Cities4PEDs

Atlas

From 7 case interviews to recurring strategies and PED relevant aspects

Integrative working document as part of Cities4PEDs WP2 | Nov. 12th 2021

From 7 case interviews to recurring strategies and PED relevant aspects

Disclaimer:
The document you are looking at is the draft version of the PED Atlas, intended as a working document and subject for discussion within the broader community working on the energy transition. This document was further sharpened during the intensive working sessions of the Cities4PEDs Deep Dive on 5 to 8 October 2021. Insights from these international meetings of the consortium of Brussels, Stockholm and Vienna were then processed and are now ready to be shared with other European cities to take a first step towards structuring recurrent strategies and tools for the development of PEDs.

Introduction

For a city to embark on developing a Positive Energy District (PED), the framework conditions, such as political mandate, legal, financial and organisational structures, etc. will have to be in place or established over time. The Cities4PEDs project has investigated the framework conditions for developing PEDs in three cities, Brussels, Stockholm and Vienna and further interesting PED-relevant projects across Europe.

Twenty-five PED-relevant projects were identified by the consortium for further investigation. Out of this list, seven projects were selected for in-depth interviews based on their holistic approach to sustainability at large but in particular, their relevance from a PED perspective. Three newly constructed and four existing districts were selected. The investigations have been analysed and a multidisciplinary overview of the different aspects of concern for the realization of PEDs has been developed. This PED Atlas is a documentation of the process, the known framework conditions and PED elements.

The document is structured in the following way. First, the seven projects are described, explaining their vision and sustainability ambition ("Stories"). Each project names the specifics of their site, the preconditions and political ambitions and targets for energy, mobility etc. For each project, the interviewers have summarised the lessons learned.

Following thereafter, the cases are interpreted by the Cities4PEDs project team and the combination of strategies they apply is presented in seven respective strategies. Here, relationships are made between the spatial context, the energy system transition that is being aspired to and the organisational model that is required to achieve this. The intention of these strategies is to transcend the context-specific level, so that other cities and neighbourhoods can recognise themselves.

Fuelled by the Cities4PEDs Deep Dive, the next chapter makes a first analysis of PED relevant aspects that are used within the analysed cases, divided in newly built and existing districts ("Aspects for the implementation of PEDs"). In the last chapter, two transversal working lines have been identified for further discussion and research ("Preliminary Conversation Starters").

1. Approach

The consortium started from a broad international stocktaking, based on the available knowledge and desk research looking at cases in Belgium, The Netherlands, Austria, France, Sweden, Ireland and in Finland, Italy, Spain, Germany and The Czech Republic. Based on different criteria, like stakeholder collaboration, citizen engagement, city instruments, legislation & regulations, business case, building typologies & urban development, digital tools & mapping, the selection of interesting districts towards a PED was narrowed down to seven cases. They were selected so that they cover a broad range of focus topics. The cases are both existing districts as well as new ones, with different sizes, in different phases of development or with different time frames. Also, the case studies from the partner cities are included (Northern District Brussels, Royal Seaport Stockholm, Aspern Seestadt Vienna). The interviews were conducted with partners varying from cities to architects to developers in order to better understand the specificities of the district and go in depth in certain focus topics. The interviews are then translated into seven stories, which are written down in the next chapter.

Belgium
- ROLECS (Flanders)
- Brussels Airport (Brussels)
- Positive4North (Brussels)
- La Pile (Brussels)
- Oostveld (Eeklo)
- Ter Walle (Kortrijk)
- Buurzame Stroom (Ghent)
- Mediapark (Schaerbeek)
- Climate Neighbourhood (Mechelen)
- Climate Neighbourhood (Leuven)
- Nos Bambins (Ganshoren)

The Netherlands
- BoTu (Rotterdam)
- Gas-free neighbourhoods (The Netherlands)
- Making City (Groningen)
- Energy for Rotterdam (Rotterdam)

Austria
- Pilzgasse (Vienna)
- Seestadt Aspern (Vienna)
- Otto-Wagner-Areal (Vienna)
- Simmering (Vienna)
- Innsbruck
- Bahnhof/ Reininghaus (Graz)

France
- Confluence (Lyon)

Sweden
- Royal Seaport (Stockholm)
- Hammarby Sjöstad (Stockholm)
- Brunnshög (Lund)

Ireland
- +CityxChange (Georgian District - Limerick)
- Cooperate (CIT Bishopstown campus Cork)

Finland
- Tampere
- Espoo

Italy
- Castelletto (Parma)

Spain
- Paterna (Valencia) - Barrio La Pinada

Germany
- Berlin Tegel (Berlin) - Schumacher

Czech Republic
- Pisek - CityXChange

			Basic information					Focus topic						How is energy a leverage on other transitions?				Integrated types of projects	Why?	Goal?
			NEW/ EXISTING	Preparation & feasibility, Planning, Implementation, Operation	Energy system	Building technology	Mobility concept	Stakeholder collaboration	Citizen engagement	City instruments	Legislation & regulations	Business case	Building typologies & urban development	Digital tools & mapping	Climate	Local economy	Social and care	...			
Belgium	ROLECS (Flanders)				Solar PV community Virtual Power Plant Hybrid Heat Pumps Batteries EV charging station Heat grid CHP etc.	Not implemented	Depends on site EV charging infrastructure	Testing how far local stakeholders are willing to go - Some pilot sites are eager to create an EPV while others do not go further than collective purchase schemes	Local Energy Community with end-user engagement - Strong focus on understanding and predicting stakeholder behaviour	No strong focus on city instruments or influence	No strong focus on legal component	Optimise the local energy flows to reduce the current grid costs	Depends on pilot site - Residential Urban Residential Rural Business park Research park University	Monitoring production and consumption - Create energy management algorithms - Test different tariff structures	Aim of the project is to defining the impact of large scale roll-out of LECs on the decarbonization of the energy system	LECs can open up new market opportunities	Focus on how to engage end-consumers participation to LECs		Buurzame Stroom, Kortrijk Weide, Thorrocoud, The Sharing Park, Smart Residential Neighborhood, Research Park Haasrode, Business Park Mechelen, Waterse Kaak, Green Energy Park, de Nieuwe Dokken	The focus is particularly on the participation of end consumers and monitoring in pilot projects.	Assess implications of rolling out LECs • Which tariff structures • What data to collect • how to manage energy (algorithms) • How to incentivize end-user • ..
	Brussels Airport (Brussels)				On-site electricity consumption	Not implemented	EV charging infrastructure						Airport area- Fully private area							This project represents a strong example of scenario modelling where the pace of developments in relation to the strategic vision and the energy ambition levels of the airport are taken into account.	Evaluate the impact of the Airport 2040 vision on its energy system
	Positive4 North (Brussels)				Feasibility studies on the use of innovative technologies for the energy system will be conducted in the framework of the RESPONSE project	Feasibility studies for innovative building technologies will be conducted in the framework of the RESPONSE project		Making a Coordination Platform where stakeholders can work together						Community dashboard, the City of Brussels is also looking into developing a digital twin with the North District as a pilot area						
	La Pile (Brussels)				Electricity	?	Not included		Setting up a local energy community within the neighborhood. Organizing event bringing people together.			Redistribution of electricity among neighbours investing together in the future.							In this project a link between neighbours is created to provide a testfield for local electricity generation and distribution, incentives for the diminishing or spreading of energy consumption, and locally-based investment strategies.	Project to create several Local Energy Communities with the neighbourhood
	Oosveld (Eeklo)				Mixed: PV, solar collectors heat network, heat pumps, buffering, geothermal buffering, batteries	Insulation, renewable boilers, building compact	Not included	Working together with intercommunal, province, recycling plant, Energy cooperatives (EcoPowers)	Organising info events. Wind mills and heat network owned by citizens		No heat network regulations in Belgium. Wind mills gives permission under terms		Research on how the type of heat network buildings can be connected to the energy transition network - Different building types	Energy consumption mapped by Enprove and Reken Solutions		Money spent by municipality on energy slowdowns, help in municipality by producing (smart) locally		Demographic growth		It shows how demographic growth, space and buildings can be used to realise at the same time the energy transition. Focusses on the spatial and architectural aspects of producing energy locally. Big goal and pioneering role of municipality to produce energy locally.	100% renewable energy / Energy transition to absorb demographic growth
	Ter Walle (Kortrijk)				Photovoltaics, wind turbines, geothermal, aquathermal, solar thermal	?	?			Citizens are engaged in the community dashboard.				Monitoring Smart Grid, dashboard						From a digital perspective, this project aims to build a smart grid for exchange of electricity/heat/cold in a coordinated way. This needs to be monitored continuously and can be visualized in a community dashboard. This dashboard strengthens stakeholder engagement and facilitates a local anchoring of the project.	
	Buurzame Stroom (Ghent)				Photovoltaics	?	Not included	Together with the city of Ghent, Energent and Community Development Ghent	Reach all residents in locally diverse neighbourhood		Setting up a cooperative			Digital monitoring site						It's of mobilising aspect. Energent is a cooperative that unites citizens in its striving for a sustainable society.	Installing 700kWp on pilot site, grid-supporting/implementation of renewables (shared use of energy)
	Mediapark (Schaerbeek)				? Waste heat	?	Increasing soft mobility and redevelopment adjacent highway into a boulevard		Citizens questionnaires				Researching wind corridors, and lay-out of buildings				Densities			
	Climate Neighbourhood (Mechelen)				Heat network	Renovation	No	Support associations of co-owners in the collective energetic renovation of apartment buildings												
	Climate Neighbourhood (Leuven)												Heritage?							
	Nos Bambins (Ganshoren)				Photovoltaic	Not included	Not included	School Nos Bambins, APEBa, Foducateur.vivendum (Prosumer particular, Sibelga), Consom'acteurs, Sibelga			Setting up a legal exchange possibility. Exception in legislation.	Cheaper electricity		Sibelga installed a communicative energy meter, to monitor the local electricity						Setting up an legal and infrastructural exchange between neighbouring solar panels installations	Putting up a project to share electricity between neighbours in Ganshoren. Local self-consumption at the neighbourhood level. Testing of governance and sharing models. Inclusion of two producers
The Netherlands	BoTu (Rotterdam)							Involving anthropologists.	Anthropological interviews (5 anchormen), working with the residents, energy coaches... Exploration by OOZE + exhibition				Spatial studie by typologies: plan-, facade, orientation Lexicon Energie & Architectuur, CHAT, architects	Mapping energy potential and consumption Spatial-energy building blocks by Proud						City of Rotterdam tested different neighbourhoods and tools in different pilot projects (of which BoTu was one). It had a relative coherent testing phase.	
																		Dakparkschool, Rotterdam	It is an example of how the energy transition in the neighbourhood is being tackled concretely, in this case as an opportunity to improve the indoor climate in the school and to design a climate-proof schoolyard. The roof will become a collective solar roof on which neighbourhood residents can jointly generate energy. And last but not least, the entire process will be used to make the students more climate-conscious; resilience will be integrated into the curriculum.	
	Gas-free neighbourhoods (The Netherlands)				Solar thermal energy, heat pump system, district heating/local heating, industrial waste heat - focus on thermal energy			connection to national goals – initiative of municipalities	integration of residents in projects/social acceptance										The government's goal is to become natural-gas free by 2050 and supports 52 pilot projects (so far) in various municipalities to learn how to transition from natural gas to renewable alternatives. Connecting tasks, participation and communication, juridica, financing and costs, organisation and government, technical solutions	
	Making City (Groningen)				Photovoltaics, BIPV, PV on water, Watermad, Waste digestion, geothermal or waste heat (from a data hotel), geothermal heat pumps, district heating.	Retrofitting of residential buildings	A special focus will be made on cycling and electric mobility e.g. "Sallaflaad", smart charging stations for electric vehicles...		making citizens part of the transformation How?	role of the cities on the way to sustainable urbanization How?			Residential and public buildings, high-rises, industrial and tertiary buildings		Groningen's goal is to be CO2 neutral by 2035		Focus on mobility		MAKING-CITY (Horizon 2020 project) aims to address the transformation of urban energy systems towards smart and low-carbon cities, based on the Positive Energy District concept. Operational concepts were developed to help European and other cities around the world to support sustainable urbanization.	
	Energy for Rotterdam (Rotterdam)																			
Austria	Pilzgasse (Vienna)				geothermal heatpump, PV, waste heat, wind peak shaving,		on site e-mobility	regular stakeholder meetings, topic-related quarter-meetings		urban contract?			mixed usage: commercial and residential, educational, office	demand side management				research project "future quarter"; urban strategy of "productive city"		
	Seestadt Aspern (Vienna)				aspern klimafit criteria: for annual PV production on the building + for heating and cooling per site	aspern klima criteria for heating demand, energy efficiency factor, primary energy demand, CO2-emissions and final energy demand	bicycle parking, public transport, electric charging infrastructure, incentive systems for e-car sharing	Wien 3420 aspern development AG	district management teams	Wien 3420 aspern development AG			mixed use						The area around an old railway station and of an old brewery (Reininghaus) are being refurbished over the course of these development projects.	The aim is to create high quality districts that are in line with the goals of the smart city graz strategy for 2050.
	Otto-Wagner-Areal (Vienna)				PV, district heating/cooling network w/ geothermal heatpumps	refurbishment of protected building stock	subway, tram close by		integration of citizens through city administration				refurbishment of protected heritage former hospital: pavilions will be transformed into university, student housing and medical usages							
	Simmering (Vienna)				district heating, waste heat, solarthermal energy, PV	refurbishment	e-car sharing, bus, tram	integration of stakeholders (developers, schools) into planning	integration of residents into planning				residential, educational					Smarter Together		
	Innsbruck				district heating, biomass	renovation			holistic refurbishment of housing buildings with residents living inside				residential, public buildings					Sinfonia		
	Bahnhof/ Reininghaus (Graz)				district heating partly decentral energy production - local heating/cooling supply network, Photovoltaics	low energy houses (e.g. klimaaktiv certification)	free annual public transport ticket, cycling and pedestrian infrastructure, sharing & e-mobility	PPP, team for coordination (developers and public representatives), district management	open idea workshops in the development process	"Reininghausboard" for political communication	Smart City strategy LOIs from developers for energy concepts		mixed (Reininghaus: high percentage of residential)	wish to expand monitoring	whole city 2050: 100% renewable energy supply			Smart City Graz	The area around an old railway station and of an old brewery (Reininghaus) are being refurbished over the course of these development projects.	The aim is to create high quality districts that are in line with the goals of the smart city graz strategy for 2050.
France	Confluence (Lyon)				district heating, system, 1/3 powered by forest waste, 30 PV installations, monitoring (consumption & production)	to reduce consumption by increasing efficiency, use of sustainable materials, integration of green space, flexible concepts	garages only allowed directly under building (not in between), mutual car park, Bus Highway in north of the district.	private company for management, capital was created (public in between), as shareholders). Works through contract with authorities.		still responsible for certain topics (overall transport infrastructure and waste). Communication with private district company.	Contracts in which district management sets requirements for developers when they buy ground, proportion of social housing & private housing; is set and stricter than building code.	private developing companies buy & build. They contribute to mutual parking and to public facilities. Funding(?)	heritage should be preserved (market: architectural lens environment (clay and other materials used)	monitoring to compare and explain an object to its environment in the neighbourhood (not public!)	goal of low energy district	to redevelop the area between the two rivers to double the size of the city			It is a **comprehensive development** of a district with years and years of experience in several fields. Lyon Confluence has its **own institution taking care of the district** (25 people), thereby speeding up decision processes but still in close communication with the city. **Guidelines set in contracts** ensure quality. Still **financing, partly even of the public facilities, is done through private developers**.	To build a low energy district providing high diversity and an innovative new half of the city of Lyon for the citizens through a comprehensive development.
Sweden	Royal Seaport (Stockholm)			12.000 apartments (27.000 residents) and 35.000 work spaces. 240 ha	district heating, heat pumps, solar panels, electricity central grid, PVs, cooling: district cooling (for offices)	low-energy buildings (good u-values, solar shading, AAU, WWHE), 2 energy positive multi-storey buildings (44 apartments)	Reversed traffic hierarchy, decentralized parking, car-pools, electrical charging, well developed public transport etc.	Extensive stakeholder cooperation, capacity development programme, cross-departmental working groups	Extensive public participation, dialogue (e.g. focus groups), residents survey, residents initiatives and activities, information and dialogue	Politically ratified policy document, civil contracts for land allocation, land allocation competitions, procurement, architectural quality programme	Building Code, Planning and Building Act and Environmental Act (but we have stricter requirements - SRS)	Business as usual so far.	mixed use (30 % commercial), 3 public schools, 40 preschools, public services: sports facilities, etc., 6-7 storeys in general, historical buildings are going to be preserved	Monitoring of performance by the city, monitoring of energy supply systems, various digital survey systems	fossil fuel free 2020			MACRO (integration of waste water and energy systems), Connected SRS (digital data collection for monitoring and arwareness raising), The City ´s biochar production,	SRS is Stockholm´s spear-head for sustainable urban development and will serve as a testbed for developing new and innovative technology, methodologies and knowledge that will be transfered into other developments in the city.	fossil fuel free 2030
	Hammarby Sjöstad (Stockholm)			25.000 residents and 35.000 work spaces	district heating, heat pumps, solar panels, electricity central grid, PVs, cooling: district cooling (for offices)	Buildings fulfill Building Codes.	Public transport (tram) + central, bike-lanes, car-pools, electrical charging, etc. Energy community: common procurement for charging infrastructure and transport for waste management - testing of e-vehicles and e-bikes	ElectriCITY (Hammarby Sjöstad 2.0): collaboration of private and residents, quadruple helix: Electricity, Hammarby Sjöstad 2.0 - supporting the Energy community financed by member fees.	Energy community with 55 privately owned building associations were created energy performance investigation, training, common procurement of equipments in progress to create a micro-grid for sharing electricity	Originally Hammarby Sjöstad was supposed to be built "twice as good" than standard (eco-governance), based on voluntary commitments. No follow up.	Building Code, Planning and Building Act and Environmental Act (but stricter voluntary commitments)	Common procurement	mixed use	"Vardsgrundsdata fast", i.a. locally developed dashboard using open data	climate neutral 2030.	increased awareness through activities in energy competitions, sharing cities, "Framtidsspanarna" (i.a. training of 6 school children as the age of 10-12 years		The Eco-Cycle model, the "Hammarby Model" was developed in late 1990s, describing how to intertwine energy, water and waste. The Hammarby Model has served as a role model for development of eco-cycle models all over the world. TRANS-PED, a JPI Europé project to develop a PED.	Hammarby Sjöstad was the first spear-head project, appointed by the Stockholm City council in the 90s.	climate neutral 2030.
	Brunnshög (Lund)			18.000 residents; 25.000 work spaces ; 220 ha	low-temperature district heating, using waste heat from research laboratories, heat pumps electricity: PV and grid cooling: district cooling	6 energy positive buildings (semi-detached houses) based on combination of technology, e.g. PVs, batteries, AHU in every apartment	Tram, carpool, bike-pool, pedestrian and biking lanes, car-free living	Stakeholder collaboration with research facilities (MAX IV and ESS), energy utility (E.ON), developers and city of Lund.	Public dialogue (e.g. developers, residents)	land allocation competition and agreements (e.g. positive energy houses, car-free)	Building Code, Planning and Building Act and Environmental Act (but stricter requirements)	Energy flexibility in low temperature district heating system	mixed use	Lora senders - digital platform smart heat and cold sharing, local electricity system	100 % locally produced renewable energy, city as a power supplier (long-term goal 150%), 1/3 public transport, 1/3 walking/biking and 1/3 private car			COOL DH - (low temperature energy system), www.coold.eu: a pioneering project for district heating solutions TRANS-PED, a JPI Europé project to develop a PED.		100 % locally produced renewable energy, city as a power supplier (long-term goal 150%), 1/3 public transport, 1/3 walking/biking and 1/3 private car
Ireland	+CityxChange (Georgian District - Limerick)				Photovoltaic (PV) Heat Pumps (HP) Tidal turbine	Energy management system (Neighborhood / Building), Heating controls: Reduction of the DHW supply temp, heat recovery, Smart thermostats per room, Enhanced envelope	EV, V2G, V2B (Electric Vehicle Vehicle to Grid, Vehicle to Building)	Limerick City and County Council IES Intelligent Communities Lifecycle company Trondheim, Norway +22 companies and universities	Online survey To allow the use of the information collected to improve a public 3D model of the Limerick city: geo and electricity energy bills,	3D Model: Digital Twin Integrated Environmental Solutions Virtual Environment	There were some constrains about GDPR but they managed to re-ale pseudo-anonymised data		Office 68% Residential 12% Social housing 10% Commercial 10%	Digital Twin (3D Model) Integrated Environmental Solutions Virtual Environment (IESVE) Intelligent Community Information Model (ICIM)					The remarkable points of this project are the strategy to achieve PEDs through scenarios simulations within the district: 3D model / Digital twin. In this case, they saw within the Digital twin the possibility to achieve the PED through stages: 3D model with data, Improve operational efficiency of the building, Shallow retrofit measures, Deep retrofit measures, Local Renewable Energy Generation . In order to be able to obtain approximately 65% of energy savings. Moreover, the idea to add up a tidal turbine that in this case would enable the positiveness of the district	To make the Georgian district in Limerick a PED
	Cooperate (CIT Bishopstown campus, Cork)				CHP (Combined Heat and Power)	Real-time measuring of consumption Demand response Boiler upgrades	-	EMBEX, BOUYGUES ENERGIES & SERVICES, CORK INSTITUTE OF TECHNOLOGY + universities and research centers	-	ICT tools	The legislation did not allow to sell the engy to the grid, however it was possible in another project in Guyancourt, France	Optimization of energy costs through an algorithm that takes the energy from the cheapest source: the grid, the battery or the PV panels	University campus Student accommodation Sport center	day-ahead forecasts in energy consumption Optimization engine					It has been found that the optimization system service was the fundamental energy service to reduce costs. Whereby optimization of power purchases from the grid versus on-site generation allows the battery to be charged when the grid tariff is low and discharged when the tariff is high. In short, the optimization system service strategy proved to be able to bring up to 11% of economic savings, therefore, it could be useful for further saving strategies in PED developments.	To demonstrate the ICT tools for energy-positive neighbourhoods

