LOCAL ENERGY SYSTEMS: GOVERNANCE ANALYSIS

Bernd Bonfert, Helle Ørsted Nielsen and Anders Branth Pedersen, Aarhus University 2023

PREFACE

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ACCESS – Governance Analysis

1. INTRODUCTION

This report analyses the governance models of four local energy community pilots in the project "Advancing Communities towards Low-Carbon Energy Smart Systems" (ACCESS) in order to identify enablers of and barriers for the transition towards local energy systems based on renewable energy. ACCESS was a four-year project (2019-2023) funded by the EU under the Interreg North Sea Region program, exploring and demonstrating how local energy generation and storage can be promoted while also maintaining grid stability and avoiding grid congestion, as Europe moves towards renewably based, decentralized and digital energy grids.

Local involvement in future energy systems is being promoted by the European Union through the Clean Energy for all Europeans Package, envisioned in part through citizen-driven energy communities. Local energy generation is expected to offer benefits to local communities in the form of energy security, energy savings and jobs as well as energy system benefits by providing flexibility to the electricity system through digital demand-response and storage, thereby increasing grid resilience (European Commission, 2020).

Advancing this energy system transition requires not only new technologies, but also new financing and governance models. This report focuses on governance aspects of the transition, analysing what stakeholders have been involved in the four ACCESS pilots, what role each has played, and how activities have been coordinated. As the pilot projects were designed and planned by the four municipalities, these local authorities have taken on the role of coordinating other stakeholders in the pilot phase. We examine what governance mechanisms they have had at their disposal, gaps in governance resources and possible governance models when pilots are upscaled.

The report is structured as follows: section 2 briefly outlines the concept of governance used in this report and relates it to energy sector governance; section 3 describes the methodology and data used in the analysis. The four sections that follow analyse the governance setup of each of the four pilots, identifying enablers and barriers and drawing out key lessons for upscaling. This is followed by a comparison of the four governance setups to define commonalities (and differences) across contexts. Finally, in section 9 we conclude on the questions of roles and interactions among stakeholders, focusing particularly on the role of local authorities, as well governance resources and gaps.

2. GOVERNANCE MODELS – CONCEPTUAL FRAMEWORK

The term 'governance', broadly defined, refers to the range of activities involved in reaching decisions, involving stakeholders and coordinating responsibilities within a given organisational context, from policy-making to running a business. This can take many different forms as actors seek to adopt a mode of governance appropriate for their particular objectives. Multiple and different modes of governance can operate simultaneously within the same sector, each pursuing different goals and rationalities and making use of different instruments and infrastructures, as in Ostrom's conceptualization of polycentric governance (Andersson and Ostrom 2008; Cowell et al., 2017; Peters 2014) .

Traditionally, *state governance* is conceptualised as hierarchical, as decision-making and executive authority are 'vertically' subordinated across various institutional levels and implemented top-down through regulations and planning policies. This authority can be centralized or decentralized (or federated), depending on the distribution of governance over sectors and geographical areas. By contrast, in *market governance*, authority is dispersed across a multitude of actors, whose behaviour is driven by mechanisms of competition and negotiation (Bednar et al., 2019). *Network governance* differs from both by being based on cooperation and information exchange rooted in mutual trust and reciprocity. Network actors are connected through shared interests and their mutual commitment is voluntary, with little or no official authority over them. Like state governance, network governance can be more or less centralised, but it is inherently 'horizontal' in ,nature, relying on collaborative management and facilitation rather than traditional directed leadership (Rhodes 1996; Stevens & Agger, 2017). These three governance modes may be considered ideal types. However, the core question in governance research concerns the roles of and relationships between government and private actors in steering societal decisions, indicating that none of these modes exist in their pure form. Part of the original network approach scholars advocated 'governance without government' (Rhodes 1996) and contrasted this model with the state governance model - arguing that the state could no longer provide effective steering. Others, e.g. (Peters 2014), argued that involvement of social actors in public steering was nothing new - in most governance systems, involvement has happened for decades or centuries and therefore the state governance concept also includes involvement of non-governmental actors. Furthermore, governance through networks normally also implies some delegation - which can be withdrawn - from legitimate political institutions (Scharpf 1997; Peters 2014).

Involvement of private and civil society actors in governance is argued to increase the efficiency of public policy because it draws on the skills and knowledge of multiple types of actors (Bednar et al., 2019; Peters, 2011; Sørensen & Torfing, 2019). At the same time, it is important to ensure coordination among multiple actors with different – potentially conflicting - interests and foci (Sørensen & Torfing 2009; Peters 2011; Scharpf 1997). Governmental bodies have the legitimacy to set public goals as well as governance mechanisms to guide societal activities, including regulation, budgets, information and organisation. According to Peters (2014), then, governance analysis should examine how actors (state and non-governmental) work together to provide governance. This governance analysis reported here follows this approach by asking what actors

are involved in local energy governance, what role each plays, and how activities are coordinated through governance mechanisms.

Governance of the energy transition

Governing the transition to renewable energy is a major undertaking. Due to the widespread privatisation of energy provision since the 1990's governments largely do not hold direct ownership over production infrastructures and distribution networks. Instead, they have to rely largely on incentive regulation to correct market failures and push private actors towards more sustainable practices. A widely used tool has been the decoupling of energy prices from costs, either by using price or revenue caps to incentivise energy companies to innovate, or by instituting feed-in tariffs to ensure guaranteed energy profits for companies investing in innovative renewable energy production. Due to increasing volatility of the energy market, however, many of these measures have diminished in effectiveness (Bauknecht et al., 2020).

In recent years, one approach to develop a well-functioning energy system based on renewables has been to involve a wider range of stakeholders in energy transition projects by exploring forms of decentralized energy governance. Local authorities are relied on to ensure stakeholder involvement in a variety of energy transition projects by driving renewable energy innovations, generating renewable energy in municipal buildings and the public sector, offering resources, time and guidance to businesses, and cooperating in joint ventures. This approach has been directly pushed by EU policy through the 'Clean Energy for all Europeans Package' (e.g. Regulation 2018/1999), which defines civic and renewable energy communities and promotes their support through governance (Haf & Robison, 2020). Local energy systems can vary in their degree of distributedness, i.e. the degree to which energy production, control, management and economic benefits of production facilities is centralized or decentralized: from a centralized version where energy distribution operators play *the* key role where local producers may provide flexibility services to the grid to the other 'extreme': a fully decentralized version based on peer-to-peer (P2P) trading.

Nonetheless, the role of local governments in the energy system varies depending on the country specific governance setup which partly defines the decision-making scope and instruments available to local government and, importantly, the role of local government depends on the knowledge and capacities of local governments in relation to the energy system (Pedersen & Nielsen, 2021).

Innovation projects such as the ACCESS pilots are a key component in trialling local energy communities as well as the role of local government and other stakeholders in local energy systems, and their lessons are intended to inform longer-term scaling strategies. Scaling can involve different dynamics, most notably *scaling up*, which refers to the organisational growth and professionalisation of innovative projects within the same local context, and *replication* (or *scaling out)*, which refers to the diffusion of innovations across territories and sectors, thus expanding their volume and reach (Moore et al., 2015). In practice, energy transition projects can be expected to combine the two dynamics to utilise their complementary strengths. Steering this scaling process presents a challenge in itself, as it requires effective collaboration between multiple relevant stakeholders (potentially at different institutional levels) to pool resources and

engage in reflexive learning (Naber et al., 2017). To do so, stakeholders need to understand why their innovative practices are effective in the first place, identify which elements are conducive for scaling and how, and actively contribute to promoting and institutionalising them (Pitt & Jones, 2016).

3. METHODOLOGY

This report is based on qualitative case studies of the four ACCESS pilot projects in West Suffolk (UK), Amersfoort (NL), Malmö (SE) and Mechelen (BE). The projects were investigated using a combination of document analysis, semi-structured interviews, and participant observation.

The document analysis covered policy documents on local and national energy and climate strategies, municipal action plans and environmental evaluation reports, as well as reports authored by the pilot project teams themselves. Documents were identified by Access pilot partners. Documents were analysed using qualitative open coding to map the four cities' approaches to steering the energy transition, including general goals and concrete actions, as well as the pilots' progress throughout the project period.

We conducted 17 semi-structured interviews with local administrators working on energy, sustainability, and city development, local politicians connected with the pilots, business representatives involved in the energy transition such as peer-to-peer energy exchange, and network operators (table 1). Interviewees were selected in order to get different perspectives on the pilots and future governance and were selected in collaboration with the ACCESS pilot partners.

#	Pilot	Respondent function
	West Suffolk	
1		Suffolk County Council
2		West Suffolk Council, Strategic coordination
3		Housing Association
4		Precision Marketing
5		LecSea Project
6		UK Power Network
7		Urban Chain
	Mechelen	
8		Mechelen Municipality, Sustainability Management
9		Mechelen Municipality, City Development
10		Triginta
11		Mechelen Municipality, Alderman
	Malmö	
12		Malmö Municipality, Energy Strategy
13		Malmö Municipality, City Development
14		Parkering Malmö
	Amersfoort	
15		Amersfoort Municipality, Energy Team
16		BAAS
17		Energie van Nu

Table 1: List of Interviews

Interviews took place between October 2022 and April 2023 and lasted around an hour on average. Questions revolved around the respondents' experiences with the pilots, particularly their assessment of governance mechanisms, stakeholder involvement, achievements, shortcomings, and lessons, as well as their views on the wider renewable energy transition, including enablers and barriers to upscaling innovation, key actors they consider essential for leading the transition, as well as their own envisioned role and needs. Interviews were recorded and transcribed, followed by a qualitative open coding along the same pattern as the document analysis. Finally, participant observation was conducted by co-organising a total of four workshops with each pilot team (some of them online, others on-site), which focused on involving (potential) project stakeholders in discussions about the opportunities and needs of the pilots themselves and the larger renewable energy transition. Written notes were produced by researchers and participants, capturing the main arguments and positions exchanged at the workshops, which were analysed as well.

4. GOVERNANCE ANALYSIS: WEST SUFFOLK COUNCIL (UK)

The ACCESS pilot in West Suffolk consists of a local energy hub in 'Mildenhall Business Park', located on a public shared estate, which hosts 50 small and medium-sized businesses. The pilot's initial plan was to deliver an effective combination of demand-side energy management, including smart energy monitoring, generation through a solar photovoltaic system (PV), and battery storage, with P2P energy exchange across a wider local network, to minimise grid congestion and imbalances. It was hoped that all businesses would eventually be involved in the P2P exchange and demand side management (Interview business representative).

Despite heavy restrictions during the pandemic lockdown, the project made considerable progress, ensuring the participation of five businesses, installing PV and energy monitoring devices. Including a battery and facilitating demand-side energy management, however, did not work out as planned due to excessive costs and the unsuitability of small batteries for manufacturing businesses (Interview council administrator). One business located in West Suffolk, and West Suffolk Council (WSC) have joined the local P2P scheme established by 'Urban Chain' and already generated additional revenue, yet the rest of Mildenhall's businesses have not been onboarded thus far. A local virtual power plant has now been established, with both local generation (11,500 MWh) and consumption being exchanged through Urban Chain. The project team aim to increase the volume of the P2P exchange by adding additional PV generation and providing a leadership role, demonstrating that P2P energy supply is a secure option. Over the next few years, they also hope to diversify generation by adding onshore wind power.

In the medium to long-term, the project's goal is to demonstrate the feasibility and replicability of P2P exchange and turning it into a standard business practice.

4.1 GOVERNANCE CONTEXT

ENERGY POLICY

WSC declared a climate emergency in 2019, partly in response to increasing public pressure to act on climate change, as reflected in the protests by Extinction Rebellion (Interview council administrator). Since then, the Council's five-year 'Strategic Framework' includes environmental and climate change commitments, focusing in particular on reducing carbon emissions. It also set up an 'Emergency and Climate Change Taskforce' to develop a roadmap and strategic actions, including renewables, towards reaching net zero emissions by 2030 (West Suffolk Council, 2020). Concretely, WSC planned to improve building emission standards, promote, install and trial more renewable energy systems, reduce transport and vehicle emissions by moving the council fleet to low-emission vehicles and developing an EV charging strategy, collaborate with a range of stakeholders on improving the local area's air quality, grow the local forest area, promote recycling and improve waste collection, and reduce the council's own carbon footprint through reduced energy use and local procurement (West Suffolk Council, 2020).

