activities that appeal to social tenants. At the same time, the tools described can be used by the municipality to keep an eye on what is going on within a neighbourhood, and what kind of people live in it, in order for them to tune their communication and incentives to the target audience(s). It is therefore important that the activities organised are not incidental or a one-off, but that instead a route is being developed, which can provide support for the next steps in the process.

Although developing an awareness campaign by a municipality is not something new, the added value of the UCEA is that within a complex process, such as the energy transition, it can offer concrete support through the tools that are connected to the various activities. Since the order of the activities in the UCEA is not fixed, the approach remains flexible, enabling the adjustment or expansion of the tools, depending on the experiences and insights gained in practice.

The open nature of the UCEA also means that it can be perceived as a 'living' approach, which is in constant development: the more often the framework is being used, the more (real life) experiences and best practices can be incorporated, and the more effective its contribution to supporting the energy transition and reducing energy poverty.

The full description of the UCEA and its tools are described in *D3.11 – New citizens' engagement strategies in Groningen*. This report can be downloaded from the MAKING-CITY project web-site (makingcity.eu) under Resources > Results & Publications.

Organizing residents' involvement in the heat network

Karin Hoogterp and Anne Huizinga (Grunneger Power)

In the coming years, part of the housing stock in the municipality of Groningen will be transferring to the heat network. For the municipality it is important that everyone is able to participate in this collective heating supply, and has asked the local energy cooperative Grunneger Power to represent the interests of these private home owners regarding the development and use of the heat network. Anne Huizinga is involved in this project in her capacity as participation expert at Grunneger Power. She describes the steps she believes are necessary to reach all residents who have the option of connecting to the heat network.

“Here in Groningen, we believe that all residents should have the opportunity to participate in the heat network in their neighbourhood, including those who are not in a position to invest in making their home more sustainable. But how do you organize the involvement of the various different residents’ groups? How do you ensure that residents inform themselves properly? And what if people have too many other concerns to be thinking about sustainability? In such cases, we look into the existing possibilities with a tailored approach and a personal discussion. In order to include the entire neighbourhood, we employ a neighbourhood-oriented approach based on a step-by-step plan.”

1. Get to know the neighbourhood and its residents

This starts with familiarizing yourself with the neighbourhood. On the one hand, there is the technical aspect: what kinds of dwellings are there in the neighbourhood? We gather information about building types and property ownership. On the other hand, there is the social aspect: the questions, concerns and wishes that people have. You learn about this in the streets, by approaching people and talking to them. We initiate discussions by setting up a coffee cart in a neighbourhood, distributing soup in the community centre and where necessary seeking contact with or joining parties that are already connected with these residents. Based on questions and concerns, we formulate a participation approach which the municipality, the heating company and the housing cooperative can build on. We also conduct public support surveys among all the residents in the districts, giving us additional hard figures to work with. Combined with the discussions, this provides a more accurate and complete picture.

2. A participation plan together with residents

Once you are aware of people's needs in a district, you can consider together with the parties involved – residents, the municipality, housing cooperatives – how residents can be included in the forthcoming changes. Who are our target group and what are their motives for making their homes more sustainable? On what subjects can people contribute ideas, and what do they need to be informed about? And what means can we use to facilitate participation? For some people, a good information leaflet or a clear and informative project website will suffice. Others will first want to hear about

Making your home more sustainable will have an impact

experiences of other residents who have already taken the step, or just want to see what a connection to their house would look like. Activities such as the Duurzame Huizendag (sustainable housing day), which we organize together with Duurzaam Groningen (sustainable Groningen) and citizens' collectives are excellent ways to facilitate this. During these events, people also meet local residents, and it helps if you can share concerns or questions with fellow locals.

3. We make the impact clear and comprehensible

Making your home more sustainable will have an impact. You will be heating your home differently, and you may have to cook in a different way. This raises many questions. Will my home warm up as quickly as it does now? What is it like to cook on an induction hob? Will I have to buy new pans? Simply explaining or offering the

technology will by no means always persuade people to make the change. Time, attention and a tailored approach is needed for that. The possibilities will often increase substantially if you eliminate barriers and provide a full-service solution in order to remove people's worries. This is appreciated by many residents. With the Zet 'm op 70! (set it to 70) approach we help residents to set their boiler at a lower

Once you know what people's needs are in a neighbourhood, you can consider together with the parties involved what is needed to include residents in the forthcoming changes.

temperature so that they can experience for themselves how warm their home will be when connected to the heat network. This will also immediately save them energy costs because less gas will be used to heat up the home. In addition, we organize cooking workshops where we make tasty meals together and explain the best ways to cook with an induction hob. People often have no idea that gradual heating is better. And with a little magnet, you can easily check whether your pans are suitable for an induction hob. There is a good chance you will not have to replace your pans. That is always the point of departure: finding out what people are able and willing to do considering their social and financial constraints. This may mean engaging the handyman services of the municipality of Groningen if you observe that people cannot start taking small-scale energy-saving measures due to their home situation.

4. We try to alleviate people's concerns insofar as possible

Many people are apprehensive about making their homes more sustainable, and find the prospect rather bewildering. Also, residents are not always given the help they would like. Looking into funding options and filling in applications for subsidies can be experienced as quite stressful. We aim to remove obstacles to sustainability by helping people with things they find difficult. For instance, in the Selwerd residential district, we applied for the subsidy for the heat network jointly. Instead of everyone trying to work out how to go about things by themselves, we sat down together with all the residents who were interested, laptops and ipads at the ready. It took less than an hour to arrange the application for everyone. Helping people with such matters is of inestimable importance. One resident told us that he had spent sleepless nights worrying about the subsidy application and thanked us for having organized it in this way. That's what we do it for!

Project leader *Achter de Voordeur* (Behind the front door)

For situations involving tailored approaches, we have a project leader who helps residents make the transition to the heat network. This person can make a personal cost calculation and offer suggestions about different boiler settings or insulation possibilities. There will sometimes be situations that require particular attention during installation, such as caregiving, pregnancy or an imminent operation. In such situations, it can be very helpful if there is someone to discuss the situation with. This project leader can then arrange for the scheduling of the installation in the home to be adjusted, for example.

Setting your boiler to 70 degrees, is that more efficient? Pilot in Selwerd

Will my home be just as warm and cosy if I connect to the heat network? This is a pressing question for many Selwerd residents who could opt for connection. Grunneger Power and residents conducted a test. In four homes in the Selwerd-Zuid district, the central heating boilers heated the water to 70 rather than 90 degrees on a trial basis.

The heat network to be installed in the district will supply water at the temperature of 70 degrees. “By setting the central heating boiler to this temperature, we can find out whether homes can be heated sufficiently when connected to the heat network, as well as how long it takes to heat the home”, Richard Hesling from Grunneger Power explains. He is project leader for Achter de Voordeur (Behind the front door) at Grunneger Power. In this capacity, he helps residents to make their homes sustainable and gas free. He sets the boiler to 70 degrees, gives advice about insulation and other energy-saving measures, and can help people submit subsidy applications.

Learning from experiences

Today, Richard is visiting Aletta in Selwerd to collect the first measurement data. Aletta is participating in the 70 degrees trial. For the past three weeks, a USB stick has been attached to the thermostat switch in her living room, where it saves measurement data. The first measurement data are for the baseline measurement: no adjustments have been made to the central heating boiler for the past three weeks.

Richard and Aletta have set the boiler to 70 degrees. For the next three weeks, Aletta will note down in a log when she sets the thermostat to a higher or lower temperature, and why. Aletta says, “In the mornings, when I get up, I set the thermostat to 19 degrees, but by the afternoon I start to feel a bit chilly and raise the temperature a bit.”

Advice and tips

“Sustainability is very important to me”, Aletta says. “And it also makes sense economically. Another reason I am participating is that this is our own house. We have to maintain it ourselves, and insulating the house will be at our own expense. Grunneger Power gives advice, and I appreciate that very much. Richard scanned the house using a heat meter, and that was an eye-opener. The living room floor had been insulated but the kitchen and corridor floor had not. I hadn't thought about it before, but he said it would make a difference. It appeared that the small windows above the front door and the toilet still had single glazing and some windows have old double glazing. There is a subsidy available to tackle these issues, and Richard gave me some tips and advice on the matter.”