Figure: Matrix of list of cases and focus topics

2. Stories
Examples in Europe

	Royal Seaport – Stockholm / Sweden	*Northern District – Brussels / Belgium*	*Aspern Seestadt – Vienna / Austria*
			
Partner city	Yes	Yes	Yes
Existing / new	New	Existing	New
Time frame	2000 – 2030	2018 – ...	2009 – 2028
Project phase	Development	Research	Development
Area	2,36 km2	1,32 km2	2,4 km2
Inhabitants	26 400 inhabitants 9.300 inhabitants/km2 12 000 households 35 000 work spaces	31.500 inhabitants 23.800 inhabitants/km2 6.500 households 1.200.00 m2 office 18% social housing	25.000 inhabitants 10.400 inhabitants/km2 12.000 households 20.000 workplaces 66% subsidised housing
Interview partner	City of Stockholm – Development Administration	City of Brussels and Urban innovation platform	Wien 3420 Aspern Development AG
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Confluence – Lyon / France	*Oostveld – Eeklo / Belgium*	*Bospolder-Tussendijken (BoTu) – Rotterdam / The Netherlands*	*Georgian District – Limerick / Ireland*
			
No	No	No	No
Existing and new	Existing	Existing	Existing
2003 – 2030	/	2017 – 2028	2018 – 2023
Development	Development	Development	Planning
1,5 km2	30 km2	0,78 km2	0,35 km2
20.000 inhabitants 13.300 inhabitants/km2 10.000 households 25.000 workplaces	20.900 inhabitants 700 inhabitants/km2 9.400 households 8,1% social housing	17.500 inhabitants 22.400 inhabitants/km2 7.200 households 62% social housing	2.600 inhabitants 7.500 inhabitants/km2
Project manager at the local public company Lyon Confluence	Alderman for spatial planning, urban renewal, youth and sustainability	Architect-urbanist and Initiator of a neighbourhood (energy) cooperation	EU Programme Manager Limerick City & County Council
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2.1 Royal Seaport – Stockholm / Sweden

Time Frame:	2000 – 2030
Numbers:	236 ha 12.000 housing units | 35.000 working places
District:	Mixed usage Newly built
Targets:	Create a fossil free district, local production of renewable energy, resource efficiency, climate adapted district
Date of interview	11th of March 2021
Interview partner:	City of Stockholm – Development Administration — Christina Salmhofer, Sustainable Strategist — Maria Lennartsson, Environmental Specialist

Christina Salmhofer works as sustainability strategist for the city of Stockholm. She's currently working at the Stockholm Royal Seaport, the largest urban development area in Sweden and one of Europe's largest urban (brownfield) development projects with high sustainability ambitions.

Maria Lennartsson works as an energy expert and consultant on the development of the Stockholm Royal Seaport.

Stockholm Royal Seaport (SRS) is one of Europe's largest urban development projects – one that is transforming former industrial land into a city district on land owned by the City of Stockholm.

The City of Stockholm owns the land which is managed by the City Development Administration (DA). The DA manages all project activities in close collaboration with other city administrations and companies. The project is funded by land sales and land rights fees.

Development process

The planning for SRS began in 2000 and land remediation started in 2004. In 2009, Stockholm City Council decided that the urban development project should become a model in sustainable urban development.

In 2010, an open invitation was made to design the strategy paper for the district development. The invitation was extended to whomever was interested in the project – developers, city administrations, the construction industry and citizens– in the shape of a three-day broad consultation process.In a second step, though only researchers and focus groups were invited, others were always allowed to participate. In this case "future workshops" with KTH Academia enabled the collection and compilation of ideas which in a final conference provided another possibility for feedback.

Since the first developers were allocated land in 2010, the city has run a capacity development programme – a series of seminars for developers, their consultants, and City of Stockholm representatives. The purpose of the programme is to increase knowledge and understanding of sustainability requirements and to highlight good practices and the latest research. The programme is adapted to developers in each phase of the project. There is also a capacity development programme for personnel involved in planning and implementation of public open space.

Stakeholders

The development of SRS is a broad collaboration between the City's administrations and companies. Within the City Administration, the project organisation is interdepartmental: The SRS Project is led by the City Development Committee and staffed by the City's Development, Planning, Transport and Environment and Health Administrations. Other bodies that work actively on the project include the City District Department of Östermalm, Stockholm Vatten och Avfall AB and Ports of Stockholm.

The Planning Administration prepares programmes and zoning plans which determines the location and design of buildings, parks, infrastructure and more. The Planning Administration is also responsible for building permits, ensuring that the urban planning principles are fulfilled in area planning and detailed development plans, and execute quality programmes. The Development Administration is responsible for implementing detailed development plans and developing public open spaces, streets, and parks and is responsible for budgeting. The Development Administration enters into agreements with developers on site allocation and development. It also prepares requirements based on

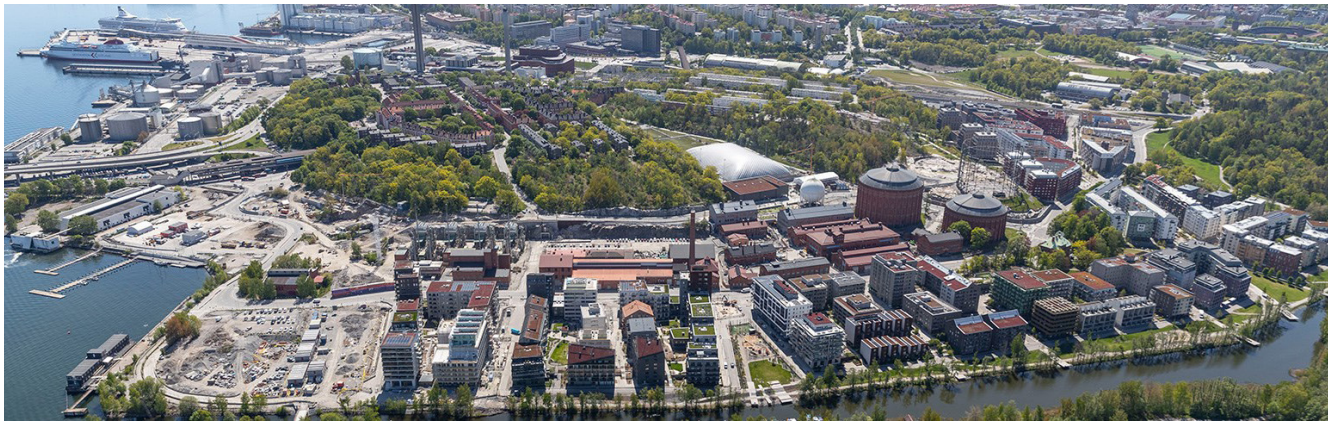


Figure: Stockholm Royal Seaport

sustainability targets in the area programmes and prepares detailed development plans that include sustainability requirements for block land and public open space.

Institutional organisation and legal instruments

Detailed development plans regulate future land use in legal terms. Based on the overarching sustainability goals, the development agreements include specified sustainability requirements. When a detailed development plan gains legal force, it forms the basis for building permits etc.

How each property developer intends to meet the sustainability requirements is monitored from idea until the building has been in use for two years. Developers submit documentation in a web-based tool and their submitted results are reviewed be external auditors. This process contributes to an increase in skills among developers and the City of Stockholm. Continuous monitoring is also conducted into the City's own projects on public open spaces.

Citizen involvement & participation strategies

Citizen participation is key to the development of the SRS. In recent years, several different methods have been tried. Game elements and video games, presentations of the local development plan and resident consultation with the public, workshops with entrepreneurs, and a qualitative study with girls between the ages of 12 and 18, are some examples of new angles for dialogue.

A map-based survey tool is frequently used to facilitate simple and effective public participation. It is a quick way to receive feedback and insights from the residents. The process has also highlighted different target groups that are hard to get involved in the planning process.

Efficiency and energy supply concept

- Heating:
  - district heating 72%
  - heat pumps 28%

The district heating system in Stockholm is currently (2020) powered with 39% residual waste (renewable), 14% electricity, 13 % residual waste (fossil), 25% bio fuels, 22% heating from lakes and wastewater treatment plants (extracting energy from the Baltic Sea), 87% of the energy carriers in the district heating system are renewables.

A new bio-fuelled CHPP was taken into operation 2016 and according to the utility company, by using bio-ccs-technology the district heating system in Stockholm will, , be climate positive by 2030 at the latest.

- Cooling: The need for cooling is rising primarily for commercial buildings. Most buildings are connected to the district cooling system, which is based on extracting energy from the Baltic Sea and Lake Mälaren.

- Electricity: Stockholm is connected to the national electricity grid and the electricity is based on the Swedish Energy mix (2019) that combines 63% renewable. Solar power is still marginal but gradually increasing. Therefore, the requirements in SRS is that renewable energy has to be generated locally: 2 kWh/m2 electricity and/or 6 kWh/m2 heating. By generating more kWh/m², the producer would be considered as an energy producer which leads to increasing tax expenses.

- Buildings: Developers need to make sure buildings have good building envelopes that reduces energy consumption. Calculations of estimated energy use are submitted for all phases. Metered values are submitted after a building has been in use for two years.

Based on metered energy use, the average annual energy consumption is 70 kWh/m² (including heating, domestic hot water and building electricity).

Based on metered energy use, the average annual energy consumption is 70 kWh/m² (including heating, domestic hot water and building electricity). This is 22% better than applicable Swedish building code regulations and means that buildings in the area meet the zero-energy directive.

The technology used is Air Handling Units (AHU) with heat exchangers, solar collectors/ panels and wastewater heat exchangers installed by some developers. An R&D project is exploring how data on a building's energy use can be collected for monitoring the energy performance over time.

Mobility concepts

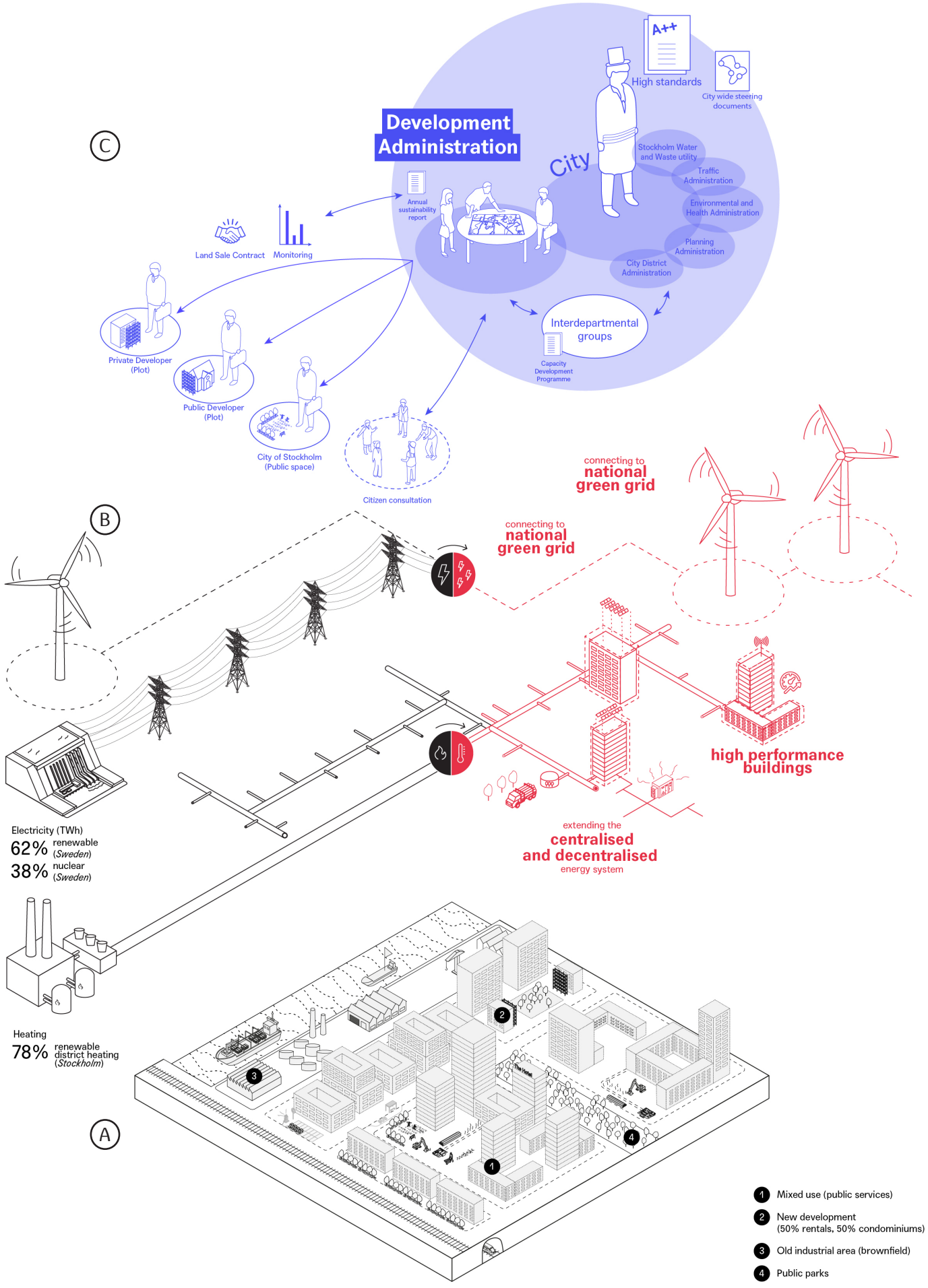
In Stockholm Royal Seaport, situated 3 kilometres from the city centre, a dense and accessible urban environment is being created with close access to amenities and parks. This contributes to increased opportunities for good mobility irrespective of age, disability, or other individual circumstances.

The area's transport hierarchy prioritises walking and cycling, followed by public transport. The majority of developers meet parking space requirements for cars (0,5 per apartment), bicycles (2,5 per apartment), and electrical charging points (20–50 %). With the introduction of the Mobility Index, more flexible parking options will be made available to motorists. The number of bicycle parking spaces has increased in each successive phase.

Proximity to private and public amenities and public transport plays a key role in determining travel patterns. Everyday amenities such as supermarkets, pre-schools, bus stops, and the underground stations are planned to be within five minutes' walk.

Learnings & Success factors

- The interdepartmental project management led by the City Development Committee and staffed by the City's Development, Planning, Transport and Environment and Health Administrations, leads to a more effective development process and supports leaving the silo-thinking.
- Working Groups with experts from different departments and city-owned companies move certain issues forward faster and with relevant stakeholders involved.
- The use of consultants is a way to limit the organisational burden and gives the possibility to involve highly competent experts
- The Capacity Development Programme by highlighting best practice and the latest research increases knowledge and acceptance of the ambitious targets and sustainability requirements among developers and their consultants.
- A strict and transparent monitoring process over all construction phases which is communicated beforehand increases the ambition of developers and the skill set of local developers.
- Political will and appointing SRS as testbed paved the way towards a fossil free development.
- A wide consultation process was implemented to develop a common vision and targets for the SRS.


C
Development Administration
City
A++
High standards
City wide steering documents
Stockholm Water and Waste utility
Traffic Administration
Environmental and Health Administration
Planning Administration
City District Administration
Annual sustainability report
Interdepartmental groups
Capacity Development Programme
Land Sale Contract
Monitoring
Private Developer (Plot)
Public Developer (Plot)
City of Stockholm (Public space)
Citizen consultation
B
connecting to national green grid
connecting to national green grid
high performance buildings
extending the centralised and decentralised energy system
Electricity (TWh)
62% renewable (Sweden)
38% nuclear (Sweden)
Heating
78% renewable district heating (Stockholm)
A
1 Mixed use (public services)
2 New development (50% rentals, 50% condominiums)
3 Old industrial area (brownfield)
4 Public parks

The Royal Seaport in Stockholm, Sweden is an example of a

high-target, city-coordinated energy district

Ⓐ They are mostly newly-built districts, for example on brownfields in former industrial zones. Often, the land is owned by a limited number of actors, such as the city or the port. Because the plan for the district can be designed as a whole, a conscious effort can be made to create a smart, planned layout: the density is often high, sufficient public space is provided, facilities such as supermarkets, schools and public transport are planned. And for the same reason, very high and integrated targets can be set on an energy-technical level. This type of neighbourhood is often found in cities or regions with a more centralised planning culture where the government sets clear frameworks and takes the initiative in the development of city districts.

Ⓑ The planned cities that these districts are part of are often already equipped with a highly centralised energy system, with district heating (either on fossil or renewable fuels) and connected to a national electricity grid charged by large-scale nuclear, wind, solar or water installations. How to make the switch to a new system is relatively clear, because only the sources have to be changed (e.g. from gas-driven district heating to biofuel or residual heat) and not the networks and connections themselves – or they should simply be extended to the new district. To achieve a positive energy balance, this district can also count on the application of innovative new technologies, such as in Stockholm Royal Seaport for example heat exchangers, solar collectors or panels and wastewater heat exchangers.