Multiple councils across Suffolk have long coordinated their policies at county level, including via the 'Suffolk Climate Change Partnership' launched in 2007, which committed all to reduce their emissions by 75% in 2050 (Suffolk-wide HECA report). Suffolk County Council (SCC) has therefore declared its own climate emergency and developed a common 'Climate Emergency Plan' in 2019 as well, which includes over 100 planned actions spread across five thematic sectors (Suffolk County Council, 2021).

West Suffolk Council has constructed the large 'Toggam Solar Farm', which generated 11,500 MWh of energy in 2021-22, and launched a 'Solar for Business Programme', installing PV on the property of businesses and giving them the right to sell excess energy free of charge, which has resulted in 78 installations and 6.463MW of installed capacity (Interview council administrator) and publicly hosted PV generate 4.6 million kWh of energy annually (West Suffolk Council, 2022). However, despite this successful expansion of renewables, many of the more complex ambitions have not been realised yet, such as the installation of PV across the council's hospitals (Interview council administrator). Funding for these net-zero projects was initially supported with a GBP 1.5m pool from public sector leaders, which has been expanded by another GBP 9m investment by WSC in 2022 (Interview council administrator). Additionally, a nationwide scheme enables companies to join 'business improvement districts' to receive funding for providing community benefits such as greening or environmental restoration (Interview business representative).

ENERGY GOVERNANCE - ROLE OF LOCAL AUTHORITIES

Local councils in the UK do not have direct authority or ownership over their local energy systems but they may play an important role in leading the transition to renewable energies through facilitation and coordination, as well as exerting indirect influence through planning. As they hold the democratic mandate and responsibility to govern local energy transitions, other stakeholders, including DSOs, look to them for guidance (Interview business representative). Thus, in addition to planning and local development, councils may exert a variety of crucial transitional functions, such as facilitating communication and collaboration between different stakeholders, providing support for local communities and educating the public. To increase the uptake of distributed renewable energy production, councils also support the creation of local energy communities, such as the Mildenhall industrial estate, both by offering capacity and resources to businesses and other stakeholders interested in forming them, and at times by launching such communities themselves (Interview business representative). While decisions about building new nationally significant infrastructure projects are made at national level (Interview council administrator), councils are still able to operate beyond the local scale, such as by engaging in mutual knowledge exchange via the UK-wide 'Association for Decentralised Energy' (Interview council administrator).

WSC is tasked with leading the renewable energy transition in the local area of West Suffolk. The local cabinet is responsible for annually renewing the Climate Emergency Plan and developing interventions aimed at WSC's own administration and the wider community. It also approves applications for small-scale energy infrastructure projects in its local area. A dedicated

'Environment & Energy' team offers advice and support on energy efficiency and renewable energy to the public, businesses and other groups.

At county level, Suffolk County Council acts as convener for collaborative projects, bringing together different stakeholders, facilitating knowledge exchange, and acting as a role model on sustainable practices. As one administrator explains, one of the core responsibilities of this role is to create 'beacons of opportunity in terms of what can actually be delivered', thus providing a much-needed form of leadership that other stakeholders are actively relying upon (Interview council administrator). In practice, a strategic director liaises with other councillors, while a public sector board facilitates coordination of sustainable transition efforts between local authorities and public sector organisations, which has proven quite successful and able to reach across all four areas and into the third sector (Interview council administrator).

Collaboration between councillors and businesses is facilitated in part via 'local enterprise partnerships' and the local chamber of commerce, which coordinate and inform business actors and SMEs, locate the workforce for planned projects and offer reliable feedback on business interests. Suffolk County Council also has good relations with third sector organisations, some of whom co-develop its 'collaborative action' interventions. While the council's own budget is stretched thin, these collaborative links to various stakeholders enabled it to collect £1.5m in seed funding from public actors for the Climate Emergency Plan in 2019, followed by an additional £9m in 2022 (Interview council administrator). Funding is collected in a common pool and allocated to renewable energy projects across all four local areas, thus offering better access to more ambitious match funding schemes.

4.2 GOVERNANCE AND STAKEHOLDERS INVOLVED IN THE PILOT

The pilot was steered by WSC in close cooperation with the Mildenhall businesses. Additionally, the project involved Urban Chain, which has been responsible for handling the P2P energy exchange, Grid Duck for coordinating the local energy management among some of the businesses, and a knowledge transfer network, including the local university, which provided innovation support and was independently convening with other industry partners. Various other businesses in West Suffolk, such as Precision Marketing, have also joined Urban Chain's P2P network to trade energy with WSC, which may eventually involve the Mildenhall businesses as well.

Local administrators from WSC's 'Environment & Energy' team were in charge of steering the pilot with oversight from their strategic director. They also occasionally commissioned Suffolk County Council to provide targeted support to certain tasks. Their core tasks were to bring together all the relevant stakeholders to coordinate the installation of energy infrastructure and facilitate the onboarding of Mildenhall's businesses (Interview council administrator).

Urban Chain is a young company that specialises in facilitating P2P energy exchange between (largely corporate) stakeholders through innovative blockchain technology. It became involved in the Mildenhall pilot as a means to showcase the efficacy of P2P schemes by integrating the

project's renewable energy production and consumption into its 'virtual power plant' network. While the onboarding of Mildenhall businesses did not proceed as planned, the renewable energy generated in the district and through WSC's Toggam solar farm has been fed into Urban Chain's P2P network, resulting in revenues for the council (Interview business representative). One of Urban Chain's corporate clients in West Suffolk is the marketing company Precision Marketing, which recently joined the P2P scheme and started exchanging energy with the council. The company has been an early adopter of renewable energy practices and by 2023 already generates over 42% of its electricity through roof-mounted solar PV, much of which was installed through Suffolk's 'Solar for Business' scheme (Interview business representative).

Absent from participating in WSCs pilot on Mildenhall hub has been the DSO UK Power Networks (UKPN), as it only becomes active for energy projects above 33 kV transmission capacity, while the WSC pilot operates on an 11 kV transmission level. UKPN focuses on building grid capacity and expanding customer flexibility, and it tackles the need for renewable energy by providing low-voltage and green connection options, as well as running its innovation projects. Although UKPN does not actively support distributed energy projects below 33kV, it has begun assisting councils in their energy planning by creating an online database to track local energy consumption and make forecasts based on individual stakeholders' plans for their renewable energy transition (Interview business representative).

4.3 KEY ENABLERS

Piloting infrastructure in place WSC has already acted as a sustainability pioneer prior to the ACCESS project, first through its ability to launch and coordinate ambitious environmental actions together with neighbouring municipalities through Suffolk's Climate Change Partnership and eventually through the launch of its Climate Emergency Plan. This has given the council a significant level of experience and public reputation, as well as strong local networks that contributed to ensuring the success of the Mildenhall project. Unlike the other pilots in ACCESS, WSC was able to draw on technical expertise early on due to the existence of its local 'Knowledge Transfer Network' consisting of various research, development and education partners, such as the local university. The network conducts and shares research, convenes with industrial partners, and occasionally runs innovation competitions, making it an important resource in the design of innovative pilot projects. Also, unlike some other ACCESS pilots, the building and business community in Mildenhall was already in place and did not have to be established from scratch for the pilot, thus more easily ensuring commitment by project participants. Moreover, Suffolk County Council has cultivated strong connections to local third sector organisations, some of which co-chair the 'Collaborative action' section of its climate emergency plan, which offers ample opportunities for sharing the lessons learned in the pilot and promoting the creation of new local energy communities (Interview council administrator).

Looking forward, WSC's involvement in scaled-up P2P exchange via Urban Chain pushes the council ahead of other municipalities in exploring alternative forms of energy provision, further strengthening its pioneer role (Interview business representative).

Political leadership

Another key enabler is the active political leadership by WSC and, to a lesser extent, the national government in supporting renewable energy and distributed production. The UK government introduced binding net-zero emission targets, creating a general pressure towards a sustainable energy transition, while more than 80% of councils have declared climate emergencies and developed their own transition goals even more ambitious than the central government's (Interview business representative). WSC's involvement in the Suffolk Climate Change Partnership and its adoption of a Climate Emergency Plan in 2019 were highly conducive for implementing innovative environmental actions and supporting pilot projects such as Access. WSC also actively uses its planning authority to leverage the development of local buildings, energy, and heating infrastructures supporting local renewable energy (Interview council administrator). Moreover, WSC uses its strategic position in planning to link energy to other portfolios such as jobs and education to ensure that the skills necessary for a local energy transition are available now and in the future. This political leadership is mirrored by a wide societal consensus over the need for a transition towards renewables, which many businesses experience in the form of direct pressure and demands by clients and auditors (Interview business representative).

Funding and financial incentives

Given the beneficial conditions for innovation projects in West Suffolk, the Access pilot did not encounter any difficulties securing sufficient funds. At national level too, the UK's commitment to net-zero is reflected through government funding, for instance in the form of the 'Net Zero Pioneer Places' scheme, which funded innovation projects with renewables in 30 different cities with up to £75k, or the 'Strategic Innovation Fund', which supports innovative projects in general (Interview business representative). In the lead-up to the last general election in 2019, 100 cities also received special government funding, which many of them invested directly into sustainable innovations.

To upscale energy communities and P2P schemes, they can no longer depend on government funding but need to be financially self-sufficient and provide financial benefits for participants. These primarily include income from selling surplus energy and savings from reducing energy consumption. While many local energy communities are run as non-profit enterprises, they too can use additional income for making new investments (Interview council administrator).

Inexperienced actors in a risky energy market

Although funding was not much of a problem in the Mildenhall hub pilot, some of its funding schemes were tied to conflicting conditions and difficult to amend after approval (Interview council administrator). A barrier during the pilot's launch was the project team's initial lack of expertise on local energy communities (LECs), including its limited knowledge of the energy market, making procurement and specification of tenders difficult (Interview business representative). On top of this, skyrocketing energy and gas prices, while being an important motivator for P2P participation, were a constraint on Urban Chain by sending many of its backup suppliers into insolvency. The businesses in Mildenhall also did not place much trust into the new and (at the time) small company and many already had other energy contracts, preventing them from joining the P2P scheme (Interview business representative). Precision Marketing's experience shows that businesses can face significant risks when choosing P2P, as the company was charged exorbitant rates by its former energy provider when its transition to Urban Chain was delayed for a brief period, almost threatening their entire businesses case for switching (Interview business representative). While Precision remains committed to generating renewable energy and engaging in P2P exchange, the inherent novelty of this model creates lingering uncertainties:

> 'We're buying off some absolute pioneers in this area. Is this on safe footing? Will they keep trading through the next year or so with the many commercial challenges they must have, like all energy companies? It's done with an amount of fear. [...] But it just seemed like an outstandingly good opportunity to buy genuinely, so this business can say we run on 100% genuine renewable energy.' (Interview business representative)

The DSO had similar concerns and was also unwilling to invest in any projects beyond their 5-year business plan, which frustrates any potential for long-term transitional planning (Johansson & Mohlin, 2021).

Covid and other stumbling blocks

More so than in the other ACCESS pilots, the impact of Covid-19 and the lockdown restrictions in 2020 presented a significant barrier for advancing the Mildenhall project (Interview council administrator). While there was a generally beneficial shift in favour of more local transition strategies in the UK's public discourse, constraints on movement and face-to-face engagement made it difficult to initiate contact between stakeholders, effectively halting any collaboration with businesses for the duration of the lockdown (Johansson & Mohlin, 2021). On top of this, bureaucratic processes such as an energy audit took significant time to complete as well, all the while halting the production process. Similarly, due to the old historical architecture and off-grid housing in the area, there were limitations to any interventions seeking to improve building insulation and energy efficiency (Interview council administrator).

