SONNET - Social Innovation in Energy Transitions

Co-creating a rich understanding of the diversity, processes, contributions, success and future potentials of social innovation in the energy sector

D4.3 (D14): Report on the SIE City Lab in Antwerp

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2	Dutch Research Institute for Transitions	DRIFT	NL	
3	University of Sussex, with its Science Policy Research Unit (SPRU)	UoS	UK	
4	Grenoble Ecole de Management	GEM	FR	
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9	City of Antwerp	ANTW	BE	
10	City of Bristol	BRIS	UK	
11	City of Grenoble	GREN	FR	
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13	City of Basel (Associated Partner)	BASE	CH	

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Executive Summary

This report has been written to document all the stages that the City of Antwerp's City Lab has been through; from the scoping and mapping phase to collect all existing SIE projects, to the selection of the experiments and supporting the lead stakeholders of these experiments to the roll out and lessons learned.

The City Lab chose to support four experiments:

- Energy community Stalinsstraat
- Rental of energy-efficient household appliances like washing machines, fridges and freezers
- Renovation coaching for emergency buyers and residents ('Noodkoopfonds')
- Collectief Goed, an organization who retrofits former social housing into energy efficient houses who will be rented to households with lower income

The four experiments all had the same goal: finding a solution to reduce the level of energy poverty for vulnerable households. Each experiment had its own lead stakeholder, method and way to improve the energy situation of these households. Some of the experiments had a structural and long-term effect such as the renovation coaching and Collectief Goed, but were only possible for households who are owner of their house. The rental of energy-efficient household appliances intervene in a short-term way, but is also accessible for tenants. The energy community is the most community based experiment, long-term and accessible for everyone, owners and tenants, households with a high/normal income and lower incomes. Some of the experiments faced some barriers, like covid-19, but also changing regulations in Flanders which made the implementation of some of these experiments challenging or made them to put the experiment on hold like Collectief Goed.

One of the outcomes of the City Lab is the thematic call 'social energy transition' of the Climate Fund. The experiments made the support of the city of Antwerp to initiate projects on social innovation and energy transition more clear. With the Climate Fund the city of Antwerp wants to support SIE. They can get a subsidy of maximum 50.000 euro and the support of a godmother or father (a member of the city of Antwerp). In May 2021 three SIE's were chosen to get funding. The projects have a maximum of 2 years to implement their project. After this the city of Antwerp will evaluate if there is a need for a second thematic call on social energy transition.

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1 INTRODUCTION

1.1 Information about city lab-like activities before SONNET

1.1.1 What have been city-led initiatives towards energy transition and their outcomes up to date?

Climate plan: together work on sustainable and affordable energy in Antwerp

The city of Antwerp has set a target of carbon neutral neutrality by 2050. This commitment was made with the signing of the Covenant of Mayors in 2009. The Covenant committed European cities to emitting at least 20% less CO_2 by 2020 compared to 2009. Antwerp therefore drew up a 2020 climate plan. In 2017, the renewed Covenant of Mayors for Climate and Energy was signed, in which the reduction of at least 40% CO_2 emissions and a plan to build a city that is resistant to climate change was committed. That is why the city is currently working on a 2030 climate plan. In December 2020 the new climate plan 2030 was approved. Antwerp wants to go further and plans to be carbon neutral neutral in 2050. Furthermore, they want to achieve a 50-55% emission reduction by 2030, with specific attention for fighting energy poverty. The city of Antwerp is the first one to use the European Green Deal as a guideline. The new climate plan makes maximum use of co-creation with residents, companies and industry. Together we sit at the table to work out the objective, the concrete actions and the monitoring of the new plan. To reach the targets of this plan a Climate Director will support the roll-out of the climate plan 2030 and guide the city and stakeholders in the implementation of this plan.

An energy transition is indispensable to achieve the objectives. All partners in the city are working hard on energy efficiency of the building stock, the use and implementation of fossil free resources and to produce more local renewable energy. In the coming years, the city will focus on the roll-out of a city-wide **district heating network** that is fed as much as possible with waste heat from industrial processes. The port of Antwerp with the largest chemical cluster in Europe offers an enormous advantage in this regard.

Via Ecohuis Antwerp (EcoHuis is the location where the department of Climate & Environment is located. More information see https://www.antwerpen.be/nl/overzicht/ecohuis-antwerpen/nieuws) citizens are informed, sensitized and stimulated to save the maximum amount of energy in their home and life by giving energy advice and organizing free informational webinars, providing interest free energy loans and offering renovation coaching, Masterplan studies for big apartment buildings and energy advice at home. The one-stop-shop for energy renovations is successful, but we need to improve it because renovation of the complete housing stock of the city to the 2050 BENOvation standards (= heat transfer coefficient standards set by the Flemish government for the retrofit of houses.) is an enormous challenge. It is a priority for the local policy since it offers multiple win-wins:

- for the local green economy;
- for the budget of families and businesses;
- comfort of users;
- and for achieving the local climate goals.

Therefore, the SONNET living lab in the experiment of integrated service of energy-poor house owners focusses on improving the one-stop service for a particular vulnerable group, but with a high potential on impact for climate and social policy.

The share of **renewable energy production** in Antwerp is growing, both on a larger scale via wind farms in the port area and via energy cooperatives and the set-up of various citizen energy communities. These are optimally supported by the city's policy, including in the SONNET project, where 2 experiments work on **local energy communities.** The new legal framework for energy sharing and local energy communities that will be made possible through the conversion of the European Clean Energy Package (more information https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en) will soon offer a range of new possibilities to take steps in Antwerp towards an accelerated transition.

1.1.2 What have been other initiatives towards energy transition (private, civic) & their outcomes up to date?

In the city of Antwerp we have different initiatives or projects ongoing toward energy transition for example, Samenklimaatactief, Circular South and Stadslab2050 described below.

Samenklimaatactief

Samenklimaatactief is an online platform that supports companies and organizations in reducing CO_2 emissions. It is an initiative to reduce CO_2 emissions from offices, light industry and shops in Antwerp through energy efficiency and renewable energy. Companies play a major role in the climate plan and in reducing CO_2 emissions. The city of Antwerp invited various companies and organizations to look for solutions. It soon became clear from this meeting that companies were insufficiently informed. They don't know where to go with all their questions. That is why the city decided to develop a helpdesk for energy management, 'Samenklimaatactief'. Two concrete tools have been developed on www.samenklimaatactief.be)

- Through the website, companies receive information and energy tips such as purchasing green electricity, using a smart thermostat, insulating roofs and pipes and generating sustainable energy themselves.
- There is also a virtual marketplace on the site. Companies can immediately request a quote from the partners of Sameklimaatactief. This way they can immediately put the information and energy tips into practice.

Originally this was an initiative of the city of Antwerp, but Samenklimaatactief is now active throughout Flanders.

Circular South

The city of Antwerp becomes a testing ground for the circular economy. Circular South is organizing experiments in the Antwerp South district to make the circular economy possible in everyday life. 'Circular' stands for the reuse of raw materials and products, so that less energy, water or materials are lost. In Antwerp South, residents are testing it out for themselves. They use smart technologies that can lead to energy gains and less water wastage or waste. Circular South is a real lab for circular economy. An example for other neighbourhoods in cities all over Flanders and Europe. In Antwerp South, the neighbourhood of the future with high sustainability ambitions is being built on 'Nieuw Zuid'. There is a heat network, there will be a lot of greenery, homes will be provided according to a CO_2 neutral district and wadis for rain collection make Nieuw Zuid a rainwater-neutral district. Under the name 'Circulair Zuid', the residents themselves participate in local actions on the reuse of materials, less waste, water and energy consumption. In this project we will test 5 different topics:

- Smart consumption with Circular South: By working together and using smart technologies, we can ensure that less energy, water, waste and materials are lost. Participants get access to a personal dashboard that shows the consumption of water, waste and energy from day to day. The data is collected via smart measuring devices and via the waste sorting streets. With their personal profile, residents also receive useful tips to save energy and water and to produce less waste. Those who succeed are rewarded with 'circules', points that can be exchanged in the neighbourhood. In addition, residents are given the opportunity to invest in the production of solar energy in the neighbourhood.
- Innovative solar panels and neighbourhood energy cooperative: By using large roof and facade surfaces for solar energy, the city wants to increase the production of local electricity fivefold by 2030. Thanks to the support of Circular South, innovative solar panels find their place on 4 buildings in Antwerp South. Classic solar panels have been installed on an office building in M. De Braeystraat and the Hof Ter Beke service centre. The roof of the Groothandelsmarkt was fitted with lightweight solar panels, especially for very large roofs, and facade panels ('building integrated') on the heat plant in Nieuw Zuid provide a more aesthetic touch. Electricity will be produced on a total surface of 3.640 m^2 of panels spread over these 4 buildings, which corresponds to an average annual consumption of 150 families. The energy produced on these buildings is on the one hand used directly by the users in the building; on the other by a specially established neighbourhood energy cooperative. Interested residents of Antwerp South can join this neighbourhood energy cooperative by buying shares in the solar panels on these 4 buildings. With the income from the production and sale of the unused energy, the group can realize new sustainable projects in and around Nieuw Zuid. The estimated annual budget is 15,000 euros. For example, apartment dwellers without their own roof also benefit from solar energy.

- Less waste: The city of Antwerp wants to help offer solutions and is resolutely opting for less waste. By purchasing more consciously and by reusing materials and raw materials more, we can reduce the mountain of waste even further. This applies to, for example, kitchen waste, paper and cardboard, plastic and metal packaging, drink cartons, glass, textiles or batteries. By keeping these materials out of residual waste and reusing them, we are working towards a sustainable circular economy in which we close cycles.
- Circuit, experience center for circularity: With its circuit, the Kringwinkel Antwerpen wants to become the hotspot in Antwerp South in the field of circular experience. On June 19, circuit opened its doors in the Palazzo Verde in the district. 18 circular entrepreneurs have their studio, shop or exhibit their products there. You can also go there for workshops, a visit to the neighbourhood bar or a bicycle repair at the Kringwinkel.
- Community gardening and composting: A number of residents started a first communal garden in the Leon Stynenstraat. The community garden group makes agreements about the maintenance of the herb and vegetable containers and meets regularly. A community garden also includes a compost bin. Together gardeners can recycle their green waste from the kitchen or garden here. In this way, less waste ends up in the sorting streets and you contribute to a circular neighbourhood. Compost is ideal food for the plants in the garden.

1.1.3 Experience with living lab methodology: Stadslab2050

Stadslab2050 was initiated in 2013 as the urban innovation lab in which the local government engages co-creation with all city stakeholders to bring solutions towards a climate neutral city in 2050. Stadslab2050 helps 'urban laborants' (= stakeholders like residents, citizen organisations and community groups and businesses) in solving complex challenges by offering inspiration, innovative approaches, financial or logistic support or by involving other urban laborants, organisations or institutions. By learning from other experiments and research, we can help to avoid pitfalls and offer everyone a kick-start using the latest tools and instruments. Last but not least, we offer access to an ever growing and strengthening network of citizens, businesses and institutions, who work towards our common goal: 'Antwerp 2050'. Stadslab2050 focusses on all kinds of innovation, technological as well as social innovation (example of intervention). Stadslab2050 was one of the five cases in the JPI Urban Europe project URB@EXP. The URB@Exp project aims to develop guidelines. It did so by reviewing experiences of urban labs, and conducting action research in urban labs in five European cities, among which Antwerp. Stadslab2050 works on the broad challenge of 'sustainability', but it was also active in the energy field. Currently 11 Stadslab2050 projects are running on energy topics. Stadslab2050 has three goals: solve, learn and connect:

1. SOLVE: ideation & prototyping. We look for challenges that are specific and limited in scope. Next step involving as many stakeholders as possible: citizens, retailers, academics, producers, institutions, government officials, etc. Together we turn the challenge inside out and seek for entirely new ways of looking at a problem. By experimenting new combinations of insights and resources, we are able to see what

works and what does not. If something seems to be a great success, we try to scale it up. If things do not go as expected, we are equally satisfied because failure is the best teacher and we can move on to the next experiment.

2. LEARN: through knowledge development. We do not merely focus on the results as such, but also on how we came by those results: which cooperative approaches worked most efficiently? What is the best way to set up an experiment? How do we ensure that all the needs are being incorporated? The better we cooperate, the better we can understand each other and come up with the best sustainable solutions.
3. CONNECT: networking. We do not limit ourselves to finding optimal ways of cooperation, but also seek ways to maintain, strengthen and expand the partnerships we form along the way. That network of involvement and interaction, of acknowledging each other's needs and wants through questions and answers, is the very foundation upon which a sustainable city is built.

As from 2021 the StadsLab2050 as a name stopped to exist. StadsLab2050 is integrated in the city of Antwerp under the department Climate & Environment and has changed to Process Support and Funds.

Challenge energy transition Antwerp Just transition framework

The energy transition poses an important social challenge. Families with the smallest incomes have (relatively) very high energy bills because they live in (rental) homes with poor energy performance. They often consume grey energy or fossil fuel powered energy at very expensive rates (for example through expensive pre-paid meters). Renewable energy is not accessible to everyone. Disadvantaged groups do not benefit from subsidies / support measures because of thresholds for, investing in their own PV installations or joining cooperatives. Energy efficiency measures are also difficult to apply ((social) rental housing, emergency buyers lack a budget for investments …and are of limited benefit, as the fixed share of taxes in the energy bill is constantly increasing. Disadvantaged groups are also limitedly involved in niche regimes such as LEC ("local energy community") or prosumers because, in addition to financial barriers, they often also lack a necessary network and knowledge or administrative insights or social skills. The challenge of a social energy transition is high on the social agenda, as also highlighted by the yellow vest movement (active mainly in the French speaking part of Belgium). Energy poverty is also a major challenge in Antwerp: there is an above-average share of groups with a high risk of energy poverty (1 at every 5 citizen in Antwerp had a low income), such as tenants, single people and single-parent families and people without income from work. Although various Antwerp initiatives already contribute to the challenge described, such as Het Ecohuis, the autonomous municipal company AG Energy Savings Fund and the energy cell of the OCMW, making the energy and climate transition fair remains a mission of the City of Antwerp. SONNET is tackling this challenge.