Ⓒ The city takes charge of the management and budgeting of the development process. This leads to a high degree of effectiveness, flexibility and impact. Different city administrations and experts from municipal companies team up and define the guiding principles and requirements, and set high sustainability targets in interdepartmental working groups. The city obliges developers to construct energy infrastructure or build very high performative buildings, using for example land sale contracts, civil law agreements or specific building regulations. One of the biggest challenges of these neighbourhoods is to get a grip on who the final users will be, as they are not yet in sight at the planning stage. Special attention is thus paid to include the needs and concerns of future residents, developers and companies, for example through seminars in the case of Stockholm.

This strategy is one of the most ambitious in terms of energy targets specifically. For many other districts (both newly-built and existing), energy is seen as a link or lever for other challenges, such social inclusion, vacancy, etc. (a.o. Brussels, Lyon, Limerick).

Other examples that could (partly) fit this category are: Pilzgasse Vienna, Nieuwe Dokken Ghent, Mediapark Schaerbeek, Hammarby Sjöstad Stockholm, Brunnshög Lund, Schumacher Quartier Berlin

2.2 Northern District – Brussels / Belgium

Time Frame: by September 2022 draft of a strategy to become a PED in September 2025

Numbers: 150 ha: 1/3 offices (1.732.000 sqm), 1/3 housing
16.000 inhabitants (6.500 households) (2016)

District: Mixed usage
Existing

Targets:
- City of Brussels
  Development of the first PED in the City of Brussels
- Regional authorities
  Densification of housing

Date of interview: 26th of March 2021

Interview partner:
- Roeland Dudal
  Director at Architecture Workroom Brussels
- Filis Zumbultas
  Smart City Coordinator for the City of Brussels
- Lea Kleinenkuhnen
  Project Coordinator at the Smart City Unit of the City of Brussels
- Coralie De Crem and Bastogne Arnaud
  Project Coordinators at the Energy Unit of the City of Brussels

Architecture Workroom Brussels is a cultural innovation platform for the transformation of the social and physical living environment. It initiates the development of new practices, principles and visions for the design of our habitat.

The City of Brussels commits itself to be part of the network of ‘smart cities’. This is a city that meets the needs of citizens, businesses, institutions and manages its resources in a better way, based on a better use of information and communications technology.

Development process

The Northern District became Brussel's main office district in the 1960s and 19070s. It was transformed into a district which opens at 8 a.m. and closes at 5 p.m., leaving behind a problematic history after erasing former neighbourhoods with 20.000 inhabitants. The current district's population is still linked to former residents, although 65% of the inhabitants were born abroad. With an unemployment rate of 33% (46% youth unemployment) in 2012 the incomes per household are low in relation to other districts in Brussel. Because of the high amount of office buildingsthe Northern District has become very monofunctional. The current office buildings do not provide much comfort anymore and are badly insulated due to high amount of glass façades, 65% of them need deep renovation.

Figure: Northern District Brussels

Because the economic reality of it was far off from what was imagined decades before, a major renovation imposed itself in 2020. The limited cultural value of the local building stock caused hardly any heritage concerns, which was seen as an advantage. However, a lack of public space and a permanent influx of undocumented migrants and homeless people confront the area with more pressing challenges. The City of Brussels as a public authority owns quite a substantial amount of housing units in the area, yet these are rented out at market prices. Other public buildings like schools or parts of the port are under long-term concessions with industrial actors.

The chapter "Smart City" in the political agreement for the period of 2018-2024 provides for the first PED on the territory of the City of Brussels. Hence, the city's Smart City Unit initiated talks with the urban planning department to find afitting appropriate district. Although several options were available, the selection of the Northern District grew very organically. The Smart City Unit invited an existing group of building owners (Up4North) to collaborate. As such, political and local ambitions met.. However, the city aims at transforming the whole district into a PED while the Up4North partnership is active only in one part of the district.

Stakeholders

Though 88% of residents are owner-occupiers, 80% of the district's entire building surface is owned by 20 users. Up4North is an association of real estate developers, who among them own 80% of Northern District's building area. Their goal is to revitalise the area around the Brussels North railway station. As part of that, they committed to making their buildings carbon neutral by 2030. The gas and electricity utility firm ENGIE, also part of Up4North, drafted a decarbonisation roadmap for the Up4North buildings. As there were few data available, many assumptions for the roadmap turned out false. Therefore, a new energy masterplan will be elaborated in 2022, for which ENGIE plans exercises and workshops in the near future.

The district is of regional interest and responsibilities are very complex. The land of the district belongs to three municipalities, while half of the office area belongs to the City of Brussels and the other half to the municipality Schaerbeek. As yet, the third municipality, St-Josse-ten-Noode, is not involved in the transformation process.

The involvement of three municipalities makes coordinating the district's transformation very difficult. To promote a transversal approach involving private and public actors, citizens, associations and politicians, to make all actors accountable and to make the neighbourhood's development more transparent the City of Brussels launched the Coordination Platform. Architecture Workroom Brussels (AWB) and City Mine(d) were commissioned to support the City of Brussels in setting up and feeding the Coordination Platform. They favour methods like design thinking, systems thinking and participation methods, over top-down implementation strategies. Therefore, from

the beginning AWB aimed to involve all actors, both by building different working groups to investigate specific local question and opportunities, as well as by presenting the steps taken to the general public. Once the Coordination Platform is established, the City of Brussels will take over its development in the district.

Institutional organisation and legal instruments

The legal framework for Local Energy Communities by the EU has already been transposed in the two Belgium regions Flanders and Wallonia, but not yet in the Brussels-Capital Region. However, if energy communities can prove an innovative approach, special dispensations can be granted to a Local Energy Community, allowing it to experiment with the production or sharing of electricity

After the decision to transform the district into a PED, a funding instrument on the district level, called "Sustainable Neighbourhood Contract" (CQD) enabled the allocation of funding to the Northern District. The sustainable neighbourhood contract is an action plan, agreed upon by the Brussels-Capital Region and a municipality, aimed at improving the living environment of a neighbourhood considered disadvantaged. Through the CDQ for the Northern District, the Department of Urban Planning of the City of Brussels receives funding from the Brussels-Capital Region. The CQD allows for intervention in areas such as the creation of public housing, public facilities, public spaces and productive spaces. The funding can only be spent on the public sector, including public entities that are not part of the city or city-owned. In general, the options for what can be financed with the money are broad. In total, 14 Mio. € will be invested in the Northern District, of which more than 4 Mio. € are allocated directly to the City of Brussels. As such, public property can be redeveloped and public ownership becomes a lever for transformation processes. An entire administrative, political, expert and citizen universe develops and actions are carried out thanks to the CQD. The contract touches upon different phases from feasibility over design participation phase, to analysis phase, etc. all of which are very multidisciplinary. The execution phase of the CQD in the Northern District started in September 2020 and is planned to last 5-8 years for big renovations.

Citizens and housing-owners are currently excluded from the different financing strategies, as they neither qualify as part of the Up4North partnership, nor as stakeholders in the CQD.

Citizen involvement & participation strategies

In November 2020 the Brussels-Capital region launched an online questionnaire, about the district's mobility, energy, social structure and economy. As part of an H2020-funded research programme, questionnaires will be distributed about ways to attract people to the neighbourhood and how to involve them in its development.

City Mine(d), an organisation also active in the district, aims at making local residents actors in and even authors of the districts' transformation, rather than subjects to its consequences. Together with a local community they rediscover instances of the districts' energy history, when local residents pioneered with solar panels and allegedly built the first wind turbine in the region in the 1970s. These stories become the inspiration for new local cultural actions and campaigns, which subtly construct a counter-narrative to the overwhelming development strategies.

Efficiency and energy supply concept

Currently, the electricity supply of the whole Currently, the electricity supply of the whole district is provided by the national grid. The buildings are mainly heated by decentralized gas boilers and cooled by electricity. In Belgium, gas is very cheap compared to other forms of heating. Additionally, Belgium as yet does not support the decarbonisation of heating. Therefore, switching to other heat networks is currently not profitable. Furthermore, the energy systems of the buildings are not flexible as they were built at a time when there was only one owner per building. Nevertheless, a technology concept was made with the support of ENGIE, and a set of options was outlined: Heat exchange between buildings, local energy communities as there are actors with many roofs and actors with high consumption. As

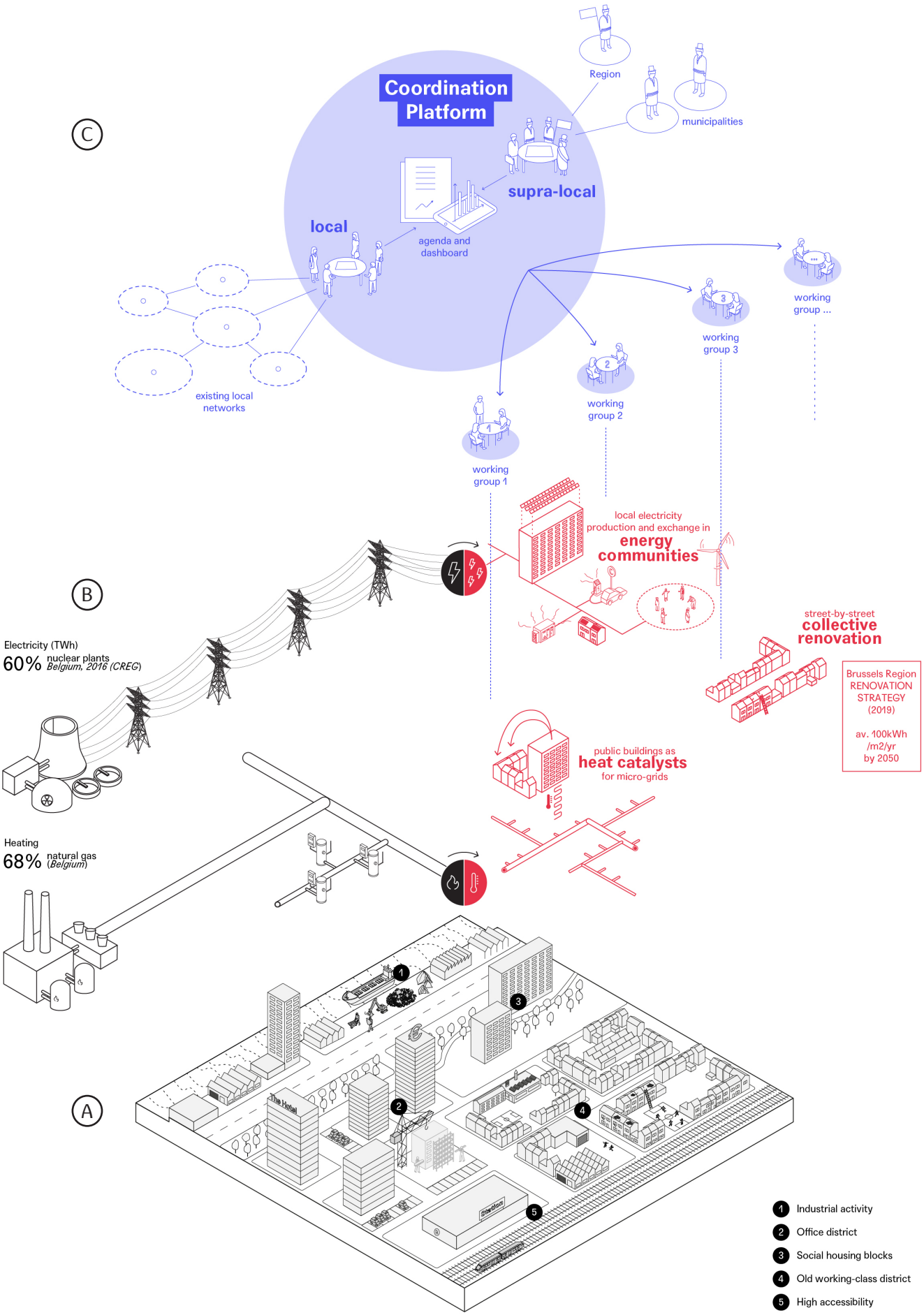
there are 60.000 commuters a day, mobility plays a role as well in these options.

Mobility concepts

The train station located in the district mainly carries out international connections. Underground trams are connecting the North and the South (which North and South?) Electric mobility charging spots have been implemented. Unfortunately, there is a lot of private motorized mobility and little public transport and walking isn't an attractive option as there are no shops on underground level Right now, a lot of investments are made into public transport and cycling lanes together with the redesign of public space. Up to now, many companies provide private vehicles for their employees instead of paying a higher salary to them. The tax regulations which are in favour of the car support for employees can be seen as a barrier for the mobility transition in Belgium as companies do not have a stimulus to behave in a more sustainable way.

Learnings & Success factors

- The set-up of the Coordination Platform as the organisational structure for coordinating the transformation in the district was outsourced by the City of Brussels. In the future, the City of Brussels will take over the coordination of the district development.
- A lack of centralised data and restricted access to it, makes it difficult to plan ahead..
- The Sustainable Neighbourhood Contract is a funding scheme/ programme contract limited in time and money. Due to the contract, 14 Mio. € will be invested in the development of the Northern District.
- The JPI Urban Europe funding project is an important contribution to the district;s transformation.


C
Coordination Platform
Region
municipalities
supra-local
local
agenda and dashboard
existing local networks
working group 1
working group 2
working group 3
working group ...
B
local electricity production and exchange in
energy communities
street-by-street
collective renovation
Brussels Region RENOVATION STRATEGY (2019)
av. 100kWh /m2/yr by 2050
Electricity (TWh)
60% nuclear plants Belgium, 2016 (CREG)
public buildings as
heat catalysts
for micro-grids
Heating
68% natural gas (Belgium)
A
1 Industrial activity
2 Office district
3 Social housing blocks
4 Old working-class district
5 High accessibility

The Northern District in Brussels, Belgium is an example of a

hyperdiverse, energy district without central coordination

Ⓐ They are existing districts, often close to the city centre, a hyperdiversity of different spatial contexts exists in close proximity: industrial activities, offices, a mix of low- and high-income houses, a mix of obsolete and newer buildings, etc. These districts already have history of profound transformations, turning them into a collage of different morphologies. The district has grown organically and consists of very different, decentralised realities: very dispersed ownership, very different building typologies, extremes in socio-economic population groups, etc. There is usually a harsh confrontation between different inhabitants (gentrification is a big challenge), but also between inhabitants on the one hand and other users on the other (for example, commuters who only use the neighbourhood to come to work).

Ⓑ Because of these very different realities, the transition from the central, fossil-based energy system to a renewable system will have to be made step-by-step and with diversified methods and partnerships. There is no one-size-fits-all strategy to develop. The focus of the energy approach is on energy technologies that can be de-centrally implemented, such as solar panels, individual heat pumps, local geothermal energy, local residual heat or sewage heat. The complementary use and production profiles in the district create an opportunity for local energy exchange and balancing. In addition, renovation is a serious task here. The outdated parts of the neighbourhood consume a lot of energy and are therefore a central pillar of the energy approach. The big challenge is to develop a strategy that considers the personalised approach needed for each home or building. To create the indispensable buy-in from local residents, both owner-occupiers and tenants, but also to accommodate reluctance inspired by trauma following previous attempts to transform the neighbourhood, a bottom-up approach should be part and parcel of any new attempt to improve the (energy balance of) the neighbourhood.

Ⓒ In order to manage the transformation of these types of districts towards PEDs, a platform to coordinate a multitude of smaller, local actions is set up. It matches the various local interests, (financing) opportunities by private actors, municipal and regional investment programmes, cooperative projects and so on. This platform facilitates the exchange between a broad community of stakeholders within the district, setting a shared agenda and building new partnerships and projects. In the case of the Brussels' Northern District, this coordination platform is steered by the city itself, supported by facilitators and neighbourhood managers that know very well what's at stake within the district. Within this platform, specific working tables are organised around local opportunities, such as "energy communities", "heat catalysts" and "collective renovation", which lead to strategies that can be multiplicated within the neighbourhood.

For an existing district, this strategy is the most dispersed, compared to a.o. Rotterdam and Limerick, which have a grid structure, uniform architecture and fairly simple ownership model. The focus on coordinating the many different decentralised initiatives is therefore crucial here.

Other examples that could (partly) fit this category are: Buurzame Stroom Ghent, La Pile Brussels

2.3 aspern Seestadt – Vienna / Austria

Time Frame:	2009-2028
Numbers:	240 ha | 2,6 Mio m² GFA 25.000 inhabitants | 20.000 working places
District:	Mixed use Newly built
Targets:	Creating a functional new district. High quality and low energy targets have been becoming increasingly important.
Date of interview:	26th of March 2021
Interview partner:	Lukas Lang and Peter Hinterkörner 3420 aspern Development AG

Lukas Lang is a project manager for urban planning and mobility at the agency responsible for aspern die Seestadt Wiens, called Wien 3420 aspern Development AG. Lukas focuses on urban mobility in Seestadt to create a city of short distances as well as to provide a wide range of mobility options.

Peter Hinterkörner is project manager for urban planning and urban design at Wien 3420 aspern Development AG. Peter is also responsible for the conception and implementation of quality criteria for building plots.

Development process

Aspern Seestadt is being built on the ground of a former airfield, which lost relevance after World War II. Urban planning in the area started when infrastructural research was carried out in the 2000s in the North-East of Vienna. In 2002, the increasing demand for residential and business locations in Vienna led to the decision to continue the development of the area. A masterplan was created, including guidelines for the design of public space, mobility, buildings, usage, diversity, climate adaptation and protection. This masterplan was decided on by the municipal council in 2007 and developed further in 2012. The district development company "Wien 3420 aspern Development AG" (Wien 3420) was founded in 2004, bearing the main responsibility for this plan and following up development tasks. Aspern Seestadt is developed in multiple stages. Today, the district development area consists of several quarters such as "Seeparkquartier", "Pionierquartier" etc. with different focuses. Their borders are either temporally (building phases) or spatially defined (one quarter as a "functional unity"). The aim is not only to develop a new residential area, but also to create a functional new district which has impact beyond its borders and provides a new central function for the 22nd municipal district. The *Smart City Wien Rahmenstrategie* (Smart City Wien framework strategy, 2014) was a great impulse and resource efficiency (material and emissions) became central for the development plans and for project marketing

Stakeholders

One advantage for stakeholder collaboration in the area is the ownership structure. There are only two owners of the land: The "BIG – Bundesimmobiliengesellschaft" ("federal real estate corporation") and the "Wirtschaftsagentur" ("Vienna Business Agency"). Thus, the area is owned by subsidies of the City of Vienna and national subsidies. Subsidies of "BIG" and "Wirtschaftsagentur" founded the district development company *Wien 3420 aspern Development A*G (Wien 3420) which is responsible for the project coordination and for selling the ground to developers.

The City of Vienna has been supporting the district development as a partner and works in close collaboration with Wien 3420: The city has set up a project coordination in the building department as a communication partner regarding infrastructural construction. The wohnfonds_wien, as the responsible Viennese unit that subsidises housing construction and renovation, ensures the implementation of affordable housing targets as a project partner. In 2010, private companies became partners as well.

There are various cooperations with research projects to support innovation ("ASCR – Aspern Smart City Research", "Digital findet Stadt", "gemeinsam gesund" and aspern.mobil LAB). Further, the district council and "Wiener Stadtwerke" (utilities of the City of Vienna), take part in this process. The neighbourhood management was commissioned by the City of Vienna and Wien 3420 to ensure community work for the district in operation.

Institutional organisation and legal instruments

The city induced the transformation of the airfield more than fifteen years ago through an urban development plan. Wien 3420 is in charge of the transformation process with respective tasks as project management, stakeholder coordination, acquisition of partners, location marketing and branding and supports all projects in Seestadt to ensure an integrated planning approach. Wien 3420 is also responsible for the sale of plots without permanently owning the ground. The detachment of the real estate capital enables the company to stay flexible: Wien 3420 becomes owner briefly before selling the ground to developers. Income from selling building grounds is used to finance infrastructural projects. Land selling contracts ensure high quality standards that have to be met by developers. In a legal agreement with the wohnfonds_wien at the beginning of the project, the aim of 60% subsidized social housing (a binding terminology) of all residential units was set. To compensate the construction costs of the social housing, high quality, privately financed housing had to be constructed in order to reuse its profits.