Inadequate national policy framework

One of the key barriers to the development of LECs in general lies in the UK's implementation of its decentralised approach to energy system transition itself. While the

government's emphasis on a locally driven transition is generally supportive of distributed energy provision, it lacks a strong national legal mandate and centralised funding source to guide this process. Instead, local authorities experience diffuse pressure to deliver solutions and are forced to approach a range of different potential funding sources (with varying conditions and deadlines) and rely increasingly on private investors, resulting in divergent local strategies and uneven outcomes (Interview council administrator). This is exacerbated by the inherently limited power and capacity of local authorities, which lack the regulatory influence and comprehensive data to intervene in energy markets, e.g., to ensure equal access to energy across socio-economic groups? (Interview business representative), as well as the operational resources to upscale innovative renewable energy projects on their own.

This necessitates creating larger local alliances, which can be constrained by stakeholders not trusting one another or key actors, such as landlords, being sceptical about the value of installing PV. Even when private sector partners are willing to collaborate their own agency may be limited, such as in the case of local branches of larger companies, which require (inter)national approval before switching energy providers or installing their own production infrastructure (Interview council administrator).

Altogether, energy innovation projects tend to take a lot of time, both in their initial implementation phase and down the road as lessons and good practices are slowly introduced across the market. Due to the inherent complexity of renewable energy projects, there is also often a risk of mistakes or duplication of tasks, which can further extend the duration of the process (Interview council administrator).

4.5 LESSONS FOR UPSCALING

An important lesson of the WSC pilot has been that renewable transition projects tend to take more time, commitment and stakeholder engagement than anticipated. Initially, the project team lacked the necessary experience and technical and market expertise. To overcome this, the Knowledge Transfer Network provided essential help and should, according to an interviewee, have been consulted even earlier, as should the other potential stakeholders and expert consultants, this would have also helped them gain a much clearer understanding of what the project would ultimately look like (Interview council administrator). At the same time, the project team in WSC found it difficult to determine how sharing experiences with the other Access pilots across countries could be beneficial. Thus, effective transnational collaboration between innovation projects needs to be trained as well, which is likely to become increasingly difficult given the decrease of collaborative research projects between the UK and EU following Brexit (Interview council administrator).

WSC administrators see themselves in a key role for addressing the sustainability challenge, which they do directly through leadership and planning policy, as well as indirectly by promoting renewable energy communication, education, and community support. Private stakeholders also point to local government as an important actor, corralling other actors and working 'between these' as a facilitator and agenda setter despite a lack of local funds (Interview business

representative). Learning from the experiences of innovation projects such as the Mildenhall Access pilot can prove crucial for enhancing their capacities across all these areas. Thus, as an interviewee points out, there is a need to celebrate their successes, promote good practices and share knowledge about their encountered challenges, both between decision-makers and through the media (Interview council administrator).

Municipalities largely rely on the market to drive the upscaling of renewable energy innovations, yet their own involvement as role model and facilitator will likely remain an important factor. Due to the significant differences between local councils, they cannot be expected to have the same beneficial conditions as Suffolk (Interview council administrator), but as WSC proves, developing the reputation and experience as a sustainability pioneer can be a crucial resource in its own right. This requires municipalities to lose some of their risk-averseness and rely not only on autonomous growth and diffusion, but instead support and deepen local partnerships that can guide this transition. Especially private sector partners are primarily interested in cutting costs; thus councils need to make the financial benefits of renewable energy (the 'business case') perfectly clear to them. Depending on their local composition, local energy communities can thus be created as for-profit or not-for-profit enterprises, although most of them tend to be the latter, even when run by businesses (Interview council administrators). Indeed, councillors are cautioned against promising 'non-viable commercial elements that [they] cannot backtrack from' (Interview council administrator) and are incentivised to emphasise the essential, non-commodity nature of energy instead. Thus, community-based energy groups can also play an important role, such as by offering local energy services and handling installation and operational tasks on a non-commercial basis (Interview business representative).

Ultimately, councils require additional funding, a supportive regulatory framework and guidance from the national government to provide them with the necessary capacity to continue supporting the creation and upscaling of renewable energy projects (Interview city administrator). For P2P exchange to reach a significant scale, national government also needs to provide the necessary financial incentives, raise awareness of P2P schemes, and invest in upgrading digital systems for energy data reporting and communication. While DSOs such as UKPN are not particularly interested in P2P schemes at this stage, their own ability to balance the grid depends in part on the success of such alternatives. Thus, as P2P expands in scale, it may become a more important factor for DSOs as well (Interview business representative).

5. GOVERNANCE ANALYSIS: AMERSFOORT (NL)

The ACCESS pilot in Amersfoort consists of smart energy systems in two residential sites, using roof-mounted PV energy production and battery storage, and aiming to introduce P2P energy sharing among households. It seeks to demonstrate the efficacy of smart energy innovations and P2P schemes, as well as explore their potential for upscaling. By keeping energy affordable for its citizens, it also hopes to strengthen its bargaining power towards the DSO.

The pilot's scope expanded over time, as it grew from initially 10 single family houses with heat batteries to include a second site of two large apartment buildings with PV and energy storage. At the same time, several of the participating households already had PV installed when the pilot was launched, which jump-started the project's initial progress but also made it less representative vis-à-vis the wider population.

By early 2023, all the planned infrastructure has been installed and providing the required energy. However, P2P energy exchange has yet to commence, as no stakeholder has been contracted to organise the energy management between households (Interview business representative).

5.1 GOVERNANCE CONTEXT

ENERGY POLICY

The Netherlands is pursuing a national carbon emission reduction goal of 49% by from 1990 to 2030 (and a 95% reduction in 2050) and tasking regions and municipalities with planning their individual contributions towards this target. On the theme of energy, regional energy strategies are intended to facilitate the production of 35 TWh of energy from renewable sources by 2030 (Amersfoort Region, 2021). The Dutch government also introduced a 'National Action Programme on Net Congestion' to tackle its increasing problems with grid imbalances (Netbeheer Nederland et al., 2022). There has been a general shift in the Dutch energy system from a demand-orientation to a supply-orientation, letting existing network capacity determine which demand can be met. Changes to the national 'electricity net code' directly enabled DSOs to pressure companies into putting less strain on the grid. To address this condition, the action programme aims to facilitate greater integration between centralized and decentralized energy provision and envisions actions around three core themes: building fast, flexible capacity, and leading stronger.

Under the theme of 'building fast', the programme aims for government, DSOs and provincial administrations to collaborate on 'regional energy boards' to accelerate grid expansion projects by standardising procedures, optimising investment, intervening in land acquisitions, and strengthening the planning and permit competences of local administrations. Under the theme of 'flexible capacity', the same actors are expected to launch an 'information and education offensive' to raise public awareness, strengthen communication with stakeholders and conduct market consultations. They are also tasked with facilitating the development of decentralised

'energy hubs', particularly in business clusters, and potentially introducing subsidies for actors providing flexible capacity, such as through large-scale storage, delayed feeding, and peak smoothing – thus directly supporting the expansion of local energy communities. Finally, under the theme of 'leading stronger', the programme plans for government, DSOs and the national competition authority ACM to work towards changing regulatory and tariff frameworks to tighten mandatory participation in grid congestion management and enable more flexible and time-bound energy contracts. Among other things, this also involves possibly introducing congestion charges and compensation for grid relief – again directly affecting the financial benefits of smart energy systems (Netbeheer Nederland et al., 2022).

Implementation of these actions is monitored in part by the Dutch Ministry for Climate and Energy and various specialised working groups. The action programme does not provide any direct funding, but there are various new grant mechanisms being developed. The planned actions further strengthen governmental authorities at provincial level, whose authority around questions of high-voltage energy provision and large-scale wind and solar production has already grown in recent years (Interview city administrator). At the same time, the programme consistently emphasises the need for consultation and coordination with municipalities, whose influence on facilitating decentralised energy provision and local energy communities remains crucial (Netbeheer Nederland et al., 2022).

The municipality of Amersfoort first introduced the aim to be carbon neutral by 2030 in its 2008 'Environmental Policy Plan'. Between 2010 and 2015 it primarily focused on upgrading its built infrastructure before conducting various feasibility studies to assess the potential of different renewable energy sources. It also launched an energy saving campaign, supported by EUR 500k in seed funding and a EUR 53k annual budget. Amersfoort's energy strategy was later consolidated through the launch of its 'Amersfoort CO2-Neutraal' programme in 2017, which set up concrete transition pathways and goals for 2030 in the areas of energy, mobility, and heating (Over Morgen B.V., 2019). Together with its neighbouring municipalities, Amersfoort also pursues a wider *regional energy strategy,* which has set the Amersfoort region on course to produce 0.5 TWh of electricity from renewable sources by 2030. To facilitate a transition in electricity, Amersfoort aims to build additional solar PV on roofs, fields and along infrastructure (~165 ha across the whole region), as well as wind farms, smart energy grids and EV charging stations. As the city intends to retain local ownership over half of its large-scale renewable energy production, it also supports the work local energy cooperatives (Amersfoort Region, 2021). In regard to transport, Amersfoort plans to eventually ban fossil fuel vehicles in the inner city and plans to facilitate a transition to EV, e-scooters and bicycles (Over Morgen B.V., 2019). In regard to heating, Amersfoort aims to upgrade building insulation and phase out natural gas in favour of collective heating networks, especially in areas of high demand, and (preferably electric) heat pumps in all other buildings. Determining the relative contribution of heat through renewable electricity, biogas, geo- or aquathermal sources is a matter of ongoing research (City of Amersfoort, 2021).

In practice, Amersfoort collaborates with the local sustainable building consultancy '033 Energie' with whom local businesses and other organisations can strike up 'sustainability deals' to pursue their own transition goals (Over Morgen B.V., 2019). It also works with 'Greenspread' to offer

businesses a reduced price for conducting feasibility studies into solar PV installations (Amersfoort Region, 2021) and offers 'sustainability loans' to residents intending to install solar panels on their roofs (City of Amersfoort, 2020). The city's electric bus fleet has been expanded and the number of EV charging stations rose sharply in 2019 to over 600 (City of Amersfoort, 2020). Through an interactive online map, residents and real estate owners can look up the city's heating strategy for any address, enabling them to plan ahead. By 2020 around 5% of homes were already part of a heating network (City of Amersfoort, 2021), 11% of residential buildings had solar panels installed and 8% of private cars were electric (City of Amersfoort, 2020).

The problem of grid congestion has been a hot button issue within Amersfoort as well, as publicly installed grid infrastructure has been insufficient to meet the growing energy demand. At present, households and companies seeking to open new grid connections are placed on waiting lists (Interview city administrator) and their connections are limited to 80 amperes (Interview business representative). While these conditions could at least be considered beneficial for promoting smart energy solutions, public debate tends to focus on the needs of large industrial users rather than individual households, thus not creating much of an opportunity for initiatives such as the ACCESS pilot (Interview city administrator). To implement the National Action Programme on Net Congestion, Amersfoort's administrators plan to participate in their regional energy board and help accelerate grid expansion, as well as lend support (including subsidies) for companies, business clusters, producers and households to build smart solutions and flexible capacity, thus supporting the expansion of 'energy hubs' / local energy communities (Interview city administrator).

ENERGY GOVERNANCE - ROLE OF LOCAL AUTHORITIES

Amersfoort's environmental policy programme sketches out three possible governance strategies for pursuing a transition towards environmental sustainability, all of which place heavy emphasis on multi-stakeholder collaboration (Over Morgen B.V., 2019). The municipality can either act as 'early adaptor' of sustainable innovations, which enables the fastest possible transition but also requires most funding and dedicated personnel. It could also be a 'fast follower', leaving other stakeholders to implement innovations first and then putting major resources into supporting best practices, which may be successful too, but includes a higher risk of failure. Alternatively, its current business-as-usual approach is characterised as fostering a 'late majority' by only gradually adopting innovations after their effectiveness has been proven, which is considered too slow for a sustainable transition. In any case, the plan calculates that a successful transition requires at least 5 to 10 fulltime employees working towards communicating, marketing, managing and organising sustainable transitions, instead of the current 1.5. The plan also distinguishes between two streams of stakeholders. An 'upper stream', consisting of the municipality itself, housing companies, net operators, large property owners and neighbourhood initiatives, all need to foster a sustainable transition at scale and communicate with citizens. A 'lower stream' of local communities, households, and small enterprises still need to be motivated to contribute, for instance by being encouraged to participate in energy hubs and other innovation projects, such as the ACCESS pilot.