Ready for the heat network

After six seeks, Aletta's house proved to be warm and comfortable, even with a supply temperature of 70 degrees. This means that her home is ready for the heat network and she is happy to have been able to ascertain this herself. Aletta was convinced, and signed the letter of intent to connect. She is now busy insulating her home with the aid of subsidies she was previously unaware of.

Towards a sustainable future together

Frank Pierie, Rosa Kappert and Kim van Dam
(EnTranCe en NoorderRuimte Research Centre, Hanzehogeschool Groningen)

The energy transition is something that will soon affect us all. But what approach should residents take? In general, the expert advice is to start by insulating your home, then prepare the home for heating based on a lower temperature, and after that, see what the options are for sustainable generation of the remaining energy needs. It sounds simple enough on paper, but in practice, things can be more complicated; not only for residents, but also for other parties. It is often difficult to obtain the correct information and to consider what the possibilities are, for example, with regard to finding the right sustainable source. And should you approach this as an individual resident or is it better to mobilize the neighbourhood to tackle things jointly?

To assist residents and other parties in this search process, researchers from the Hanze University of Applied Sciences Groningen have developed a set of three tools to better visualize the steps to be taken and the effects of those steps. The first tool is a standardized way to establish the initial situation: a kind of baseline measurement. The second is a method that affords more insight into measures that people can take in their homes (the residential home model). The third tool is a user-friendly model that can be used to explore various possibilities and options for generating energy from sustainable sources. Important points of departure here are making reliable information on energy technology available, actively involving residents, and raising awareness and increasing knowledge among all the parties involved. In other words, making highly technical information accessible. Attention is also paid to the interaction between various scale levels: we take into account decisions by residents of individual homes but also look at the collective levels, such as the district level. Finally, the use of these tools fosters interaction and communication between various groups of people who are involved, from residents to municipality employees.
In recent years, the models and tools have been developed in practice and tested on the island of Ameland. They are now being further developed and rolled out in a number of districts in the city of Groningen. Below is a brief description of a common route towards a sustainable district.

The baseline measurement: awareness

The first thing to do is to establish the starting point. Literally, precisely what area are we dealing with? A district, a city or an entire region? And figuratively; what part of the energy system are we considering and what falls outside the scope? Once this has been clearly established, the initial situation, or baseline measurement, can be analyzed. We have developed a baseline measurement based on the 'district passport', an initiative of the Land Registry Office (Kadaster) and the Association of Netherlands Municipalities (VNG) – see wijkpaspoort.vng.nl (in Dutch). The district

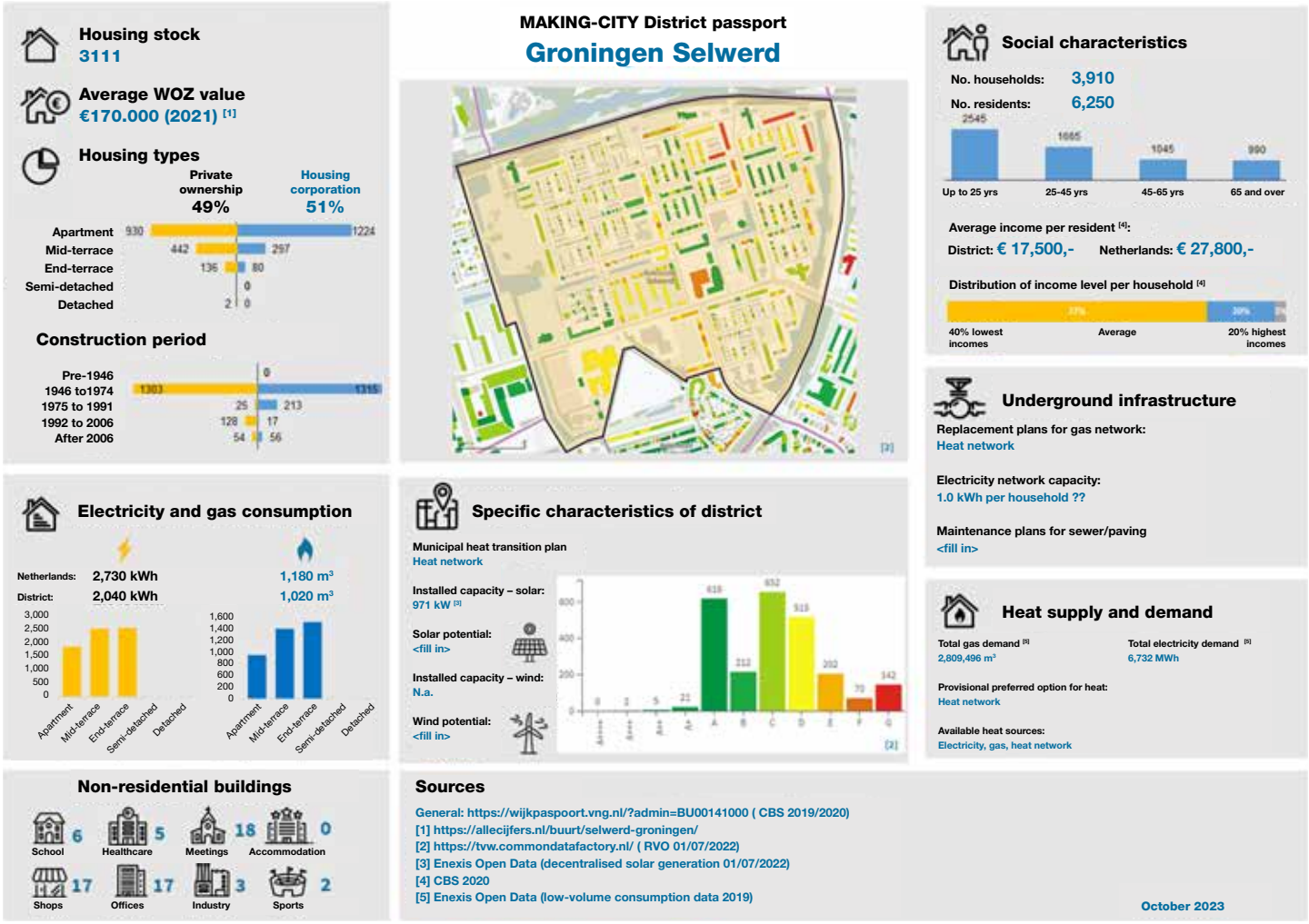


Figure 1: the district passport.

Figure 2: example of a heat scan.

passport is designed to show at a glance what the situation is for a particular district. The standard VNG district passport uses general, aggregated data from a relatively small number of sources, which makes it quite limited. We therefore supplement it with more detailed data from other public sources, such as public data on consumption and generation from the network manager (Figure 1).

In practice, it often appears that the data are not yet complete, or are too aggregated. Knowledge and insight into the situation in a particular area are therefore vital: in other words, local knowledge about, for example, the types of houses in a particular district, the precise composition of the population, and other characteristics. For this reason, we supplement the district passport with data obtained in other ways, for example, by organizing a stakeholder session with the municipality concerned, at which the available data can be verified and supplemented if necessary.

Finally, we further supplement this data with information obtained from residents on their actual energy consumption, using questionnaires that are distributed door-to-door or which can be completed online. During the winter, it is also possible to have a heat scan made of a house. Recordings can be made of homes using thermal cameras (Figure 2). Heat scans like this afford insight into where heat is escaping, for example, improperly sealed windows, doors and/or through façades. This last step in particular – the questionnaires and the heat scan – ensures that residents are actively involved; not only to improve the data in the district passport, but also as a means to raise awareness of the current situation. On the island of Ameland, for example, every resident has received a personal, tailored brochure of their house showing areas where heat is escaping, and containing advice on how to solve any problems. In this way, residents are provided with suggestions so they can start implementing energy-saving measures. The first step towards rendering the home sustainable has thus been taken.