Citizen involvement & participation strategies

To include adjacent areas in the development process of “aspern Seestadt”, people were invited to contribute when design principles were set ahead of the development of the masterplan. Citizens’ needs were collected through questionnaires over the course of informational events in 2005 and three experts from the active neighbourhood were nominated to represent the public in the development process of the masterplan. The satisfaction and social fabric of the operating parts of the district is regularly surveyed. It has become clear that there is a high identification with the district and that aspern Seestadt has a small-town participation character. There is a neighbourhood management called “Stadtteilmanagement” in place which can always be contacted by inhabitants and companies based in Seestadt. It provides an annual programme with activities like district breakfasts, community gardening, a bookshelf with free withdrawal, events as street festivals, guided tours etc. The district management has an on-site contact point as well as an online forum. Further tasks of the district management are public relations, budgeting for the neighbourhood and company networking. Housing costs are lower than the Viennese average due to the high percentage of social housing. To compensate the locational disadvantage, innovative and sustainable concepts and high-quality buildings have become part of Seestadt branding to increase value. These innovative concepts, the affordable housing and educational offers attracted many rather young people like students and young families. Elderly people are attracted by local supply, services and short distances. To include future inhabitants in the planning, “Baugruppen” (cooperative building groups) were integrated in the beginning of the development process and were able to bring in ideas. Baugruppen are an innovative community which design their future residency together. As 50% of the area is public space (parks, squares), hopes are high to strengthen the community and diversity through a lot of shared spaces.

Efficiency and energy supply concept

Aspern Seestadt has become a testbed for various fields such as district development, the integration of renewable energy technologies, building optimization and the integration of user behaviour. The recently developed “aspern klimafit” criteria are breaking down the overall goals of the Smart City Wien Framework Strategy to plot level. They were developed to create an incentive for energy efficiency and the use of renewable energy sources.

- Heating & Cooling: At the beginning of the development process, supplying the district with gas was up for debate. Finally, a decision was made against it and in favour of the connection of aspern Seestadt to the Viennese district heating network with a connection point in the south of the district. Reasons for this decision were, among others, the release of the Smart City Wien Framework Strategy and a related entrepreneurial change of the city-owned energy utility firm Wien Energie. The connection in the south was expanded and is now mostly used within the districts. Recently, locally produced energy became an issue in Vienna and therefore as well in Seestadt Aspern. Studies for possible energy concepts were conducted e.g. the use of geothermal energy, but were not realized in the end.

- Electricity:
  - Photovoltaic installations
  - Thermal and electric storages in testbeds
  - Monitoring for optimization: user habits, sensor data, weather forecast, etc.
  - Demand-side-management in applied research

- Energy efficiency: As energy efficiency has been an important issue from the very beginning, attention was paid to the performance of newly constructed buildings already in 2011. To reduce the energy demand efficiency measures are implemented e.g. through insulation thickness and ventilation units with high heat recovery. The ASCR (Aspern Smart City Research) is a Vienna-based research company owned by Siemens, Vienna’s energy and grid utility firm and the City of Vienna. It collects data of buildings and

their supply, power grid, communication and information technology, e.g. it monitors three smart buildings (residential, student housing, education campus). Furthermore, 111 households take part in a monitoring project focusing on user behaviour, where energy consumption data is collected. The building certification “total quality building” (TQB) of the Austrian sustainable building council is a required standard for all new buildings in aspern Seestadt since 2011. To secure integral and sustainable construction, 800 out of 1,000 points have to be achieved.

Mobility concepts

As the extension of the subway was part of the urban development plan in 2004 and operation started in 2013, Seestadt is now easily accessible by subway. Two subway stations are in direct commuting area of 2/3rds of “Seestadt”. The district is situated 9–10 kilometres from the city centre, which equals 30 mins by public transport. Two tram lines and several bus lines connect the district to surrounding infrastructure. Additionally, since 2019 there is a train station and an extension for the connection to Bratislava is planned. The infrastructure in the district is developed by Wien 3420 and then returned to the City of Vienna for operation.

The first framework for the mobility concept was set in the masterplan, addressing parking, infrastructural aspects and street design, with the aim of an allocation of 40% walking and bicycling, 40% public transport, 20% motorized individual transport. The mobility concept tries to reduce motorized individual transport by only allowing cars to use connection roads to the existing street network (red), main network streets (orange) and the district streets (yellow) in which collective garages are situated.

Figure: Aspern Seestadt

To decrease “permanent parking” on the streets, there are only garages and parking spots next to subway stations. The garage parking spot ratio was set at a maximum of 0.7 parking spots per residential unit. The measures were implemented through private contracts in the selling process and are supported by a fund for sustainable mobility. E-Mobility will get a higher priority in the future, as Aspern klimafit criteria include requirements for e-mobility charging stations. Bike sharing has already been established in form of a lending system. There are several research projects concerning mobility.

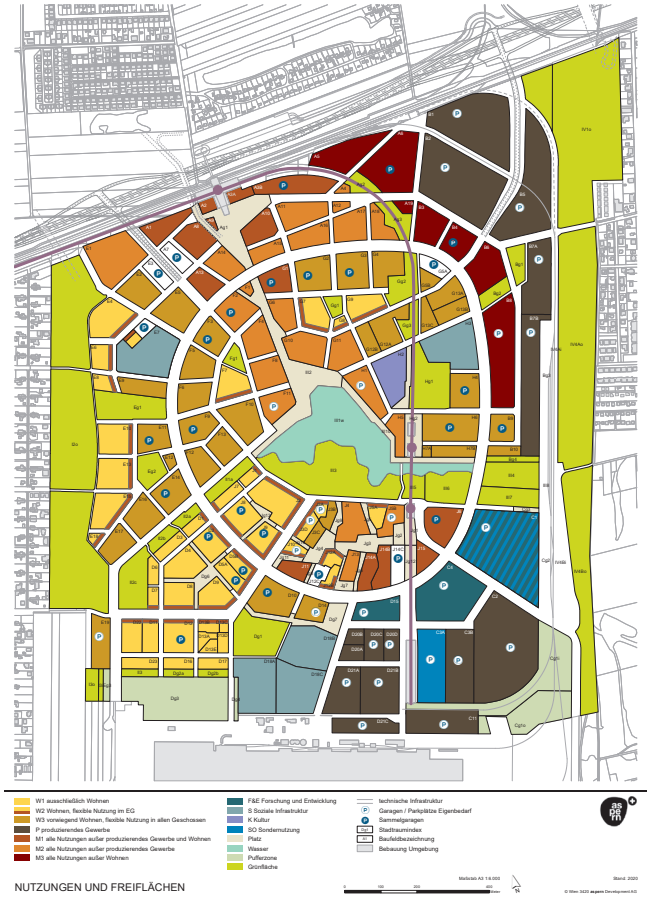
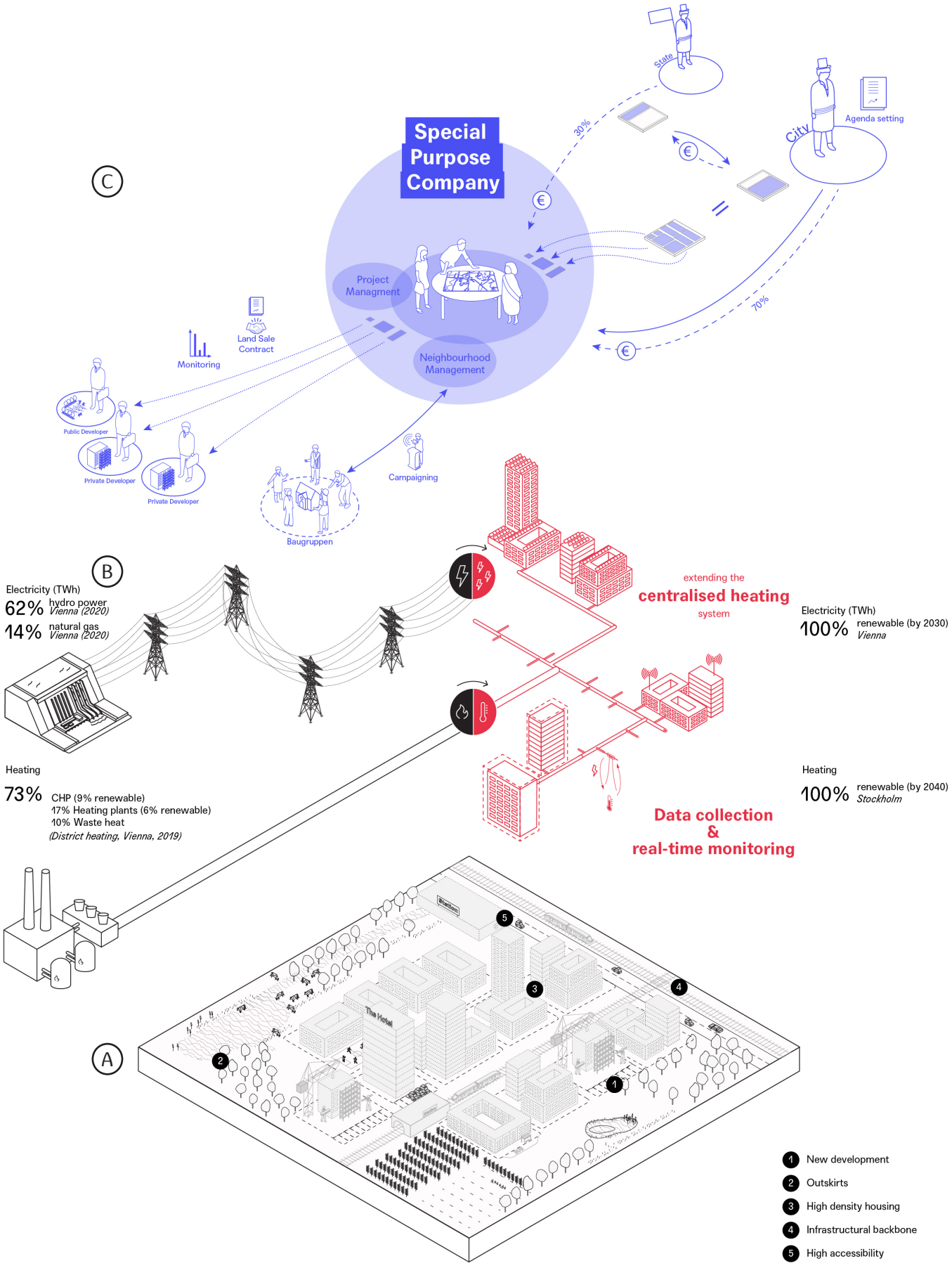


Figure: Aspern Seestadt

One advantage for the stakeholder collaboration in the area is the ownership structure, where only two institutions own the plots which are sold to the developers via the district development company.

Learnings & Success factors

- The project company enables the steering of the district development to act more agile.
- The project company has a more integrative perspective on the planning process of the district than the city administration and bundles the development of the whole district and single plots in one organisation.
- There are only two owners of the ground, which are national and city subsidies, which makes the development process less complex.
- The private owners of project company ensure private capital flows in the district's development.
- The Aspern klimafit criteria in the land selling contracts set strict requirements for developers on plot level.
- Political ambitions and the "Smart City Wien Framework Strategy" paved the way for the relevance of energy related topics and for setting respective requirements.
- If certain grounds are sold to "Baugruppen", active citizens are automatically involved in the development process


C
Special Purpose Company
State
City
Agenda setting
30%
70%
Project Managment
Neighbourhood Management
Land Sale Contract
Monitoring
Public Developer
Private Developer
Private Developer
Campaigning
Baugruppen
B
Electricity (TWh)
62% hydro power Vienna (2020)
14% natural gas Vienna (2020)
extending the
centralised heating
system
Electricity (TWh)
100% renewable (by 2030) Vienna
Heating
73% CHP (9% renewable)
17% Heating plants (6% renewable)
10% Waste heat
(District heating, Vienna, 2019)
Heating
100% renewable (by 2040) Stockholm
Data collection
&
real-time monitoring
A
1 New development
2 Outskirts
3 High density housing
4 Infrastructural backbone
5 High accessibility

Aspern Seestadt in Vienna, Austria is an example of a

satellite, company-coordinated smart energy district

Ⓐ They are newly-built districts at the outskirts of a large city, built to function independently and bring together working, living, and recreational activities. Preferably, they are brownfield redevelopments on earlier reserved land (in the case of Aspern Seestadt, on a former airfield), instead of greenfield developments. They accommodate the increasing demand for housing and offices in the city. They are made up of high-rise towers with plenty of room for green, water management and biodiversity. High-quality public transport (train, tram and bus) connects these satellites to the city centre. The planned structure of the district allows for the application of innovative urban planning concepts, including the prevention of parking in public spaces, the prioritisation of e-mobility and the creation of walkable public

Ⓑ spaces. The dense building typology is in itself very energy-efficient, and is reinforced by high demands on energy performance. A mix of private homes and social housing is provided in the district, which also seeks out the socio-economic balance between resident groups. The district aims to strengthen the community through shared spaces such as public parks and squares.

Ⓒ The energy concept in the district is a test bed for a new integral district approach, with a strong focus on a smart grid, where smart buildings are guided through smart technology. Real-life experimental techniques are monitored and the effective solutions are multiplied. They can be fuelled by centralised energy systems, such as deep geothermal or a connection to the existing district heating network (as is the case for Aspern Seestadt). This is combined with an ecosystem of complementary technologies, including battery storage, smart meters, management systems, but also water management and air quality regulation.

Because the district is located in a remote area which has not been subdivided before, the ownership model of the development is straightforward. One or two owners (the federal real estate agency and the city in the case of Aspern) sell the land to a newly established Special Purpose Company. This company can be entirely publicly owned (see the case in Lyon), or partly privately and partly publicly owned (as in the case of Vienna). The Special Purpose Company becomes owner briefly before selling the ground to developers. Income from selling building grounds is used to finance infrastructural projects and high quality, privately financed housing can compensate for example for the construction of social housing. Land selling contracts ensure high quality standards provided by developers. Next, there is the project management with private developers, neighbourhood management in contact with future local residents, and research, data collection and adjustment. In Aspern Seestadt, these roles are divided among three separate teams that help coordinate the development process alongside the Special Purpose Company.

This strategy is very similar to Stockholm, but is more disconnected from the rest of the urban system. The district is viewed as a separate unit, which is monitored autonomously through smart models.

Other examples that could (partly) fit this category are: Thor Science Park Genk, Ter Walle Kortrijk

2.4 Confluence – Lyon / France

Time Frame:	2003 – 2030
Numbers:	150 ha | 1 Mio m² NFA 20.000 inhabitants | 25.000 working places
District:	Mixed use Newly built and existing
Targets:	Doubling the size of the city centre Creating a high-quality low energy district
Date of interview:	29th of March 2021.
Interview partner:	Etienne Vignali, Project Manager at Lyon Confluence

Etienne Vignali is project manager at the local public company Lyon Confluence. The company has been the development planner of the urban renewal project for 20 years. In this position, Etienne also coordinated the European Smarter Together project with 37 partners from 8 countries.

> ***"The development company designs public spaces and sets regulations in land selling contracts."***
> ***- Etienne Vignali***

Development process

In the early 19th century the land between the rivers was reconstructed and a railway station was situated there. The first studies for potential changes of the area were conducted in the 1990s. In 2003, the development of the new Confluence district started with the intent to extend the inner city of Lyon. Approximately half of the district (green area in Figure 2) is characterized by existing buildings, the other half will be newly constructed. Over the course of two building phases, new buildings will be constructed and existing buildings will be retrofitted. To make this possible, a development company was created by the city and the greater Lyon Authority to take care of the district and to design and implement the masterplan. The development company had to deal in the first place with the bad reputation and social issues of the district. After years of refurbishing public spaces to make changes visible for inhabitants and creating affordable housing, the project has become successful. Even though energy was not an important issue in the beginning, its importance is continuously growing. New concepts are often tested in Confluence in form of projects, financed through partnerships and then reproduced

Figure: Lyon Confluence

without subsidies.

Stakeholders

The city and municipalities of the greater Lyon Authority wanted to refurbish the area and therefore created a private special purpose company (SPL Lyon Confluence) with public authorities as shareholders to take care of the district development (25 employees with private contracts). A contract between the shareholders and the development company specifies their mission and budget, which are described further in the next paragraph. This company will be dissolved or their contract will be changed as soon as the project is finished. A board of only public shareholders meets every 3–4 months to validate changes in development plans. During more than ten years, the president of the SPL Lyon Confluence was the mayor of Lyon, as well as the president of the Greater Lyon Authority. This provided a stable governance and strong political support for the Lyon-Confluence urban project. The developers (private owners, social housing developers, public facilities, real estate developers) were not easy to convince in the beginning due to the area's bad reputation but they have been crucial for the ambitious plans. Due to the improvement of the area, the developer's interest and willingness to implement superior construction are high. The citizens' support was vital for the development and was achieved by PR and a strong involvement of citizens in the development process.

Institutional organisation and legal instruments

The founded development company Lyon Confluence consist of urban developers who are in charge of creating and editing the quarter's masterplan, designing public space, conducting studies, communicating with relevant stakeholders and selling ground to developers. When a ground is sold, the development company sets guidelines in the respective land selling contracts and supports the developers to fulfil them (e.g. concerning public spaces, refurbishment, percentage of social housing, architectural aspects and environmental performance). To create ambition, the guidelines are stricter than the current French building regulations. Besides selling the ground,

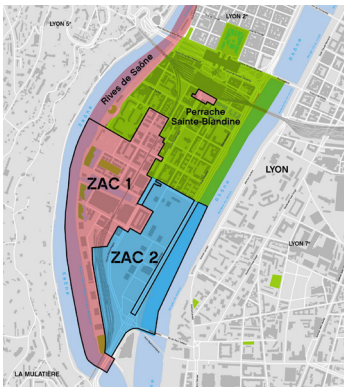


Figure: Lyon Confluence

designing public spaces is one of the main tasks of the development company. After construction, the city is responsible for the operation. The company is financed through their contract with the city (1/3), the ground selling and the support of the developers (1/3) and from funding of taking part in several innovation projects (1/3).

Ownership structures had to be changed in order to enable the development company to sell the ground. A small part of the ground is owned by private entities, but most of it belongs to the public, as the French railway company and the state organisation for river and riverbank management. With each of the owners, negotiations were necessary to enable the development (e.g. riverbank management: concessions for usage). Although an expropriation act for big scaled projects with a supra-regional influence exists in France, strategic negotiation was sufficient expropriation was not necessary in Confluence.

Citizen involvement & participation strategies

In 1998-99 the exhibition "Lyon Confluence, an urban project" presented the area's potential to nearly 24.000 visitors and collected thousands of comments. Additionally, a centre was created in Rue Casimir Périer to welcome, inform and listen to the public and to answer questions from inhabitants. In 2003 there were four public meetings prior to the creation of the first area of the district. Since 2006, the participatory monitoring committee has been bringing together the neighbourhood's socio-economic, cultural and governance actors for coordination sessions three times per year. In 2008 and 2009 there were six thematic workshops, an exhibition "My city tomorrow" in which people submitted written contributions, and an interactive website was created before ZAC2 was built. In spring 2016, a consultation on the redevelopment of the "Perrache" station area resulted in 247 written submissions. As such, the public has always been integrated in the development process ever since the beginning. To stay flexible and to adapt the concept, when needed, there has never been the urge of a label or certification for the district. Important activities that contributed to the neighbourhood's improvement were the redesign of public space and providing affordable living. Both made people believe in the district again. Further community concepts are: evening events, welcoming parties after construction, various workshops (e.g. on public space design, heat network, mudbricks, construction machines). Efficiency and energy supply concept

So far, there have been several concepts for energy supply.