By running these small renewable energy innovation projects, Amersfoort is actively pursuing an 'early adopter' approach. The aim is to trial new practices and identify their challenges and lessons, before relying on the market and DSO to drive upscaling. Lessons are also intended to inform new city development projects in Amersfoort and be shared with other municipalities, for instance in the form of a guidebook. Additionally, pilot lessons are also expected to feed into potential changes in local building codes, for instance regarding battery storage, as well as changes in energy policy. Especially the latter require efforts to publicly promote pilot innovations and engage in lobbying at higher political levels. In any case, pilot lessons are intended to incentivise change at scale without requiring local administrations to oversee the upscaling process themselves. As one city administrator explains:

> So, this is mostly what we do. We coordinate, we start up, we subsidise, or we try using rules to make things happen, but we're not really doing it ourselves mostly. (Interview city administrator)

That said, the role of municipalities in the Netherlands is currently undergoing a process of reappraisal due to the increasing demand for municipal intervention for tackling grid congestion. The ACCESS pilot contributes to this reappraisal, as the city team's central role in managing the project, their relatively equal collaboration with a private partner, and their responsibility for procuring the technical equipment all represent entirely new tasks for the local administration, thus functioning as a trial in their own right (Interview city administrator).

5.2 GOVERNANCE AND STAKEHOLDERS INVOLVED IN THE PILOT

The pilot in Amersfoort is steered by a designated 'sustainability project manager' from the municipality, who collaborated on relatively equal footing with the companies 'Energie van Nu' (also known as 'Klimaatmissie') on one of the two pilot sites and 'Starke Energie' (later replaced by 'Bax & Co.') on the other, as well as the housing corporation 'de Alliantie' which owns both apartment buildings.

The project manager has been in charge of coordinating the involvement of stakeholders and procuring equipment from various suppliers, the latter being an entirely novel task for a city administrator in Amersfoort. The project manager also engaged in exchange with the municipality's 'energy team', which is tasked with eventually scaling up the lessons and good practices from pilot projects. There was also occasional exchange with other municipal departments, such as legal and finances, but interaction with these departments came relatively late and was intermittent (Interview city administrator). Amersfoort's college of 'aldermen' (local politicians) had to approve the decision to fund the project and one alderman, specialised in working on the energy transition, remained affiliated with the project and provided input to the direction of the work (Interview city administrator).

15Energie van Nu and Starke Energie acted as system integrators in their respective pilots, helping to coordinate communication between municipality and the various stakeholders and organizing the technical installation. In the first pilot, Energie van Nu collaborated with the homeowners and the company Bloemendal Bouw which provided and installed the heat batteries. In the second pilot, Starke Energie worked with the engineering company 'BAAS', which

installed the battery, de Alliantie, which prepared space for installing the equipment within the buildings and communicated with residents, and Petawatts, which steered the battery software (Interviews business representatives). In the medium- to long-term, de Alliantie will continue running the smart energy system for the building (Interview city administrator).

As in other ACCESS pilots, the regional DSO 'Stedin'[1] did not become involved in the project throughout most of its running time, due to its inherent preference for large energy storage and grid capacity solutions over small local projects (Interview business representative). However, at the time of writing, it has begun working with the project team to look over the pilot lessons, demonstrating an interest in local energy projects.

5.3 KEY ENABLERS

Learning from pilots

Despite some challenges in relation to Amersfoort's Access pilot outlined below, the potential of the local administration to play a proactive role in steering innovation projects is generally considered to be a strength. Municipalities are seen as ideally placed to take the initiative in transformative projects due to their ability to take risks and coordinate the involvement of other stakeholders. Steering pilot projects such as Access enables them to adopt this role and directly contribute to the local renewable energy transition (Interviews, city and business representatives). Looking towards upscaling, however, stakeholders such as Energie van Nu consider the private sector to be better suited for operational tasks, while underlining the need for municipalities to focus primarily on legal and policy concerns (Interview business representative). For their part, the involvement of companies such as Energie van Nu and Bax & Co. contributed to the project's level of expertise, which provided an important driver and resource. Some of the insights shared between international knowledge partners across the Access project were deemed helpful as well (Interview city administrator). Engaging in and learning from pilots such as the Access pilots is therefore considered an important enabler for local energy innovation. Amersfoort's new progressive government has placed a heavier emphasis on climate mitigation, thus raising the prospects for integrating the innovations and insights from such plot projects into future activities.

[1] Stedin is a private company but strictly regulated by the Dutch competition authority ACM's 'Energiekammer' because of its monopoly status. ACM sets the rates at which Stedin can cover its grid management costs and turn a profit. Since 2018 it is also designated as a 'provider of essential services', thus having to comply with rigorous reporting and digital security obligations.

Grid congestion provides an opportunity

At the national level, the pressing issue of grid congestion only adds to the urgency of supporting a renewable energy transition, thus increasing the need for, and receptiveness to, energy innovation. This is particularly evident in the emphasis on energy hubs in the National Action Programme on Net Congestion, which creates important opportunities for local energy communities in particular. The pilot team therefore sees potential in practices such as peer-to-peer energy sharing and smart charging, especially towards addressing uneven access to electricity, although they harbour some scepticism about the scalability (see barriers section) (Interview city administrator). In regard to upscaling, networks such as GOPACS, an initiative by the Dutch grid operators to mitigate grid congestion. are enabling numerous companies to coordinate their renewable energy production and grid feeding activities, thus allowing smaller producers to combine their contributions to balancing the grid. While individual small energy communities may not attract the support of DSOs, these collaborative initiatives can thus more easily prove their effectiveness and potentially build a bridge beyond the local level (Interview business representative).

5.4 KEY BARRIERS

Lack of know how

The ACCESS pilot encountered a number of challenges also seen in other innovation projects, such as a lack of time, funding and expertise. The team's lack of experience and technical know-how led to difficulties in procurement. The decision to have the municipality pay for the batteries while leaving the purchase of inverters to de Alliantie created unforeseen additional costs for the latter (Interview business representative).

A rather unique challenge was the municipality's strong sense of risk aversion due to its relative lack of experience in project management related to energy projects. This was reflected in its initial refusal to involve the private company Energie van Nu, with the argument that this would be an unfair privilege. This deprived the project team of much-needed resources, limiting the pilot's progress during much of its early phase (Rydberg & Johansson, 2021).

Legal and policy constraints

The pilot also encountered legal difficulties, brought about by the municipality's deep involvement. As a public authority, it was not entitled to collect participants' personal energy data, which limited the project's ability to enable energy sharing between households – a barrier that a private company could easily avoid. As a result, the project's intended P2P scheme has yet to be implemented. These barriers, combined with disruptions to inhabitants caused by installing the battery systems, have led the project team to conclude that a reliance on citizen participation and household energy sharing in smart energy systems is highly unlikely to be

scalable (Interview city administrator). Similarly, Dutch law required the municipality to create open tenders for its contracts with other partners, causing delays in the procurement process. A private company would not be subject to such requirements (Interview business representative).

Smart energy solutions also face more general policy barriers, similar to other ACCESS pilots, as the Dutch energy taxation system penalises P2P sharing, while financial incentives for energy storage and grid balancing are too imprecise, being calculated based on the annual difference between energy consumption and grid feeding, which disregards fluctuations in price and net congestion entirely (Interview business representative).

Complex decision-making

Project partners also experienced the communication between different stakeholders as slow and inefficient, as every decision had to be approved and budgeted by multiple actors. Relatively minor challenges, such as the search for a suitable location for battery installation, therefore incurred several delays. Since most installations and tasks tied to the pilot's smart grid system were spread across multiple contractors, partners also raise the concern that some of these challenges may persist and decrease the system's ability for responding to acute problems (Interview business representative).

5.5 LESSONS FOR UPSCALING

A lesson from the pilot in Amersfoort has been the experience that municipalities can be too closely involved in running energy innovation projects, both due to the legal difficulties this created and the risk of causing disagreements with other stakeholders. This experience appears to be unique to the Dutch governance setting. The pilot team thus considers it advisable for local administrations in the Netherlands to delegate more actively, invite external consultants, and involve the support of several departments, such as finance and law, to address budgetary and legal questions as early as possible (Interview city administrator). Conversely, some of the project's private partners suggest concentrating external responsibilities in fewer companies to shorten coordination time and avoid misalignment in technical equipment (Interview business representative). As multiple respondents highlight, providing the technical equipment for smart energy systems itself is relatively easy, but organising collaboration between multiple stakeholders can present a considerable challenge (Interview city administrator). This points towards a key role for 'entrepreneurs' (such as Energie van Nu and Starke Energie in the case of the Access pilot) who can develop holistic plans for implementing the transition plans (Interview business representative).

Looking to the long-term renewable energy transition, the project team considers it essential for innovation projects to present a clear business case to incentivise upscaling among market actors. They also need to accurately assess their own impact and potential and share their lessons and success stories in a way that can guide policymakers in setting the priorities for future energy transitions (Interview city administrator). While the role of local administrations still needs to be determined, they are seen by some as key actors not only for running innovation

projects, but also for convening with the multitude of stakeholders necessary to collaborate on upscaling, notably the DSO and housing corporations. Some private project partners also flag the potential for considering mobile plug-and-play solutions using city-wide vehicle-to-grid charging rather than static batteries, which is already being launched in Utrecht, and which also holds potential for DSO involvement. Supporting any of these solutions necessarily also requires changes in national policy and electricity pricing, as well as targeted subsidies, to incentivise energy storage and grid feeding (Interview business representative). Lowering energy taxes for renewable energy production is one concrete possibility cited by respondents. Requiring the possibility for flexible solutions and open standards in energy contracts between end users, suppliers and operators is another (Interview business representative). Given that the National Action Programme on Grid Congestion itself has drawn heavily on lessons from trial projects in several Dutch cities (Netbeheer Nederland et al., 2022), the potential for such pilot projects to affect significant policy change seems relatively high.

6. GOVERNANCE ANALYSIS: MALMÖ (SE)

The ACCESS pilot in Malmö consists of a mobility hub in 'Sege Park', an area where the City of Malmö seeks to demonstrate sustainable urban redevelopment. The mobility hub involves a parking garage, sustainably built from wood, and fitted with smart EV charging infrastructure, powered by PV installation on the roof and installation of a battery. The aim is to enable battery storage and reduce electricity imbalances in the local grid.

The pilot's scope was amended over the course of its development, as the Malmö project team decided to scrap plans for additional hydrogen storage. Building a wooden construction was a later addition as well, which became an important point of innovation itself. By running the pilot, the project team gained considerable new experience, especially around public procurement, as well as through the international exchange through ACCESS.

In the long run, the pilot seeks to engage in collaboration with the DSO and focus more strongly on benefitting end users, thereby becoming an energy asset to nearby Sege Park and to the rest of Malmö. Its demonstrable climate benefits are intended to encourage replication and turn renewable transportation into a standard practice.

6.1 GOVERNANCE CONTEXT

ENERGY POLICY

Sweden is considered a global leader in the transition to renewable energy. It tops the World Economic Forum's Energy Transition Index, drawing well over 50% of its energy consumption from renewable sources (Kretchmer, 2020). The country's 'Climate Policy Action Plan' aims at 100% renewable electricity production by 2040 and net-zero emissions by 2045. However, these goals are considered in jeopardy due to the election of a new right-wing government in 2022, whose shift in priorities is set to increase greenhouse gas emissions in the near future (Klimatpolitiska Rådet, 2023). Notwithstanding this change in national governance, Swedish cities continue playing a major role in facilitating the renewable energy transition. 23 municipalities, including the country's biggest cities Stockholm, Göteborg, and Malmö, have signed on to the 'Climate Neutral Cities 2030' initiative, committing themselves to achieve climate neutrality by 2030 and signing 'climate city contracts' that outline concrete individual contributions they intend to make towards this goal (Viable Cities, 2020).