1.2 Understanding of SIE for SONNET:

How is SIE understood in the city lab? What are its major characteristics?

For the city of Antwerp SIE as terminology was rather new. But on the basis of previous projects SIE for the city of Antwerp means looking at projects and experiments done by citizens and organisations which are facilitated by the local government. Instead of the government taking control of telling citizens and organizations what to do. The definition as used in the SONNET living lab (new ways of doing, thinking and organising energy) is very broad and if we look at all activities, project, policy of and actions on the ground, this is of course not new. Already in the application phase of the SONNET proposal and in the writing of specifically the Antwerp challenge and solution in this topic it was clear that SIE is not new for Antwerp and that the city was already making policy plans (like the new Antwerp climate plan 2030) that actively work on SIE. Process Support and Funds (formerly known as Stadslab2050), the innovation lab for a sustainable city is also familiar with social innovation. Innovation is more than technology. An example is the living lab on resilience that was set up together with Drift in the framework of the Urbact project Resilient Europe in 2018. Transition thinking and social innovation are as such not new concepts. For complex transitions as the energy and climate challenge we are convinced that social innovation works well. Already in the SONNET proposal it was decided that the specific challenge of the Antwerp living lab was energy poverty.

How was it decided? If any, what were other options considered? Who was involved in defining SIE in the city?

The project lead (Jana Deforche) started with desk research and the consultation of experts on energy, social innovation and energy poverty in the cities own existing network. (01/07/2019-01/11/2019). Jana Deforche was working for Innovation & participation. Lina Nurali, her successor, works for the Public relations department. A team was set up with Gert Vandermosten, coordinator of Innovation & Participation (formerly known as Stadslab2050) to make a work plan for the scoping phase of the living lab.

There were several meetings on the project plan, mapping examples/other relevant projects, network and theory of change. Jana also participated in two meetings of existing local networks (called 'energie in de breedte') with members of local government, department of social services, social organisations, social rental office and social housing company on the intersection on the topics energy, housing and poverty. This was done to get a better view on the field, its specific challenges and opportunities to build on in the setup of the SONNET living lab in Antwerp. This was also an excellent network to start and build upon and a source for the mapping of existing SIE initiatives. Five interviews between 12/2019 and 02/2020 were conducted with key stakeholders to define the scope and map relevant initiatives in and outside of Antwerp. The goal of the interviews was to get more insight in the present potential in the city of Antwerp (who does what?) as the broader theme of just transitions in Antwerp, Flanders and abroad. The five interviews were conducted with:

- Sven Claes from Collectief Goed on 14/01/2020
- Geert Vielfont from the city of Antwerp on 17/01/2020
- Bart Martens from the cabinet of deputy of mayor Tom Meeus on 18/02/2020
- Jan Jaeken from Samen Klimaatactief on 07/02/2020
- Antje Schurmans from the energy cooperation ZuidtrAnt cvba on 23/01/2020

A long list of possible SIE interventions was made. In the long list we describe the initiatives based on the following parameters:

- Type of justice: on which type(s) of justice does the intervention focus (distribution, recognition, participation, wealth)?
- Type of intervention: what is the aim of the experiment to the energy transition (mobilizing, iconic, symbolic, effect, etc.)?
- Type of effect: what type of effect and impact is the intervention aiming for in relation to the energy transition (low hanging fruit, direct result, long-term focus, learning focus, fundamental change, etc.)?
- Type of approach: is the intervention social, technical and/or policy-related?
- Type of mandate of the City: to what extent does the City of Antwerp influence the field of action of the intervention? What scope and wish does the city have (administration and politics)? And to what extent can this trajectory from the City offer added value for an intervention?
- Existing/not existing in Antwerp: is the intervention already applied in Antwerp?
- Existing/not existing outside Antwerp: has the intervention previously been applied in Flanders/Belgium/Europe?
- Interest Antwerp partners: does the intervention already have (potential) initiators?

See below an overview of all projects that were included in the long list.

Initiative	Existing project in Antwerp?	Existing project outside Antwerp?	Interest from Antwerp partners?	Type approach (social, technical, policy)	Type justice	Type intervention
Stalinstraat and Woonhaven want to share an electric car	Yes			technical	acknowledge ment	Catalysing
Stalinstraat citizen cooperation	Yes			social, technical	Procedural	Catalysing
Steering group 'Energie in de breedte'	Yes			policy	Procedural	Catalysing
Hub in EcoHuis	Yes			policy	procedural	Catalysing

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Initiative	Existing project in Antwerp?	Existing project outside Antwerp?	Interest from Antwerp partners?	Type approach (social, technical, policy)	Type justice	Type intervention
ZuidtrAnt advice and participation trajectories in schools	Yes			social	Power	mobilising
Energy advice and interventions EcoHuis for vulnerable groups	Yes			social	Power	mobilising
ZuidtrAnt energycooperation	Yes			social, technical	Procedural	Catalysing
Collectief Goed	Yes			social	Acknow-ledgement	direct result
Direct mailing Energy scans and energy measures	Yes			social	Acknow-ledgement	mobilising
EcoHuis operation	Yes			all	All	mobilising
Energy coaches	Yes			social	Power	mobilising
Higher renovations subsidies for specific target groups	Yes (indirect)	Flanders		policy	Distributive	direct result
Noodkoopfonds or Renovation coaching for buyers out of need and residents	Yes (indirect)	Flanders		policy	Distributive	direct result
Repowering London	Similar	United Kingdom		social, technical	Power	Catalysing
The 'Energy cutters'	Similar	Flanders		social, technical	Power	mobilising
Dampoort renovates	Similar	Flanders		social	Acknow-ledgement	direct result
Minimal quality norms for rental houses	Yes (indirect)	Flanders		technical	Acknow-ledgement	mobilising
WarmWorks	No	United Kingdom		technical	Acknow-ledgement	iconic
RHEDCOOP	No	Flanders		technical	Acknow-ledgement	Catalysing
Gents Climate Alliance	No	Flanders		social, policy	Distributive	Catalysing
Papillon	No	Flanders	Yes	technical	Acknow-ledgement	direct result

The information gathered during the scoping phase (01/07/2019 - 02/2020) was discussed in four meetings with the broader project team (Anwerp SONNET team, drift SONNET team, external consultant and 3 internal experts of city of Antwerp). The scoping document with the selection of 5 interventions were presented to the deputy Mayor for Climate and Energy, his chief of cabinet and senior advisor for energy and environment. A presentation was given on 20/02/2020. For more information about this process, see section 2.1 and 2.2. Next step was conducting 5 meetings with possible intervention leads. They were contacted bilaterally to check 3 things:

- Present the idea and first elaboration on it;
- Get approval of intervention leadership (personal) and support of the organisation they are working for (invest time, fund, communication;)
- List of other organisations/people to contact for planned kick-off and workshop.

Because of COVID-19 the planned kick-off moment for the Antwerp living lab could not take place due to the lock down. At this meeting (planned 23 April for half a day) we wanted to present the Antwerp living lab, the framework of the Antwerp challenge of energy transition and energy poverty and the power of social innovations to test solutions. Also presentation of the five experiments and first interactive parallel work session for each experiment to sharpen the scope and ask for the commitment of participants. Alternatively, an online kick-off was organized on 9 June. Because we wanted to make it participatory, we carefully selected 30 participants. There was a plenary part and parallel working sessions per experiment. Instead of a half day, we had a 2 hour Zoom-session.

The working document Stadslab2050 *eerlijke energietransitie or just energy transition* was finalised on 17th February 2020. This document contains an introduction to the topic, analysis of the energy system and transition, description of the concept of a fair energy transition and potential starting point for the policy context (local-regional-national-European) and the ambition of the city within this living lab. The scoping of the living lab includes: its ambition, the desired result, learning questions, selection of interventions, the assessment framework and developing a shortlist.

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2 SONNET CITY LAB PROCESS

2.1 Setting the stage and challenge structuring:

In the city of Antwerp 1 out of 5 citizens have difficulties paying their energy bill. An above average group of citizens are at risk of energy poverty such as tenants, singles, single parent families and people with no job and income. The following numbers confirm the situation in the city of Antwerp:

- In the city census of 2014 Antwerp has the lowest share of energy efficient houses (46%) in Belgium.
- 30% of the Antwerp building stock has no (well) insulated roof.
- Per 1000 households there are 28 households with an active budget meters for electricity and gas (Flemish average is 16 per 1000).
- In 2013 in total of 27 households per 1000 in Antwerp were shut down from the access to gas (Flemish average is 11 per 1000).

The city of Antwerp already made initiatives to help these citizens, but we didn't reach every citizen and we couldn't help everyone. For this we want to support experiments or projects who can offer a (part of the) solution. In the mapping phase we gathered initiatives from Europe, Belgium and Flanders, but the focus is Antwerp.

There has been a focus on energy poverty for some years, but as we see in daily practice, energy is just a part of poverty itself which is a social inequality. Researchers see energy transition as a fundamental change in the structure, culture and working methods of the current energy system. After a pre-development period, a transition is currently taking place from a fossil fueled, centrally organized energy system to an energy system based on renewable energy sources that is organized on different scales and by a multitude of players. The main drivers for this transition are the depletion of gas and oil resources worldwide, concerns about climate change and the international agreements made to reduce CO_2 emissions and the rise of sustainable energy.

Transition studies generally use the 'X-curve' to indicate the transition dynamics present within a system. In the curve, a distinction is made between patterns of build-up and patterns of breakdown that interact with each other and reinforce or counteract each other. The current energy system is in a phase of acceleration that is characterized by increasing social attention for energy issues as well as the maturity of alternatives such as the (decentralized) generation of renewable energy. At the moment we note that the majority are still on the curve of the established order and a smaller part is working on emerging alternatives (in the form of renewable energy, energy cooperatives, etc.). Many energy companies feel that the system is

destabilizing. When we look at the emerging curve, we see that the majority are in the phase of emergence. We also still see a lot of attention being paid to experimenting with alternative forms of energy generation and accelerating these new practices.

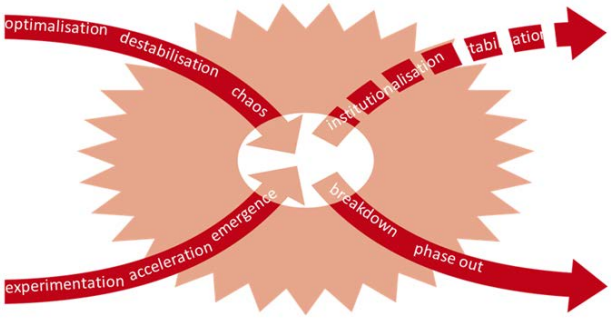

Figure 1 The 'x-curve', a commonly used heuristic in transition studies (see Loorbach 2014).

This interpretation is difficult to examine in an objective or quantitative sense: depending on their own position, experience and ambitions, people recognize or experience a different type of dynamic. Where chaotic and disruptive change cannot be violent enough for one actor, another actor will be threatened by these kinds of changes and consider them undesirable. The mechanisms and patterns described by the X-curve are therefore not so much a way to scientifically indicate the state of transition, but rather a starting point for a social discussion about the state of a specific transition. The current transition dynamics order in the energy system of acceleration in combination with an increasing disruption of the existing ones, brings us to the question of who should bear the costs and benefits of the energy transition. Certainly in phases of destabilization and demolition, it is important to reflect on the distribution of the costs and benefits of system changes as well as processes of inclusion and exclusion (see Van Steenbergen & Schipper 2017). In addition to the fact that transitions can perpetuate or even increase existing inequalities, they also offer the opportunity to address them by keeping an eye on the distribution of costs and benefits. Which parties and groups are given more room to discuss and decide upon the access to resources? Are other parties and groups being forced to take action? Which people, households or professional groups are and are not compensated? What does it mean for making private home ownership more sustainable? To what extent can (access to) a basic need also be regarded as a right? It raises a set of questions in which moral and ethical considerations often play a role and thus the political and ideological differences also manifest themselves. For example, Block & Paredis (2019) argue that ecological challenges and social challenges are inextricably linked in sustainability issues, but that this link is not always made. According to them, it is "important to always ask the political question par excellence: who decides what for whom, for what purpose, from what interests, and who loses or wins?". The ethical and social tensions associated with system changes therefore require a democratization of the same transitions.

So we can assume that the energy transition is alive and kicking. On several policy levels (European, Flemish and local) there are steps taken to create a vision and plans with a focus on

energy saving, the production of renewable energy and making the heat supply more sustainable.

Oosterlynck et al (2019), for example, explore how the transition to a more (environmentally) sustainable society can be socially inclusive. They see three core issues in which the social inequality dimension of the ecological issue is visible: 1) the unequal distribution of environmental problems (a double inequality); 2) an unequal ecological footprint and 3) an unequal distribution of ecological policies. They propose a socio-environmental thinking framework around poverty and poverty alleviation that takes into account the following conclusions: "We found that the ecological issue reinforces the social debt model. All kinds of structural social mechanisms mean that people are unequally exposed to environmental risks, but are also not equally responsible for them." (Oosterlynck et al 2019). According to various authors, if no explicit thought is given to a 'fair energy transition', transitions can lead to a double Matthew effect = low-risk groups bear the greatest burden of the energy transition because of poor insulation, no home of their own, fewer energy skills, etc.) while the most affluent groups and parties reap the benefits. The result is deeper poverty and a devaluation of opportunities for certain groups of people.

So if we can't solve poverty and inequality in Flanders, what are the possibilities to distribute the consequences of the energy transition in a fair way? To answer this question, we have to make a distinction between energy measures that are technical, interpersonal and policy.