- Heating & Cooling: In 2016, a district heating system was installed. Two thirds of the district heating's energy mix come from renewable energies (biomass) or from residual waste incineration. In the Lyon-Confluence area, more than twenty buildings are now connected to the district heating system, representing in total, around 150,000 m2. In some cases, gas heating is still in use, while other buildings have their own biomass power plants. Ground water (heating and cooling through heat pumps) can only be used in a small number of systems as its temperature would increase and an environmental imbalance would be caused

Figure: Lyon Confluence

- Electricity: There are 30 Photovoltaic installations (which represent ~2MWp). In addition, 1,5MWp will be installed in the upcoming years. This does not cover all the electricity demand of the neighbourhood but equals to the annual electric consumption of 1,000 households. Wind turbines cannot be installed as Confluence is located in the inner city of Lyon. Neither is using the river for energy production feasible.

- Buildings: Lyon Confluence started to build the first high energy performance buildings

15 years ago. Additionally, the buildings reduced their grey energy through the integration of wooden material and clay, increased their insulation thicknesses, improved their monitoring and were planned flexible to change usage. Lyon-Confluence concerns also many projects of environmental building energy retrofit in the existing and historic neighbourhood.

- Monitoring: In several projects energy consumption and production is recorded to compare outcomes and to find ways for improvement. Waste management, wastewater treatment and transport & infrastructure are in responsibility of the city of Lyon and several small cities around, not the development company.

- Waste management: Wastewater treatment and transport & infrastructure are the responsibility of the Greater Lyon Authority and cannot be steered by the Lyon Confluence development company.

Mobility concepts

A busy highway in the north and east of the district separates the inner city and Confluence. A railway station is located within the district. As mentioned above, the authorities are responsible for transport and infrastructure (buses, trams). Still, mobility is part of certain projects for “last mile logistics” in the district. The development company forbid the construction of underground parking between building blocks in the land selling contracts. It is only allowed under the building itself to prevent area-wide sealing and to keep green spaces. A mutual car park was built as well to have dedicated parking spots for people and “shared” ones for people living there and people working there. Developers who buy ground have to contribute financially to public facilities and public spaces. In new buildings, some of the inhabitants will have parking spots underneath the building and some at the mutual car park. Other measures, such as increasing the frequency of public transport, can only be taken by the Greater Lyon Authority.

Learnings & Success factors

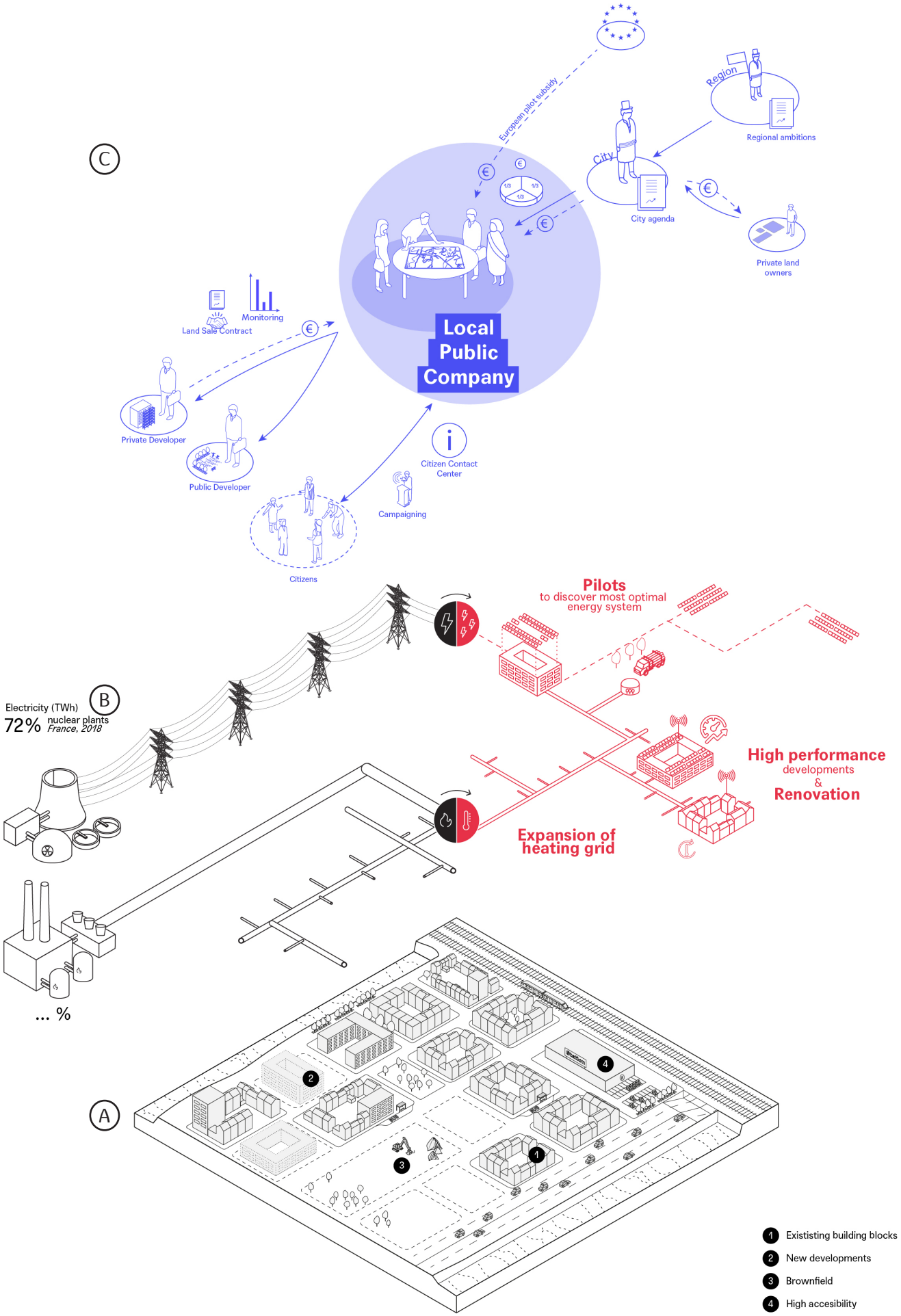
- The special purpose company is able to act more agile on the development process.

- Setting strict criteria in land selling contracts and support developers contributed to implementing high quality solutions and environmental performance.

- No labelling or certification of the district in order to stay flexible and to adapt the concept, when needed.

- Key persons, like the mayor in the parallel role as president of the development company, offered agency and therefore simplifications of the development processes.

- A bad reputation of a district could be changed through creating visibility by international cooperations (such as European projects) and incentives for active citizenship.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1 Exististing building blocks
2 New developments
3 Brownfield
4 High accesibility

La Confluence in Lyon, France is an example of a

mixed-use, company-coordinated energy district

Ⓐ They are partly existing, partly newly-built districts, often in post-industrial areas close to the inner city. A lot of attention goes to shaping a highly dynamic use of the neighbourhood with a mix of different functions, both to live, work and for various cultural activities and recreation. The reputation of the district is being boosted by new centres of attraction, such as museums, and a highly sustainable character. Internationally renowned architects are invited to draw the plans for this new urban district and its landmarks, which contributes to its attractiveness to new residents. A combination of social diversity, architectural quality, environmental performance, user comfort and quality of life are guiding forces.

Ⓑ The energy concept is ambitious and multi-faceted. In order to become energy positive, the district applies a combination of centralised and decentralised strategies. The new developments become part of the urban heat network as much as possible, which in the case of La Confluence is the Grand Lyon Centre Métropole network. This is complemented by decentralised technologies such as solar panels, local heat pumps, biofuel boilers, etc. And finally, a massive effort is being made to reduce energy consumption. New buildings have low levels of energy consumption, and old buildings become part of a renovation programme.

Ⓒ The project is led by a public special purpose company SPL Lyon Confluence, which is owned by the City of Lyon and the Greater Lyon Authority ('Lyon Métropole'). The city administration buys the land they do not yet own from private land owners through strategic negotiations. The Special Purpose Company sets up strict planning and urban design principles that developers are required to integrate into their designs as a condition to become part of the project, through funds, legal benefits and land selling contracts. Developers need to win design competitions to be part of the project and not just offer the best price for the land. New energy concepts are tested in the form of projects, financed through (subsidy) partnerships and then multiplied later on autonomously. Public involvement and decision-making is an important part of the whole process, with the aim of involving the community early on in the process to avoid opposition afterwards.

This strategy is situated between those of purely new and purely existing neighbourhoods. Much attention is paid to local actor ownership (cf. a.o. Brussels, Rotterdam), but the coordination of the development is in the hands of one actor (cf. a.o. Stockholm, Vienna).

Other examples that could (partly) fit this category are: Île de Nantes, Paris Rive Gauche, Simmering Vienna, Bahnhofviertel Reininghaus Graz

2.5 Oostveld – Eeklo / Belgium

Time Frame:	/
Numbers:	30 km² 21. 000 inhabitants 700 inhabitants/km² Cooperative energy production since 1990s
District:	Mixed use Existing
Targets:	/
Date of interview	7th of May 2021
Interview partner:	Bob D'Haeseleer, Alderman/councillor for spatial planning, urban renewal, youth and sustainability

Since 2012, Bob D'Haeseleer is back in his hometown Eeklo. He helped to work out a vision on wind energy, a heating network and a model for third party financing with citizen participation of solar panels, rebranding energy as a local product. The profits of all these local energy projects are kept local and are paying for renovation and climate adaptation measures.

> ***"The key to success is looking at energy as a local product with local added value, local ownership and local participation." – Bob D'Haeseleer***

History and development process

Eeklo's bankrupt industry at the end of the 1980s brought a lot of poverty, which made the town not the typical place for green innovation. In the 1990s, the newly founded cooperative Ecopower asked the city if wind turbines could be installed in the municipality of Eeklo. In 1999, a public call for tender was launched, foreseeing the construction of three wind turbines on public land with criteria as "direct citizen participation," "comprehensive information for citizens" and "local added value for the town and its population." The criterion "direct citizen participation" meant only cooperatives were able to join the call. The criterion local added value a criterion in the procurement process, it was ensured that the city's energy demand has to be produced in or near the city. In the call, a minimum of 50% direct participation was required. Offers which included more than 50% received extra points. The applicant receiving highest score won the call.

Following this very first call in 2001, three cooperative wind turbines were installed. After a successful second call, five more wind turbines were added on private land with two of them owned by a cooperative. Over the two projects for 8 wind turbines only one single complaint was handed in but no lawsuit followed. By comparison, in the rest of Belgium the construction of more than half of all wind turbines projects is delayed or cancelled due to lawsuits. In the third phase, higher authorities wanted to add another 14 wind turbines. to safeguard its unique public support for wind energy, the administration of Eeklo needed to protect its unique public support for wind energy and offered citizens a close-end scenario with both a concentration zone and an exclusion zone in order to gain their trust and acceptance. On top of this, in the concentration zone, inhabitants were asked not just if they were in favour or against wind turbines, but under which conditions they would allow the construction of 14 additional wind turbines. An agreement was reached in 2014, which included that 50% of the total project have to be open to direct citizen participation, 5.000 € per turbine should be invested into a neighbourhood fund and 5.000 € per wind turbine should be invested into a climate fund run by the city. Owners of land on which turbines have been installed are receiving a rental fee. In 2019 all permits were delivered without noticeable opposition and in 2020 all 14 wind turbines became operable in Eeklo.

Stakeholders

Ecopower, a renewable energy cooperative, won the call in 1999 and implemented three wind turbines in 2001, which are now being renewed and renovated. The shares of Ecopower can be bought by every citizen, giving them the right to vote within the cooperative. One person gets one vote in the cooperative, in contrast to multinational companies where shareholders get one vote per stock. This creates a different dynamic, as the members of a cooperative are more interested in low energy prices rather than in high profits and dividends.

It can be observed, that people who are co-owning wind turbines cut their own energy consumption after three years by 50%. This means that cooperative wind turbines are actually producing for twice the number of households than turbines with a classic business model. Due to the ownership of wind turbines shareholders become more aware of their energy usage. The example of Eeklo shows, that this cooperative-effect is twofold and brings both, an increased acceptance for renewables and a direct energy cut.

The added value generated by the wind turbines returns as much as possible to the local community through the citizens owning a cooperative share but also through an energy consultant who's on the payroll of Ecopower. He's in charge of accelerating the energy transition for the town over the last twenty years. The energy consultant looks out for new opportunities to produce energy locally, and makes project suggestions which have to be commissioned by the city. Because he is

Figure: Eeklo

being paid by Ecopower and he can act more independently from the city and from political changes. This allows to set up strategies that go beyond multiple election cycles and offers true long-term engagement a company can offer a small local municipality. It stands in sharp contrast to companies who come in with a building application and a once-a-year-maintenance. Up to now, the consultant's three main projects have been: helping out setting up a new legal structure for district heating network, for the installation of PV modules on all suitable roofs in the city and for a new energy poverty project which was recently approved by the European Commission.

Communication strategy

Before project developers were invited to the first call, the city presented the plan of the wind turbines to residents. Fortunately, in 1999, inhabitants were sceptical but undecided and there was no fixed opinion on wind energy with the advantage of politicians not being polarized yet.

Thanks to direct participation and constant campaigning of the energy consultant, an ideological discussion was avoided and energy projects are supported by the public up to now. Key in this new narrative is to consider energy as more than just CO2 but as a local product with local added value. To bring people on board, different formats and narratives were used: Energy became part of the communities' identity, even city marketing in a holistic narrative. As such, all stakeholders are able to identify themselves in advocating for local energy. Furthermore, one single point of contact, facilitated by the energy consultant, was a crucial element for a high acceptance among the citizens.

Efficiency and energy supply concept

All 14 wind turbines are producing more All 14 wind turbines are producing more electricity than Eeklo's total use of electricity over one year, adding up to a 130% coverage rate (133 MW consummption, 170.5 MW production).

Currently, mainly centralised gas is used for heat supply in Eeklo. This it is the case in most Belgian municipalities, as the network is provided by a public company with a monopoly, whereas the supplier is a private company. A waste incinerator in the North of Eeklo is already in operation but currently just 30% of its heat of the is recovered through cogeneration. There was no legal framework on national or provincial level so until now, district heating was exclusively implemented in newly built areas with private ownership. To make use of the other 70% the city had to write its own legal framework in order to make use of all the waste heat. Many networks of the city are now being renovated and put back into place with implementing a district heating network.

For the new district heating network, the city opted again for the known formula of the public tender. Ecopower joined forces with the multinational utility provider Veolia to set up a special purpose vehicle (SPV) for the call. The SPV, consisting of Ecopower and Veolia is unique in the world: The business models of a cooperative and a multinational differ fundamentally but this special purpose vehicle succeeded due to their common goal. Both business models offer benefits. Veolia provides clustered capital and knowhow and Ecopower provides a high level of trust to the local community. This is vigorous to convince homeowners to switch from gas to district heating, a relatively new and rarely adopted technology in Belgium. In their concept, customers would not pay more than for gas supply and inhabitants are not obliged to connect to the district heating network. But there will be a gas network and a district heating network "in parallel" as the EU regulations of freedom to choose have to be complied with. Because of the regulations, residents can choose to connect to the district heating network or to invest e.g. in their own on-site heat pump as well. When residents choose to connect to

In the case of the new district's heating network in the existing parts, the city opted for a public tender instead of a direct contract.

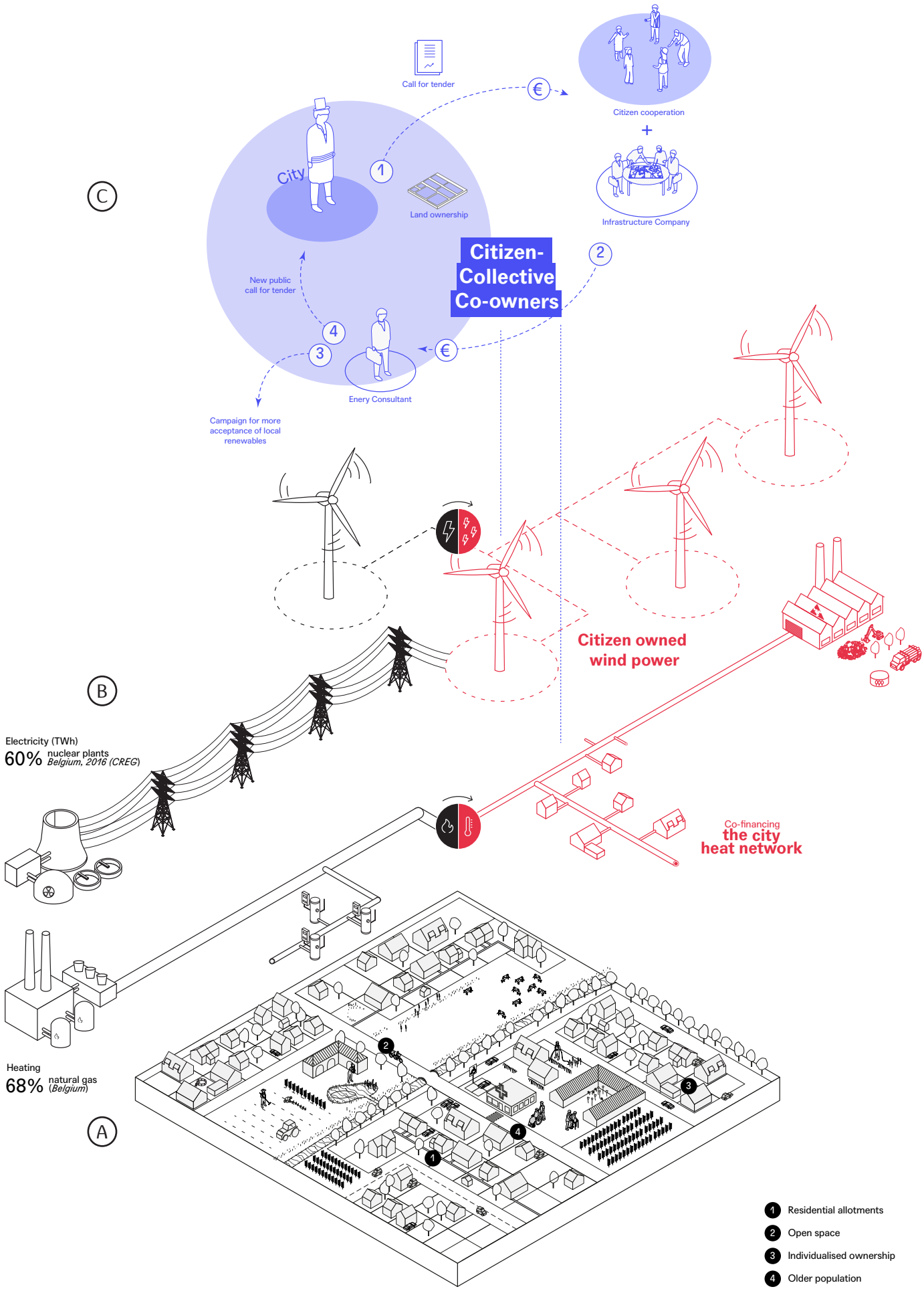
the network, the SPV of Ecopower and Veolia will cover the investments for installation. The aim in Eeklo is to cover 60% of the city with district heating, while the potential from waste incineration plants could cover the demand of the whole city twice. Unfortunately, the construction costs of district heating are very high: 750.000 – 1.000.000 €/ km district heating pipes, therefore a high connection density is important. A heat source map of the whole city now shows under which price-scenario's which areas can be connected to the district heating, when this would be possible. But also, in which areas they will probably need to look for different, more individual solutions.