Residential house model: insight into your own home

In the next step, residents are given the opportunity to learn more about their current energy consumption, and possibilities are explored for effecting energy savings or even generating energy. We developed a model for this: the residential house model (Figure 3). Here too, the approach is based on clarifying the current situation. This requires that people take action themselves, such as by measuring the total floor area, determining the current state of insulation, and also by looking at how the house is currently being heated. This ultimately yields an overall view of gas and electricity consumption which should correspond to the actual gas and electricity bill from the energy company. If this is not the case, a good means of checking, experience teaches, is that there will often be a hidden energy guzzler somewhere – for instance, an old fridge in the garage for beer, or perhaps a wood-burning stove providing additional heat.

Once the figures more or less line up, the model can be used to calculate the effects of various measures. For instance, what will happen if more insulation is applied, or other heat sources are used (for example, a heat pump) or if power is used from solar panels? The combined effect makes it clear what effect measures such as these can have on total energy consumption, CO_2 emissions, and total costs.

Equipped with this knowledge, residents can take decisions on the best possible solutions for their homes. Although the model is relatively low-threshold, the tool works best when used in sessions with a group of residents, where participants, guided by a professional, can go through the model step by step. Such professionals could be researchers, staff from the municipality or another organization, or installers, for instance: on Ameland a group of installers were so enthusiastic about the model that they intend to use it when advising residents.

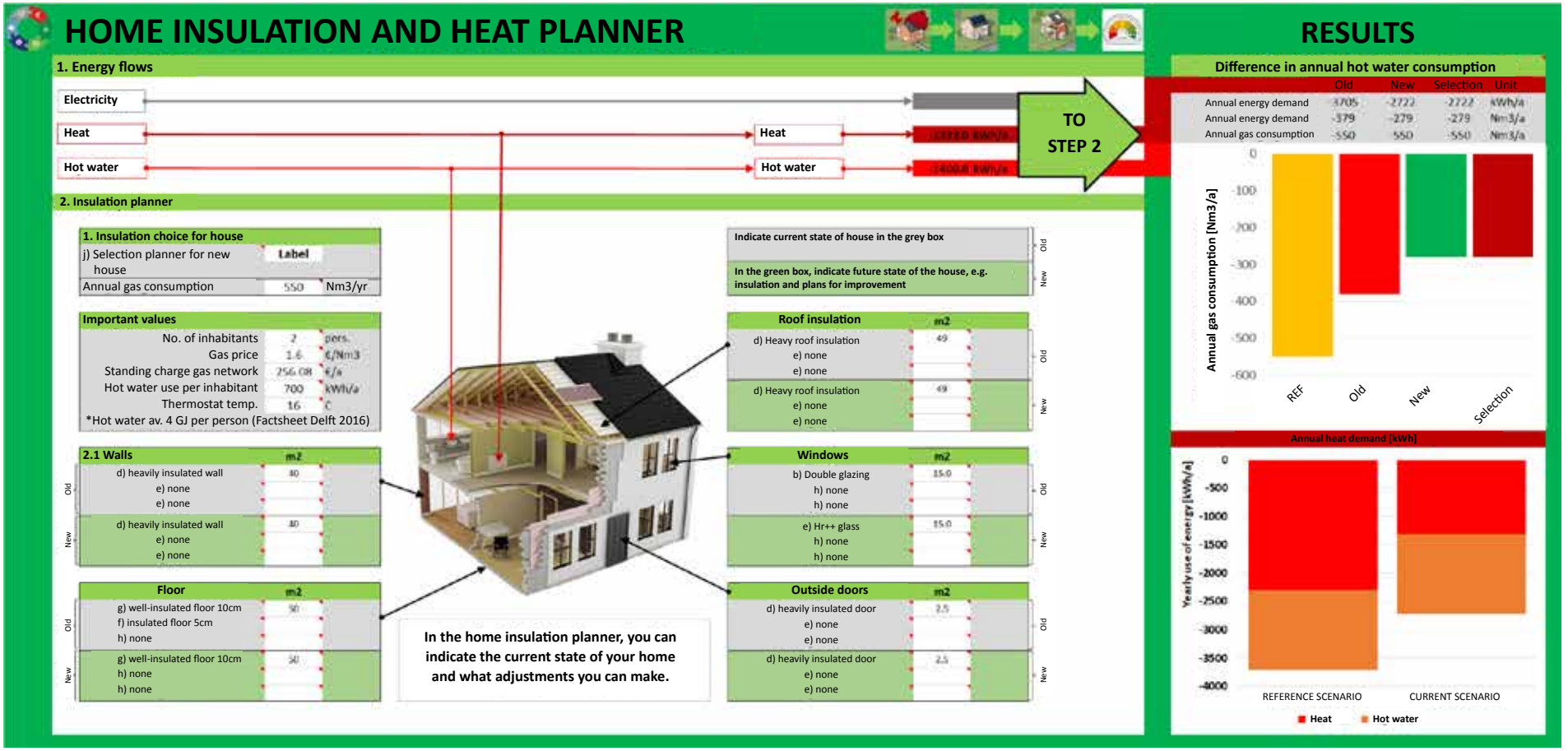


Figure 3: the residential house model.

The regional tool: looking at sustainable generation at district level

When, as a resident, you have established what action you can take yourself, the next concern is how to get sustainable heat and electricity. You may be able to generate electricity at home with solar panels, but you will usually need another source. Moreover, if everyone opts for solar panels, how will this impact the electricity grid in the district? To further investigate this, we developed another model, the regional tool, which examines the various possibilities for sustainable generation and storage at the area or district level. This tool can be used to model various future energy scenarios for a particular area. For example, what will happen to the electricity grid if everyone has a heat pump? How many solar panels will then be needed in a certain district in order to meet all the energy needs? Or is a large wind turbine a serious option? And will temporary storage be necessary? All these options can be assessed. Ideally, stakeholders (residents, the municipality) will develop these scenarios in consultation with experts. This is often an iterative process, in which the results of a modelled scenario constitute the input for a session with stakeholders, which can then in turn lead to a new scenario.

The model provides insight into the energy balance (production and demand), the distribution of generation, the impact of the chosen solution on the energy grid and on the planet (for example, CO_2 emissions, impact) and the costs for the consumer. And, not unimportantly, in combination with a map of the area concerned, users can gain an impression of the potential spatial impact of the chosen scenarios, provided everything has to be generated in the district. All in all, this model is an important instrument for quickly and easily charting the options for a particular area, making the consequences of certain choices clear to residents and policymakers alike.

Conclusion

The tools and models presented here are being rolled out in various districts in the city of Groningen within the framework of MAKING-CITY. We aim not only to further develop the route to CO_2-neutral districts, but also to involve residents and other stakeholders. In doing so, we attach primary importance to three elements of approach (Figure 4):

1. ensuring a solid starting position by assessing the current status;
2. creating a joint approach in which the interaction between technical-economic modelling and scenario development is the main focus in consultation with those involved;
3. communication with the parties involved. This is not only to check data but also to give everyone a role in the decision-making process leading to the ultimate goal of sustainable homes in sustainable districts.

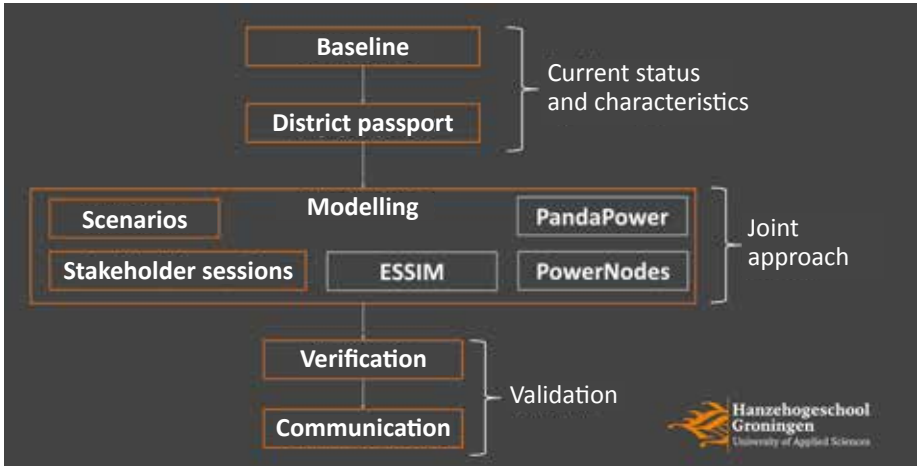


Figure 4: a diagram of the elements of the approach.