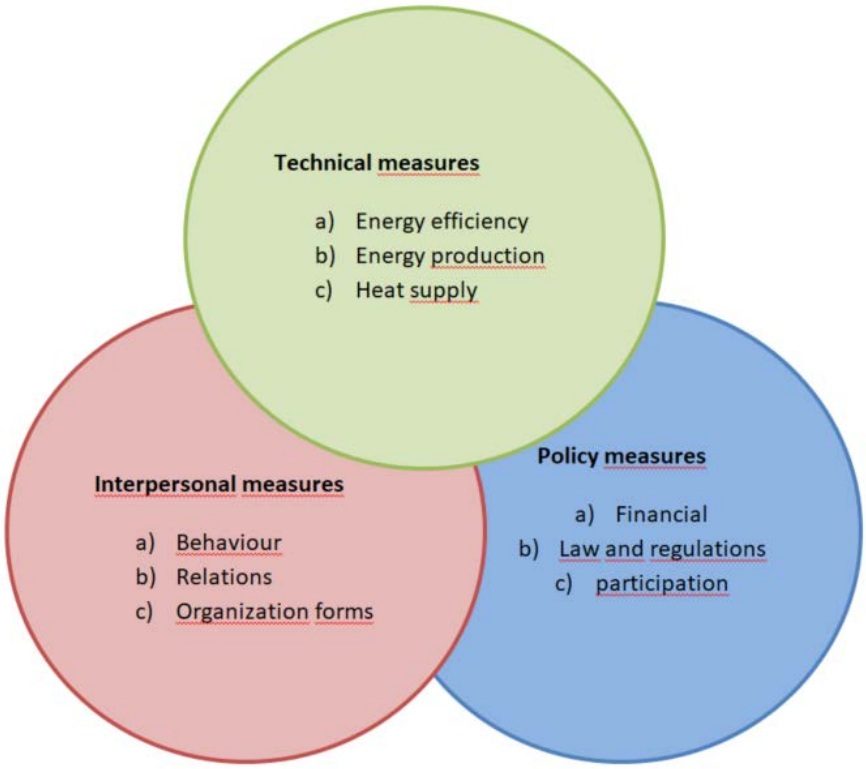

Figure 2 type of energy measures: technical, interpersonal and policy

As technical measures we think of insulation, installation of solar panels and making the heating system as sustainable as possible. Offering an energy loan subsidies which is a policy measures can be useful, but is mostly for households with very low incomes which makes it more difficult to invest in technical measures. For Interpersonal measures we think about a change in behaviour to save energy, but also in the roles that different stakeholders like the grid operator or the organizations of citizens in an energy cooperation.

It is then interesting to link the type of interventions to the four principles of justice from the previous section:

- Distribution (verdeling): interventions that take into account the distribution of the advantages and disadvantages of the energy transition (e.g. discount on energy bills, subsidies for renewable sources, fines for polluters, energy batteries with more energy for everyone, etc.).
- Participation (participatie): interventions in which various disadvantaged groups are involved in policy-making and can participate in discussions about energy issues (eg shaping an energy debate in a certain neighbourhood(s)).
- Recognition (erkenning): specific interventions for specific disadvantaged groups (e.g. schemes such as white goods, isolation in certain neighbourhoods and tackling social housing, etc.).
- Capability (vermogen): interventions aimed at developing skills to deal adequately – and according to one's own insight – with the energy transition (e.g. focusing on social cohesion and group formation, energy coaches, awareness of generating energy yourself, etc.).

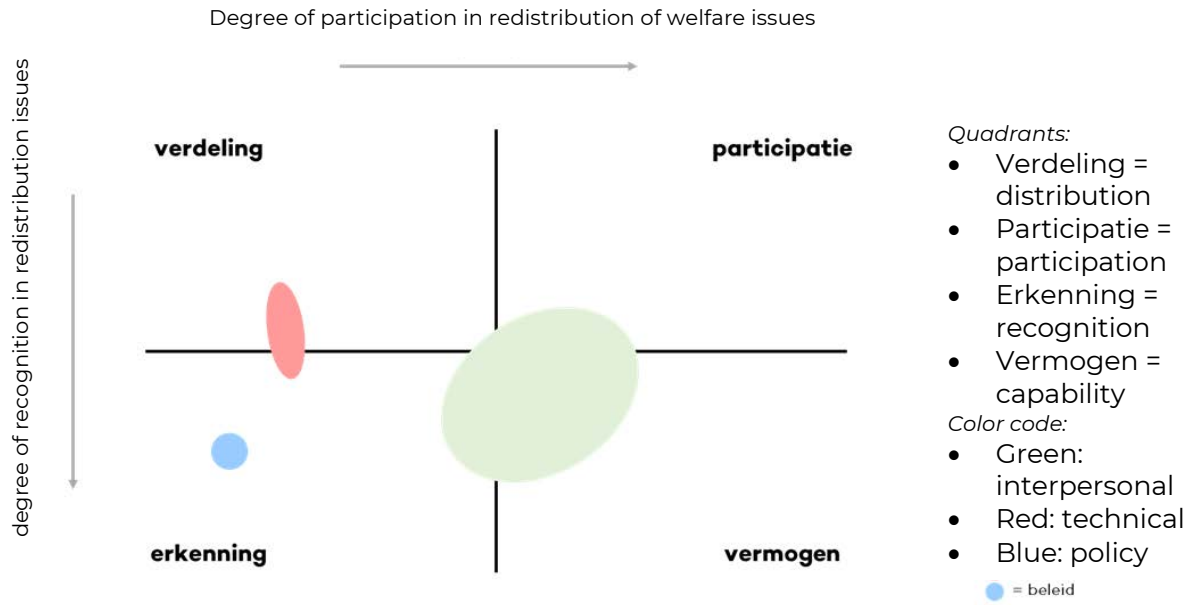

Figure 3 Possible framework to plot interventions by type of justice.

In this manner a local authority as the city of Antwerp can create a balanced palette of energy measures that are not only social, technical and policy-related in nature, but also take into account the various effects in relation to a fair energy transition.

What is an energy related issue that is to be addressed by a city lab? What is the rationale behind the choice?

With the SONNET city lab experiments we want to involve disadvantaged or vulnerable groups in the energy transition. As mentioned above, citizens of the city of Antwerp have a high risk to land in energy poverty and the energy efficiency of the building stock is low. These two factors have the risk that an energy transition can heighten the inequality of citizens instead of minimizing it. With these city lab experiments we want to tackle energy poverty in an urban context. First of all, we want to see how we can make existing and new energy measures more social. Second, we want to incorporate an explicit focus on the energy theme in existing and new social measures.

We started mapping out the current dynamics and potential in the city on SIE. We focus on social innovations within a fair energy transition in Antwerp, but we also look broader than that, both geographically, and at initiatives and interventions that are (currently) situated within the energy transition or the social domain, but where we see potential links with the fair energy transition. We also mention a number of measures that are not necessarily innovative, but which do contribute to understanding Antwerp's dynamics.

We interviewed relevant stakeholders in the field. Because the living lab in Antwerp aims to stimulate all actors in the city (civil society, businesses, citizens, actors within city organisations) willing to innovate in the crossing fields of energy/poverty/housing we have to know what is on the agenda of stakeholders. Social innovation is just as much about new combinations of old things, as it is about integrating new things into existing contexts. In practice this means an encounter of old and new and the need for co-creation amongst diverse actors. Such encounters don't take place in a vacuum, but are developed by people and evolve in concrete places. This makes the local level and especially cities take centre-stage for social innovations.

The framework of the principles of justice and the type of measures (technical, social and policy), see figures 2 and 3 above are used to structure the mapping.

We can draw a number of conclusions from the mapping and the interviews:

- For social initiatives, in Antwerp and elsewhere, focusing on sustainability and energy efficiency is a side issue. The investments this requires are high and form a major barrier for disadvantaged groups. Initiatives such as Collective Good also often involve much-needed "basic renovations" – focusing on sustainability and energy efficiency would be "the icing on the cake".
- Many current initiatives are considering adding an inclusive or energy dimension, in order to be able to link up with the inclusive energy transition. Think of the citizens' cooperative in

the Stalinsstraat that, together with a social housing company, wants to make an electric shared car accessible to all residents of the street. Or the basic renovations that are needed, according to the ZuidtrAnt energy cooperative, so that people can participate in solar sharing projects. Because successful social innovations in this inclusive energy transition consist of a complex interplay of technical, policy, social and financial measures, we can capitalize on the 'missing links' in existing initiatives.

- There is fragmentation within the functioning of the services of the City of Antwerp, the cabinets with different objectives and the approach to disadvantaged groups differs depending on the organisation. There is a need for integrated operation. Steps are being taken towards integration of operation and debate, such as the Energy in the Breadth steering group or the EcoHouse's hub function, but these are not yet sufficient. This Stadslab2050 trajectory can form a prelude to an urban strategy on the fair energy transition in which, among other things, integrated operation is further mapped out.

What other issues were considered and dropped? Why?

We had to drop interesting ideas where no leading person in an organisation was found. There was an idea to implement a solution to the problem of spilt incentive in energetic renovation of the rental market. We decided to study the topic first and try to find later (with the special funding of the call on social innovation in energy of the Climate Fund (Klimaatfonds)). Also, when additional money was needed we could not select it.

More details see below.

Who was involved in the process of identifying an issue?

Jana, the former project leader and Gert Vandermosten, former member of the Stadslab2050 formed the Antwerp SONNET team.

Jana talked with different colleagues of the city of Antwerp to get a shortlist of possible SIE experiments/project. They did different interviews with the innovators (project leads) of the SIE experiments/projects to get more insight.

Has the issue been addressed by the city so far? In what way?

SIE as such is not explicit. Circular South or other projects where innovative ways to stimulate energy transition, but we never talked in this terminology about it.

The term SIE is not very well known amongst the different city departments. When we have energy projects we always mention that we want to have a focus on vulnerable citizens with low income and bad housing quality, but we never saw energy projects as needing to integrate both climate and social goals. We also see this in the fragmentation of the operation and targets of different city services. for example, the EcoHuis focusses on the energetic renovation of the building stock and less on the improvement of the housing quality and vice versa.

How is the issue related to the city's current strategies and policies?

There is a clear connection to the challenge of the Antwerp climate plan 2030. In the climate plan we have energy goals to reduce CO2 emissions, but also goals to tackle energy poverty and to create a just energy transition.

In the climate plan there are various measures to counter the challenges. Most of the measures are already operational for some years:

- Interest free energy loans for households with lower income (>31.870 euro joint taxable income) and for associations of co-owners of an apartment building. The loan is max. 15.000 euro and has to be paid back in 10 years. Associations of co-owners can lend 7.500 euro extra for each individual apartment. The energy loan is specific for low-carbon technologies
- Free advice in the EcoHuis or at home for households with low income or high energy or water consumption. We inform them how to save energy and water and how to find a cheaper energy supplier. They can also get advice at home from an energy auditor. During this visit they get free energy saving materials installed like LED lamps, pipe insulation etc.
- Free renovation coaching for home-owners. They get advice and coaching from a technical expert who requests price offers and compare them and support the home-owner during execution of the works. They get help to ask about energy loans and subsidies.
    - These measures focus merely on the reduction of the energy consumption of households with lower incomes, but don't necessarily help them with the energy transition or to increase the quality of their house. Most of these households deal with mould and moisture or safety problems like fire hazard due to non-maintained electricity.
    - Some of the SIE experiments are included in the Climate Plan 2030 like the emergency buyers fund (Noodkoopfonds), collaboration with social rental office (SVK) and the leasing of energy efficient household appliances.

Team formation

- City of Antwerp team:
    - Core project team city of Antwerp: project lead Jana Deforche and from January 2021 Lina Nurali. Support from Stadslab2050 coordinator Gert Vandermosten and from February 2021 Luk Lafosse. Local communication support from Willem Somers and Jo Van de Velde. The Stadslab2050 has been integrated in the city department Climate and Environment in 2020 and now goes by the name Innovation & Participation. The 5 experiments are conceived as living lab experiments. Stadslab2050 was the departments of living labs in the city of Antwerp and wrote the project application. Afterwards Stadslab2050 contracted Jana to lead the project.
    - Extended city of Antwerp team: 5 experts in energy transition from perspective of social inclusion. Interviewed and input in workshop definition of scope and selection of interventions (19/02/2020)

- SONNET team (city of Antwerp + Drift): Jana and Gert, now Lina and Luk, and Julia Wittmayer and Maria Fraaije from Drift
- Contractor city of Antwerp: consortium of Rebel group/Drift: contracted by own budget city of Antwerp to support Stadslab2050/Innovation & Participation in the definition of the scope, selection of interventions, structuring the process of the living lab and evaluation and learning during and afterwards. Rebel group is in international consultancy company. They work on challenges within sustainability, transport, area development, care, the social sector and more. They deliver quality in strategic advice & development, business analysis & evaluation, partnership consulting & contracts, financial advice & modelling and investing & fund management. Drift is a company who focuses on research, academics and consultancy and organises arenas to share ideas, experience and knowledge. Drift is responsible for the evaluation part of this city lab report.