This will create an interesting question and a conflicting situation: the collective solution of a district heating network is cheaper than the sum of all households buying a solar boiler or heat pump so collectively you want to promote the option of the district heating. Stimulating individual solutions there would be counterproductive in the areas where district heating is a viable option. This would create a lock-in scenario making the total district heating impossible. But would it be just if the city would only hand out premiums for solar boilers or heat pumps in the outskirts to more upper- and middle-class homes in those residential areas which take up a lot of space? Can you differentiate premiums in the first place?

With the newest call for tender, the city wants to open up all the roofs belonging to the city. An analysis clearly showed that capital to invest and a suitable roof for PV are necessities for PV installations. Again, with the tested formula of a public tender, the city of Eeklo wanted to use the cooperative model to matchmake citizens with capital, who want to invest in roofs of people and organisations that didn't had that money but were happy to open up their roof in return for cheap electricity. After all roofs of public buildings were covered, a second phase offering this to schools and small businesses was started. In a third phase this would be expanded to private houses and apartment blocks. As no additional investment is needed, it is also very interesting for rental homes and social housing.

Learnings & Success factors

- Criteria in public procurement led to revenues which stay in the municipality and are still financing the local energy transition.
- Cooperatives have two main effects: an increased acceptance for renewables and a direct energy cut.
- A strong narrative to convince many citizens was to frame energy as a local product with local added value, local ownership and local participation.
- The proposal of the citizen cooperative for locally produced renewable energy was implemented by the municipality.
- When the development process started in 1999, inhabitants were sceptical but undecided and there was no fixed opinion on wind energy with the advantage of politicians not being polarized yet.
- Having one single point of contact was a crucial element for a high acceptance among citizens.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1 Residential allotments
2 Open space
3 Individualised ownership
4 Older population

Oostveld in Eeklo, Belgium is an example of a

citizen-owned infrastructure in a village energy district

Ⓐ They are existing districts in a rural context, with a dispersed distribution of buildings and a lower density, which means that there is still quite some space within the district that is not built. The allotment houses are mainly privately owned. These are neighbourhoods that are almost exclusively residential, with near to no facilities such as schools, shops or public transport. The infrastructure cost per household is generally high and the ever-growing land take of this type of neighbourhood is a risk to the preservation of open space, water systems, biodiversity, etc. Mechanisms are therefore being sought to densify these types of neighbourhoods and to integrate them into a more efficient service, mobility and energy system.

Ⓑ The rural characteristics of the district allow for specific energy solutions such as wind turbines to provide locally produced renewable electricity, deep geothermal energy or waste-to-energy plants connected to a heat grid. The renovation and densification of the energy-wasting detached houses offer an occasion to make the connections and adjustments to accommodate the central grid.

Ⓒ The strategy for this district transformation is being carried by a collective citizen-owned energy cooperative. The success rate of this strategy largely depends on the willingness and readiness of inhabitants to become active participants and even co-investors in the project. There is a large focus on making the local benefits clear, raising awareness about the energy transition and building local capacity. The cooperative prevents the outflow of money via energy bills to external parties and, on the contrary, helps to reinvest this money in local energy infrastructure, with profit for the citizens and the municipality. For the implementation of the energy infrastructure, the citizen cooperative collaborates with the municipality and a private infrastructure company. The city can give legal exemptions and usage rights for public land, but also initiate feasibility studies and hire energy consultants to support the implementation, such as is the case for Oostveld. The profit of the citizen-owned wind turbines, solar panels, heat network, etc. can then be reinvested again, and initiate a next cycle of investment in energy infrastructure in the surroundings.

This strategy radically places users and residents as part of the business case and organisation of the PED, similar to Rotterdam and Brussels, but in a more unified and formal way (citizens are represented in a single cooperative vs. as part of a stakeholder platform or table).

Other examples that could (partly) fit this category are: Climate Neighbourhood Leuven, Nos Bambins Ganshoren

2.6 Bospolder-Tussendijken (BoTu) – Rotterdam / The Netherlands

Time Frame:
2017-2019 research
2019-2020 community building and prototyping
2021-2023 development local organisations
2023-2028 large scale implementation

Numbers:
17.500 inhabitants

District:
Existing building structure
Mainly residential use
(>60% of the housing stock is social housing)

Targets:
Gas-free by 2030

Date of interview
5th of June 2021

Interview partner:
- Eva Pfannes
  Director of OOZE architects & urbanists
- Robbert de Vrieze
  Founder of Transformers, Co-initiator of the (energy) neighbourhood cooperative

Based in Rotterdam, Eva Pfannes is an architect and urban designer and co-founded the international design practice OOZE. Their projects use space as a tool to transform their culture of living. In 2020 Eva was the lead designer of the IABR–Atelier Rotterdam III, working on a Local Energy Action Plan (LEAP) to decarbonize a local neighbourhood.

Robbert de Vrieze is a social designer and architect. With his agency Transformers he operates at the edge of design, politics and economy. He co-founded Delfshaven Coöperatie, a neighbourhood cooperative with a local investment fund for the long-term value development of Bospolder-Tussendijken. With this partnership of institutional parties and local citizens new initiatives on community building, welfare, work and energy were initiated and facilitated.

History

The district derives its great heterogeneity from G.J. de Jongh's urban design from the late 19th century, which was implemented in Delfshaven (an area in the harbour of Rotterdam, of which the district of BoTu is a part) and is characterized by a homogenous street grid. It was marked by prostitution and drug dealing during the 1980s and 1990s which led to strong protest and action from the citizens. In the 1990s and 2000s, many buildings were demolished and rebuilt. Within this starting point of the transformation process, the strong bottom up dynamic of the Delfshaven district can already be seen.

In 2017, the Delfshaven Cooperative, the city municipality and a local housing corporation applied for the project "next generation living districts" and joined forces with the International Architecture Biennale Rotterdam (IABR), where a common goal was developed: using the energy transition as a lever for social and inclusive city making. Luckily, the district can build upon a vibrating network of local cooperatives, and projects, where people are involved in different projects and roles without a certain coordination point in the district. This enables transformation processes with a strong community engagement.

District transformation

BoTu 2028 is an initiative on neighbourhood scale, which started in 2018, that built upon the results and successes of a project of a 'Stadsmarinier' (marine servant) that was commissioned by the mayor with a budget of 2.4 million € in order to increase local safety over the following two years. The servant included actors who were already working locally to address pressing local issues. Like this, an iterative working method was established and the budget was invested directly into implementation projects. The result was a growth of the social and safety index of more than 10% in the district. The projects which bring together businesses, the municipality and citizens are still ongoing. BoTu 2028 has three thematic streams: energy, care and employment as well as three key working methods: community building, the working culture of civil servants and their responsibility for resilience and impact by design, a programme, where pressing issues are addressed locally.

The BoTu2028 hybrid programme organisation facilitates the process of change towards a resilient neighbourhood.

After this success, the local actors were able to convince the mayor that a 10 years programme is needed to increase the social and safety index locally in order to reach the average safety level of Rotterdam. The programme amounts to circa one million euro's per year. Of that budget, 50.000 €/yr from the BoTu 2028 programme and further 50.000 €/yr from the municipal sustainability programme, brings 100.000 €/yr investment for local energy transition initiatives for the district up to 2023 (and hopefully 2028). The foreseen budget for the years until 2028 can be assembled in a new way each year by the local civil servant and 'program council', which brings a great flexibility and the possibility to react on local dynamics. Recently, a "Working Together Agreement" on energy transition was signed by many initiatives of the district. It incorporates participatory budgeting to let citizens decide into which projects the money is invested.

OOZE architects & urbanists joined the district transformation with a strong perspective on CO2 emission savings and communication strategies for inhabitants. A big challenge is to bring inhabitants on board for the gas exit, as gas is cheap and often used for cooking. OOZE calculated that the transition of domestically used energy only accounts for 20% of CO2 emissions. Therefore, other challenges like mobility, transport, food, waste, consumption of everyday life should be addressed equally.

Development of the Local Energy Action Plan (LEAP)

The LEAP is built on technical research conducted by PosadMaxwan & Generation Energy as well as an anthropological social study. It outlines a step-by-step process which closes resource loops and leads to a more self-reliant and resilient neighbourhood, which can be replicated and scaled up to be applied to the rest of the country and beyond, helping to achieve a net zero carbon economy by 2050.

To develop the LEAP, the neighbourhood was subdivided into cases (housing blocks with each counting 200-500 inhabitants), which served as a unit to extract information on energy

savings and generated a bottom-up vision of the whole neighbourhood. A first conclusion was that 60% of the CO2 emission can be saved, 45% of the electricity can be produced in the neighbourhood easily while the neighbourhood can be made gas-free. These conclusions became the goals of the LEAP. In the next step a set of principles were defined: (1) Building and assessing local capacities (energy potentials and social capital, Asset Based Community Development); (2) an integrative approach for climate mitigation and adaption measures that are cross-sectoral and based on the integration of budgets; (3) the definition of close-by milestones which can be measured and lead to a countdown to 2030.

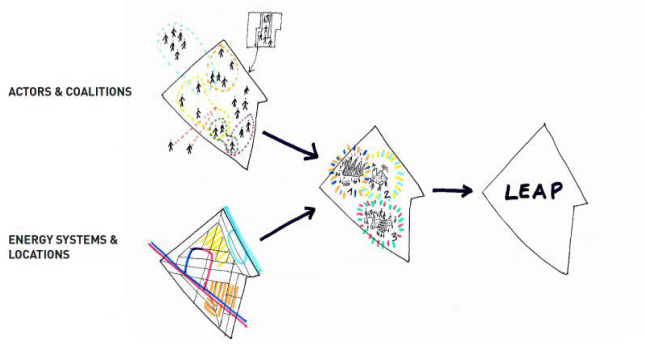


Figure: Bospolder-Tussendijken

BoTu is one out of four pilot districts in Rotterdam of the national gas-free initiative. The strategy, which runs from 2016 to 2023 is now adapted as there was a lack of flexibility in adapting it to different districts.

Local community building

An exhibition about local initiatives with a focus on local actors themselves was curated. People were depicted regarding their own investments into local initiatives. As such, the (design) research and local (energy) action strengthened each other. Furthermore, the exhibition format gave a greater appreciation to people working on initiatives as it is very empowering that their work is part of a museum.

Additionally, OOZE ran lots of tours and walks and initiated the development of a game as well where tools for the energy transition of different quarters can be tested by the players. Like this, the journey from pilot projects to future scenarios is made accessible for citizens too.

A group of anthropologist and OOZE started to engage with certain local communities via key players and their networks. Main observations on activation strategies for inhabitants to become part of the energy transition were the following:

- The assumption that people in poverty are mainly concerned with survival and therefore cannot care about what is happening in the district was proved wrong. Most people want to be part of a bigger goal and contribute to it. This is why imagining a better future through the energy transition is fundamental.

- People like to learn in general but the way the information is presented to inhabitants often hinders them from participating. For example, in many cases flyers do not have images but complex text and inhabitants cannot derive any information from it. Inhabitants can be supported to engage themselves into the projects by e.g. showing them exactly where they can tap in.

- Some initiatives in BoTu already improved their communication strategy in a more direct way: e.g. energy consultants help inhabitants to save energy.

- The residents' contribution should be valued, either by money or ownership. Otherwise they are inclined to drop out

Figure: Bospolder-Tussendijken

— The residents' contribution should be valued, either by payment or the feeling of ownership. Otherwise, they are inclined to drop out.

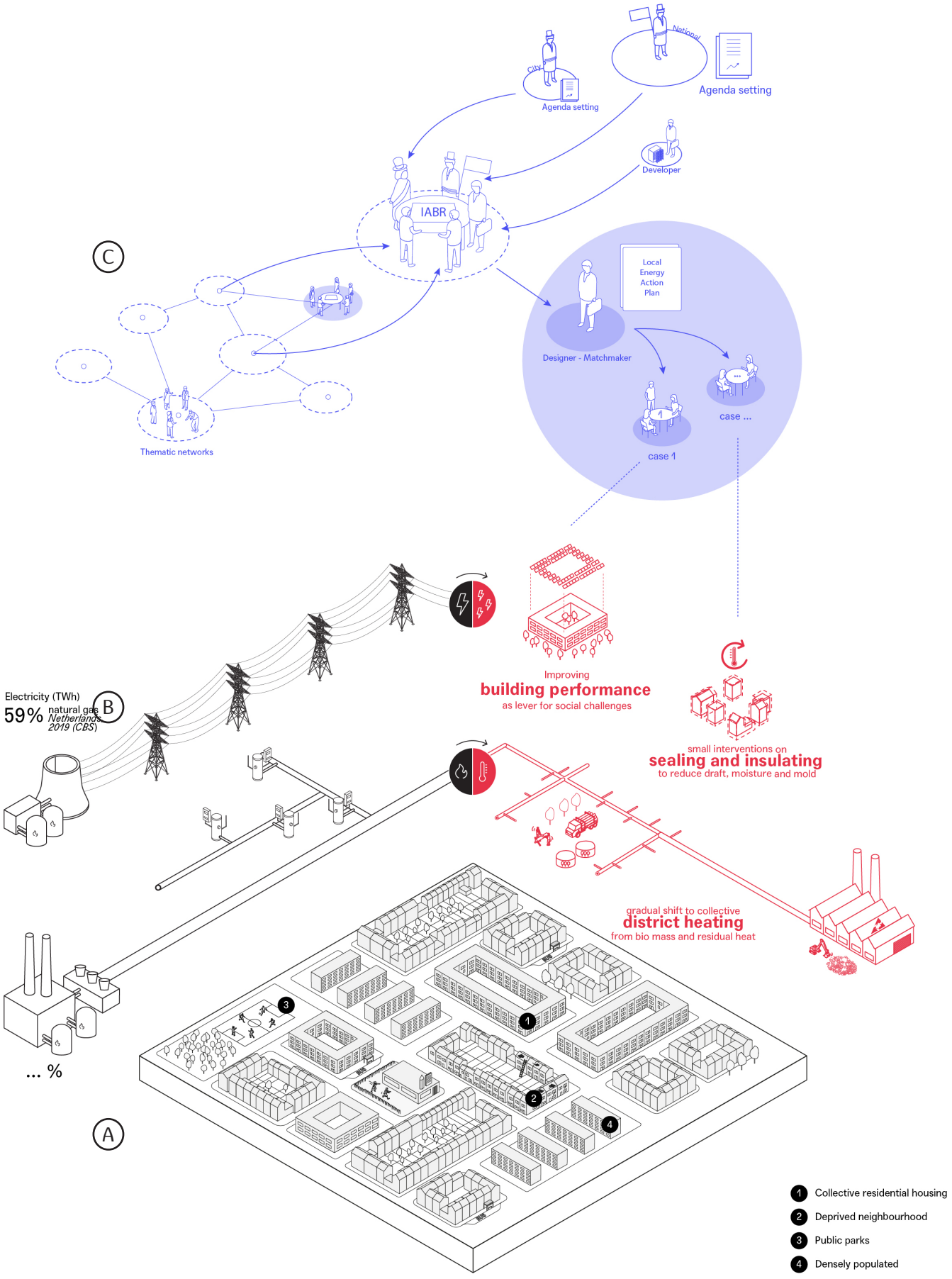
— When everyday problems of the district's residents, like humidity and mould in the homes or the lack of a neighbourhood centre and playgrounds, were addressed in a framework strategy for energy transition, the residents were grateful and became interested in contributing to the provided plans.

Organisation of local actors

The complex intertwined form of district initiatives (BoTu, LEAP, Working Together Agreement, exhibition) is a driver for innovation. Nevertheless, some form of organisation is needed. A problem is that the different levels (district, city, region, federal) do not always communicate and decision-making processes are not connected to the neighbourhood level enough. At the same time, it is important that the formal and the informal processes do not become one, as the formal processes could take over and a lack of innovation can be faced. In BoTu, the energy-district-table was installed to make use of cross-benefits of different initiatives working on the energy transition and the municipal instruments. It comes together monthly with paid representative citizens and therefore can connect the active local community with the municipal policy goals and instruments.

Learnings & Success factors

- There is an informal structure, that is facilitated by a formal structure, which is facilitating the many initiatives in the district. Like this, innovation is driven but the communication between authorities and initiatives is complex.
- Implementation of different instruments to include inhabitants in the district transformation: Exhibition, game, walks, (Asset Based) Community Building, internships, local jobs, participatory budgeting, deep democracy.
- The vibrant network of local cooperatives and projects, where people are involved in different projects and roles enables transformation processes with a strong community engagement.
- When everyday problems of the district's residents, like humidity and mould in the homes or the lack of a neighbourhood centre and playgrounds, were addressed in a framework strategy for energy transition, the residents were grateful and became interested in contributing to the provided plans, which shows how the energy transition can be a lever for socially-inclusive city making.
- The assumption that people in poverty are mainly concerned with survival and therefore cannot care about what is happening in the district was proved wrong. Everybody wants to be part of a bigger goal and contribute to it. This is why imagining a better future through the energy transition became a fundamental part in OOZE's work in the district.


City
National
Agenda setting
Agenda setting
Developer
IABR
C
Local Energy Action Plan
Designer - Matchmaker
case ...
case 1
Thematic networks
Improving
building performance
as lever for social challenges
small interventions on
sealing and insulating
to reduce draft, moisture and mold
Electricity (TWh)
59% natural gas
Netherlands 2019 (CBS)
B
gradual shift to collective
district heating
from bio mass and residual heat
... %
A
1 Collective residential housing
2 Deprived neighbourhood
3 Public parks
4 Densely populated

Bospolder-Tussendijken in Rotterdam, the Netherlands is an example of a

uniform, locally supported district with energy as a lever

Ⓐ Bospolder Tussendijken is a pre-war neighbourhood with some modernist interventions, a diverse urban typology. In these districts, we recognise a limited number of spatial typologies that are repeated several times: for example, small row houses with private gardens or apartments with a collective courtyard, public buildings such as schools or libraries that are repeated identically, small parks and squares between the dwellings, etc. These repetitive building blocks are mostly owned by housing corporations. The districts are often located on the outskirts of the city and are rather outdated, attracting mainly socio-economically vulnerable residents, resulting in a higher poverty index than average. The streets are car-oriented. Small-scale public transport is fairly well provided for, but the real mobility hubs are located outside the district.

Ⓑ The location on the edge of the city is usually an opportunity to connect to industrial activities and their residual heat. As the energy transition is often not the main urgency in these neighbourhoods, solutions are sought that can simultaneously leverage other societal challenges, such as improving the quality of living or resolving daily life problems like draughts, mould and moisture. The uniform character of the district and the rather centralised form of ownership (via corporations, for example) allows for the implementation of and connection to centralised infrastructure, such as district heating. The location on the edge of the state is usually an opportunity to connect to industrial activities and their residual heat, such as the port in the case of Rotterdam. The energy system to be implemented is a combination of centralised (residual heat net) and decentralised energy strategies, with a focus on low-cost, low-tech solutions that are affordable and can be implemented incrementally (like for example local sustainability coaches, cultural projects, isolation programmes and collective solar projects).

Ⓒ There are often many self-organised residents' groups and communities in these neighbourhoods, which deal with issues such as affordable housing, food distribution, public space, etc. At the same time, there is a clear national agenda concerning the energy transition (for example the decision to be gas free by 2030 in the Netherlands). An in-between table that connects existing local networks with different city departments and national governments aligns the local with the supra-local interests and facilitates a structural conversation between them. In the case of BoTu, this matchmaking role was played by a team of the city administration, a neighbourhood cooperative, a cultural organisation (the Architecture Biennial), a design agency, technical experts and anthropologists. They set a mutual agenda that culminated into a Local Energy Action Plan (LEAP). The uniform character of the district allows to develop a series of case studies that are representative for the district as a whole (a school, an archetypical apartment building, a street of row houses, etc.).