Co-creation in Hoogkerk-Zuid: the design of a local energy landscape

Ifigenia Psarra[1], Adrian Figueroa[1], Bob van Ulsen[1], Ethemcan Turhan[2], Kim van Dam[1] , Livia Tonu[1] and Esperance Mfukarazi[1]

Introduction

The energy transition is not a matter of 'one size fits all'. Something that works in one location will not necessarily be suitable for another. It is therefore crucial to take into account the local context and circumstances when making plans for the energy transition. In addition, it is essential to involve the local community if energy transition plans and projects are to be successful. If this is neglected, resistance from the population may cause the energy plans to fail.

These issues converge in what is known as the integrated energy landscape approach. A guiding principle here is the local environment, both regarding the physical landscape (what does the environment look like?) and from a socioeconomic perspective (are there many rented homes or double-income households in a district?). An integrated approach is taken, which means that attention is paid to the technical, financial, social and spatial aspects of a particular area. Last but not least, the approach is based on the expectation that local citizens' initiatives and cooperatives will be able to play a catalysing role in the creation of energy plans thanks to their knowledge of and connection to a location.

In order to investigate how this works in practice, researchers from the Knowledge Centre and the University of Groningen, together with students, tested this approach in the Hoogkerk-Zuid district. This district serves as an appropriate example because the possibilities regarding sustainable energy and how they could be applied in the current environment are still unclear. In addition, a local citizens' initiative called the *Groene BruggenBouwers* (Green Bridge Builders) is already playing an active role in he district.

[1] NoorderRuimte Research Centre, Hanze Univeristy of Applied Sciences Groningen
[2] Faculty of Spatial Sciences, University of Groningen

What is important to residents?

First of all, a systematic investigation was conducted into how the residents of Hoogkerk experience various aspects of the local energy transition process and what aspects of it are important to them, on the assumption that this determines how people respond to plans. A distinction was made between three different groups in Hoogkerk, with each group consisting of people who more or less agree on the aspects they find important. For instance, for one group the local values and characteristics of the district were particularly important: these need to be taken into account and supported in the energy transition plans. Another group emphasised the need for energy-saving solutions. Their priority was to first reduce energy needs and then to see how locally generated sustainable energy can meet the remaining needs. A third group stressed the importance of setting up an integrated local district energy transition plan in which the municipality would play a leading role and citizens would contribute towards the plans.

These groups differ with respect to the importance they place on certain aspects. It is interesting to note that the first two groups focus mainly on the spatial aspect of the energy transition, giving priority to the preservation of the foremost characteristics of the location. For the third group, the procedural aspect (the process) of the energy transition and the role that local residents can play in this is particularly important. This is useful to know because the municipality or local citizens' initiative could involve these different groups in different ways when plans are drawn up – for example, to ensure that the potential of bottom-up processes are not overestimated. Incidentally, the protection of social housing tenants in energy transition policy is a priority for all three groups. These and other insights were incorporated into the next phase of the study.

Using co-creation to develop a local energy transition plan

In the next phase of the study, a start was made on a design to transform the district of Hoogkerk-Zuid into a Positive Energy District (PED), the central concept of the MAKING-CITY project. A PED is a delineated area where the total annual energy balance has to be positive. This means that the area must generate surplus energy that can be shared with other areas. The PED concept is important because within the perspective of energy, the specific energy needs of an area are considered and account is taken of the ecological, social and cultural context.

PEDs are often developed from an energy-technical perspective. In this study, this has been combined with an integrated energy landscape approach. It was therefore essential to find out what people see as important elements in their living environment. To this end, a methodology was used that links various ‘services’ known as ecosystem services to the living environment. These ecosystem services make an important contribution towards the functioning of the living environment: for instance, trees serve to cool the local climate. In Hoogkerk-Zuid the researchers, together with the local citizens' initiative and residents, literally charted locations with these services during participatory sessions. The potential consequences of, for example, sustainable energy technologies (solar panels, wind turbines, digester) on ecosystem services were then examined, and together with residents it was investigated what measures would be most appropriate and where they should be applied. The point of departure, however, was that according to the principles of the Positive Energy District, the interventions will ultimately be sufficient to cover the energy consumption of the district, and that even a surplus of energy will be generated. Early calculations show that this is possible with measures such as insulation, green roofs, PVT systems on roofs, floating PVs, an ATES system and biodigesters.

The final result of this design process is a map showing various solutions for rendering the energy system sustainable, taking into account the knowledge and ideas of residents and the characteristics of the district. For instance, the co-creation process

Figure 1: Joint SWOT analysis event with the local citizens' initiative Groene Bruggenbouwers in October 2021.

yielded a number of interesting ideas such as the proposal to use a polluted field for solar panels, which meant they did not have to be installed in the district's green zones.

A sustainable business case model?

Finally, based on the proposal, a sustainable business case model was developed to see if the plans were financially feasible. The model shows that value creation is possible: on the one hand through cost savings due to traditional energy sources not being used, and on the other through revenue from energy sales to the grid. What is special about this model is that apart from the traditional economical value, the value of the ecosystem services are also incorporated. (These are often neglected or even threatened in energy transition projects and plans). Account has also been taken of possible synergies with the integration of the proposed sustainable energy technologies in the local context. By taking explicit account of these matters, this study opens the door to a new approach to the valuation of sustainable projects.

Conclusion

In Hoogkerk-Zuid it was investigated whether and if so how an integrated approach could help to make the local energy landscape sustainable. To this end, researchers worked together with residents on an integrated plan to make the energy system sustainable, taking into account both the characteristics of the location and the knowledge and interests of the residents. A visualised design was then made, incorporating various energy options based on the existing spatial qualities of the area. This yielded interesting and creative new insights that, when assessed, could also be financially feasible. What next? Due to the largely exploratory nature of the study, it is not possible to proceed immediately to implement the plans. But armed with the results of the study, the local cooperative, the Groene BruggenBouwers, have a solid basis to build on.

The power of the Groningen approach

Karin Hoogterp (Grunneger Power)

In Groningen, we have been working with energy coaches for nearly three years. The municipality of Groningen and the energy cooperative Grunneger Power are collaborating on a comprehensive approach to tackle energy poverty. Where necessary, citizens are relieved of burdensome tasks, the sharing of insights is facilitated so that the quality of service continues to improve, and the services provided are under constant development.

In 2020 Grunneger Power, commissioned by the municipality of Groningen, started recruiting and training the first energy coaches on voluntary basis, who would be tasked with advising residents in the municipality on small-scale energy-saving measures. People wishing to take further steps could contact the regional energy service counter.

Information cafés and thermal camera walks

Residents can visit neighbourhood information cafés for advice on saving energy, and participate in neighbourhood walks with a thermal camera. From experience, we know that residents benefit from a personal approach. The information cafés are designed to give a general presentation about steps people can take at home, as well as providing space for small group discussions with a coach so that there is ample opportunity to ask specific questions. It is important to seat residents with others

who are in similar situations. In other words, tenants with tenants, home-owners with home-owners, people who are all interested in far-reaching measures, and those who share an interest in small-scale measures. The questions that residents ask will then almost always be relevant to the other residents participating in the discussion. This is reinforced by neighbours informing each other, asking each other questions and exchanging knowledge.

Peer supervision and coaching

Energy coaching is a profession in which you learn on the job. And the quality of the services provided improves as experiences are exchanged and questions shared. In addition, this creates a sense of engagement and work satisfaction. Most coaches are volunteers, and they appreciate the contact with colleagues. Consequently, many coaches do this work for years and there is little turnover.

Close at hand and tailored to individual needs

In 2022 the Sustainable Groningen (Duurzaam Groningen) platform of the municipality of Groningen was established as a point of contact for anyone with questions or needs regarding sustainability. The demand for energy coaches has grown in recent years, alongside a growing demand for major energy-saving measures in homes as a result of rising gas prices. In response, the municipality of Groningen has been working since 2022 with its own coaches, both paid and voluntary, within the context of the Sustainable Groningen platform, and Grunneger Power has been entrusted with taking care of the recruitment, coaching and supervision of the volunteer coaches. Grunneger Power is active in neighbourhoods and is familiar with the residents, the types of homes and the current neighbourhood initiatives. In cooperation with these initiatives, Grunneger Power continues to organize information cafés on saving energy and thermal camera walks.