To facilitate a transition towards renewable energy, Malmö pursues an 'Energistrategi' for the years 2022 to 2030 (Malmö Stad, 2020). Its main goals are to create a long-term secure and sustainable energy system, supply the city 100% with renewables, and reduce carbon emissions by 70% (baseline 1990) in the region and net zero in the city. In addition to the transition to renewables, the strategy addresses the challenge of meeting Malmö's energy demand. The city has experienced increasing risks of electricity shortages in recent years, and while household energy demand is gradually decreasing, demand for energy in the transport and mobility sector has remained constant. This challenge is closely tied to Malmö's relative lack of energy

sovereignty. While all heating is locally produced, two thirds of the city's electricity is imported from outside the region and only 10% of municipal power needs are met by renewables. The city's formerly public heating and electricity networks are owned by the company E.ON, while the company Weum owns its gas network. This makes the city's energy supply relatively vulnerable to price fluctuation and dependent on non-municipal actors.

As the energy strategy summarises, 'the municipality has a responsibility to work for a safe and sufficient energy supply' (Malmö Stad, 2020). To build a secure electricity system, the strategy requires stakeholders to contribute to increased local and regional RE production, which the city's energy system must be adapted for, while municipal operations contribute to increased flexibility. To make the energy supply and built environment resource-efficient and climate-neutral, the strategy plans to reduce energy consumption across businesses, households and buildings, optimise different energy uses, and produce renewable fuels and solar PV locally. It also aims to reduce fossil energy use in transport, including by shifting municipally operated vehicles to renewable and energy efficient alternatives.

ENERGY GOVERNANCE - ROLE OF LOCAL AUTHORITIES

Malmö's municipality is relatively decentralized, and many tasks are delegated across departments. Its Environmental Department is further divided into several strategic sections and sub-sections. Energy and heating, for instance, represent two key sections working on the climate transition process, which also have substantial overlap in personnel (Interview city administrator). The main task of the energy section is to work out how to reach the city's environmental goals, as outlined in the city's 'Energistrategi'. This includes cross-departmental collaboration, primarily with the departments of building, planning and land (Interview city administrator). This collaboration has been intensified through Malmö's recent shift towards a 'mission-based' approach[2]. Instead of letting each department pursue its own targets and actions, the city now works across 12 policy focus areas, half of which are centred on transitional themes of sustainable heating, mobility, consumption, construction, the circular economy, and electricity. Each theme is led by a steering group of city officials from different departments, as well as some external stakeholders, and contains specialized working groups and coordinators tasked with involving additional actors (Interview city administrator)

Malmö's 'Energistrategi' gives its local administration a strong mandate to pursue a transition towards renewables. It is characterized by a holistic system perspective that incorporates themes of energy efficiency, circularity, social commitment and justice, as well as digitization and learning. To put the strategy into practice, the municipality is expected to take on distinct

[2] Although not explicitly mentioned by city adminstrators, this approach seems directly inspired by the European Commission's recent promotion of 'mission-oriented' R&I policy-making, which also involves public-private co-production, coordination across silos, and citizen involvement (Mazzucato, 2019).

leadership and coordination functions. Having little direct influence on the city's energy system after its privatisation, it is primarily seen as a 'forerunner' that adopts innovative practices early, as a 'planner' that influences the development of Malmö's built environment and land use, and as a 'community actor' who connects businesses, associations, and residents, and raises awareness. A planning board has been established to regularly evaluate and adjust the strategy and its actions (Malmö Stad, 2020).

Concretely, the energy strategy directs the municipality towards investing in renewable energy and fuel production, storage and trading, to plan for the additional power demand, facilitate the building of energy-efficient housing and renewable transport systems, and promote ways to reduce energy consumption. As a forerunner, Malmö aims to purchase all of its energy from renewable sources, run an EV fleet, invest in measures and flexibility services such as energy storage, smart control and power trading, and design buildings for flexible and efficient energy use. As planning authority, the municipality steers city development towards building RE capacity, such as by incentivizing builders to adhere to high climate and energy ambitions and making EV charging infrastructure more widely accessible. As community actor, it collaborates with businesses, academia, civil society and residents to generate and disseminate knowledge about energy needs, technologies and assessments, in order to promote the development and expansion of renewable energy. The strategy's implementation is regularly evaluated by the city's planning board (Malmö Stad, 2020).

Given a limited municipal budget Malmö does not conduct major renewable energy investments by itself but relies on municipally owned companies (such as Parkering Malmö) and partnerships with E.ON and other private businesses. As in the case of many other municipalities, local administrators see one of their key responsibilities in supporting innovation projects, such as the one near Sege Park, to pilot sustainable solutions. This support can target all stages of the projects, from selecting proposals for approval by local politicians and helping write funding applications, to steering the project groups and facilitating collaboration with external stakeholders, and finally promoting the projects' outcomes and sharing lessons. Administrators often also need to raise awareness of projects within the local community to ease potential concerns, such as in the case of thermal heating, whose drilling can cause minor earthquakes (Interview city administrator). Conducting such trial-and-error projects is crucial for identifying the needs and challenges of implementing sustainable innovations, which helps ensure their successful upscaling. It also enables the city to gather and consolidate the generated knowledge, making it easier to share with other stakeholders and utilize for future projects (Malmö Stad, 2020). The municipality's extensive involvement in these projects furthermore enables local administrators to test out and reflect on their own ideal role in the long-term energy transition process (Interview city administrator). Especially projects such as Sege Park, constructed primarily by a municipally owned company, allow the city to act as direct investor (Interview city administrator).

Yet, small pilot projects alone do not necessarily trigger the upscaling of innovations, nor can they account for their widespread and effective adoption. Thus, the city of Malmö also creates 'pilot areas' to study the effects of innovations within certain urban contexts, thus accounting for socioeconomic differences between populations. Generating such macro-level socioeconomic

data can enable the city to, for instance, offer direct advice and (digital) performance tracking to property owners, thus directly influencing the uptake of innovative practices to reduce building emissions (Interview city administrator).

To involve local businesses in the business of Malmö's renewable energy transition, the city has created the 'Local roadmap for a climate-neutral building and construction sector in Malmö 2030' (LFM30). As Sweden's national sustainability targets are not binding, this initiative was launched as a voluntary agreement to make Malmö's building construction fully climate neutral by 2030 and climate-positive by 2035 (Interview city administrator). 215 businesses have signed up to date, pledging to halve their current climate impact and start at least one climate-neutral construction project by 2025 (LFM30, 2023). In addition to the common targets, LFM30 organises its participants in six working groups around the themes such as business models, circular economy, climate calculation, building materials, management, as well as construction sites and transport, thus facilitating a joint learning and development process (Interview city administrator). Malmö also collaborates extensively with the DSO E.ON. Since its privatisation in 1991, E.ON has held an effective monopoly and major financial resources within the energy and heating systems in Southern Sweden, making it an essential stakeholder for any of Malmö's planned actions towards a renewable energy transition (Interview city administrator). Yet, as is typical for DSOs, E.ON's main focus has been on building grid capacity and offering flexible solutions to users, while remaining relatively disinterested in innovations around decentralized small-scale energy solutions (Interview city administrator).

6.2 GOVERNANCE AND STAKEHOLDERS INVOLVED IN THE PILOT

Local administrators from Malmö's Environmental Department have steered the pilot in close collaboration with the municipally owned parking company 'Parkering Malmö'. Both were in charge of planning the project and bringing in other stakeholders and suppliers.

As the official company in charge of Malmö's parking infrastructure, Parkering Malmö's chief motivation was a desire to upgrade its new and underused buildings by investing extensively in scalable energy innovations. The company's highly ambitious CEO (Interview business representative) sought to make the pilot's innovative potential as holistic as possible, contributing to its unique integration of PV installation, energy sharing, and wooden building construction. The project also closely communicated with the municipal housing company MKB, whose tenants in Sege Park would be the core users of the garage. Thus, the Malmö pilot has been characterized by extensive involvement of municipally owned companies.

To deliver on the objectives of the pilot, city administrators and Parkering Malmö procured the services of various suppliers. Parkering Malmö itself was in charge of constructing the wooden parking garage in collaboration with the architectural firm 'Lloyd's Arkitektkontor'. The company 'Assemblin' installed the electricity infrastructure within the building, while the energy hub company 'Ferroamp' delivered and installed the battery system, and the company Eways provided vehicle charging stations.

In contrast, the DSO E.ON has not been involved in the pilot at Sege Park, despite being an official partner in other city projects. The DSO has shown little interest in supporting the spread of distributed energy provision and peer-to-peer schemes in general (Interview city administrator). Given its central position, many project participants underline the need to involve E.ON in connecting and upscaling renewable energy innovations, for instance through policy interventions that could incentivize the company to move beyond its traditional role as grid developer and operator (Interview business representative).

6.3 KEY ENABLERS

Experience in piloting sustainable innovation

One of the key enablers in the pilot project at Sege Park has been Malmö's ambitious environmental strategy and supportive stance towards renewable energy. Indeed, the rapidly fluctuating energy prices of recent years have made the financial benefits of batteries (and of investing into new battery technologies) increasingly apparent. Additionally, public opinion in Sweden is gradually turning against the monopoly position of DSOs such as E.ON, providing an important window of opportunity for local energy solutions in general. In this context, Malmö is ideally positioned to develop new innovation projects and attract investment by actors interested in scaling up those innovations, as the city has developed a reputation as being a pioneer of sustainable solutions (Interview business representative). Moreover, the pilot's piecemeal construction process – at the time experienced as a shortcoming – proved to be beneficial because the full cost of the project emerged over time, which facilitated continued city approval (Interview business representative).

In the long-term, the lessons generated by Malmös pilot projects themselves act as enablers of a larger scale renewable energy transition. Pilot projects not only develop and spotlight innovative practices but can also teach local administrators and other stakeholders to develop effective collaborative practices, not least by helping business gain trust in local administrations. While pilots themselves often benefit from legal exceptions, they help identify gaps in legislation and thus inform changes in policy. The Sege Park project, for instance, highlighted legal uncertainties around wooden building construction. Since the city has the planning authority over new development projects, it can also use pilot lessons to steer new construction towards implementing renewable energy solutions. To help ensure this impact, pilot lessons need to be clearly communicated and shared (Interview city administrators).

Collaboration across municipal organisations

The Sege Park pilot also benefitted from the collaboration between the city administration and Parkering Malmö, as well as their close alignment on the need to develop scalable solutions.

This emphasis on cross-departmental collaboration and learning represents a key enabler for facilitating the long-term upscaling of pilot innovations and lessons. Through the city's new

missions-based approach several departments share responsibility for contributing to the energy transition, thus ensuring collaboration between, for instance, the environmental and building department. Lessons from pilot projects are thereby more easily shared across departments, thus avoiding the concentration of knowledge in single resorts (or individuals) and ensuring that insights can directly feed into new and larger projects (Interview city administrator). This is already evident in Parkering Malmö's plans to use batteries in additional parking buildings, or the department for municipal building developing an interest in smart energy solutions (Interview city administrator). Beyond the city level, knowledge is also actively shared across Sweden via the 'Viable Cities' platform, and in the case of the Sege Park also internationally between ACCESS project partners themselves (Interview city administrator).

6.4 KEY BARRIERS

Legal, technical and knowledge constraints

The Sege Park pilot ran into a number of challenges over the course of its development. It experienced significant delays, partly due to requirements of Swedish tendering law and other difficulties in procurement, which involved contracting 13 individual suppliers for different components of the project. While it is not uncommon for innovation projects to rely on separate contracts, this left all responsibility for ensuring the technical fit between equipment parts with the project team of city administrators and Parkering Malmö. As the team lacked the necessary technical expertise to meet this challenge, it encountered various misunderstandings with its suppliers, resulting in the purchase of inadequate equipment that had to be changed later. Certain planned elements, such as the use of hydrogen, had to be scrapped entirely due to resistance from fire safety consultants. During the project, Parkering Malmö's highly ambitious and supportive CEO also left the company and took a large share of personnel with him, further reducing in-house expertise and inhibiting knowledge retention beyond the pilot. By the time of the project's official conclusion, the peer-to-peer scheme has not been operational, as the technology remains affected by 'children's diseases' such as software errors (Interview business representative).