This strategy is closest to the other existing districts, in the sense that the support for the projects comes from the local residents (cf. a.o. Brussels). Energetically, it is similar to Lyon in terms of the combination of centralised and decentralised energy infrastructure.

Other examples that could (partly) fit this category are: Climate Neighbourhood Mechelen, Sinfonia Innsbruck

2.7 Georgian District – Limerick / Ireland

Time Frame: +CityXChange project: 2018-2023

Numbers: 0,353 km²
2.600 inhabitants

District: Existing
Mixed use: predominantly residential, commercial and some tertiary uses (no heavy industry)

Targets:
- CityXChange Project
  Co-creating Positive Energy Districts, with integrated planning and design, a common energy market and community exchange.
- City administration
  Regarding circular economy as a basis for the construction sector and encouraging new circular development. Going beyond the boundaries of the PED influencing also new development on the other side of the city.

Date of interview: 14th of July 2021

Interview partner: Terence Collony,
EU Programme Manager Limerick City & County Council

Terence Connolly is a European Programme Manager and Team Leader working in organisations promoting progressive change. He combines a scientific and analytical mind-set with a political perspective gained through his time working in Brussels. He is skilled working with stakeholders at local, national and European levels.

Development process

Limerick was originally founded by Vikings near the Shannon River. In the 1800s, there was a period when Georgian architecture was popular, which led to the origin of the Georgian district. The district is delimited by the river and includes half of the city centre. The architecture is quite typical of the period with tall windows at ground floor level, and smaller windows at upper floor levels, which gives a unique character to the city. However, the buildings are really old and in a desolate state and many heritage rules apply. That's why they are really difficult to renovate (only specific window frames, single panes are allowed, etc.), they cannot be knocked down either. This, among other factors, has led to a Doughnut effect where district residents move away from the city centre, leading to a lot of vacancy.

The Georgian district was chosen for the +CityXChange project because it is a lighthouse project. Many cities have similar districts with old, high energy consuming heritage buildings and thus face the same issues in trying to renovate them due to heritage regulations. At the same time, the Doughnut effect should be mitigated through the project and people should be motivated to move back into the city centre. Like this it will become a lever on the one hand and save energy on the other as the embodied energy of the houses in the city centre is significantly lower due to the high density.

Figure: Georgian District

The transition process was started off one by one. The first "anchor building" belongs to "Limerick Twenty Thirty", a property development company, which is a special purpose vehicle of Limerick City and County Council. Firstly, the focus was at the building and then at the block level before owners of the buildings were approached. The Post Office and Limerick Youth Services as building owners were on board right away. The Ulsterbank was on board but they decided to leave the project, then the Chamber of Commerce jumped in. The small size of the city made it possible to talk to everybody one on one.

The first pilot block project comprises five different buildings within one block: a LEED Gold certified office building (Gardens International), a youth services centre, a post office, an auctioneer and the city's Chamber of Commerce. All buildings have a Georgian architecture style and therefore similar particularities regarding their thermal renovation conditions (bad insulation, not airtight, expensive to renovate, many heritage regulations, etc.) The block was chosen due to one building, which is owned by "Limerick 2030", a Special Purpose Company working for the city's Council of Development. The other building owners were mobilized in one-on-one meetings, which is possible due to the small scale of the city. However, a next project aims to mobilize twenty building owners. Here, the mobilizing will occur via a designated company which will send out a questionnaire to building owners, screening criteria such as the current energy provider, the interest in building renovation and the willingness to get involved into DH with CHP among others. Probably the final list of participants will in practice mostly depend on whoever is willing to participate.

Institutional organisation and legal instruments

The city of Limerick is mainly steering the transformation process in the district and is also partner of the +CityXChange project. Further project partners are the University of Limerick, ESB (the national electricity provider) and Smart MPower, IES (software company for analysis and digital tools) and Arup. The programme management of +CityXChange has been quite traditional, in the sense that plenary discussions are held once a month with all participants. The project defined KPIs for PEDs in the fields of

- Energy: Improved energy efficiency, renewable energy infrastructure, e-mobility as a service, energy trading, sustainable investment
- Integrated planning and design
- Community exchange

The City of Limerick started with a tax incentivizing and subsidy system to decrease the vacancy in the quarter. One issue with the tax incentive system is that the system was either for renovating the building or installing renewable energy systems, but not for both. However, they've realized this discrepancy and the two branches of government have started working together so they can have a combined approach.

Limerick City and County Council created an Urban Innovation Department who are working to improve the city centre through the +CityxChange project. It should primarily guide the cross-departmental energy transition of the city and has a huge success in reducing vacant buildings in the city. Urban Innovation Limerick are currently transforming an old shopping centre in the middle of the city into a Citizen Innovation Lab. It consists mainly of architects and serves as one-stop-shop for building refurbishments and PV installations with a focus on Georgian buildings, architecture and energy related topics. Urban Innovation Limerick carries out actions in three fields:

- At the one-stop-shop, council officials from different departments (conservation, fire, spatial planning, architecture, etc.) review properties and offer advice for owners who want to get active.
- Matchmaking between willing property owners and interested developers who want to invest in upgrading buildings.
- Advice about grants and incentive schemes, including the Living Cities Initiative Scheme which provides various tax breaks on the costs of refurbishment.

> ***It is important to get in contact with building owners in the moment they decide to renovate, because they are open for new ideas and therefore open to invest more money if they get the revenues later on.***

Figure: Georgian District

Digital tools

For the district's transformation process, three main tools were used in combination. These tools are (1) IESVE Digital Twin, (2) iCD: intelligent Community Design, and (3) iCIM: intelligent Community Information Model.

The digital twin replicates the built environment digitally and allows to add information to the buildings. This can be information such as the insulation value and heating type, but in the future, it will be supplemented with census data to include socio-economic information, as well as measured data from smart meters. For socio-economic data the national census is the most reliable data which was found. The census data was broken down into small census areas (20-30 households). Like this, there shouldn't be a problem regarding GDPR (General Data Protection Regulation). The data of the smart meters in the PED buildings is fed into the virtual building models. This way, effects of measures can be seen in the 3D model as well. The data for the PEB (Positive Energy Building) was firstly gathered through questionnaires, which were sent out. As there was little feedback, best estimates were fed in and the owners were asked afterwards to take real measurements. The digital twin contains as well a physics simulation model to test the impact of retrofit changes to the buildings in order to reduce the energy demand to the lowest as possible. Furthermore, it can also be used to look at shadowing, PV installation and climate modelling. The digital twin technically is a Sketchup plugin. Its original version was crowdsourced in 2017 and cleaned up later.

The intelligent Community Design (iCD) tool is based on the digital model or on a freely available OpenStreetMap model and is meant for 3D Sustainable Urban Design and early-Stage master planning.

The intelligent Community Information Model (iCIM) helps to communicate and to connect owners and dwellers as well as planners and community leaders over a range of operational dashboards, portfolio management and community engagement tools. The goal is to bring citizens to the innovation laboratory – an interactive information centre – where the effects of changes via the digital model can be seen. The digital model will also be available online, albeit one that has less information as the one in the innovation laboratory. Currently, the platform is at a point in its development where it can be used both as a planning tool for the city and as dashboard for citizens to interact with.

Actors

The planning process of the tidal turbine was the biggest task where stakeholder engagement was important. The city itself can advise on planning, but the final decision can be appealed by any member of the public to "An Bord Pleanála". The city supported the planning company to get in touch with necessary stakeholders for the planning.

It is important to get in contact with building owners in the moment they decide to renovate, because they are open for new ideas and therefore open to invest more money if they get the revenues later on. When the authorities get in touch with the owner who have been renovating for two years, they are exhausted and they are not open and willing to invest more into the renovation.

Citizen involvement & participation strategies

The Open Calls for "Innovative Citizen Solutions for Positive Energy Transition and Limerick's Georgian Laneways" have been funded by the +CityXChange Project in order to mobilize citizens. The first set of calls was focused on community groups. However, due to lack of technical expertise, and the impact of Covid-19, these calls became too complicated

for groups to implement. The second set of calls was focused on community energy and asked for expertise, and will probably lead to more concrete results. There is always the risk that citizens could get annoyed by starting the project, especially if the project is not working. When COVID came along, the projects were inclined to not work out as planned anymore. The strategy of the +CityXChange Team was to put projects which fit thematically together.

The Positive Energy Champions Campaign is being run in collaboration with the University of Limerick and +CityxChange partners. The Positive Energy Champions are citizens of Limerick, who take Positive Energy Actions and share their knowledge and experiences with their communities and fellow citizens during the twenty weeks of the Positive Energy Champions journey. As Limerick is small, everybody knows one of the energy champions and can relate to the individual motivation.

One of them e.g. recently bought an electric car, another one is renovating a building for homeless and took advantage from the tax regulations for renovations.

On the City Engage Weeks, progress updates are shared with the general public and citizens can engages other citizens to take a first step in the energy transition. Here new projects are introduced and progress updates are given.

Energy infrastructure

- Heating: Most of the buildings are heated by decentralized gas boilers and are individually metered as there is no district heating network. Several local initiatives have sprouted, such as the local café re-using waste heat or the boat club using electric equipment.

- Electricity: One goal of the project is to install a tidal turbine and make it part of the Energy Community. First tests of the tidal turbine will happen in October 2021. Another goal is that 3-4 MWH should be installed by the community.

In Ireland, energy is mostly generated by fossil fuels. The “Money point power station” was one of the largest generation plants in Ireland, which was fired by coal and shut down in 2021. As there is just one electricity company in Ireland, the entire Irish grid can and has to be greened at once. Therefore, the company invests into offshore wind. Currently 44% of the national electricity mix comes from renewable energy production.

A CHP system boosted by heat pumps is envisioned by MPower. The resultant heat would then be directly used and the electricity would by default be used for heat pumps since feeding into the grid is not being remunerated in Ireland currently, as there are no feed-in tariffs yet. However, with the arrival of a national legislation for Energy Communities by the end of 2021, feeding into the electricity network could be remunerated.

A 100% community owned energy community is planned to be set up in the Georgian District. According to Terence Connolly, the community is taking the risk, that the citizens have too little technical knowledge. In his opinion, the energy system should be 51% owned by the community, while developers own the rest, as developers have an important role to build the infrastructure and run it. The legislation is moving into a different direction to enable 100% community owned Renewable Energy Communities with having the community in charge of building the infrastructure.

Mobility infrastructure

Most infrastructure is/has been constructed with an eye on catering to the car. A shift towards walking and biking is hard but highly desirable.

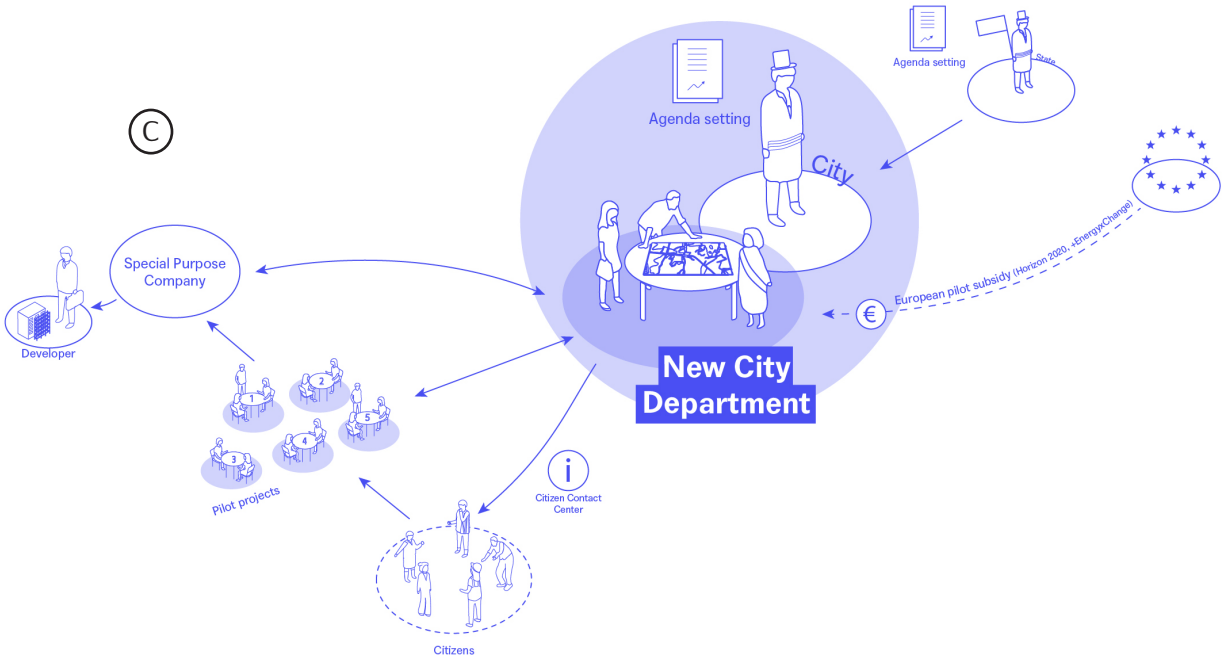
Learnings & Success factors

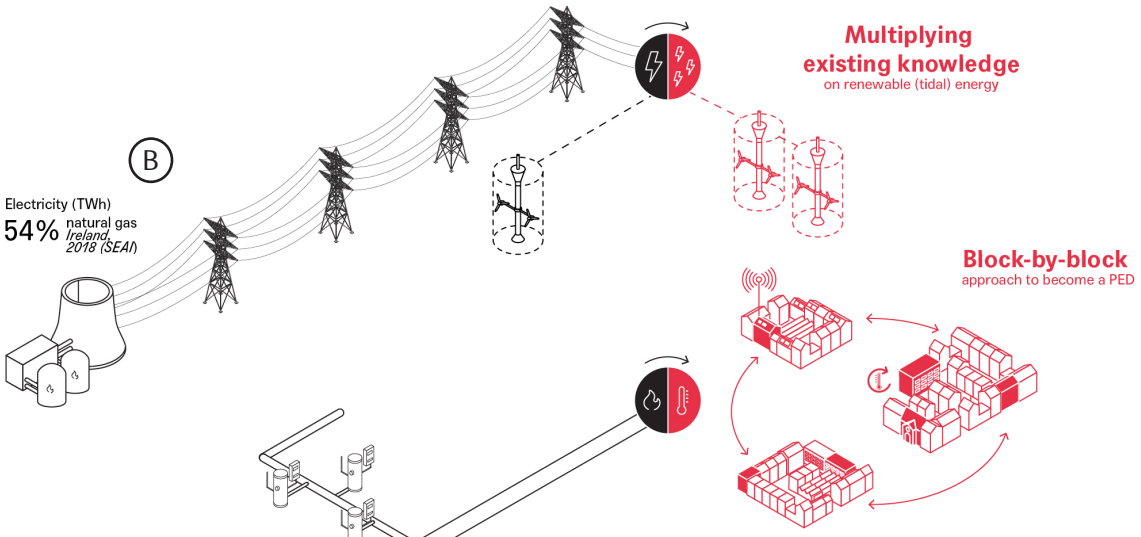
- The money from EU projects is not needed so much, but the focus funding projects give on certain topics is a success factor for district development.

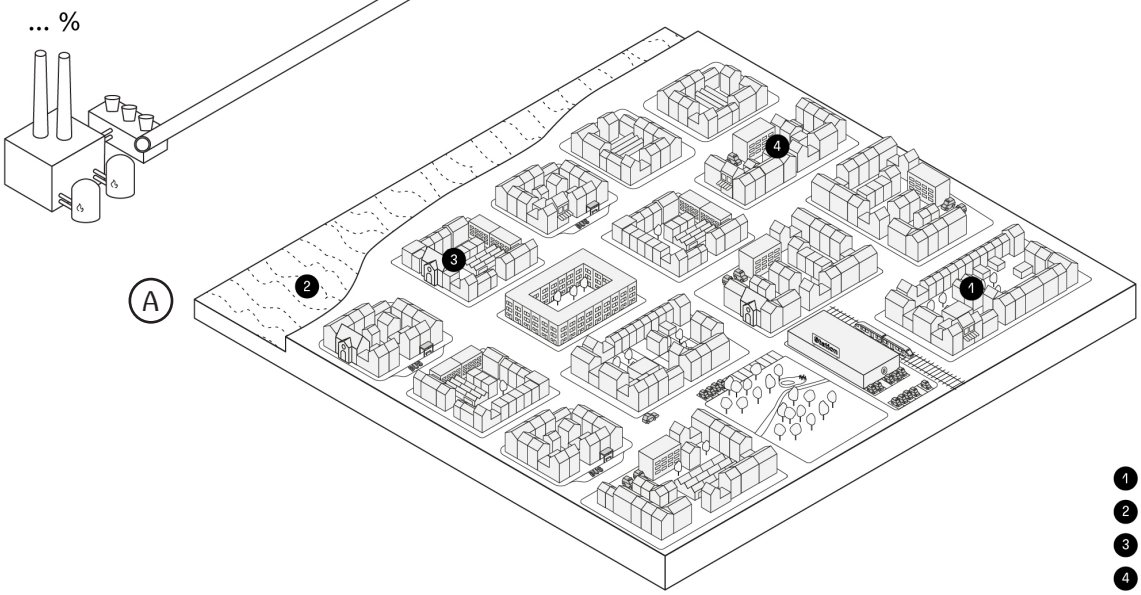
- The SPV “Urban Innovation Limerick” was founded to guide the cross-departmental energy transition of the city. E.g.: The City of Limerick started a tax incentivizing and subsidy system to decrease the vacancy in the quarter. The system could be used either for renovating the building or installing renewable energy systems, but not for both. However, this discrepancy was realized and two different administration units started working together to have a combined approach.

- The real power of a PED is all the activity it generates due to its holistic view on energy, mobility, behaviour and urban development.

- Word of mouth and the small scale of the city helped activating the building owners who are now participating in the project to make the first Positive Energy Block.


C
Agenda setting
Agenda setting
State
City
European pilot subsidy (Horizon 2020 - xEnergyxChange)
Special Purpose Company
Developer
New City Department
Pilot projects
Citizen Contact Center
Citizens


B
Multiplying existing knowledge
on renewable (tidal) energy
Electricity (TWh)
54% natural gas
Ireland, 2018 (SEAI)
Block-by-block
approach to become a PED


... %
A
1 Exististing building blocks
2 River
3 Historical buildings
4 High density

The Georgian district in Limerick, Ireland is an example of a

historical, block-by-block, city-coordinated energy district

Ⓐ They are existing districts with a high historical and heritage value in the city centre. They have a unique spatial character, with a typical architecture. Within the district, most of the buildings have similar particularities and ideally, also the building blocks are uniform, like in a grid (as is the case in Limerick). These districts usually have a high density and are well conserved, but buildings are badly insulated and not airtight. Additionally, the high energy consuming buildings must comply to strict heritage requirements and regulations. Renovating them to a level of comfort is expensive and few candidates are up for the challenge: residents move away from the city centre, leading to a lot of vacancy in the district. There exists a strange paradox in these districts: they are often tourist attractions because of their architectural character, but very few people actually live there.

Ⓑ The shift to the production of renewable energy in this district is dependent, on the one hand, on the conversion of the existing national grid and, on the other, on smaller, decentralised energy solutions such as solar panels and heat pumps. The focus of energy transformation in this type of neighbourhood is on renovation though, as it combines both sustainability goals and makes the district more attractive for residents again. There is a desire to preserve the architectural quality of the neighbourhood, and therefore not to opt for new construction. The advantage that can be worked with is the uniformity of the neighbourhood: if a strategy and business case can be developed for one of the blocks, the others can follow along in the block-by-block renovation. The advantage of tackling the transformation per block instead of per individual building can be the economy of scale (one contractor and one single administration for a combination of projects), the convincing, community-building effect of a collective project and the focus on exchange which allows positive-energy buildings to compensate for harder to renovate ones.