It is becoming increasingly apparent that those living in real poverty are less likely to engage an energy coach.

Citizens living in energy poverty need help with implementing energy-saving measures.

It was becoming increasingly clear that people living in real poverty are less likely to take steps to engage an energy coach, and if they do, they frequently fail to implement energy-saving measures in the home. For this reason, a handyman bus organized by Sustainable Groningen has been active in neighbourhoods since the summer of 2022, implementing small-scale energy-saving measures for residents. This takes place in close cooperation with housing associations. In addition, in cooperation with neighbourhood initiatives, energy-saving items have been distributed free of charge at central points in districts and villages.

This approach has proven highly successful. Residents are approached actively through door-to-door promotion, and the handyman bus is parked visibly in the neighbourhood. And the neighbourhood initiatives use their own networks to invite residents to collect a free bag full of energy-saving items. If people need more help or advice, the handyman bus or an energy coach are called in. As it appears that non-Dutch speakers are often hesitant to adopt energy-saving measures, flyers are available in several languages including Arabic.

Local Sustainable Homes Day

For several years now, Sustainable Groningen and Grunneger Power have been organizing a twice-yearly Groningen Sustainable Homes Day, affording residents of the municipality a peek into their neighbours' sustainable homes. Here too, the sustainable neighbourhood initiatives are closely involved to encourage residents to participate or to visit sustainable homes. Residents who show their homes share their experiences, ranging from substantial to more minor savings, and provide interested viewers with independent and reliable information. Residents with the prospect of connecting to the heat network in the future can see for themselves how residents who have already taken this step are experiencing the change.

During the Sustainable Homes Day itself, a market is held at a central location in Groningen where people can talk to energy coaches and obtain information about subsidies and purchasing offers, as well as receiving free energy-saving products to take home. This inspires residents to start or continue making their homes more sustainable as soon as they get back from the event.

The power of the Groningen approach

In summary, what makes Groningen's approach so strong?

1. **Work together with parties that have similar interests and are close to the municipality's target group.**
   For example, energy cooperatives, housing cooperatives, and sustainable neighbourhood initiatives. This creates a broad approach and optimal use is made of the knowledge that these parties have about the homes and residents in the neighbourhood.

2. **Make the approach as local and comprehensive as possible.**
   This affords insight into the needs of residents, recognition and trust on the part of residents, and generates enthusiasm and engagement among neighbourhood initiatives and cooperatives, fostering collaboration and the contribution of ideas.

3. **Ensure that you help residents to take measures where needed.**
   Help will be given in places where residents are usually difficult or impossible to reach.

4. **Monitor your activities and develop your offerings on this basis.**
   You can then deliver truly customized services, even for larger groups at the same time.

5. **Ensure that there is a robust network of energy coaches.**
   Apart from coaching and supervision, offer scope for social aspects so that mutual relationships are forged. This will foster a feeling of engagement among energy coaches, while giving them opportunities for further development in their field of expertise.

A fair energy transition

Groningen's municipal energy transition fund and its role in the social process

Bert Horst (Municipality of Groningen)

In this publication, we discuss how investing in the energy transition requires a broad societal approach. But above all, we need to reduce unnecessary energy expenditure; preventing unnecessary energy consumption must be given the highest priority. This is an investment that will stop millions of euros from evaporating like CO_2 from a coal-fired power station. An investment that will lead to better, healthier and more affordable housing conditions. An investment, moreover, that will lead to savings ranging from poverty reduction and youth care to sports subsidies, and ultimately to returns in the form of a viable urban economy that can continue to develop thanks to increasing spending capacity among our citizens. We must therefore invest comprehensively in the city.

To get a handle on this type of investment, we look at a number of challenges relating to the risk of rising poverty, citizens' hesitations about investing in a connection to a heat network, and the matter of involving citizens in collective projects and decision-making. But we also discuss aspects that are already possible and happening. We examine the role of an energy transition fund as an accelerator, the unburdening of citizens by means of coaching and assistance, and the way in which collective energy projects can be effected. First and foremost, we want to show how investing in the energy transition based on diverse policy agendas will pay off. And we emphasize yet again that the energy transition is about much more than energy; it is a gateway for envisioning our future society and cities.

Energy transition fund

The energy transition fund (*Fonds Energietransitie – FET*) of the municipality of Groningen was set up in 2022. Its primary goal is to provide subsidies and loans to facilitate sustainability. The fund will be provisioned through structural income from solar parks and wind turbines which we will develop ourselves via the municipal energy operating company currently being established. Additionally, one-off contributions such as the € 2 million allocated by the municipality of Groningen for energy

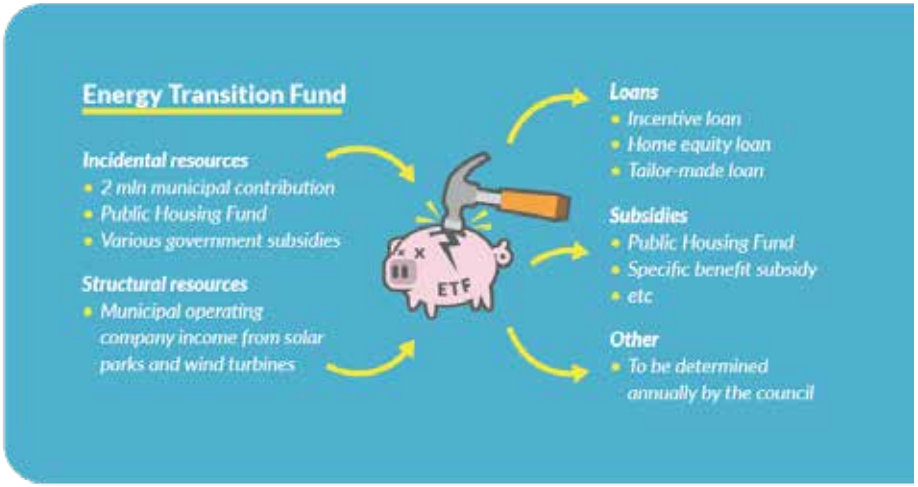


Figure 1: diagram of the possible development of the FET.

poverty reduction, government grants, funds and other subsidies for the energy transition will be added to this fund, making it the central location of funding for the energy transition in the municipality of Groningen. The precise size of the fund is not yet known; it is a growth model. Figure 1 illustrates how the fund may develop.
In order to ensure that the money from the fund reaches those who are experiencing or are at risk of energy poverty, we are initially focusing on private homeowners who do not quality for other funding to make their homes more sustainable. This had top priority because energy poverty is increasing substantially. Another reason for selecting this target group is that we can consult with them directly. When people live in rented housing the process is lengthier because the housing organization or landlord will be involved.

We are using the €2 million already available on a risk-bearing basis to provide loans to homeowners living in energy poverty so that they can render their homes sustainable and leave energy poverty behind. The public housing resources mentioned in Figure 1 are only available to private owners in the districts of Paddepoel, Selwerd and Vinkhuizen, who are required to contribute 25% to qualify for the subsidy. Further, the available specific benefit (SPUK – specifieke uitkering) resources are used to combat energy poverty among both tenants and private owners in the form of extensive advice and small-scale measures such as draught strips and LED lights. Tenants can only access supplementary, large-scale measures via the corporations or private lessors. Discussions

The energy transition is about much more than energy; it is a gateway for envisioning our future society and cities.

are currently taking place through various channels to help the sizeable group of tenants who are experiencing energy poverty to escape from it in the long term, but it will take time for solutions to be found.

The plan includes a flow chart to be used by energy advisers from the municipality in discussions with private owners. Energy advisers are deployed based on a block-by-block route, with the accent on actively seeking contact with the target group, assisting people where needed, and providing guidance throughout the implementation process where desired. This is coordinated via the energy information centre (EnergieLoket) of the municipality of Groningen (www.duurzaamgroningen.nl).