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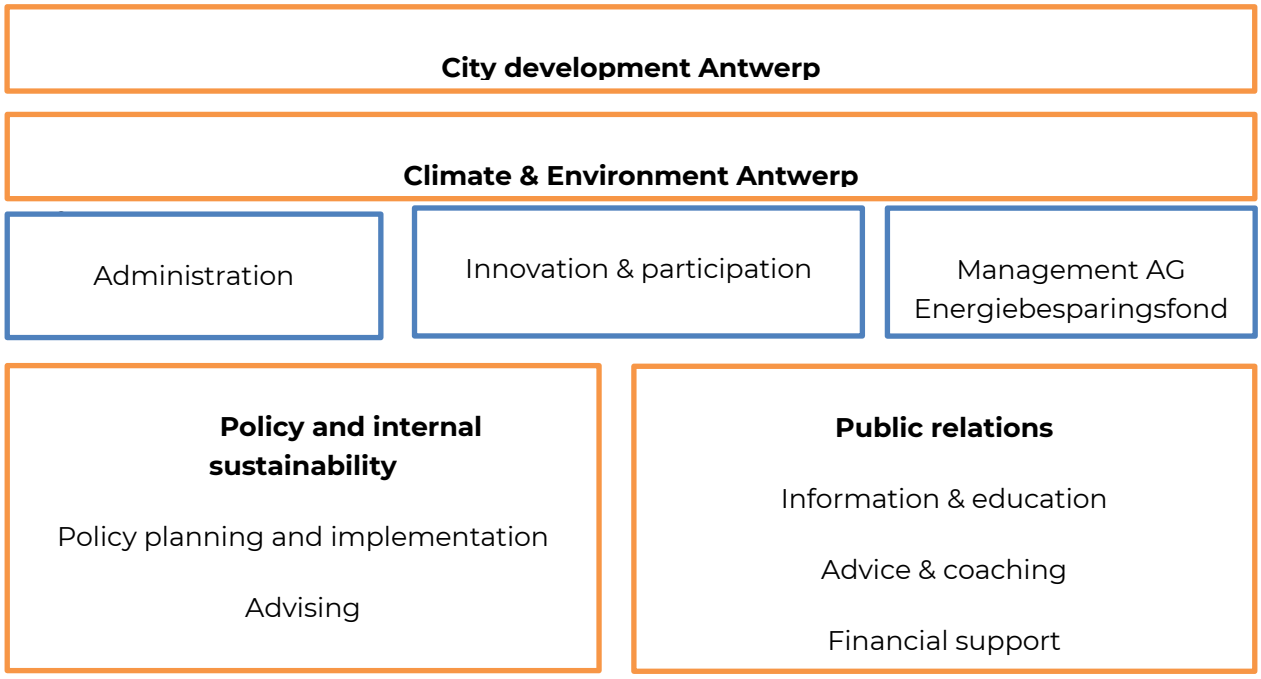

Figure 4 Organization chart of the different city departments where members of the city of Antwerp team are situated

- Actors in the working field: each experiment has an external stakeholder with a specific expertise in the field. We also call these external stakeholders 'trekker organizations':
    - Energy community Stalinsstraat: energy cooperation ZuidtrAnt cvba, social housing company Woonhaven, engaged citizen of the Stalinsstraat and energieID and since 2021 expanded with Klimplant vzw.
    - Collectief Goed: Samenlevingsopbouw, SVK and ZuidtrAnt cvba
    - Papillon: Samenlevingsopbouw West-Flanders and Antwerp, supplier of household appliances BSH Home appliances nv and Woonhaven
    - What was done to ensure that all the relevant parties were included and treated on equal terms?
    - Initial idea was to set up a steering group to make connection, gain support and allow for ownership of local actors in the field. This is important for sustainable results when the city lab ends. This steering committee however was never set up, because nobody came to the lead to organize one.

How was the process of needs analysis conducted? What were the methods, timeline, outcomes?

GelijkStroom (or "Equal current". The specific name for the Antwerp experiments was chosen after the short list of interventions was approved). It aims to foster a just energy transition and wants to put energy poverty on the agenda (without institutionalising it). Existing policy on the energy transition can be made more just and energy poverty policies can be tailored towards the energy transition through implementing and learning from five experiments.

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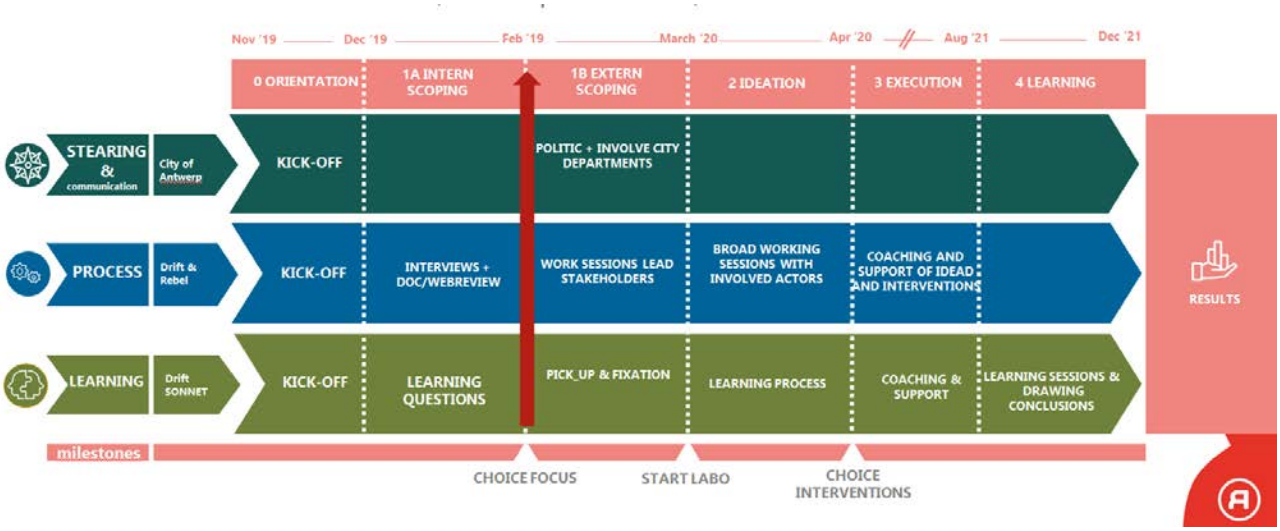

Figure 5 Timeline of GelijkStroom city lab

The city lab consists of five phases: orientation, scoping, ideation and application and learning. In the orientation phase, DRIFT/Rebel framed the just energy transition consisting of four types of justice related to distribution of (dis)advantages, degree of participation and involvement in decision making, recognition of certain individuals and communities as well as to resources and skills. To achieve this, the team identified several technical, social and policy related solutions. Think for example of energy savings with proper insulation for low income families (technical), engaging in local energy cooperatives (social) or subsidising investments for energy renovations (policy related). In the scoping phase, this framework was further developed and illustrated with best practices from the SONNET database. Desk research and interviews about the context in Antwerp were carried out, to map the current dynamics related to social innovation in the just energy transition. The mapping of initiatives and a longlist of interventions was made in January 2020.

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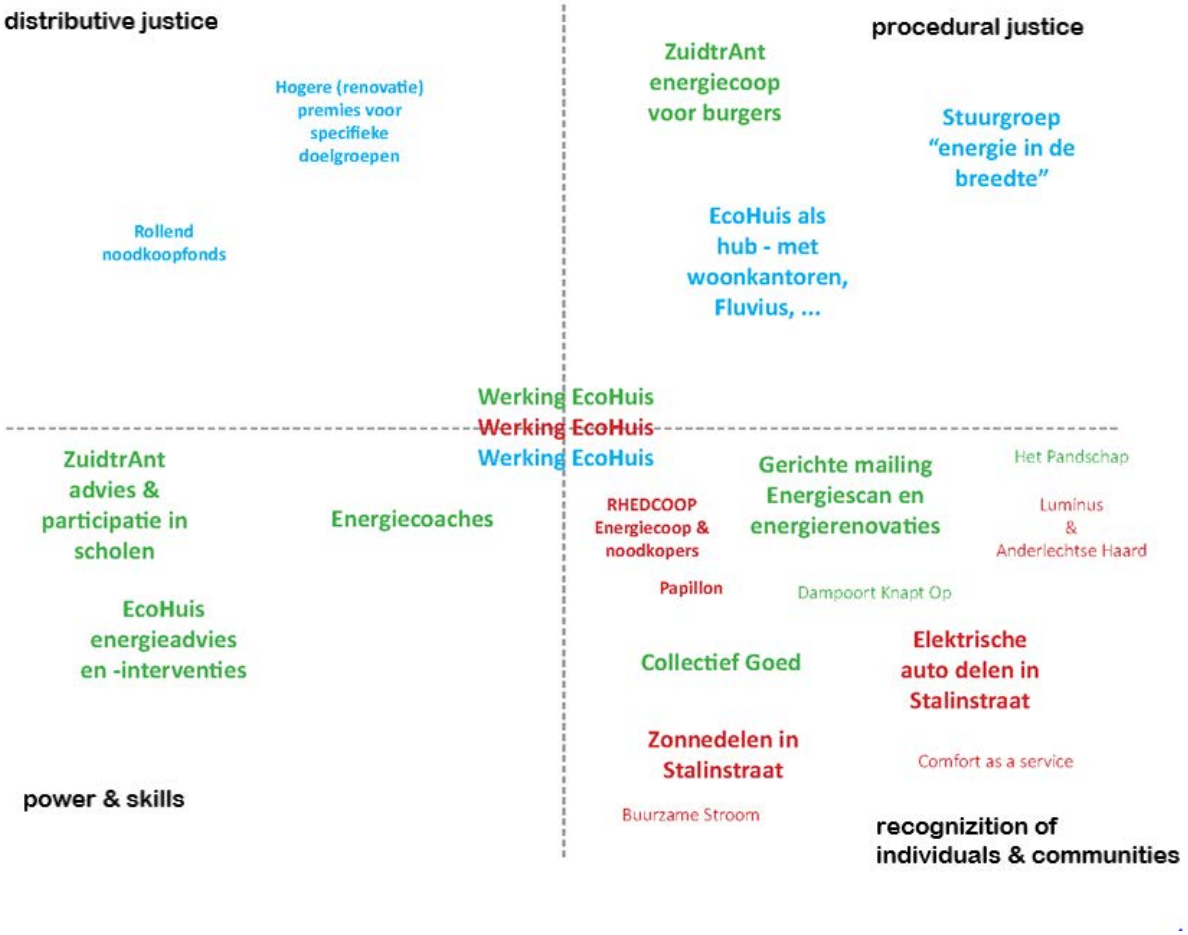

Figure 6 Mapping of the different energy and social initiatives in Antwerp

A list of criteria was decided on in the extended team to make a longlist of possible interventions to select. In the selection of 4-5 interventions we decided a good mix of different types of interventions is desirable. This led to the formulation of the city lab's objectives and approach with five experiments, selected from a long list. The five experiments were discussed and further developed in dialogue with the social welfare administration.

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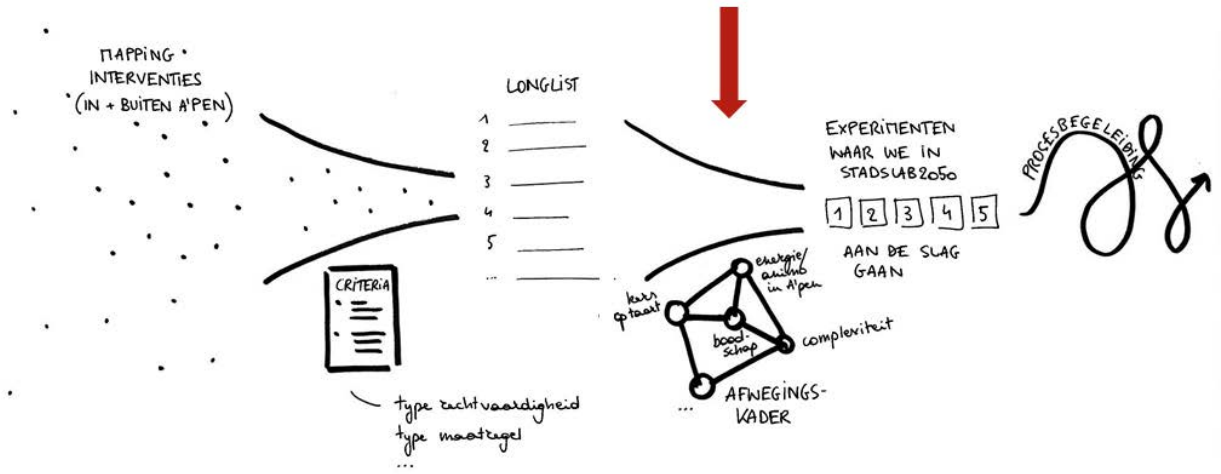

Figure 7 Process visualisation: from mapping to 5 experiments

The longlist contained 27 possible projects. The goal of the longlist was to get an idea of the richness in possible interventions. That is why few or no exclusion factors are used to draw up a long list of interventions. In view of the broad framework, we believe it is important not to limit ourselves at this stage and to approach the theme broadly. To make a short list, we used an assessment framework where we investiged following questions:

- Does the project already exists in the city of Antwerp?
- Is the project the icing on the cake, a connection or integral?
- Does the project already exists outside the the city of Antwerp/did similar initiatives already were conducted in other local authorities?
- Is there an intrest from the city of Antwerp in this kind of project?
- What is the typology: social, technical or policy?
- What is the typology of justice: aknowledge, procedural, distributive or power?
- What is the type of intervention: catalysing, direct result, mobilizing or iconic?
- Who is involved?

These questions were the parameters to select the shortlist for possible experiments. In order not to lose support for this politically sensitive theme, we opted for at least 1 potentially successful intervention in the short term. The assessment framework from the SONNET project is also included in the final selection. The aim is to achieve a synergy advantage with the cases studied from the SONNET project in order to create more mass. In the desk study, we mapped out concrete interventions that are explicitly aimed at pursuing a fair energy transition. An important dataset is the SONNET database containing a wide range of social innovations in the energy transition. The input for the SONNET mapping comes from various members in the consortium. We extracted 20 examples from this database that are explicitly aimed at addressing energy poverty. We also found about 30 Belgian examples in the database, but only

2 or 3 examples relate to energy poverty. We also searched sources received from respondents and obtained through the Stadslab2050 project team.