At the city level, there have been barriers to innovation in Malmö's planning policy, which require time and effort to change. This concerns, for instance, legal restrictions on altering culturally protected buildings, which lower the potential for installing PV and reducing building emissions. Sweden's new right-wing government, inaugurated in 2022, also phased out subsidies in support of energy efficiency in apartments, exacerbating this problem (Interview city administrator).

Lack of engagement from energy actors

As mentioned there has also been a lack of engagement from the main network operator (E.ON). While energy provision is facilitated by municipal companies in other areas in Sweden, E.ON's monopoly position in Southern Sweden confronts local administrators with the need to reconcile their planning with the company's profit interests, creating challenges for upscaling local

production projects and peer-to-peer schemes (Interview city administrator). Furthermore, local energy communities are relatively scarce in Malmö, lowering the potential for building grassroots, bottom-up alternatives (Interview city administrator).

Funding

Funding has also been a challenge. Notwithstanding Malmö's mission-based approach, the budget for environmental administration has been relatively sparse, creating additional pressure for pilot projects to save costs and offer financial benefits. Project funding tends to be relatively short-term and tied to differing conditions, resulting in many pilot projects having to address a patchwork of priorities. At the same time, the inherent costs, risks, and lack of legal clarity around highly innovative practices threaten their wider adoption by private actors unless pilots can definitively prove their business case (Interview business representative). Problematically, in the case of various smart energy services, such as energy storing, feeding to the grid, or engaging in peer-to-peer sharing, this business case simply does not exist yet without the right level of financial compensation (Interview city administrator).

6.5 LESSONS FOR UPSCALING

A key lesson for the Sege Park project team is to become more deeply involved in the technical design of future renewable energy innovation projects by developing more in-house expertise within the city's departments and demanding proof of expert knowledge from suppliers and consultants. This would also involve drafting procurement tenders in a way that specifies the desired outcome and sustainability goal, rather than a (potentially ill-chosen) instrument. To develop this level of expertise, the team considers engaging with market actors and technology providers before designing tenders (Johansson & Mohlin, 2021). After relying on numerous different contractors in Sege Park, the team also considers it potentially more beneficial to strike up public-private partnerships with single companies in the future, allowing them to hold their partners more accountable (Interview business representative).

Looking towards the future of renewable energy in Malmö, city officials point towards the need for more local energy production, as only one fifth of Southern Sweden's demand in renewable energy is met by regional production (Interview city administrator). Coordinators of the Sege Park project underline the essential need for 'master plan' documents, including an updated energy strategy and climate contracts. They also wish to see more EV parking and sustainable solutions incorporated in buildings across the city. For either of these to come to fruition, local administrators, Parkering Malmö, building companies, and E.ON would need to coordinate their efforts and develop reliable business models to prove the economic benefits. For its part, Parkering Malmö expects to play a central role in upscaling renewable energy alternatives, for which it requires the collaboration of other actors such as the city's municipal building department (Interview business representative). Some city administrators underline this relevance of municipally owned companies, suggesting that municipal energy companies elsewhere in Sweden are more oriented towards the common good than the profit driven orientation of private companies such as E.ON (Interview city administrator).

To facilitate a transition to renewable energy at scale, several respondents emphasise the essential need for broader coalitions and more long-term collaboration between the various aforementioned stakeholders (Interview city administrator). As one city administrator notes, local energy communities alone cannot contribute much to this transition:

> I've done a bit of work with energy communities and the conclusions that we draw from that work was that it wasn't the largest factor for the energy transition as a whole. It was more the other values connected to community-driven solutions, such as empowerment and energy democracy. But it doesn't really have a large influence on the energy transition as a whole, because that's driven by much larger investments and those are made by large companies, whether they are publicly owned or privately owned. (Interview city administrator)

As pilot projects, however, such energy communities can spotlight innovations and incentivize municipal and private companies to follow suit (Interview business representative), as well as develop important insights that can feed into changes to policies or building codes by presenting politicians with data, success stories, and highlighting the potential impacts of new approaches. As explained above, this requires sharing the pilots' lessons across sectors and enabling other interested stakeholders to assess their outcomes (Interview city administrator). One obvious policy change necessary for upscaling smart energy solutions is to connect them to financial incentives, such as compensation for energy storage or feeding back into the grid (Interview city administrator).

Local authorities are expected to continue playing a crucial role in launching and running such innovation projects and sharing their lessons. Even if market actors are responsible for the 'heavy lifting' of upscaling innovative practices, they still benefit from receiving clear municipal guidance (Interview city administrator). Local authorities also have the capacity to focus on the social dimension of the energy transition, rather than only the financial benefits, thus adding a crucial perspective and ensuring social cohesion (Interview city administrator). To be able to play this important role, authorities require not only more funding and capacity, but also access to more comprehensive socioeconomic data, external expertise and opportunities to engage in mutual dialogue with their local communities (Interview city administrator).

7. GOVERNANCE ANALYSIS: MECHELEN (BE)

The ACCESS pilot project in Mechelen consists of a local energy community and mobility hub 'Keerdok', using roof-mounted PV on a local parking centre. The pilot's aim is to integrate low-carbon mobility with a local smart grid, thus enhancing the generation and flexibility of PV. It is part of a larger city renewal effort to move car traffic and parking from the city centre to the semi-periphery (Interview government official).

The project's overall scope was revised after a feasibility study found that the planned PV installation could not deliver the necessary energy for the already constructed parking lot, thus requiring the construction of additional PV and charging stations (Johansson & Mohlin, 2021). The number of involved stakeholders also grew over time and the building and energy sharing scheme eventually included the company 'VOKA', whose offices are located on the top floor, and the supermarket 'Louis Delhaize' on the ground floor (Interview business representative).

Pilot experiences are expected to benefit other concurrent and follow-up projects, including a larger smart charging project in the nearby area, as well as the 'Nekker Nova' urban renewal project (Interview government official). From 2026 onward, only energy-efficient company vehicles will be fully tax deductible, which is expected to sharply increase demand for such smart charging projects (Johansson & Mohlin, 2021). In the long-term, the pilot aims to contribute to developing alternative energy transition pathways and urban investment planning.

7.1 GOVERNANCE CONTEXT

ENERGY POLICY

The city of Mechelen pursued sustainable climate policies since 2013, when it introduced a Sustainable Energy Plan and began conducting biennial emission inventories. In 2018, Mechelen joined the EU's Covenant of Mayors, obliging it to reduce its carbon emissions by 40% until 2030 and 85% to 2050. This is mirrored by the 'Flemish Climate Plan 2021-2030', which obliges local authorities to realize an annual reduction of 2.09% starting in 2019.

To put these goals into practice, Mechelen introduced a 'Klimaatactieplan' (climate action plan), employed a full-time climate programme coordinator to oversee it and established an 'action group climate' and 'climate policy group' to develop interventions. It also dedicated additional budget to improve city officials' expertise on sustainability, develop guidelines for a more sustainable public sector, and organise public awareness campaigns around the upcoming climate actions. Workshops were organized with citizens and experts, which underlined the public's interest in a green local circular economy, ecotourism, and high quality of life. Meanwhile, the city conducted a risk and vulnerability assessment, which pointed towards future risks of heat, drought and flooding which needed to be tackled. Based on citizen suggestions and anticipated risks, a range of actions were planned to be rolled out and assessed over the following years (Stad Mechelen, 2020).

Planned actions revolve around four key themes, including 'Clean Air'. Under this theme, Mechelen mobilises over €40m to reduce carbon emissions and improve air quality through urban renewal projects, which include renovating Mechelen's built infrastructure and facilitating a mobility transition (Stad Mechelen, 2020).

ENERGY GOVERNANCE - ROLE OF LOCAL AUTHORITIES

Implementation of Mechelen's climate action plan is facilitated by the city's climate programme coordinator and a 'Team Climate' of ~6 people who work together to push for further environmental ambitions at both the strategic and operational level, and report on progress and achievements. Their work focuses predominantly on climate mitigation tasks, while other colleagues in the public sector domain work around climate adaptation and building the circular economy. The team primarily works by creating coalitions and delegating tasks across multiple departments and involving a range of stakeholders. They also offer public advice to private households to aid them in their energy transition, as this service would not be profitable enough for market actors (Interview city administrator).

The Keerdok pilot project is firmly embedded in both the mobility transition and building emission reduction objectives of the 'Clean Air' theme (Interview government official). In this area, a 'Restart Mechelen' city development team works on reducing emissions in Mechelen's built environment, including through geothermal and wastewater heating, as well as strengthening green mobility, such as by reducing car parking and investing in carbon-neutral alternatives. The team's work involves, in part, organizing the provision of public space and sale of public property to create renewable energy and mobility projects, such as the Keerdok mobility hub (Interview city administrator). As the project coordinator of the urban development project Keerdok stated, this work primarily involves organizing and coordinating the participation of different city departments and private sector stakeholders:

> I'm just the coordinator. In a perfect world, I don't have any work to do because everything is coordinated and everybody's picking up the things. The reality is something totally different. But in fact, our city development team works with all the other teams in the city. And our role is to bring together all those aspects and interaction within them and within, during the project as such. So that's our role to get everybody together and by bringing people together, ending up with a better project than when we do it all separately. (Interview city administrator)

In 2019, Mechelen's emission inventory found that recent reductions had been insufficient to follow the climate action plan and further measures were necessary. Around 39% of emissions were generated by private households, 26% by the third sector, 21% by transport and mobility, 12% by industry and 1% by the municipality. On the other hand, the use of energy-efficient vehicles has increased, making Mechelen the Flemish city with the most electric charging points per capita, with a high percentage of carsharing possibilities and the winner of the 'European Green Leaf Award 2020' for being a sustainability pioneer (Stad Mechelen, 2020).

This pioneer status has been embraced by the city's government, which considers sustainability and renewable energy key factors in the city's PR strategy. Mechelen is also regularly tasked by

the Flemish government with trialling new practices due to the city's ideal size for studying the effects of urban development strategies (Interview government official). Thus, city officials and administrators routinely contribute to running innovative pilot projects, often as coordinators facilitating collaboration between different stakeholders. Due to the inherent uncertainty of such projects, local authorities consider it their task as 'frontrunners' to test new practices at small scale and utilise lessons for both upscaling and potential policy changes (Interview city administrator).

Mechelen's college of aldermen is in charge of approving the ongoing funding for such innovation projects and specific aldermen have a say in guiding the direction of pilots in their policy area. After the successful conclusion of a pilot project, those aldermen will also promote the findings and best practices through public engagement and exchange with other cities. They also occasionally draw on pilot lessons to advocate for policy change, for instance by communicating with the Flemish Minister of Mobility. Since Mechelen is governed by the same party coalition as Flanders, political communication pathways between the two levels are short and efficient (Interview government official).

7.2 GOVERNANCE AND STAKEHOLDER INVOLVEMENT IN THE PILOT

The development of the Keerdok building is organised as a public-private partnership, involving a core team of city administrators, the real estate company 'Triginta' and the project developers group. The Access pilot (smart charging infrastrcuture and energy management system) was developed by a team which involved the project coordinators of the city, Ingenium as expert engineers and Energytix who invested and will operate the charging infra in the following years.

In addition to local administrators, the pilot steering group also included Mechelen's alderman for mobility, civil rights and animal welfare, who approved its initial funding and subsequent additional expenses, such as for the services of an external consultant, and in return received regular project updates. On occasion, other aldermen and the city's mayor would also join the steering group to address particular strategic questions (Interview government official).

The real estate company Triginta bought the site of the Keerdok building, collaborated with the city, architects and engineers to plan and construct the parking building, collaborated with the company Energytix to install the renewable energy infrastructure, and rented out the top floor office space to private companies VOKA and Louis Delhaize. As a company, Triginta specializes in investigating in future-proofing buildings with high social value, rather than focusing specifically on renewable energy production. Thus, Triginta's interest in Keerdok has been rooted less in the element of energy production or sharing, but instead in the project's long-term durability, as the Keerdok building is designed to gradually transform its parking area into office space over the coming decades (Interview business representative).

A stakeholder that has not been as deeply involved as the project team hoped for is the DSO 'Fluvius', which holds a monopoly over Mechelen's energy and gas networks and, as elsewhere, is concerned about losing that central position (Interview city administrator). The project was

eventually able to make use of Fluvius's energy grid to enable VOKA and Louis Delhaize to participate in the Keerdok project's EV energy sharing scheme (Interview business representative).