Energy advisers and private owners discuss what sustainability measures need to be taken, what subsidies are available, and in what other ways the measures are to be funded. Those who cannot obtain funding anywhere else can apply to the municipality. The following three loans are offered through the Public Housing Incentive Fund (*Stimuleringsfonds Volkshuisvesting – (SVn*):

- **Fair energy transition incentive loan (*Stimuleringslening Eerlijke Energie-transitie*), municipality of Groningen**
  A regular funding test is conducted within the framework of the Dutch Authority for the Financial Markets (AFM). A loan application must therefore meet the income-expense ratio (*inkomens-lastenverhouding*), whereby no account may be taken of any potential savings expected on energy costs. There is no age limit for applicants.
- **Equity loan (*Verzilverlening*) for fair energy transition, municipality of Groningen**
  A form of loan without an income assessment, where only the substantial equity of a home is taken into account. Applicants are subject to a minimum age 57 (10 years before the Dutch state pension age), and no maximum age. Applicants have no monthly mortgage payments because interest and repayment are only settled in the event of sale. The risk reduction consists of a maximum loan amount which, including any other potential debts and added interest, may not exceed 80% of the *WOZ value* (value for the purposes of the Valuation of Immovable Property Act).
- **Customized loan for fair energy transition, municipality of Groningen**
  A loan that can be provided even if the income assessment (in which no account may be taken of expected savings) shows that that monthly repayment will temporarily not be possible. Based on the results of the income assessment, this group of people are currently not eligible for other loans. However, we offer them the opportunity to take measures to render their homes more sustainable by exempting an initial period from repayment and by requesting repayment through periodical reassessment as soon as this is possible. If it turns out that this is not possible during the loan term, the loan will be cancelled (subsidized) after expiry of the term. This risk is limited to the available €2 million by limiting the loan ceiling for these customized loans to €2.5 million.

Everyone can thus be lifted out of energy poverty and a significant step can be taken towards reducing energy consumption. Homeowners are required to achieve energy label A (the highest level). These loans always supplement existing subsidies or the Heating Fund (*Warmtefonds*).

What do we achieve with this?

€10 million is invested in combating energy poverty. Socially, € 2 million is employed on a risk-bearing basis. An average investment of €25,000 can help around 400 households. Of course, the loans have to be paid off at some point, but leeway is created in household budgets. This applies in any case if use can be made of the customized and equity loans. With regard to the incentive loan, people benefit directly. Repayment and interest are only settled after a period of time, when a house is sold or if people are able to make repayments according to the income assessment. This gives these groups of people leeway regarding the household budget, which ensures that the urban economy can also continue to be supported. And if the urban economy is supported, it becomes interesting to also investigate whether it can contribute in some way to the energy transition fund. The blue arrow in Figure 1 illustrates this revolvability. While this may already be taking place through the tax system, it should be worthwhile to work this out in more detail.

Activities in the district

Karin Hoogterp and Anne Huizinga (Grunneger Power)

Organizing residents' control over energy is not only about keeping them abreast of changes in the neighbourhood but also about what people can do in their own homes. Demand always originates from individual needs. This could be to make the home more comfortable, contribute towards climate objectives, and of course also to save on the energy bill. You get a picture of residents' needs by entering into a dialogue with them. If resident participation is to be successful, this is particularly important in districts with high levels of energy poverty. People all have their own particular interests and desires, but ultimately, discoveries can be made and action taken jointly. Grunneger Power's approach is therefore always focused on individual needs as well as dialogue.

It is particularly important to get to know people in the more disadvantaged districts with a high level of energy poverty. We want to know what they want and are able to do, and especially, in what areas they need help. People sometimes have no idea what the possibilities are. Or they may have had unpleasant experiences with authorities in the past that make them suspicious of the intentions of the municipality or housing cooperative, for example. As an energy cooperative, we can step in to represent resident's interests. The fact that we are an independent and therefore disinterested party inspires trust in residents, and trust is the basis for a good discussion.

The power of concerted efforts

Above all, cooperatives are about how you do things together as a collective. It is a fact that you get more done by working together. That is why we always try to organize our actions in neighbourhoods and villages for a group of residents, while also giving people the opportunity to ask questions and discuss concerns personally. Other residents can often learn a lot from this, and people in the neighbourhood often help each other and offer ideas. This is what makes communities so powerful. For this reason, we work intensively with neighbourhood initiatives and community centres that are active in the locations we visit. They will often already have gained the trust of residents and be familiar with the general concerns that residents have. Activities in villages and districts such as Hoogkerk and Helpman are very well-attended because we organize the activities together with neighbourhood initiatives. They know all about how to engage residents in a targeted way.

You get a picture of residents' needs by entering into a dialogue with them


GRUNNEGER
POWER

District renewal

In district renewal areas such as De Wijert, Indische Buurt-De Hoogte and Selwerd, it can be more difficult to reach people, although energy saving is often the most needed in these districts. Here, we work together with the municipality, housing cooperatives and other organizations. It is generally most effective to link up with existing projects and activities. In other words, to organize an information café on energy saving in a neighbourhood where a heat network is to be installed, or to

Energy poverty is a complex issue.
Often more complex that you might think at first glance.

offer a thermal camera walk to an owners' association (VvE) that is organizing a general members' meeting. Together, we know where residents meet up and where the contacts are the strongest, such as the community centre or thrift shop, for instance. People who work at these places are often well-known to residents, and trusted by them.

People need help dealing with their financial worries

Energy poverty is a complex issue –often more complex that you might think at first glance. People frequently have many other worries that have continued to accumulate over time such as debts, relationship or parenting problems, and caregiving responsibilities. It is therefore understandable that people often have other things on their minds than finding ways to reduce their energy bills. In such situations, people need help with things that they cannot cope with themselves. This is what makes the handyman bus so appreciated in Groningen. It goes further than energy coaches by providing specific services such as installing low-energy light bulbs and draught strips, often giving people the encouragement they need to really get to grips with their energy situation.

Targeted action in the district

The thermal camera walks and information cafés we organize together with the municipality of Groningen have proved particularly successful. We organize the latter at accessible locations in the neighbourhood, creating an opportunity for good conversations over a cup of coffee. And we give tips that are relevant for the homes and residents in the neighbourhood. Again, it is firstly a matter of getting an impression of the neighbourhood and the type of people living there. In close cooperation with the neighbourhood initiative, we invite residents and start to tackle issues with each other in small groups. Walking past familiar homes in the neighbourhood with the thermal-imaging camera and talking to fellow neighbourhood or village residents about what steps you are taking in your own home forges strong connections. The atmosphere is always good from the start, and afterwards, people cannot wait to go home and start taking measures.

Overcoming barriers

An effective approach is to demonstrate the technology, familiarizing people with it and showing its applicability, and to remove barriers by enabling people to experience things for themselves. Our induction cooking workshops in the heat network districts are a great example of this. We provide a meal under a convivial atmosphere, and show people that induction cooking is not difficult at all. And they get to go home with a nice recipe book.

Warm feelings for the thermal camera walk

The thermal camera walk; looking for heat leakage using a thermal-imaging camera together with neighbours and a professional energy coach. In recent years, around 500 residents of Groningen have had the opportunity to check their homes for heat leakage. The thermal camera walk has proved hugely successful for people who want to tackle sustainability, either on their own or together with others. These walks are an accessible and sociable way to talk to others about saving energy.

Making optimal use of the thermal-imaging camera

Where is heat escaping from the home? What precisely is a thermal bridge, and how do you solve it? How can you make full use of the possibilities afforded by a thermal-imaging camera? Heat often escapes from homes through holes and cracks. The thermal-imaging camera must be used correctly in order to come to the right conclusions. As beginners are sometimes liable to make mistakes, an energy coach starts by giving the group tips on how to use the camera. For example, the photograph should be taken on a cold day, preferably early or late in the day, because colder temperatures produce the best result. No sky should be included in the photograph, as that will distort the result. Armed with some handy tips and tricks, participants are ready to use the camera independently.