The assessment framework should lead to a selection of directions for experiments in Antwerp. Rather than including 4 or 5 well-defined and ready-to-use experiments here, we outline the possible experiments that are promising for the local context in Antwerp. These elements are important to consider when selecting experiments:

- An experiment that makes use of a window of opportunity: which actors and/or which initiative have energy and how can we use that in an experiment?
- Link existing Antwerp organizations within the social and energy field to add the "icing on the cake"
- An experiment with assured short-term results
- An experiment that aims for long-term change

Week	**Activities**
6/12/2020 – 27/12/2020	Interviews, desk study, observations and progress interview
11/01/2021 – 17/01/2021	Interviews, desk study, observations and writing the first version
18/01/2021 – 24/01/2021	Discuss first draft version
25/01/2021 – 31/01/2021	Supplement working document with desk study and analysis interviews and SONNET meeting in Rotterdam: progress meeting Supplement working document with desk study and analysis interviews
01/02/2021 – 07/02/2021	Send new version working document to Jana and Gert
08/02/2021 – 14/02/2021	Feedback by Jana and Gert on working document
17/02/2021 – 18/02/2021	Processing feedback by Jana and Gert
22/02/2021 – 28/02/2021	Processing project team input + making a cabinet meeting presentation
01/03/2021 – 07/03/2021	Submit cabinet consultation input
08/03/2021 – 14/03/2021	Presentation to cabinet
15/03/2021 – 04/04/2021	Exploratory discussions with possible partners and stakeholders to further explore interventions and possibly already give shape to them
12/04/2021 – 18/04/2021	Kick-off session to choose interventions (tbd)

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2.2 Agenda and goal(s) setting, ex-ante analysis:

The living lab is successful when it brings knowledge, provides insight, and is embedded in the city. In more detail, the goals of the trajectory were:

- Knowledge about social innovations as leverage for a fair energy transition. Through innovation, we'd like to learn about how we can involve disadvantaged groups in the energy transition. Which concepts work and which do not? What are criteria for success?
- Provide insight into the role and responsibility of the city and partners. We want to learn about the role the city administration can play in the just energy transition. Which policy instruments do we have or do we need to develop to realise this? To which extent is the city already taking responsibility and which opportunities for growing are there? How do we make sure as a city that we stay focused on the just energy transition in the future, in an efficient and organized way? Which other stakeholders are crucial for success? How can we as local government ensure they contribute to our mission?
- Evolve into sustainable initiatives in Antwerp. Stadslab2050 GelijkStroom aims to create new networks, coalitions, collaborations, practices etc. The experiments are seeds for continuation. They will show that investments in this theme are needed.
- Generate support for a long-term strategy of the city. Stadslab2050 GelijkStroom needs to be embedded in the city administration's daily practice to have a long-term, sustainable effect.
- Anchoring "innovation" and "learning" with the city and partners. How can we integrate what we learn? How can we create room for learning and reflection with the involved stakeholders? This contributes to a more effective process and an increased impact.

For the selection of the experiments, the city of Antwerp takes the lead in the living lab. It has the experience of the living lab Stadslab2050. The city subcontracts (as is the policy within Stadslab2060) a consortium of Rebel group and Drift (by the existing framework contract) to support in the process. City of Antwerp is supported by Sonnet partner Drift for the learning questions related to the living lab as SIE.

The shortlist of experiments was decided top-down based on the assessment framework described above. The shortlist was made by the cabinet of Aldermen oCollege Tom Meeuws, Jana Deforche and Fleur Mercelis from Rebel Group. The short list was presented at the kick-off where stakeholders could discuss the chosen interventions/experiments. From a procedural justice point the experiments were not very inclusive, because we didn't involve the target group and selected the leaders top-down. To tackle this we would better organized a panel with representatives of the target groups to make the process more inclusive. The 5 experiments that were selected are:

- Energy community Stalinsstraat
- Rental of energy-efficient household appliances like washing machines, fridges and freezers (before called 'Papillon')
- Renovation coaching for emergency buyers and residents (Noodkoopfonds)
- Collectief Goed: an organization who retrofits former social housing into energy efficient houses who will be rented to households with lower income
- Pandschap: this experiment was dropped out. There were no partners or stakeholders who were already developing a concept.

The whole idea of the living lab was to explore and support existing projects. It was not intended to pick experiments where the whole idea of implementation of it has to be figured out from the beginning. Also it not intended to push certain ideas from the city of Antwerp towards the creation of a project. The time for the execution and implementation of the different experiments was also too short to get it done in the framework of the SONNET project and to have enough results if the experiments still had to be created.

Experiment: what?	**Goals**
Energy community Stalinsstraat ZuidtrAnt (an energy cooperation) wants to create an energy community with the neighbours living in the Stalinsstraat. They want to install solar panels on the roofs of the houses in this street. We also want to inform and give insight in the energy consumption of these citizens. The home-owners of bad oriented roofs or with less financial means can buy local renewable energy from their neighbours in the future (from mid-2022).	• locally produced renewable energy for everyone by creating an energy community • convince as much home-owners as possible to install solar panels • involvement and participation of home-owers who have a bad oriented roof or don't have the financial means for the installation of solar panels by giving them the opportunity to buy the surplus of the produced electricity by home-owners with solar panels • collaboration with non-residential building like the school or the old brewery building • installation of 2 batteries that will be used on a neighbourhood level when legislation for energy communities is approved • upscaling to other neighbourhoods
Rental of energy-efficient household appliances (before called 'Papillon') Offering a solution for households who cannot afford new energy or water efficient household appliances like a fridge, freezer or washing machine. We want to this through a circular business model with a renting formula.	• giving access to people with old and energy consuming household appliances by replacing them by new energy efficient appliances • try-out of innovative and new forms of financing like a circular business model with a rental formula. • way to get access to more vulnerable people and to see if there are other solutions to get them out of energy poverty

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Experiment: what?	Goals
Renovation coaching for emergency buyers and residents (Noodkoopfonds) Reconcile climate and social goals. Counter the problem of poor housing quality and dilapidation of certain neighbourhoods. The city of Antwerp want to unburden these vulnerable home-owners in making their houses more energy efficient, safe and comfortable. We will do this by offering them free renovation coaching, energy loan and financial means through the Noodkoopfonds (emergency buyer fund). This is a rolling fund where home-owners get 25.000 euro to renovate their house. They have to pay back when they sell the houses or when the house gets inherited.	• better collaboration between different city departments, semi-public organizations like the grid operator and private stakeholders like contractors and NZEB coaches • focus on specific opportunities to solve bad housing quality and dilapidation of certain neighbourhoods • reconciling climate goals with social ones • offering home-owners a safe and comfortable house, a better EPC-certificate, a lower energy bill, to learn vulnerable home-owners new skills and knowledge and to support the economy by working with local contractors.
Collectief Goed Collectief Goed is a cooperative living model for large families with a low income. They want to realize comfortable housing with affordable living costs. Collectief Goed receives 77 houses from the social housing company De ideale Woning. The cooperative will own these houses and in exchange the social housing company receives shares from Collectief Goed. They collaborate with the energy cooperation ZuidtrAnt, because they have more experience with the installation of solar panels. The solar panels will be installed through third party financing. This project want to be a link between energy and social goals and also wants to realise empowerment of vulnerable target groups in the city of Antwerp.	• collaboration with 2 cooperative organizations • Collectief Goed will renovate 77 houses given by the social housing company De ideale woning to rent them afterwards to large families with a small income. Collectief Goed doesn't have a big budget to install solar panels after they've insulated the houses. By collaborating with ZuidtrAnt, an energy cooperation who will finance the installation of solar panels they can offer these families the opportunity to have locally produced renewable energy. • Testing out of the cooperative model and third party financing

Figure 8 visualisation of the experiments with the name of the lead project partner for each experiment

The city of Antwerp then also chose the name GelijkStroom or ('Equal Current') for the whole SONNET city lab experiment. At the kick-off we had the goal to have an open and transparent position to include new experiments that weren't on our radar before or with stakeholders which we didn't contact before. We also want to have an active mutual learning between all partners and stakeholders. Of each of these experiments a fiche or overview document was made with the following topics[1]:

- Team
    - Who are the leads of this experiment?
- Presentation of the experiment
    - What is the vision behind the experiment?
    - Which are the steps that will be taken?
    - Why was this experiment/idea selected by the SONNET team of the city of Antwerp?
    - A few inspiring examples
- Ambitions
    - Ambitions until end of 2021?
    - What are the critical success conditions to reach these ambitions?
- Approach
    - What are the first steps?
    - What is a realistic timing?
    - Who will be involved? We made a distinction between stakeholders with a leading role and a wider group of stakeholders.
    - What is the added value for Stadslab 2050 in this trajectory?
- Learning and anchoring
    - In which stakeholders do we want to see adapted behaviour after 2021?
    - What can we learn from this experiment?
    - How can this experiment be up scaled after 2021? What is the perspective?

Since there is a long list of objectives and learning goals connected to this lab and monitoring resources should be spent efficiently, we derived a set of learning questions that form the start of our monitoring process. These questions can off course change over time, when objectives change, new insights are gained and the implementation of experiments progresses. These learning questions will be answered in the evaluation.

[1] See 2.3 for the fiches and more information.

For Stadslab2050

- How can the city lab use social innovations as a lever for the just energy transition especially regarding the involvement of disadvantaged groups?
- What are the roles (i.e. activities, expectations, responsibilities) of the city administration in relation to just energy transition?
- How can the insights from the city lab be embedded in the city strategy and the city administrations daily practice?
- How can the benefits of such an integrated approach be made visible for different policy domains (e.g. CO_2 reduction, inclusion, etc)?

For SONNET

- How and to what extent is the city lab process inclusive, dialogical and actions relevant?
- How and to what extent are results socially innovative and disruptive in relation to the status quo?
- To what extent is Stadslab2050, being a social innovation in itself, an effective means to foster an inclusive and just energy transition in Antwerp? And what conditions enable or hinder it in doing so?

For the experiments

- How can social innovation initiatives in energy be accessible to all?
- What are possible business models for just energy transitions and their enabling and impeding conditions?
- What is the value of carrying out the experiment as part of the city lab?

Ex-ante analysis of enabling and impeding conditions (institutional, social, economic, individual) and identification of milestones and bottlenecks

- What methods were used for conducting the ex-ante analysis?
- What were the analysis results?
- What methods were used for the collaborative development of foreseen scenarios?
- What were the results?

The ex-ante analysis includes the outline of the context in the city of Antwerp, the identification of the long list and the experience and support of Stadslab2050 and Rebel and Drift to make a selection for the short list. The methods that were used are described above.

Ex-ante analysis of the roles of parties involved (optional)

- Who has to do what for different scenarios?
- What was done to ensure that less skilled and less powerful groups were equally included in the process?

To empower and support the different experiment, several work sessions were organized to support the experiments. The project leads of each experiment could also get extra support from Rebel.

2.3 Experimenting (incl. network building):

The city lab team is supported by SONNET/DRIFT through a reflexive monitoring process. In this process, the city lab team reflects upon the city lab, learns about the innovations that emerge as well as how to adjust the city lab process based on new insights. Reflecting upon, formulating and answering learning questions is a major part of this process. Learning sessions (1.5 hours x 3, after each remaining phase of the project) with SONNET/DRIFT and the city lab team are the backbone of the reflexive monitoring. The goal of the learning sessions is to distil learning outcomes from the daily activities of the city lab. The dynamic learning agenda provides input for these sessions and is a tool for the city lab team to keep track of innovations, learning questions and actions.

The five experiments are guided by coordinators from the city lab team. They facilitate a reflexive session with the stakeholders of the experiments at the start and closing of the experiment.

As mentioned above, we made a document (a fiche) of each experiment where we set the goals for each experiment and outlined the timeline and discussed about the roles of every project partner and stakeholder. Each experiment also had a clear description of the different roles and engagement of the project partners and broader group of stakeholders. We defined the trekkers of the involved organizations for each experiment who will develop the concept. A trekker is defined as the person or organization who is the project lead. They also function as the contact persons for the experiment. Next to that we defined the partners/organizations who are involved. We made a distinction between the ones who will take the lead of who is a stakeholder from the broader group. We also defined of these partners what their role is and if they already showed commitment towards the experiment.

Energy community Stalinsstraat

Trekker organizations: their role was to develop the concept of the experiment

- Engaged citizen
- ZuidtrAnt

- Klimplant vzw
- EcoHuis city of Antwerp

Involved organizations

- Social housing company Woonhaven: local installation of solar panels and charging station and intermediary for the vulnerable target group
- AG Vespa: location for installation
- City of Antwerp; facilitator and engagement for subsidy and support
- Department mobility of city of Antwerp
- Partago: supplier of charging station and sharing car
- Kamp C of Provence of Antwerp: support and coaching through cVPP project and engagement for subsidy and support
- Grip operator Fluvius: subsidy to supply of 2 salt water batteries and support

Broader group of involved stakeholders

- Citizens: role is to participate by investing in solar panels, use the sharing car etc.
- Other cooperatives: possible role is to learn, facilitate and take up a specific role
- Intermediary social organizations: possible role is to learn, facilitate and take up a specific role
- Local and regional governments: possible role is to learn, facilitate and take up a specific role

Papillon

Trekker organizations: their role was to develop the concept of the experiment

- Samelenvingsopbouw Antwerpen
- Samenlevingsopbouw West-Flanders
- BHS Home Appliance nv
- City of Antwerp
- Social hosing company Woonhaven

Involved organizations

- City of Antwerp, team of energy advisors: organizing house visit
- Stadslab2050: create momentum, support, communication, learn and scale up and engagement for selection of GelijkStroom

- Other social housing companies: introducing clients
- Intermediary social organizations: introducing clients

Broader group of involved stakeholders

- Citizens: role is to participate
- Other cooperatives: possible role is to learn, facilitate and take up a specific role
- Intermediary social organizations: possible role is to learn, facilitate and take up a specific role
- Local and regional governments: possible role is to learn, facilitate and take up a specific role

Renovation coaching for emergency buyers and residents (Noodkoopfonds)

Trekker organizations: their role was to develop the concept of the experiment

- The EcoHuis of city of Antwerp
- Departments of housing of city of Antwerp

Involved organizations

- Woonkantoren city of Antwerp: technical advice and support for application of subsidies
- City of Antwerp, team of energy advisors: detection of possible clients
- City of Antwerp, project leader of the renovation coaching
- NZEB coaches
- AG Energiebesparingsfonds: responsible for the energy loans for financing the renovation works
- CAW: detection and referral
- Samenlevingsopbouw: detection and referral

Broader group of involved stakeholders

- grid operator Fluvius
- Vlaams Woningsfonds: Flemish social mortgage lender

Collectief Goed

Trekker organizations: their role was to develop the concept of the experiment

- Collectief Goed
- Samelenvingsopbouw ZuitrAnt
- SVK (social renting office)

Involved organizations

- City of Antwerp: facilitate and engagement to support and subsidies through the Climate Fund
- stadslab2050: create momentum, support, communication, learn and scale up and engagement for selection of GelijkStroom
- Cabinet of housing: find a way to bring putting vacant homes back on the market
- Stijn Oosterlink: chairman of the board of Collectief Goed

Broader group of involved stakeholders

- Citizens: role is to participate
- Other cooperatives: possible role is to learn, facilitate and take up a specific role
- Intermediary social organizations: possible role is to learn, facilitate and take up a specific role
- Local and regional governments: possible role is to learn, facilitate and take up a specific role

For each experiment we also described the critical success conditions to reach these goals. These conditions must be closely monitored, to ensure that the experiments succeed. Some of these conditions are on a policy level and are out of our reach. Various learning questions emerged from the documentation of the experiments (reports, interviews and fiches). This resulted in clusters of learning questions = learning themes. These themes ran through several experiments.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 837498.