Ⓒ The city takes the lead in the transformation by setting up the necessary development organisations and departments. In Limerick, a Special Purpose Company working for the city's Council of Development was set up ("Limerick 2030") and a new city Department was founded, focusing on mediating between other departments in light of sustainable district transformations ("Urban Innovation Limerick"). The city can use tax incentivizing and subsidy system for renovation and the installation of renewable energy systems. But it also takes the first steps in the transformation approach: it invests in the first "anchor building" and uses this as leverage to approach owners of the rest of the block. A series of pilot projects can explore different renovation methods and become catalysts for the district's transition process. The commitment of the inhabitants is of great importance to succeed this approach. Tools and instruments like a one-stop-shop can persuade, motivate, and financially support inhabitants to move in and renovate.

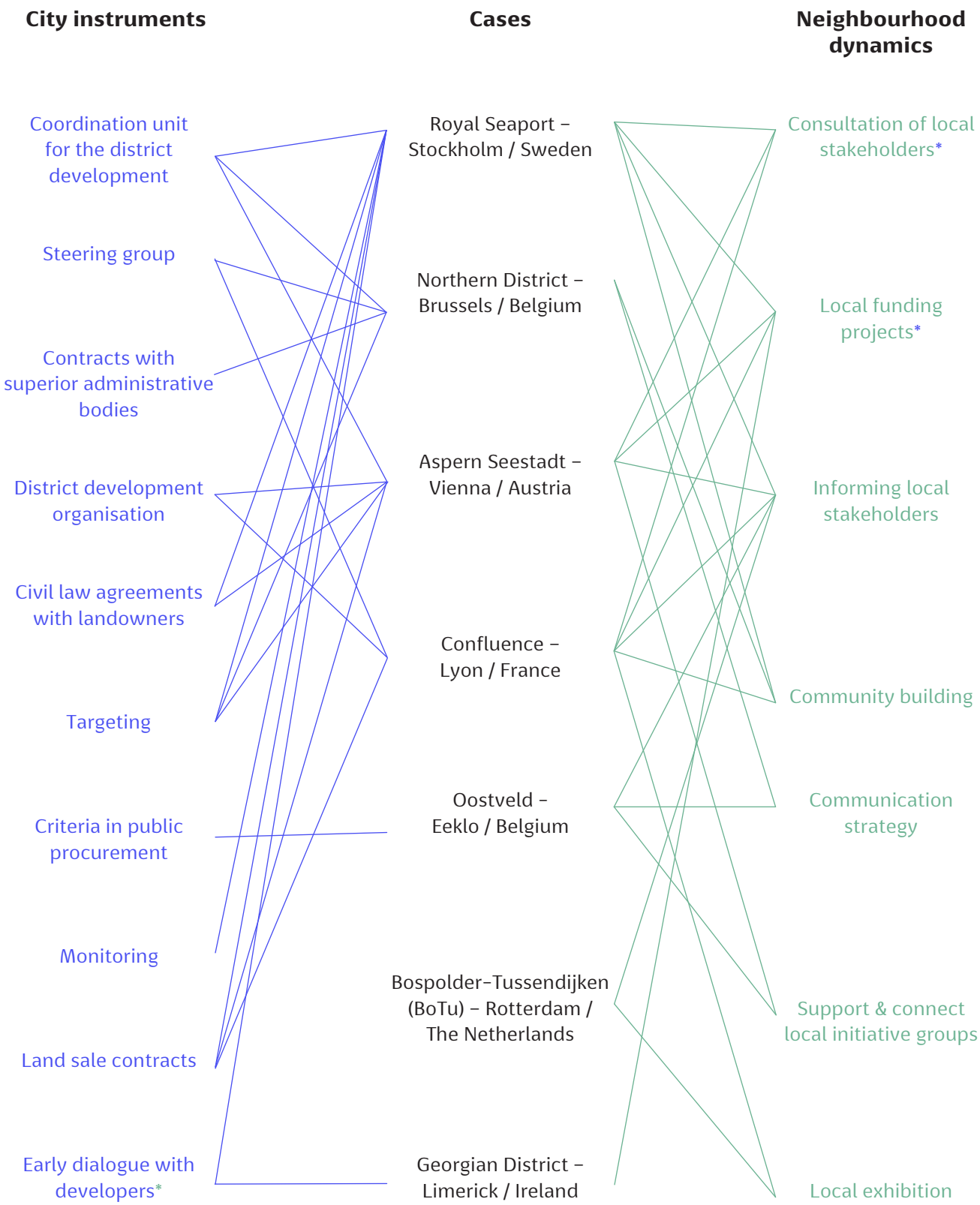
This strategy puts the task of heritage first (whereas in Rotterdam or Brussels the architectural value is less important, but the existing social dynamics are). As a result, this strategy works very well when it is driven by the city.

Other examples that could (partly) fit this category are: Otto Wagner Areal Vienna

3. Aspects for the implementation of PEDs

Out of the seven interviews it is possible to distil aspects which are relevant for the development, transformation and implementation of PEDs ('PED relevant aspects'). These aspects can be divided into relevant preconditions, challenges, city instruments, and neighbourhood dynamics. Some instruments or dynamics cannot be strictly divided, these are indicated with an asterisk in the respective colour (City instruments, Neighbourhood dynamics*). The aspects are not a mere listing, but are connected to one another, which is graphically shown in the line diagram on the following page. Some preconditions or challenges lead more or less to the application of certain city instruments or strengthen certain neighbourhood dynamics. In the diagram, these interlinkages were further connected to the interviewed cases. The illustration is not exhaustive and is based on the interviews conducted. At the same time, the investigated aspects have been discussed during the October online Deep Dive, and a series of conclusions have been drafted. This includes the identification of relevant or pivotal aspects for newly built district and existing ones, clustered in five main arguments (District Development Management, Collaboration with different actors, Citizen participation, business model, Planning process and Regulation) investigating the PED implementation.*

The objective is to supplement and refine the content and the reflection on the relevant aspect for PED implementation, in further discussions within the consortium, and more specifically within the work packages WP3: City Instruments and WP4: Neighbourhood Dynamics.


City instruments
Cases
Neighbourhood dynamics
Coordination unit for the district development
Steering group
Contracts with superior administrative bodies
District development organisation
Civil law agreements with landowners
Targeting
Criteria in public procurement
Monitoring
Land sale contracts
Early dialogue with developers*
Royal Seaport – Stockholm / Sweden
Northern District – Brussels / Belgium
Aspern Seestadt – Vienna / Austria
Confluence – Lyon / France
Oostveld – Eeklo / Belgium
Bospolder-Tussendijken (BoTu) – Rotterdam / The Netherlands
Georgian District – Limerick / Ireland
Consultation of local stakeholders*
Local funding projects*
Informing local stakeholders
Community building
Communication strategy
Support & connect local initiative groups
Local exhibition

Preconditions

Two overarching preconditions have been identified as crucial for both new and existing districts.

The **ownership of the land** usually influences many other aspects like the management of district development, the coordination of actors and business models. In existing districts, the land ownership structure is usually dispersed and cannot easily be changed to a more centralised one, such as it can be found in new districts. Therefore, a different type of actions is needed.

Furthermore, the **national and legal framework** sets different contexts to work in, regardless of the geographical PED area, or if the district is an existing or a new one.

Newly built districts

1. District Development Management

The cases in newly built environments have opened the conversation on different types of management of the development process toward PEDs. It is possible to observe that they range from a city administration with focus groups (***such as in Stockholm***), to a coordinating platform facilitated by the city administration or driven by the community (such as in Brussels), or to a publicly or privately funded development body independently steering the implementation of a (large part of the) district (a "Special Purpose Company" or SPC). A Special Purpose Company can be more publicly owned (***as we see in La Confluence***) or privately owned (like ***in Aspern or in the Stockholm Royal Sea Port***) and even combinations are possible. This type of development management can work well in newly built districts since the land ownership structure is more straightforward than in most existing neighbourhoods.

2. Collaboration with different actors

In order to develop a PED, it is crucial to involve, align and coordinate different stakeholders, departments and/or administrations within the cities themselves. In newly built districts, on the one hand, a focus on interdepartmental collaboration between the departments of energy, housing, urban planning, climate, facilities, etc. seems key. Often these departments have their own assignment, timing and budgets, and it is crucial to align them in order to develop a truly integrated district. This can be organised for instance, in regular focus groups, as is done ***in Stockholm***. On the other hand, the collaboration with developers requires special attention in newly built districts. ***In Stockholm***, for example, developers were invited to special capacity building seminars on sustainability to engage them in a process of capacity building.

3. Participation with citizens

In newly built districts, connecting to residents is a huge challenge, as it is not yet clear who will move into the district before it is built. In ***Lyon Confluence,*** for example, attention is paid to involving and participating with (future) inhabitants through a broader participation happening for the development of the new parts of the district with key actors, between citizens and local key stakeholders. Similar to ***Stockholm Royal Seaport***, where the residents of the surrounding neighbourhoods were involved in the envisioning process for the future development in order to build common ambitions and a shared view on the new environment. At the same time, involving residents once they have moved into the new district is an important step to take. In fact, there is often a "performance gap" between the models on paper and the actual energy performance of the building and systems, after those districts become inhabited, since people's behavior is predicted too optimistically. It is therefore crucial to monitor this and to continue to work with the inhabitants to achieve the most efficient neighbourhood possible.

4. Business model, specifically of the Special Purpose Company

Developing a PED comes with a certain price tag. Different business models on how and by whom this development is paid, can be identified. In newly built districts, the development itself is paid by the sale or renting new homes and must therefore entail a revenue model. But how the development process towards it is financed differs. There are different ways of financing the operation of a Special Purpose Company. ***In Lyon*** the SPC is publicly financed from the municipal envelope. In the other newly built districts, the SPC can, with the money it makes out of selling the lands, also fund the time and capacity for monitoring and steering the development of the district.

5. Planning processes and regulations

City instruments and planning regulations are deemed a crucial aspect in steering the process of PEDs. Typically, in newly built districts, the land is owned by the city or by public institutions (e.g. federal rail companies) or a small number of private owners. This gives access to a specific set of tools to steer the development towards sustainability targets of the city. Examples for those are land sale contracts or other types of civil agreements, public tendering, zoning, etc. In this way, very high energy performance targets can be transferred to developers.

Existing districts

1. District Development Management

Since the land ownership structure is more complex in existing districts, the development management will be different than the one of newly built districts and can take many forms. For example, a Special Purpose Company can also be set up in existing districts. In ***Limerick***, there is a SPC, focused on the renovation of heritage buildings, but also a new special unit in the city. There are also other alternatives imaginable in existing districts which are less centrally structured and institutionalised as a development company. For example, in ***BoTu (Rotterdam)*** and in the ***Northern District (Brussels)***, where a coordination platform is set up. This is a more informal table and is not linked with typical urban development, but connected to the more fragmented land ownership. ***In BoTu*** this table is less formalised than in Brussels, and more driven by the community.

2. Collaboration with different actors

The collaboration between development companies and departments of cities becomes even more important in existing districts, as land is not owned by one (or few) landowner(s), and thus where there are many different stakeholders present. Collaboration with these different actors is necessary in order to align and steer the transformation towards a PED. This can be recognised as one of the main ambition of the *Coordination Platform* in Brussels.

3. Participation with citizens

The involvement of different local communities is key for the transition of existing districts, since transforming neighbourhoods means more than just working with technical solutions and energy infrastructure and will only thoroughly happen if the people living there are pulling the same rope. Different elements which lead to activation and mobilization of local stakeholders can be highlighted:

a. Strong, long-term mobilising narratives

A consistent, shared narrative, meaning a story told to mobilise citizens based on a shared agenda, is a first example. In ***Eeklo***, there is the narrative that frames energy as a local product with local added value, local ownership and local participation, overarching political parties and regardless of ideology.

b. Knowledge bundling organisations

People who want to participate in the energy transition often fail to find their way, as for example the challenge of accessing existing grants, etc. The need to inform people is not just about raising awareness for the topic, but also about giving access to tools and information as well, in order to allow people to participate autonomously and take action. In ***Limerick*** for example, in the framework of 'Urban Innovation Limerick', the city opened a one-stop-shop, where all information about renovation is gathered at one central place and council officials from different city departments give advice to people wanting to renovate.

c. Socio-cultural program

A socio-cultural program, which via culture focusses on the social aspect of the (energy) transition, is a crucial element in engaging people in the transformations that in the end will land in their environments and homes. This can be done via a broad range of activities, like theatre, workshops, exhibitions, etc. In ***BoTu*** there is an important socio-cultural program on energy, where via workshops on how to cook without gas, pedagogical programs with schools, etc., they work on the behaviour of people related to energy issues.

d. Map potentials

Imagining what is possible, and making this explicit to people, helps them take part in this transition. Furthermore, monitoring where the development of the district stands, can work as a motivation. In *Limerick* they work with a digital twin in order to display possibilities and keep track of the transformations, in Stockholm, there is a focus on monitoring the set principles.

e. Ownership

Ownership is not only about informing and creating with people, and not solely about financial co-ownership, but more importantly about citizens co-owning the transition. In ***Eeklo*** for instance, this happens via public procurement where (financial) co-ownership by local citizens is a criterium. The local cooperative, set up by the people, is a form of organising co-ownership of the energy transition by the people. They are not a subject, but own part of transition.

4. Business model

Existing districts show a variety of ways to deal with these issues. Supporting the development via subsidies is one way. It is clear that the subsidies are almost always part of it. Can we, for example, activate existing subsidies more coherently, or in a package, instead of the way in which subsidies are now segregated for roofs, walls, etc.? ***The city of Limerick*** takes an active role within a building block and invests itself in the renovation of its public property to be a catalyst for the block renovation.

5. Planning processes and regulations

Instruments which are applied in newly built districts, like land sale contracts and civil agreements, do not work in existing districts in which a plain land ownership structure is missing. The transferring of targets cannot happen at the moment of a sales agreement but must be applied in a different way. How can existing city instruments and planning regulations be already in place in certain neighbourhoods be harnessed, like the ***Sustainable Neighbourhood Contract in Brussels*** or the decarbonization zone on provincial level in ***Limerick***.

4. How existing and newly-built districts can learn from each other

Parallels and overlaps can be found in relevant aspects for both existing and new districts. Lessons and aspects related to implementation dynamics of newly built environment can serve as inspiration for existing district transformation and the other way around. In light of the Cities4PEDs project, this is particularly relevant for the three specific cases part of this research trajectory, ***Brussels, with the Northern District, Vienna, with Aspern Seestadt, and Stockholm with the Royal Sea Port distric***t. Two transversal relevant elements have been identified to further be discussed and analysed: '**Steering the District development process'** on the one hand and '**Implementing Co-creation and local ownership dynamics outside and inside the district**' on the other hand.

Steering the district development process

The district development management is one of the pivotal aspects both for newly built and existing districts. In order to steer and accelerate the process of development, diverse strategies can be identified. In Aspern Seestadt, the development is steered by the setting up of a Special Purpose Company which in collaboration with a private owner, manages the whole district implementation process and has a continue iteration with the city administration in order to monitor the process.

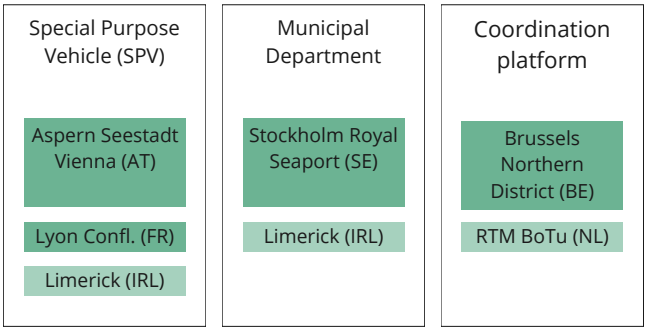


Figure: Steering the district development process

Land sale contracts are used to guarantee high targets for developers, by including specific criteria. In the same way, in Stockholm Royal Sea Port the development is steered by the administration unit. In order to implement high target standard capacity building programs are organised with developers and a monitoring system is implemented. In the Northern District in Brussels, on the other hand, the development process is less linear. The diverse ownership and irregularity of the context, demands an entirely different approach. A Coordination Platform was set up by the City of Brussels with the ambition to steer the process and push for a re-development vehicle that allows decentralised ownership and coordinates diverse local initiatives and projects. It would be interesting though to learn from concepts such as a Special Purpose Company and test how these could be adapted to the environment of an existing district.

In newly built environments, there is more experience and testing on the level of the strategies, tools, instrument for district development. In existing environments, the (mostly) heterogeneous realities of the district render the situation more complex to manage centrally. Existing district can learn from newly built environments on the level of instruments (such as civil agreements, contracts, procurements, etc.) and strategies (like governance, zoning, etc.) to tranfer high targets to the possible transformation and test them locally, but it will be necessary to adapt them to the existing context.

Implementing co-creation and local ownership dynamics outside and inside the district

In the same way, co-creation strategies to collaborate, engage and mobilize different actors, communities and stakeholders in the transformation or implementation of a PED, are a pivotal element to analyse further. In the three referenced districts, the co-creation concept is tackled at different levels: for the development of the Stockholm Royal Sea Port, focus groups within the city administration have been set up in order to align ambitions, strategies and agendas toward the development of PED. The regular focus groups serve to rethink the modus operandi in which the public administration is collaborating and resulted in an interdepartmental co-creation around shared ambitions. In Aspern, the private developer Wien3420 in collaboration with the city, started a process of stakeholder involvement and citizen information. In the Northern District, the ambition is to start from the end-user's perspective, residents and citizens living the neighbourhood. This can be considered a pivotal strategy for this specific environment since its social complexity is key to make change permeate at the local level. This will be translated in setting up with local organisation and citizens local energy communities, both formal and informal.

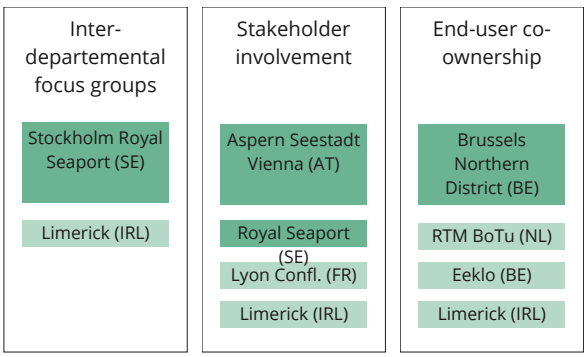


Figure: Implementing co-creation and local ownership dynamics outside and inside the district

Considering that the involvement of citizens and residents in newly built environments is still a crucial question and a bottleneck, strategies for co-creation implemented in existing environments can offer a learning ground for those districts. In fact, this can be particularly relevant when further looking at the heterogenous set of strategies and instrument in place in existing district to enhance local ownership with citizens and diverse communities. This variety can represent an opportunity for learning and exchange on implementing certain measures in the development strategies of new districts.

What becomes clear is that there is no single strategy for implementing PEDs in our living environments. Many open key-element questions that need further investigation can be identified both in newly built districts and in existing neighbourhoods. A combination of top-down dynamics and bottom-up initiative is indespensable, and the most meaningful strategy to explore this combination is by learning from each other. At the same time, the governance structure and the organizational model behind the development of energy districts can be highlighted as a corner stone for building local implementation strategies. This calls for further investigation and local testing where the three local cases, Stockholm, Vienna and Brussels, will offer the right framework to do so.

Images

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Northern District – Brussels / Belgium

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