7.3 ENABLERS

Local and national political leadership

An important enabler of the Keerdok project was the involvement of the alderman for mobility, civil rights and animal welfare, who provided a major boost, allowing it to 'skip the queue' among city development projects (Interview city administrator). This was helped by the project's obvious potential for providing financial benefits to both public building stock and private households (Interview government official), as well as its multi-use design enabling it to shift from parking to office space in the long term (Interview business representative).

Another key enabler is the overarching political-economic context, which is strongly in favour of fostering a sustainable energy transition. The growing costs of gas alone have pushed the need for renewable energy provision to the top of many actors' agendas (Interview business representative). Stakeholders also note the growing pressure in recent years to integrate their energy and sustainability commitments across multiple levels:

> More and more you see that you need to have alignment between all the levels on much further ground than we had five years ago. Because you need to step in, you need to cross barriers, you need to have agreements, you need to have a change of business (Interview 10)

The Flemish government adds to this by exerting political pressure on municipalities to phase out gas, while also tying many funding resources to sustainability objectives, thus indirectly contributing to the development of new renewable energy innovation projects (Interview city administrator). Having the same governing party coalition as Flanders, Mechelen enjoys relatively efficient communication with the regional government in this process (Interview city administrator, government official).

Innovation experience

A general enabler for pilot projects in Mechelen is the city's long-standing experience in trialling innovations, which has helped consolidate important knowledge resources at city level (Interview government official). Having signed the European Covenant of Mayors, Mechelen is highly engaged in translocal knowledge exchange to learn from and share experiences with other cities, which can help cities develop more long-term commitments and drive larger scale change collectively (Interview city administrator; government official). City officials praise Mechelen for keeping close ties to its citizens and having a strong grasp of their needs. In certain thematic areas, such as the circular economy and the heating system, city officials already have

stable coalitions with many other stakeholders and the demand for involving the city's climate team in new projects is growing (Interview city administrator). On top of this, pilot projects enjoy certain exemptions from legal restrictions (such as around energy sharing) due to their experimental nature, thus giving them considerable freedom in developing new practices (Interview government official).

7.4 BARRIERS

Inadequate technical expertise

A lack of technical and engineering expertise among the project team members created difficulties in articulating specific requirements for tenders and resulted in a longer than anticipated installation process (Interview government official).

Regarding a wider transition to renewable energy within Mechelen and beyond, officials note that the city's sustainability team lacks the capacity to closely monitor the implementation of its climate actions, as well as to continue providing many of its direct services to citizens (Interview city administrator). Additionally, legal restrictions prevent the city from creating its own public heat network, thus necessitating outsourcing. The city's building department also requires PV installations to be invisible from street-level, inhibiting installation options. The city's strategy of providing public space to private sector stakeholders to run and scale up renewable energy projects directly reflects these limitations. And while respondents consider this a pragmatic and workable approach, they also not that it reduces the city's ability to directly steer the transition process (Interview city administrator).

Late involvement of key stakeholders

One of the key barriers to governing and scaling up the Keerdok project has been a lack of support by core stakeholders. Since many of Mechelen's citizens are entitled to free parking, finding a parking lot operator in the first place proved challenging. Conducting a feasibility study only after the parking building was already designed created additional challenges, as the team realised too late that their initial plans for installing PV panels were insufficient. This was exacerbated by disagreements between the project team and Triginta, who wanted the building's PV energy to supply their tenants' offices rather than the vehicles. Resolving this required building additional PV panels, some of which were paid for with the building's art budget (Interview city administrator).

The pilot highlights the difficulty of having to reconcile diverse stakeholder interests and energy needs. For instance, retail companies in the pilot tended to prioritise energy security while individual households will focus primarily on price, making the creation of pluralistic local energy communities inherently difficult. Moreover, local branches of larger companies may be tied to collective energy contracts at national level and could not easily enter into local peer-to-peer schemes at their discretion (Interview business representative).

Corporate tenants such as VOKA and Louis Delhaize did not move into the building until relatively late in the process and were initially hesitant to join the energy trading scheme. This was largely rooted in the practice's relative novelty and difficulty of explaining its financial benefits, which fueled the companies' doubts and convinced them to consult their own experts first (Interview city administrator; government official). The DSO Fluvius also did not provide the desired support for the project (Interview city administrator) and only in its final stages enabled VOKA and Louis Delhaize (for a fee) to engage in energy trading via the power grid (Interview business representative).

…and limitations in political leadership

Despite the supportive local and national political context cited above, city officials point out that the political focus on electoral cycles promotes short-term thinking and limits the support for long-term projects. As a result, the range of successes achieved through Mechelen's climate action plan varies strongly between tangible actions and 'paper tigers'. (Interview city administrator). Despite the city's declared ambitions, respondents therefore voice concerns that political support for green innovation is limited and there is particular hesitation against supporting decentralised energy provision (Interview city administrator). Current price incentives do not yet push people to produce and store surplus renewable energy but only to directly sell to the grid, which is mirrored by legislation that is still rather unfriendly towards energy sharing, both of which undermines the capacity of a decentralized energy system (Interview city administrator). Additionally, Mechelen's approach of fostering sustainable mobility by building vehicle charging stations without also changing the sources of energy production (a strategy mirrored across Flanders) is seen as falling short of a more holistic path towards sustainability. All of these issues point towards the need for stronger legislation in favour of distributed renewable energy production and sharing at the level of Flanders and beyond.

7.5 LESSONS FOR UPSCALING

Over the course of the Keerdok project, the steering group has gained extensive knowledge about PV, electric vehicle charging, and local energy communities, and built collaborative relations with the various stakeholders now involved in the project. One of the most obvious lessons to be drawn from the pilot is that conducting a feasibility study for a renewable energy project should be done prior to or in concert with planning the project's installation and designing the site to avoid having to make changes later in the process. Since planning and installation take a long time, steering groups need to identify and approach core stakeholders early, particularly building owners, investors, construction companies and the DSO (Interview business representative). Open tender contracts for architects work well but should include sustainable energy production requirements, so building owners do not need to be convinced to include additional renewable technology later (Interview government official). Help from consultants can be a significant resource too, especially when the steering group itself lacks technical expertise (Johansson & Mohlin, 2021). For their part, building owners should be transparent about their energy contracts and proactively invest in large-scale PV (Interview 10).

Looking to the future of renewable energy transitions, city officials see a significant need for more local solar PV installation to strengthen and balance the power grid, thus lowering distribution costs, as well as for more (and more varied) electric vehicles capable of vehicle-to-grid charging (Interview city administrator; government official). At the same time, members of the steering group conclude that PV installation is ultimately the easier objective, whereas convincing stakeholders to join P2P trading schemes remains more difficult (Interview city administrator). On the one hand, pilot projects such as the Keerdok hub are evaluated on the basis of what benefits they offer their local community. Although energy sharing is not inherently necessary for facilitating a transition towards renewables, it could be instrumental for preventing energy poverty among low-income households (Interview city administrator). On the other hand, the larger business partners required for upscaling are primarily motivated by financial motives, underlining the crucial importance of presenting the business case for adopting innovative practices such as P2P schemes (Interview business representative).

Upscaling requires businesses to recognise the benefits (primarily the business case) of adopting the new practices, while policy changes require pilot projects to make the practical implications and utility of new legislation tangible (Interview city administrator). However, energy storing and sharing are currently not financially beneficial compared to simply feeding energy back to the power grid, making it unfeasible at this scale to scale up local energy communities such as the Keerdok project (Interview city administrator).

Incentivising these practices is therefore largely dependent on future legislative changes around grid pricing and building codes. Since the practice of peer-to-peer energy sharing has yet to be regulated in Flanders, one of the city's motivations for supporting initiatives such as the Keerdok project also lies in generating insights and lessons that can be used to advocate for new legislation across Flanders. Pilot projects can demonstrate the practical implications and utility of such legislative changes, thus the city of Mechelen can draw directly on the experiences of Keerdok (Interview government official). For instance, Mechelen's city officials suggest making renewable energy a natural part of urban planning, so that any new development and construction project automatically include elements of, for instance, energy sharing. To facilitate this, local governments need to treat renewable energy as the standard rather than an add-on. As one city official notes:

> 'With one [piece of] legislation we can change much more than 60 people working very hard in the field can ever do.' (Interview city administrator).

Thus, local administrations themselves do not need to scale up substantially but need to continue facilitating collaboration across broad and inclusive coalitions of stakeholders, involving in particular the mobility sector, industry, energy production, public building stock, and political or well-known figures with a strong public platform. To enable them to fulfil this role, they require the capacity and legal mandate for pursuing ambitious strategies and turning good policy programmes into tangible actions (Interview city administrator).

8. COMMON ENABLERS, BARRIERS, AND LESSONS ACROSS THE PILOTS

While the experiences made by the pilot projects were often place-specific, the majority of their encountered drivers and challenges, as well as the lessons drawn from them, display strong similarities (table 2):

	Key enablers	Key Barriers	Key Lessons
West Suffolk	**Pioneer status** **Energy transition politically prioritised** Local knowledge network P2P scheme in place No funding difficulties	**Lack of tech expertise** **No DSO involvement** **Lack of P2P legislation** **Difficulties in procurement** Lack of stakeholder involvement	**Secure expertise early** **Involve stakeholders early – show business case** **Legislate P2P** **Involve DSO** Secure enough funding
Amersfoort	**Energy transition politically prioritised** Supportive local politicians Proactive business partners (eventually)	**Lack of tech expertise** **No DSO involvement** **Lack of P2P legislation** **Difficulties in procurement** Risk-averse municipality Legal barriers to P2P	**Secure expertise early** **Involve stakeholders early – show business case** **Legislate P2P** **Involve DSO** Enlist political support
Malmö	**Pioneer status** **Energy transition politically prioritised** Proactive municipal company partners	**Lack of tech expertise** **No DSO involvement** **Lack of P2P legislation** **Difficulties in procurement** Fire safety concerns	**Secure expertise early** **Involve stakeholders early – show business case** **Legislate P2P** **Involve DSO** Rely on municipal companies
Mechelen	**Pioneer status** **Energy transition politically prioritised** Supportive local politicians	**Lack of tech expertise** **No DSO involvement** **Lack of P2P legislation** Lack of stakeholder involvement	**Secure expertise early** **Involve stakeholders early – show business case** **Legislate P2P** **Involve DSO** Enlist political support

Table 2: Key governance enablers, barriers and lessons across pilots (widely shared entries in bold)

Enablers

Across all pilots, **support by local politicians or the existence of clear sustainability strategies** were flagged as crucial drivers for renewable energy innovation. Political backup is necessary when projects face obstacles, e.g., delays or technical or financial difficulties. Conversely, when politicians are less committed to the project their willingness to make risky or uncertain moves will constrain the operational space of the administrator in charge of implementing the project. The increasing urgency of tackling the rising energy costs has pushed the transition to renewable energy to the **top of political agendas in all four countries**, providing an important boost to both pilot projects themselves and their capacity to promote and scale up good practices.

Additionally, most municipalities involved in ACCESS (with the exception of Amersfoort) have already cultivated a **reputation of being sustainability pioneers**, thus having accumulated important organisational experience with innovation and having built collaborative multi-stakeholder networks, which they can draw on when launching pilot projects or scaling up innovations. Indeed, across the four Access pilots, private and civil sector stakeholders pointed to the importance value of local governments leading the way on energy transition due to their political legitimacy, their strategic position in local planning, their ability to launch and steer pilot projects, and their high level of reliability. At the same time, the pilot government partners were mindful of maintaining the trust placed in them by private partners, e.g., by refraining from unbridled promotion of risky business models or technologies or by being vehement about observing GDPR rules in implementing prosumer models.

Barriers

Conversely, all pilots suffered from the fact that their project teams had **little technical know-how** specifically in regard to building local smart-grids and P2P systems, leading to various difficulties in finding suppliers and procuring the right equipment.