	1: how do we work together?	2: how do we realize a sustainable anchoring and out roll?	3: how do we activate and unburden vulnerable citizens?	4: which social relations and roles will change?	5: What is our impact and how do you monitor this?	6: how do we solve the incentive split problem?
Collectief goed	What can be learned from the 'win-win' collaboration between ZuidtrAnt (investment) and Collectief Goed (problem owner)? How did the parties find each other? What was positive about this collaboration among the partners? What institutional barriers have been encountered in the collaboration?	Is it possible to roll out to other social housing companies cfr. Aster? How and when do you integrate external parties to ensure scalability and anchoring?	How do you communicate with people in vulnerable situations about innovative solutions for energy (new context, new terms, behavioral change, LT framework, ICT literacy,...) How do you unburden a vulnerable target group while simultaneously encouraging them to participate in the process? How can we make sure that our communication and communication plan is accessible and takes people step by step? How will the city of Antwerp unburden tenants (technically/administratively) regarding their investment in solar panels? What role does the city play in this?	What role can a local government play in facilitating this collaboration and how can it maximize impact towards achieving urban social and energy goals? What is the potential of solar sharing/energy communities in Antwerp? How can we make it inclusive? What role does the local government play in this? What role do local organizations (NGOs, cooperatives) and companies play in this? Who is responsible for unburdening/supporting vulnerable target groups?	What is the impact of this project for families in (energy) poverty and for the city? Budget, saving energy and water, increasing comfort, new skills... Does this also lead to other sustainable behaviour? With target group and professional partners? Which measurable objectives can be achieved step by step? How can we make sure that our communication and communication plan is accessible and takes people step by step?	Is there a profitable business model for the split-incentive private rental market? Can lessons be learned from this for, for example, challenge spli incentive regular rental market?
Papillon	Does the collaboration between a company, a social organization and a government lead to new insights, a better offer tailored to a non-obvious target group,...? How can we find and resolve mutual misunderstandings, miscommunications and mistrust between public organizations (Community Building, Fluvius, urban services) and private actors (banks, construction sector)?	How do you get staff deployment (follow-up payments, etc.) without additional staff resources? Does it provide inspiration for other innovative financing solutions for the energy poverty challenge (heating as a service)?	How do you involve the target group in the impact measurement?	Who takes care of supervision (follow-up payments, etc.)? Is it effective to spend public resources (from climate and/or social policy) on these kinds of projects?	What is the impact of this project for families in (energy) poverty and for the city (co2 climate plan?)? Budget, saving energy and water, increasing comfort, new skills,...? What is the impact from a circular economy? Is there also a further impact on energy behaviour/sustainability in the target group? How do we measure (interim) impact?	

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	1: how do we work together?	2: how do we realize a sustainable anchoring and out roll?	3: how do we activate and unburden vulnerable citizens?	4: which social relations and roles will change?	5: What is our impact and how do you monitor this?
Stalinsstraat		How is the potential optimally utilized and integrated from an urban energy policy vision? Linking with spatial policy, mobility, targeted subsidies, social policy,...	How do we make these communities inclusive/accessible to all? Involving individual residents: How can we look at how we can take steps to give everyone the opportunity, or to get everyone to think about, do I want to participate?	What is the potential of solar sharing/energy communities (after implementation of legal framework)? (What is the technological/regulatory /business model?) What role do local governments play in facilitating this? Which policy instruments are effective? What role do existing or new actors play (cooperative and other companies, social organisations,...)?	Are energy communities a way to respond to a more affordable energy/energy poverty challenge? What staged goals do we have for Stalinsstraat until 2028? How can we make sure that our communication and communication plan is accessible and takes people step by step?
Renovation coaching for emergency buyers and residents **(Noodkoopfonds)**	How can we work in an integrated manner within the city, Fluvius, CAW, Community Development, etc.? How do we break through silo thinking?	How do we realize more staff? What financial opportunities are there to anchor the process after SONNET as well?	The target group has no skills or financial resources. What barriers are there to the one-stop-shop integral unburdening from the Energiehuis, and how can these be overcome?	What is the potential of solar sharing/energy communities (after implementation of legal framework)? (What is the technological/regulatory /business model?) What role do local governments play in facilitating this? Which policy instruments are effective? What role do existing or new actors take on (cooperative and other companies, social organisations,...)	Does a case management approach lead to more renovations among emergency buyers/emergency residents? What are the barriers and how are they overcome?

Figure 9 Overview of learning questions clustered in learning themes

These learning questions are used and discussed during the process of the experiment. The learning questions are an indicator to see how the experiments are going, evolving, if we could overcome the barriers and how successful the experiment was. During the experiments we had a kick-off meeting, several work sessions and meetings with the project partners. At the end we will organize a closing event.

For the opening event we wanted to tackle next questions and topics:

- What were the goals and activities? Who participated?
- Increase and deepen knowledge of SIE in Antwerp within city administration, politicians and work field
- Share information and collect information
- Awareness raising topic
- Inspire by showcase inspiring examples
- Network and matchmaking
- Communicate on the living lab: opening, its scope, its interventions, timing and goals. Important point of attention is expectation management with all actors involved.
- Crowd mapping of SIE initiatives in and around Antwerp
- Key note speech
- Pitching of experiments/interventions

Because of Covid-19 there was an online alternative for the kick-off organized on the 9th of June 2020. The goal of the kick-off meeting was to present GelijkStroom and the 4 experiments and to get to know all the participants,expectations and roles. Relevant stakeholders in the field in Antwerp (working on energy and/or innovative social project related to the topic) were involved in the kick-off and several work meetings during the process.

In the plenary sessions we drew the framework of GelijkStroom. After that we had parallel groups with stakeholders of each experiment and at the end we had a plenary conclusion and next steps. During the plenary session we have outlined the context within the city of Antwerp.

The city of Antwerp wants be climate neutral by 2050 and the challenge is to have a just and inclusive energy transition. There is a big urgency, because a large part of the Antwerp population is at risk of energy poverty. There is a need for integration, upscaling and a long term policy vision.

Work sessions were with the support of Rebel Group and were sessions were project leads of GelijkStroom and the city lab experiments gathered together to discuss the overall of the experiment, to see how the experiment was going, which progress or barriers and if the city of Antwerp could support the experiment in any way. The meetings were with the project lead of GelijkStroom and the partners from the experiments to discuss practical things, to organize events etc. Activities were meeting were citizens were involved and had the goal to activate citizens to participate in the experiment.

Below you find an overview of all other sessions and meetings.

Experiment	WORK SESSIONS	MEETINGS	ACTIVITIES
Stalinsstraat	26/06/2020: scoping 22/09/2020: communication and next steps 19/11/2020: reflect on the learning questions 14/12/2020: technical meeting and choice between 2 systems of solar installations	30/01/2020: workshop part 1: MoRe model 21/04/2020: how to continue, evaluation and closure 31/08/2020: presentation of energieID and possibilities of the platform for the project 30/04/2021: update of the project	23/01 & 06/02/2021: knocking on doors to inform neighbours about project and online information session 11/02/2021: online information session for citizens of Stalinsstraat 05/2021: approval of follow-up project Stalinsstraat 2.0 with funding of the Climate Fund 03/06/2021: filming in Stalinsstraat and interview with project lead and ZuidtrAnt 07-08/2021: installation of 2 salt water batteries and 1 Enphase battery and installation of 1 solar installation 2021 – 2023: continuation of the project through the Climate Fund
Collectief Goed	26/06/2020: scoping and next steps 7/09/2020: conclusions and economic feasibility	11/05/2021: discussion why project is temporarily on hold	
Renovation coaching for emergency buyers and residents (Noodkoop-fonds)	30/06/2020: looking back at kick-off meeting, conclusions and next steps 04/09/2020: matrix of existing initiatives and instruments and conclusion 09/10/2020: update	Different meetings between Geert, the project lead and Roelof Kooistra of Rebel Group about how to collaborate with other city departments: 25/05/2020 19/06/2020 12/08/2020 01/10/2020 15/01/2021 10/02/2021 09/03/2021 20/04/2021 26/05/2021 21/06/2021	
Papillon	29/06/2020: next steps 07/09/2020: proposal for cabinet of deputy of mayor 24/11/2020: update and learning questions	15/10/2020: financial flow project 21/01/2021: next steps to concrete realization	05/2021: launch of e-tendering for partner who will roll out the project 05/2021 – 09/2021: e-tendering and approval to point out Samenlevingsopbouw to be the partner for implementation of the project 09/2021: announcement and communication on the website 'Antwerp for Climate'.

Table 1 overview of all sessions and meetings

On 15/03/2021 there was also a meeting with all Antwerp project leaders of innovative projects for an update of their projects. On 19/05/2021 project leaders of GelijkStroom and Rebel Group had a meeting to see how we can anchor the lessons learned and SIE within the city of Antwerp.

For the anchoring and better understanding Rebel Group planned interviews with different city departments:

- 3/09/2021: social services department
- 8/09/2021: department of housing and housing management
- 24/09/2021: department of building permits

Learning lessons May 2021

A. Experiments

1. Within the framework of GelijkStroom project, work has been done on 4 experiments (some are still ongoing). Below is a very brief summary of what the 4 experiments have yielded as the most important learning lessons:

Energy community Stalinsstraat

- Integrating solar sharing at neighborhood level is complex and intensive. However, the dynamics that are set in motion through such a project pay off. Besides the positive impact on the distribution of benefits and investments in green production, the project is also a catalyst for other initiatives.
- Involving a social target group in such bottom-up processes is a challenge. For example, the return on investing in green energy is lower for families with a reduced social rate. The initiatives are also led by market parties, where a risk of default is always a threshold.

Collectief Goed

- Applying the solar sharing model in social housing initiatives offers opportunities for (a) more green energy (b) distribution of the benefits. It can provide a solution to the split-incentive challenge.
- A "floating" legislative framework and unclear future pricing are major barriers to taking steps towards solar sharing. Actively following these policy evolutions requires a lot of energy, time and also some technical knowledge. It requires a great commitment from social organizations to actively include this.

Papillon

- Household appliances are offered for rent by the market party. Will success in West-Flanders also happen in Antwerp? Which people will use this? We won't know until 01.01.2022 when the project starts.
- There is only budget for 3 years. What's next?

Renovation coaching for emergency buyers and residents (Noodkoopfonds)

- This target group is difficult to get a picture of, also little attention for housing/social policy.
- Cooperation between city services for this target group is difficult, as evidenced by the application for and the putting into operation of the emergency buyers' fund. There is a need for case management.

B. At neighbourhood level / in interaction with stakeholders

2. It pays to build networks where energy and assistance cross to the target group. In co-creation with social organizations, feasible, good models can be developed and, if successful, scaled up (e.g. Papillon and Collectief Goed). These allow us to develop models tailored to the target group. There are opportunities for integration of the social communities in the neighbourhoods with the approach of energy projects and renovation.

3. Supporting initiatives by actors in the city (eg subsidy) and facilitating (eg energy community Stalinsstraat) are promising. Moreover, they are very interesting to follow as a city. The city has a role to play in making these initiatives accessible to all Antwerp residents.

4. Embedding the energy transition in broad social innovation still requires further elaboration. So far it has been mainly abstract and theoretical. Concrete hands and feet must be given to it.

C. Subsidies and cooperation in the city

5. Within the city services a lot is thought or based on their own statement, own program and assignment. "I have received a subsidy and I have to make sure that it is put away as well as possible". Shouldn't we think much more from the target group's point of view: what does it look like, what should we do to help the group, have we involved a sounding board group from the target group, how effective is our help (monitoring). Example: vulnerable homeowners.

6. Three city services are involved: energy, housing, social policy; each with its own mission, working method and (political) direction, so that the target group can sometimes get lost. Cooperation between services could be improved which could also be discussed at management level.

7. Case management is important for the target groups (certainly applies to vulnerable homeowners): 1 responsible person within the city who can serve as a source of information and can help with referrals and who also feels ultimately responsible for the result. Of course, it is necessary to clearly define which services to the customer are involved, but let that also become clear in the way it works.

8. There is the impression that there are various subsidy pots available at the city, available at the Flemish and federal government and Europe that are not directly attuned to each other and do not always fit well with the target groups. Subsidy projects have the disadvantage that they are temporary and often no follow-up is possible, so that support is not anchored.