Doing things together is more enjoyable

Hunting for heat leakage together with the neighbours is more enjoyable than using the camera on your own. It is likely that you will have a similar type of house, and together, you will be better able to spot the differences. A thermal camera walk is therefore the most rewarding for groups of people who already know each other but have not yet discussed the subject of sustainability together. Imagine, for instance, a street or an apartment complex. "Yes, those neighbours recently got new HR++ glass, I should look into that too", was one of the remarks that we heard. Or: "I had no idea so much heat was escaping through the cracks around the windows. I'm going to apply draught strips as soon as possible!" Again, everyone is capable of doing something, and you can easily save hundreds of euros a year by taking a few small-scale measures in the home and adapting your behaviour a little. And the latter costs absolutely nothing!

A targeted approach to energy poverty

The role of municipalities and the instruments available to them

Marijn van Geet (University of Groningen)

Energy poverty requires a targeted approach because it can take various forms and the consequences experienced differ widely between households. Municipalities play a major role in the development of targeted measures to combat energy poverty. This essay examines how municipalities interpret this role, and looks at the instruments available to them. The essay is substantiated by the results of a survey into how eight Dutch municipalities with 100,000 or more inhabitants (Eindhoven, Leiden, Venlo, Westland, Den Bosch, Maastricht, Deventer and Apeldoorn) are tackling energy poverty.

Municipal toolkits for tackling energy poverty

The instruments we refer to are the various resources that authorities use to tackle social problems. These instruments are used to influence both individual and collective behaviour. Proper coordination of objectives and instruments is regarded as a prerequisite for effective policy. Authorities often use a combination of instruments in order to meet a policy objective or solve a problem. Instruments are usually divided into four categories based on the type of resources that an authority can use: nodality (position in the network), authority, funding and organization. The set of instruments to be used depends on the degree to which an organization has disposal of the resource in question. Table 1 contains an overview of the instruments that municipalities can use to tackle energy poverty. The table juxtaposes the four types of instruments and the two dimensions of energy poverty.

	Affordability (income and energy price)	Energy demand
Nodality Utilising information and communication from position in network	• Advice/assistance with finding a suitable energy contract	• Consulting (energy coach, energy information centre) • Information campaigns • Energy advice from energy coaches • Energy displays for consumption management • Performance agreements (regional development, housing cooperatives) • Sustainability agreement
Authority Utilising legal power and authorities	• Debt counselling • Cancelling/taking over debts • Municipal energy company	• Sustainability obligations (e.g. through zoning plan) • Energy performance contracts
Finances Utilising financial-economic instruments	• Reduction of tax burden (e.g. energy allowance) • Financial support of energy foundations • Financial participation in utility companies • Financial participation in local energy projects • Incentive measures for individual generation/storage of sustainable energy (e.g. fund) • Public investments in heat network	• Energy-saving kits (draught strips, insulating foil, etc.) • Sustainability loan/subsidy – possibly with priority for energy-poor households • Incentive measures for energy saving • One-off payment for energy-saving measures • Voucher system for insulation measures • Building-related sustainability service (handyman bus) • Sustainability loan • Energy-saving mortgage in district approaches for home owners without financial scope
Organisation Utilising physical means of an organisation	• Sharing energy in local energy communities • Joint organisation of purchasing	• District sustainability plans, district approach (prioritising districts affected by energy poverty) • Policy strategy for energy poverty • Temporary cross-departmental commission for energy poverty/sustainability • Energy poverty monitoring programme

Table 1: overview of instruments that municipalities can use to combat energy poverty.

The research into the approach to energy poverty taken by the municipalities of Eindhoven, Leiden, Venlo, Westland, Den Bosch, Maastricht, Deventer and Apeldoorn provides insight into the instruments used, why they are used, and the challenges encountered in tackling energy poverty.

Instruments based on nodality and authority

The municipalities that were investigated mainly use instruments based on knowledge and information. This therefore involves information campaigns about available financial schemes and the use of energy advisers or an energy information centre to support residents with saving energy and making their homes more energy efficient. Formal legal instruments on the other hand are used rarely if at all. Interviewees stated that energy-poor households will not benefit from being forced to take measures towards sustainability. They believe that an obligation for private lessors to make homes more energy efficient could be an effective measure. However, there is no mandate to enforce sustainability measures on this group of homeowners. The authority to develop such legislation lies with the national government.

As an alternative to legal instruments, municipalities often use their position as local authorities to conclude performance agreements with parties within the municipality. For instance, all the municipalities interviewed enter into performance agreements with housing cooperatives with regard to sustainability, new housing, affordability and liveability. In some municipalities, such as Den Bosch, performance agreements are established between a larger group of private and public parties in a sustainability agreement. Additionally, an increasing number of municipalities have gained a financial position within local energy companies. Through their role as shareholder, they can exert influence on the local energy transition. The Climate Agreement designates municipalities as managers of the heat transition for the built environment. The interviews revealed that, in this role, municipalities are as yet only directing energy poverty reduction to a limited extent.

Financial instruments

Financial instruments were crucial in curbing an increase in energy poverty during the energy crisis. Municipalities played a central role in paying out the government-funded energy allowance. Interviews reveal that the municipalities made considerable efforts to ensure that the allowance reached the right households, mainly based on the benefits data available to them. In addition, welfare organizations, mosques, community workers and employers were called on to reach out to people entitled to the allowance.

Municipalities also use the national scheme to reduce energy consumption in homes (*Reductie Energieverbruik Woningen – REW*) in order to support homeowners and tenants financially in saving energy. Municipalities usually use this scheme to provide vouchers that can be used to purchase items such as draught strips, LED lights and insulating foil. As one respondent said, “It is clear that some people living in energy poverty find it difficult to take measures themselves. The insulating foil will sometimes remain unused on top of a cupboard or end up for sale online […].” For this reason, some municipalities invest in a supplementary service so that the materials are installed straight away. Apart from financial schemes for promoting sustainability in homes, municipalities often also offer subsidy schemes for foundations that contribute to reaching the municipal goals regarding well-being, budget support, energy advice and sustainability. Although these instruments do contribute towards solving the problems, the amounts involved are relatively small, and are insufficient for the large-scale sustainability effort needed to tackle energy poverty in a structural manner. Interviewees experience a lack of financial means as a major obstacle to tackling energy poverty.

Organizational instruments

Municipalities only have limited organizational capacity to deal with energy poverty. As one interviewee put it, “There is tremendous political pressure to do things quickly, but the requisite capacity is somehow not being made available”. Local authorities have been overwhelmed by the rapidly increasing urgency of energy poverty. The additional task of paying out energy allowances was added to the regular tasks of civil servants but was not budgeted for regarding capacity. As a result it was impossible to develop a strategic approach, with measures being taken without clear goals being set. “This is what we are seeing in the face of the looming crisis. We follow certain policy, we have policy for special assistance, for people under the minimum wage limit, for welfare recipients and those earning less than 120 percent of the social minimum – that's the direction things are going in. Technically speaking, energy poverty has not been clearly defined. Let's say that we follow social developments in that respect”.

Energy poverty mainly impacts the social domain and the spatial domain within the municipal organization. Those are two different departments with different budgets that normally do not work together on a daily basis. Also, different members of the municipal executive are usually responsible for these domains. For practical reasons, a link is therefore often made with the general poverty policy or the affordability objective in the heat transition vision (Transitievisie Warmte), whereas ideally a more integral approach should be developed on this subject. Organizational instruments such as temporary interdepartmental working groups, commissions or process support could help to integrate energy poverty into existing working processes. Interviewees indicate, however, that such instruments are not yet being applied. Further, the analysis revealed that energy poverty is still only receiving limited attention in the heat transition vision and the district implementation plans. There are opportunities here because making homes and districts more sustainable contributes towards the heat transition and towards combating energy poverty.

A targeted municipal approach to energy poverty

Energy poverty is a multifaceted problem that calls for a targeted approach. So far, the emphasis has been on generic financial instruments such as tax reduction, the energy allowance and the price cap. Although these have proved effective in keeping energy poverty in check during the energy crisis, some reservations should be voiced. The measures cost the government a lot of money (the costs of the price cap are estimated at 23.5 billion euros), they do not offer a long-term solution for the problem, and they take limited account of the specific situation of energy-poor households. Developing a targeted approach is not only more effective but also more efficient. Municipalities play a crucial role in the development and implementation of such customized solutions, but they are still searching for the best ways to tackle energy poverty. This study has uncovered two points of special interest with which a targeted municipal approach to energy poverty can be supported.