Securing **the involvement of private business partners or procuring equipment suppliers** presented a challenge in all four cases as well. Although most companies were supportive of renewable energy generation, they were hesitant towards joining P2P schemes, either due to being risk-averse, sceptical about the financial benefits, or simply already tied to pre-existing energy contracts. This is partly tied to the fact that in all four countries **legislation does not support** practices such as P2P energy exchange or energy storage, thus most stakeholders are incentivised to directly consume or sell off their energy. Similarly, in all cases **DSOs were not directly involved** in the pilots (joining only at the very end in some instances) as they inherently prioritise building and balancing the grid and offering flexible solutions to large-scale consumers, over supporting small-scale distributed energy provision. Most project participants considered this a barrier to upscaling the pilots, but some businesses were satisfied with the DSOs' current work, given the urgent need for large-scale infrastructure and flexibility.

Key lessons

Based on their experiences, some common lessons can be drawn across all four pilots. They all highlight that building a solid foundation of energy-related technical and legal knowledge is crucial for driving innovative local energy projects. This can be done either through training local administrators themselves (as planned in Malmö) or securing competent consultants early on.

Consultant contracts should require proof of technical competences, while procurement tenders should include explicit sustainability goals so the responsibility for delivering the right equipment lies with suppliers, not administrators.

To upscale renewable energy innovations, all project teams agree that local administrations cannot dictate the whole process or handle procurement themselves, but rather need to act as pioneers and share the lessons and experiences from pilot projects to inspire other stakeholders to follow suit. Stakeholders vary in their willingness to engage with uncertain projects. Involving stakeholders early on in the development of pilot projects as well as discussions about how to mitigate risk is seen as not only beneficial for ensuring the pilots' success, but also for strengthening the stakeholders' business case and their ownership over the innovative practices.

To successfully play their role as pioneers and guides, municipalities require additional organisational capacities and greater cross-departmental collaboration, as well as the ability to retain knowledge at city level. Getting municipal leaders firmly onboard with the agenda may be important for both of these objectives. Administrators are also aware that innovative practices do not necessarily replicate automatically but require active promotion across inter-city networks and the private sector. Thus, the development of multimedia 'inspiration documents' and promotional material is seen as a crucial second step between pioneering innovations and scaling up. Enlisting politicians in promotion campaigns, telling the good stories and lending their legitimacy to projects, will also contribute to the spread of energy projects.

Moreover, respondents in all four cases underline the need for policy change beyond the local level to drive the transition to renewable energy. There is widespread agreement that national legislation needs to provide more financial incentives for P2P energy exchange, energy storage, feeding back into the grid, and smart EV charging. Respondents also look to DSOs for helping enable these practices at scale, for which they would need to readjust their perspective from solely focusing on grid capacity to enabling more distributed and flexible energy generation and exchange.

9. CONCLUSIONS

The governance analysis of the four Access pilots offers insights on the roles different actors can play in local energy transitions, and how their actions may be coordinated. The Access pilot projects were initiated and planned by the four local governments, which potentially skews the focus of the analysis towards the role of governmental actors. However, interviews with other stakeholders show that such a focus is warranted as local governments do play a key role in the pilot or demonstration phases of energy system innovations. The analysis also indicates that roles may change as local energy systems scale and mature.

While integration of local energy generation, storage and exchanging are considered necessary for future sustainable energy systems, there is still much uncertainty about the form this will take, including technologies, regulatory framework and business models. This means that many potential private partners are still hesitant to enter this realm as drivers of local energy systems. Moreover, for businesses and private households, who are expected to play a part in local energy communities as prosumers, energy remains a peripheral activity. This leaves local governments with a crucial role in setting in motion the transition towards local energy systems.

However, the model that appears is far from a typical state governance model in which government owns energy assets (although that is an option as in West Suffolk Council's Toggam Solar Farm) and operates the energy system. Local governments provide several crucial functions in the energy transition:

- They serve as role models by developing and testing new models, particularly in small-scale pilots,
- They serve as convenors, integrating other relevant stakeholders into complex energy projects. As convenors local government (should) liaise actors inside government, involving all relevant departments; liaise with actors in the private sector and civil society who are necessary partners in the energy transition, and liaise with governmental actors at other levels.
- They provide strategic planning that (potentially) ensures that pieces necessary for the development of local energy systems are in place in the near and long term, including transport infrastructure, building codes, and in some cases even job and education programs, thus facilitating the onboarding of private stakeholders as the energy transition scales and deepens.

Serving these functions, local governments draw on unique resources. According to the stakeholders interviewed for this analysis, across the pilots, local governments are trusted partners, which facilitates engagement of other partners in otherwise uncertain or risky activities. This trust has been built up through previous innovative projects in the sustainability arena which has helped governments establish networks with key partners. The core role in networks of public and private actors, including intercity and transnational networks, also give local authorities access to information, which they share with other actors in the network, another fundamental part of coordination. Finally, as mentioned, the position as local planning

authority places local government as a natural hub of innovation activities. In some cases, publicly owned companies are responsible for delivering energy-relevant infrastructure, such as parking in Malmö, which further facilitates innovation because such companies have a development-oriented outlook and are less bound by short-term profit needs.

At the same time, the analysis has revealed some governance resources that local governments may lack, especially when entering a new arena. First, the pilots did not have energy-specific technological know-how, which challenged their ability to design properly specified contracts with private sector parties. Second, local energy projects are constrained by regulatory frameworks that either limit the role of local authorities or do not facilitate an active local role of DSOs. Third, local authorities also typically do not have the financial resources necessary to invest in energy infrastructure or to incentivize private partner participation and are therefore confined to being brokers of national and European project funding. Such funding is typically available for piloting or for limited purposes only but is not expected to be available for regular upscaling of the pilots.

In addition to local governments, a number of private partners have been involved in pilot developments. At the core are businesses already involved in the energy sector, such as Energie van Nu in Amersfoort, Urban Chain in West Suffolk or Energytix in Mechelen, as well as companies involved in infrastructure development, such as the real estate company Triginta in Mechelen and Malmö's parking infrastructure company, Parkering Malmö. These companies have contributed with their expertise in developing technology solutions, infrastructure, and business models. Such partners have a strong incentive to participate in and contribute to energy innovation projects such as those tested in the pilots because it relates to the cores of their businesses and facilitates strategic development from which they benefit. Other stakeholders, such as businesses on the Mildenhall industrial estate in West Suffolk or in the Keerdok building in Mechelen, or residents in Amersfoort, have been important participants, because they are the actors who in the end populate the local energy communities and whose behaviour will determine the effectiveness of local energy systems. These actors, for whom energy is but a means to other activities, have been incentivized to participate either due to a general orientation towards sustainability or due to the prospect of lower energy bills.

Local energy systems are nested in higher level systems, which bound the governance space and abilities of local actors. As shown, DSOs have been absent as active partners from all four pilots, until joining at the very end in some cases. DSOs are more focused on their role as grid operators, which limits their interest in small scale innovation projects. However, since local energy production is considered an integral part of the future energy system and smart energy management one solution to grid congestion, it would be highly beneficial if DSOs were more closely involved in small scale trials.

EU and national governments also both facilitate and constrain local energy innovation. EU directives lay out a role for local energy communities and through funding programs the Union fosters innovation and demonstration projects such as Access. Likewise, national governments, through implementation of EU directives and other policies, define the governance space available for local actors. The analysis points to several shortcomings in this framework, as it does not offer legislative support or financial incentives to encourage practices necessary for the

energy transition - e.g., P2P energy storage and exchange, feeding back into the grid, and smart EV charging. The regulatory framework in some cases does not incentivize and in other cases actually constrains the role of DSOs and their interactions with local energy communities.

The analysis suggests some changes in governance system in relation to upscaling of renewable and smart energy innovations. Local governments may continue to play the role as pioneers in innovative demonstration models, testing and developing new pieces of the energy system. Municipalities are less likely to actually run the upscaling or the transformation of local energy systems, but the analysis indicates that they will continue to guide, incentivize and inspire other stakeholders to follow suit (e.g., through advice, facilitation, promotion, policy advocacy). Thus, local authorities are more likely to be enablers rather than doers (Fudge 2016). As lessons from pilots mature and spread and uncertainty reduces, other stakeholders can take a more central role. Cities can help foster this in two ways: by actively sharing lessons from pilots and by involving stakeholders early on in the development of future pilot projects and discussions on upscaling of pilots, strengthening the stakeholders' business case and their ownership over the innovative practices. Stakeholders may include institutional actors such as DSOs, businesses involved in developing solutions for the energy markets, and businesses, associations and households who do not have energy as a central focus, but who may be involved in the future energy system as prosumers. Local policy makers and knowledge institutions are other key stakeholders. Stakeholder involvement thus requires strategic assessment of who the core stakeholders are, keeping in mind local energy policy objectives, and a good understanding of the interests and needs of these stakeholders.

To successfully play their role as pioneers and guides, municipalities require additional organisational capacities and greater cross-departmental collaboration, as well as the ability to retain knowledge at city level. Getting municipal leaders firmly onboard with the agenda may be important for all of these objectives. Administrators are also aware that innovative practices do not necessarily replicate automatically but require active promotion across inter-city networks and the private sector. Enlisting politicians in promotion campaigns, telling the good stories and lending their legitimacy to projects, will also contribute to the spread of energy projects. Involving private investors is another core task, necessary for leveraging the resources for capacity building.

In general, our analysis of the Access pilots suggests that involvement of external stakeholders as well as municipal leadership should be done early to cultivate their sense of ownership, important for support for sometimes challenging transition projects, but not least to take advantage of their different forms of knowledge and resources resulting in better design of local energy projects (Bauer & Steurer 2013).

Moreover, the analysis underlines the need for policy change beyond the local level to drive the transition to renewable energy. There is widespread agreement that national legislation needs to provide more financial incentives for P2P energy exchange, energy storage, feeding back into the grid, and smart EV charging. Such policy changes should also help move DSOs towards helping enable these practices at scale, for which they would need to readjust their perspective from solely focusing on grid capacity to enabling more distributed and flexible energy generation and exchange. This is in line also with other governance studies suggesting that a distributed local (and regional) energy system requires a "bottom-up and interactive regulatory framework

where the central government should have a more reflexive and communicative role, providing services and national coordination for an energy system that contains a large share of fluctuating renewable energy sources" (Hvelplund & Djørup 2017:1218; see Fudge 2016 for a similar point).

While the Access pilots show ways forward for the local energy transition, it is still worth considering whether local energy communities offer an efficient approach to the energy production. The role of local energy communities, P2P trading and flexibility services can be discussed from two angles: 1) do local involvement make sense from the technical-environmental point of view, i.e., does it help to build the energy system of the future we need to decarbonize? 2) how does local energy involvement serve local needs?

From the system perspective, local production, storage and flexibility services are, as argued above, important for providing grid stability, avoiding congestion and therefore keeping down grid investment costs. This could of course be accomplished through flexibility contracts between prosumers and grid operators without involvement of local government. But the Access pilots have indicated the benefits of involving actors in more locally anchored energy communities as well. For instance, the West Suffolk pilot, via Urban Chain's market model, has shown that it makes sense to make a precise match between offer and demand, lowering energy prices for those participating in that scheme. It is not clear that this was happening at the national grid scale. Moreover, through their planning authority and local networks local governments are in a unique position to ensure a whole-system approach, linking transport building and energy sectors as well as a planning for the necessary skill pool.

However, even in terms of the business cases for producing, trading and storing, it is important to consider the fact that the optimal individual case for a household or enterprise may well be different from the optimal grid case at a larger scale. Thus, it is important to design rules or incentives to ensure collectively beneficial outcomes in the form of higher scale grid balance. Again, DSOs may well have an instrumental role in managing these interplays. More generally, as pointed out by a business partner in Amersfoort, the urgent need for large-scale infrastructure and flexibility suggests DSOs should be active also at higher levels.

From a local-needs perspective, local energy production may serve to ensure access to affordable energy, thereby working for an equitable energy transition. Local decision-makers have better knowledge about local needs and can be held accountable at the local level, while actors at other levels have different foci. Local energy production may also result in spin-off benefits such as new businesses and jobs in energy services.

Finally, local energy communities can take several forms and the first step in any local context is to analyse what first steps would be most impactful, given the local context and interests and needs of local citizen and business communities.

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