D. And further...

9. Many experiments are still small-scale and cannot or are difficult to scale up at the moment. How do we get them higher on the X-curve? Incidentally, this is a general bottleneck in transitions and therefore certainly also in the socially inclusive energy transition. This deserves further consideration and elaboration, but in a broader context (see above: social innovation, integration with housing policy and social policy).

10. See if you can involve the market in realizing your objectives. It is also in their interest that the target groups are well served. In smart combinations, they can also bear part of the costs, bearing in mind that this is usually not possible without government support. An important bottleneck is that there is scarcity in the market, which means that market parties (advisors, installers, contractors) have a choice. They will opt for the easy projects and less for the projects with vulnerable target groups.

11. Good experiments with good results in the field of socially inclusive energy transition can be made politically and administratively important, making visible what has been achieved in the area of the Climate Plan, the Housing Policy and the Social Target Groups. The successes can then be widely communicated from various cabinets.

Closing event

- What were the goals and activities? Who participated?

The closing event will be organized in September/October 2021. Because of the deadline during the Summer period and covid-19 we moved the closing event to the Fall. Of course most of the experiments will continue after the end of SONNET in 2022.

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3 EVALUATION

As a project lead who was not involved in the process of the scoping phase and selection of the different interventions/city lab experiments it was not always easy to get an overview of the project as a whole.

Because I was already involved in one of the experiments (Energy community Stalinsstraat) since the start and the familiarity of the energy(transition) topic in my daily job, it was on the other hand no whole new project topic for me.

The process and innovative part of the city lab was completely new for me and I've learned a lot by reading all the documents, reports and presentations.

The used method is something I can apply and keep in mind for future projects

I think the support of the city of Antwerp in the overall process, to overcome certain barriers, to get advice from other city departments and the funding through the Project Fund (now known as Climate Fund) for one of the experiments was something that pushed some of the experiments forward.

We see that three experiments succeeded to be in the phase of implementation or are on the way to it. This is because of the strong leadership of the stakeholders.

One project, Collectief Goed, on the other hand, had not always a clear leadership of the stakeholders and changing regulations which led to the project being on hold.

The involvement of the consortium Rebel Group/Drift made the scoping phase clear and objective by phrasing the learning questions, supporting the meetings and working sessions, by evaluating the whole process and by making learning lessons for the future.

Rebel Group also supported and guided very strongly the anchoring of the lessons learned in the city of Antwerp and were a mediator between different parties and stakeholders.

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Antwerp city lab
Evaluation report

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4 OVERVIEW OF THE EVALUATION PROCESS

4.1 Reflexive monitoring as an evaluation method

In the city lab *Gelijkstroom*[2], we have chosen **reflexive monitoring** as an evaluation method. Reflexive monitoring is an ongoing monitoring and evaluation method, which aligns daily activities with long-term ambitions and the impact of a project. Reflexive monitoring stimulates teams towards ongoing reflection, learning and action. Therefore, Gelijkstroom did not have concrete evaluation criteria, but rather **learning goals**. Similarly, there were no indicators, but rather **learning questions**. These goals and questions were addressed through 4 learning sessions throughout the project duration.

The main evaluation objectives as described in D4.1 were to study the **relevance** (whether actions undertaken addressed the goals that were set in the lab) and the **inclusiveness** (of communication and the team). Instead of compiling a comprehensive list of indicators to meet these objectives, the Gelijkstroom core team compiled a comprehensive list of **learning goals** and **learning questions** that took relevance and inclusiveness into account. These were compiled and re-assessed throughout the process in cooperation between the academic partners and the city partners. An overview of all the learning questions is given in the following sections.

4.2 Learning goals of the city lab

The following learning goals were formulated at the beginning of the city lab between the members of the core team of the Gelijkstroom city lab. Stadslab2050 GelijkStroom was to be considered successful when the following goals were reached:

- *Generated knowledge about social innovations as a lever for a just energy transition.* Through innovation, we'd like to learn about how we can involve disadvantaged groups in the energy transition. Which concepts work and which do not? What are criteria for success?
- *Created insight in the role and responsibility of the city administration and its partners.* We want to learn about the role the city administration can play in the just energy transition. Which policy instruments do we have, or do we need to develop to realise this? To which

[2] Gelijkstroom is a Dutch word for 'Direct Current'. However, it also combines the word equal (NL: gelijk) with electric current (stroom). In doing so, the title of the city lab hints at the theme of the city lab: creating equality through addressing energy poverty.

extent is the city already taking responsibility and which opportunities for growing are there? How do we make sure as a city that we stay focused on the just energy transition in the future, in an efficient and organized way? Which other stakeholders are crucial for success? How can we as local government ensure they contribute to our mission?

- *Created an evolution in sustainable initiatives in Antwerp.* Stadslab2050 GelijkStroom aims to create new networks, coalitions, collaborations, practices etc. The experiments are seeds for continuation. They will show that investments in this theme are needed.
- *Generated support for a long-term city strategy*. Stadslab2050 GelijkStroom needs to be embedded in the city administration's daily practice to have a long-term, sustainable effect.

- *Innovation and learning are embedded in the city's daily practice*. How can we integrate what we learn? How can we create room for learning and reflection with the involved stakeholders? This contributes to a more effective process and an increased impact.

4.3 Learning questions of the city lab

We divided the learning questions of the city lab into three categories: questions relevant for the city lab Stadslab2050, questions relevant for SONNET, and questions relevant to the experiments of the city lab.

For Stadslab2050

- How can the city lab use social innovations as a lever for the just energy transition especially regarding the involvement of disadvantaged groups?
- What are the roles (i.e. activities, expectations, responsibilities) of the city administration in relation to a just energy transition?
- How can the insights from the city lab be embedded in the city strategy and the city administrations daily practice?
- How can the benefits of such an integrated approach be made visible for different policy domains (e.g. CO2 reduction, inclusion, etc)?

For SONNET

- How and to what extent is the city lab process inclusive, dialogical and actions relevant?
- How and to what extent are results socially innovative and disruptive in relation to the status quo?
- To what extent is Stadslab2050, being a social innovation in itself, an effective means to foster an inclusive and just energy transition in Antwerp? And what conditions enable or hinder it in doing so?

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For the experiments

- How can social innovation initiatives in energy be accessible to all?
- What are possible business models for just energy transitions and their enabling and impeding conditions?
- What is the value of carrying out the experiment as part of the city lab?

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5 ONGOING EVALUATION

5.1 Ongoing evaluation of the process

5.1.1 Identification and engagement of all relevant parties

The following sections will describe an evaluation of the involvement of actors within Gelijkstroom and its experiments: which **actors** were involved, what the actors' responsibilities were, whether the right actors were involved at the right time. The core Gelijkstroom team and the individual experiments will be evaluated separately.

Evaluation of the involvement of actors in the Gelijkstroom core team

Figure 10 demonstrates the actor map of Gelijkstroom and its experiments at the start (top, September 2019) and at the time of writing the evaluation report (bottom, July 2021). This figure shows three important dynamics in the actor constellation that influenced the development of the city lab process:

1. The **lack of embeddedness in a wider actor network**, such as: interested organisations, people and other city departments. Whereas it had been the goal of the lab to create such a cloud of learning organisations around Gelijkstroom, this was difficult to realise because of covid-19. In the words of interviewee 6[3] "*we had virtual meetings but it was not the same, you don't get the same level of personal connection*".
2. **Changes in the composition of the project team** led to loss of information, network and insights at a crucial state of the process. Firstly, the project leader and a representative of the city's innovation department (Stadslab2050) both quitted their jobs at the city of Antwerp halfway through Gelijkstroom. This was difficult because the project leader had been very proactively involved in facilitating and leading the experiments. In the words of interviewee 6, "*when [the old project leader] left there was a vacuum, and I already had so much on my plate, and this was at the bottom of my priority list*". Moreover, two consultants, who had been involved in Gelijkstroom through a consultancy trajectory, were hired mainly for the first scoping exercise but not throughout the trajectory. Initially, this was done because the project team wanted a smaller, leaner team to make more efficient decisions. However, interviewee 1 mentioned that when they left, they took their learnings largely with them: "*the breadth of the project was suddenly gone. At the start, we had had inspiring sessions, we had brainstormed, had made a broad report – but suddenly that was gone.*"

[3] An overview of the interviews is indicated in Table 7 on page 55.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 837498.

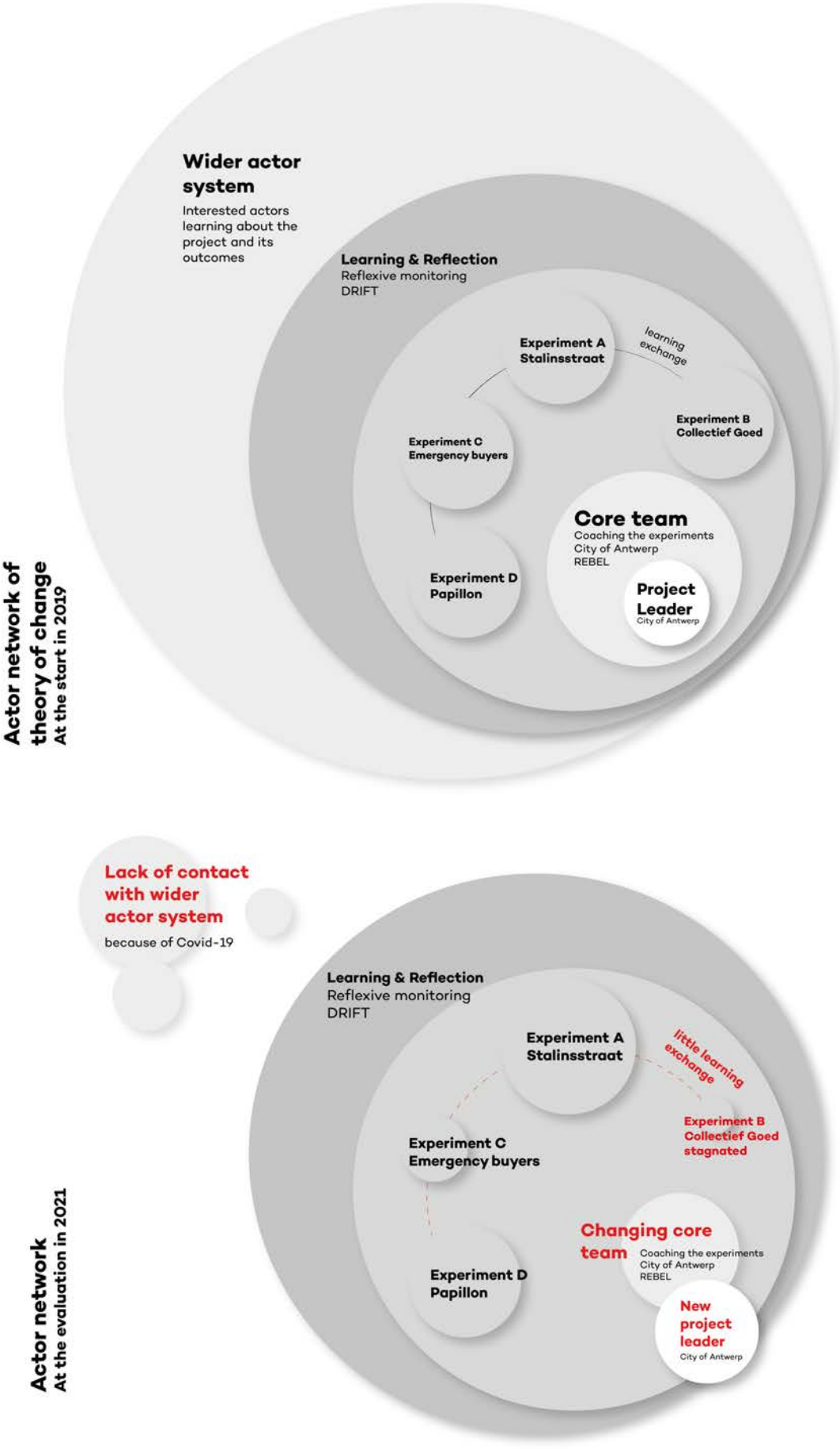

Figure 10 Actor network of theory of change of Gelijkstroom at the start of the project in 2019 (top) and at the time of evaluation in 2021 (bottom). The lower image shows what factors were unaccounted for and changed throughout the process in red.

3. **No interaction with of the Gelijkstroom core team with the target audience (= those living in energy poverty).** The core Gelijkstroom team decided against involving the target audience directly, because they wanted to unburden them from the technical difficulty of the project and the time investment. It was argued that "*participation is a form of luxury*" (interviewee 3) – a luxury that the underprivileged target audience did not have. Moreover, they did not want to raise expectations with the target audience they could not hold in the end. Instead of direct participation, indirect participation was chosen, and social organisations would represent the needs of their target audience. In this way, housing corporations and NGOs like Samenlevingsopbouw became representatives of the underprivileged target group of the project. However, around the time of the evaluation, multiple people of the core team wondered whether this indirect involvement had been the correct decision. For example, as argued by interviewee 3, "*in the experiment Collectief Goed, we chose specifically not to involve tenants [...] However, it would have been interesting to at least have a conversation with tenants. To ask them questions like: how would you even feel about this?*"
4. **Little learning exchange** between experiments and the stagnation of the Collectief Goed experiment (more on this further below in the report). According to interviewee 3 this stagnation might be explained by the lack of interaction between the experiments due to covid-19. According to interviewee 3, "*This [learning exchange] didn't happen because of covid-19 [...] They could've learnt from the Stalinsstraat experiment during the learning session, but that didn't happen because it was taking place at a distance. Because, the Stalinsstraat was doing things, despite insecurities, while Collectief Goed was saying: we'll wait until there are less insecurities.*"

Three suggestions emerged from the interviews with the core Gelijkstroom team to overcome these obstacles in future projects:

1. Installing a **steering group** (interviewee 3) with the wider innovation system (i.e. other city departments), to stimulate learning across a wider group of actors;
2. Installing a **sounding board** (interviewee 1) with the target audience, to adjust the project better to their needs;
3. Clearer communication about **roles and responsibilities** (interviewee 6) when the project team changes, to overcome the loss of information in times of change.