Integration of energy poverty into social and spatial policy of municipalities

Although municipalities are not directly responsible for energy poverty, the issue touches on domains where municipalities do have tasks. There is a clear connection between energy poverty and the social and spatial areas of responsibility of municipalities. By establishing smart links in policy, win-win situations can be created. For example, reducing energy poverty can contribute to the achieving of objectives regarding social participation, health and CO_2 emissions. Integrating energy poverty into the spatial and social domains is an important initial step towards developing a strategic approach to energy poverty that contributes towards other municipal policy objectives. For instance, regarding spatial sustainability, priority could be given to those districts that are the most vulnerable in terms of energy poverty. There is also a clear link here with the role of municipalities in the heat transition. Organizational instruments can help to forge new connections between policy fields – for example, interdepartmental working groups or a process design in which policy development

and decision-making on energy poverty, spatial policy and the social domain are brought together.

Better coordination of instruments and capacities between municipalities and national government

In order to tackle energy poverty in a targeted manner, a shift will have to take place from generic financial measures aimed at affordability to area-specific solutions. For this to happen, cooperation between national government and the municipalities must improve. This study shows that municipalities have the necessary knowledge and networks to tackle energy poverty in a targeted manner, while the state manages the financial and legal capacities. A logical way to cooperate would be for municipalities to use their position as local authorities to identify households affected by energy poverty and to develop a targeted policy, whereas the state designs suitable legal and financial instruments for them to support implementation. This would mean that the state continues to manage the instruments but aligns them with the needs of municipalities. An alternative would be to give municipalities more powers and budget to tackle energy poverty. The lack of organizational, legal and financial capacity is limiting municipalities in their ability to address the problem of energy poverty. There is simply not sufficient capacity to develop strategic energy poverty policy or to support instruments. As a result, there is limited cohesion between the small-scale measures that municipalities are able to take. The situation is compounded by the fact that municipalities do not have a formal task with regard to energy poverty. Energy poverty currently has to compete for resources with social problems for which the municipality does have an official responsibility. The lack of capacity means that municipalities remain strongly dependent on other parties when it comes to tackling energy poverty.

Introducing the energy transition in society

Christian Zuidema (University of Groningen)

By 2023, the energy transition was well under way. Considerable progress has been made in the Netherlands over the past decade. Whereas in 2012 only 4.5% of our energy was derived from renewable sources, in 2022 this figure rose to over 14%. That is a clear improvement, but we still have a long way to go. We have actually only just started. Much will have to change if we are to continue making substantial progress in the future – in our landscape, our built environment and therefore also with regard to Dutch society and individual citizens.

More than technology alone

Many people initially associate the term energy transition with new and improved technology, and that will certainly be necessary. Improved wind turbines and solar panels will lead to higher yields and lower costs, alongside energy-efficient techniques in industry, different types of mobility and many other technologies for generating energy. In the Netherlands, other areas we are looking at are the potential role of geothermal energy to extract heat from the ground, the possibilities of hydrogen generated by wind or solar energy for our economy, and smart biomass applications. And we also envisage a role for energy storage so that we will be better equipped to face times when we will need more energy than the sun, wind or other sources can provide. This could include temporary storage, such as in batteries, which are also becoming much more sophisticated technologically, but also long-term storage, perhaps via hydrogen in salt domes underground or in ammonia or other chemical compounds. Fortunately, technology continues to advance. We are going to need those new technologies, and preferably at a low price.

This publication, however, shows that technology alone is not enough. The energy transition is much more than that. It entails huge consequences for our landscape and the built environment. Locations will have to be found for the solar panels, wind turbines, hydrogen plants and biomass fields, and converting hundreds of thousands of homes, business premises and industrial complexes will be no less challenging. And then there are the cables, pipelines and heat networks to be considered, while we will also be seeing electric or hydrogen vehicles bringing changes to agriculture and our transport system. The energy transition therefore also entails

a change in our environment – from individual homes to the entire landscape. By taking a smart approach to how we as a society deal with the energy transition, there is much to be gained. Additional jobs can be created, money generated with energy projects can be used to invest in liveability in villages, districts and communities, and with energy-efficient homes, households can save considerably on expenses. If we fail to approach this matter in a smart way, the consequences are clear: more resistance to changes in the landscape, failure to reach climate targets, and an increasing gap between people who are able to benefit from the energy transition and those who remain behind in poorly insulated housing with higher energy bills. It is clear enough that a smart approach will pay off.

Social innovation

We already know quite a lot about approaching the energy transition in a smart way. Involving citizens more effectively in decision-making at an earlier stage, combining the issue of energy with other issues such as agriculture and poverty, using the power of energy cooperatives, energy projects in which citizens themselves have ownership, or investing profits from energy projects in environmental funds in order to invest locally. We are working hard in a number of areas. This publication casts light on a whole series of current projects, discussions and examples. They all share a specific perspective on what is needed for the energy transition, putting individual citizens centre stage in a way that goes further than contributing ideas to decision-making. This is explicitly about activating, assisting and supporting citizens regarding participation in the energy transition. This publication is therefore above all about embedding the energy transition more securely in society. Getting people involved so that the energy transition becomes tangible, acceptable and ideally also desirable for them. This is a quest in which we learn as we go along. A quest that clearly shows that apart from new technology, we also need new ways of thinking and working. The energy transition is about more than generating or saving Kilojoules or Megawatts. It calls on the government to align various policy documents and action with the issue of energy, from mobility and housing to poverty policy and investing in liveability. It calls for new ways to support businesses and citizens financially and practically in participating in a heat network, in making homes more energy-efficient, and enabling participation in energy projects. It also calls for new

The energy transition calls for social innovation

ways to generate money from energy that can then be invested in society. In short, it calls for social innovation. This publication is about this innovation and how Groningen is working to realize it.

Facing the future

The energy transition is something we will be dealing with for some time. That 14% needs ultimately to be a much higher percentage. It is abundantly clear that technology can help us with this. However, above all, the development of knowledge and skills to activate society in a broader sense, getting people involved, and having them participate in the energy transition is becoming increasingly important. It is crucial to recognize that this alone will not be enough to achieve the energy and climate ambitions. It will also be necessary to improve living conditions in homes, villages and districts, reduce the problem of poverty, and instead of a downward spiral, release an upward spiral in the local economy. Above all, we need to build jointly on an energy transition that will benefit us all.

Colophon

Editorial Board:
Elisabeth Koops, Cyril Tjahja

Printing:
Zalsman Groningen B.V., June 2024

Photography and illustrations:
Grunneger Power archive: p. 44, 47, 59, 67, 69
Guus den Tonkelaar: p.23
Lyuda Stinissen: p.21, 49, 56, 75
Mariska de Groot: p.54
Municipality of Groningen: p.12, 32, 35, 61
NoorderRuimte Research Centre: p.30, 31
Rachael Tillotson: p.29
Stella Dekker: p.1 (cover), p.4, 6, 37, 39, 64, 71, 77, 80 (back cover)

Acknowledgement:
This project has received funding from the European H2020 Research and Innovation programme under the Grant Agreement n 824418. The content of this document reflects only the author's view. The European Commission is not responsible for any use that may be made of the information it contains.

Design:
Schone Vormen (www.schonevormen.nl)

Translation:
Claire Jordan, Cyril Tjahja (p. 40-43)

We would like to thank the following contributors:
Adrian Figueroa, Anne Huizinga, Bas Oldenbroek, Bert Horst, Caroline van Ooij, Christian Zuidema, Cyril Tjahja, Frank Pierie, Ifigenia Psarra, Joke Kort, Karin Hoogterp, Katerina Radosteva, Kim van Dam, Marijn van Geet, Nicole de Koning, Rachael Tillotson, Rachel Boyce, Rosa Kappert, Tess van Have en Tineke van der Schoor.

FSC www.fsc.org MIX Papier | Ondersteunt verantwoord bosbeheer FSC® C017135

CO2 neutral print

Acknowledgement:
This project has received funding from the European H2020 Research and Innovation programme under the Grant Agreement n°824418.