Evaluation per experiment

This section evaluates experiments (A-D) in terms of the actors involved. The figures demonstrate their respective key question (“), the main actors involved in the experiments (in black **bold**) and the actors around the experiment (in grey, size respective to their level of involvement).

Experiment A: Stalinsstraat

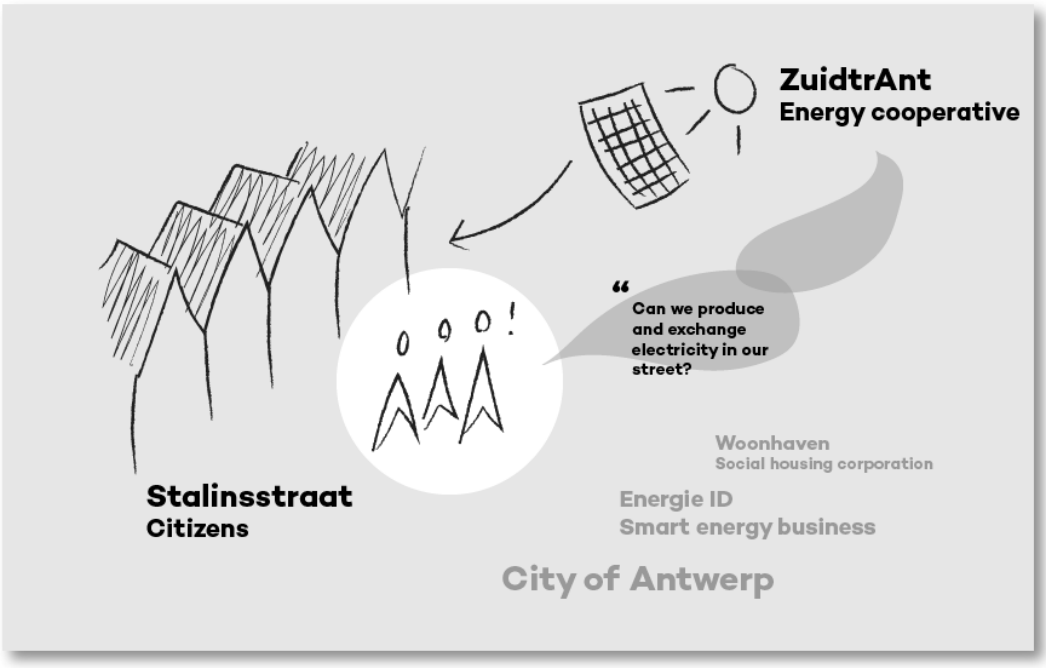

Figure 11 Experiment A: Stalinsstraat actor overview

In experiment A: Stalinsstraat, the goal was to set up specific solar sharing projects with a street in Antwerp (the Stalinsstraat). Key about this experiment is the proactive attitude of a resident in the street. This resident applied for a municipal subsidy to start solar sharing in his street. However, because the workload was too high for this resident alone, he asked ZuidtrAnt energy cooperative to join the project. The project was already running when it became part of Gelijkstroom. Involved actors are the city of Antwerp (Ecohuis), an energy system installation company (Energie-ID), an energy cooperative (ZuidtrAnt), a social housing corporation (Woonhaven), a number of residents of the street, representatives of the school in the street, representatives of a brewery located in the street (Miss Miyake) and Gelijkstroom representatives (from the city of Antwerp and consultants from REBEL Antwerp). After the first city department's project lead left, the new project leader and ZuidtrAnt took over leading the Stalinsstraat experiment. Grid operator Fluvius was not involved in the experiments as an active participant. Rather, Fluvius was consulted about certain matters, such as the effect the neighbourly exchange of electricity would have on the electricity price. This passive involvement was mentioned by multiple interviewees as a missed opportunity: "*The city had an attitude that was very helpful and active, asking 'what do you need?' The grid operator had that very little […] Real involvement of the grid operator? We didn't have that. We tried, but we didn't succeed. Now, I have the feeling that if we tried harder at the start to talk things through, we could have come to more understanding – that this would've really helped the experiments […] In that way, covid-19 has certainly led to complications at the start. In that orientating phase, when we were involving stakeholders –it was really hard to find nuance then with people [through online meetings]. We should've had more real life, one-on-one conversations with Fluvius in which we would've asked them: why aren't you participating?*" According to interviewee 3, the lack of

involvement of Fluvius was unfortunate "*because therefore we really had to wait about what Fluvius was going to decide about the electricity price [...] Fluvius was listening in, instead of learning itself. It would've been good if the project had been more of a playground for them too.*" Besides the lack of involvement of Fluvius, interviewees marked that the core responsibility of the Stalinsstraat experiment was too concentrated at the city representative's project lead: *"[The city representative] was over questioned [...] The project was too concentrated [at this representative]. She has been very busy.*" (interviewee 2) This was especially difficult when the project lead left the project taking her insights with her. Interviewee 3 posed that this problem could've been avoided if the responsibility of Gelijkstroom had been distributed across multiple actors within the city of Antwerp. "*The idea was that [the city representative] was going to transfer knowledge [to housing and energy policy makers], but sometimes it can be practical to let those people experience it themselves instead*" (interviewee 3).

Experiment B: Collectief Goed

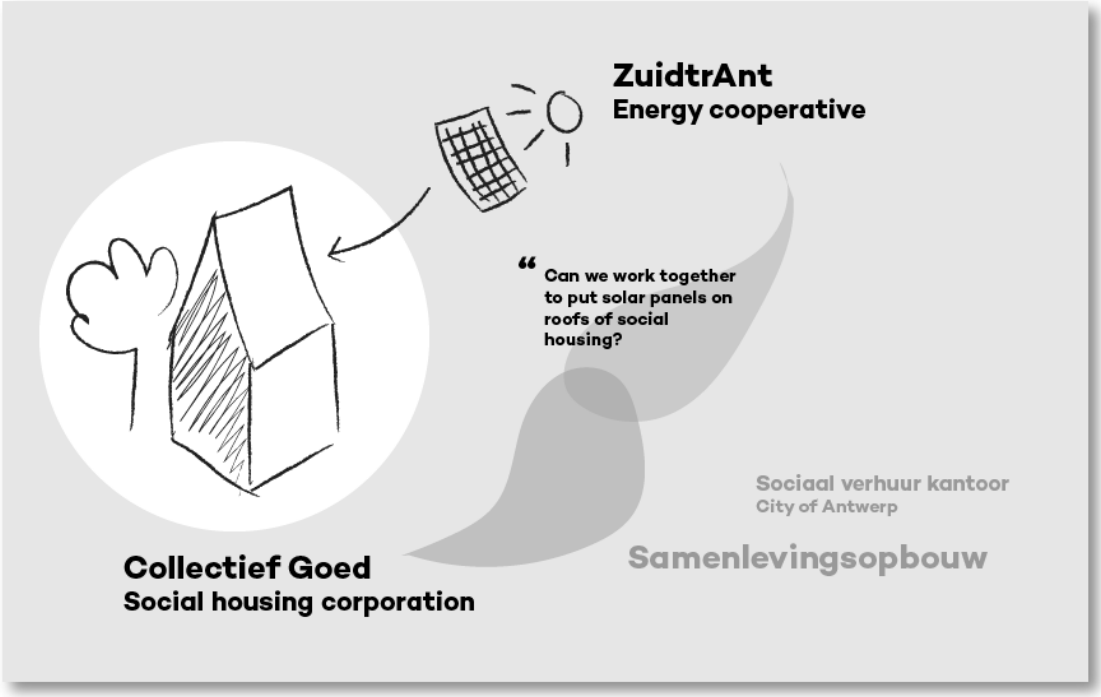

Figure 12 Experiment B: Collectief Goed actor overview

The experiment around social housing corporation Collectief Goed aimed to install solar panels on the houses of social housing tenants. Unlike the Stalinsstraat experiment, this experiment with Collectief Goed did not play into an existing initiative. Rather, Gelijkstroom played an active role in setting up the experiment and bringing the actors together around this topic. In this experiment, the city played a more central role, in particular around involving stakeholders: "*thanks to the city, people came together around this topic*" (interviewee 3). Through

involvement of the city of Antwerp, housing corporation Collectief Goed was connected to energy cooperative ZuidtrAnt. In the experiment, Collectief Goed provided the construction details of their patrimony to ZuidtrAnt, and ZuidtrAnt made a technical assessment about where and on which roofs solar panels could be installed. However, the experiment stagnated, because of "*constraints with the legal boundaries*" (interviewee 5). These legal boundaries will be discussed in a later chapter of this report. The legal boundaries and the absence of Gelijkstroom's project lead in the second half of the project, led to a stagnation of the experiment at the start of 2021. In the words of interviewee 3, "*it stagnated because there was no one to pull the project along*." interviewee 3 pointed out that it was a missed opportunity that the new director of Collectief Goed was not more actively anointed as leader of the experiment in the process.

Experiment C: Renovation coaching for emergency buyers and residents actor overviewRenovation coaching for emergency buyers and residents

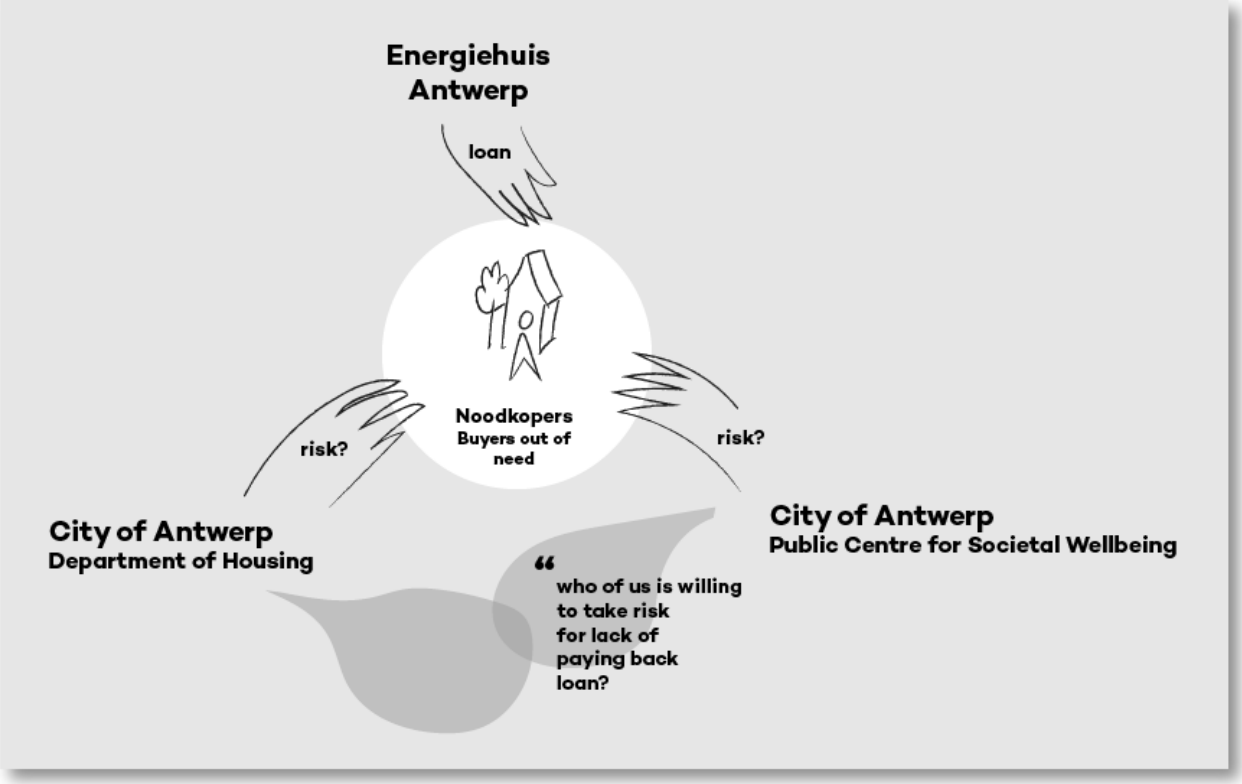

Figure 13 Experiment C: Renovation coaching for emergency buyers and residents actor overview

The experiment around 'Renovation coaching for emergency buyers and residents' (NL: noodkopers) aimed to increase cooperation within various city departments, to aid Renovation coaching for emergency buyers and residents with home renovation. 'Renovation coaching for emergency buyers and residents' is a shorthand to refer to individuals who are neither eligible for social housing nor do they have funds to buy a decent house. They therefore buy cheap

houses which have deficits and are not energy efficient. The Flemish 'Renovation coaching for emergency buyers and residents' fund (NL: noodkopersfonds) granted funding to the Energyhouse (NL: Energiehuis) of the city of Antwerp to provide loans to 'Renovation coaching for emergency buyers and residentsRenovation coaching for emergency buyers and residents' to renovate their houses to enhance energy savings. However, after the loan was granted, it was unclear who would pick up the risk associated with' Renovation coaching for emergency buyers and residentsRenovation coaching for emergency buyers and residents' who do not pay back their loans, as they had not thought of this beforehand. The experiment's central question is therefore: who is responsible for the financial risk in case these homeowners do not pay back their loans. This question is answered through an ongoing conversation between the city of Antwerp's department of Housing and Public Centre for Societal Wellbeing (NL: Openbaar Centrum voor Maatschappelijk Welzijn, OCMW) which was facilitated by Gelijkstrom core group member REBEL.

The actor structure of the experiment proved to be an obstacle on two occasions. Firstly, city cabinets are directed by politicians who are either left-wing, or right-wing. The political context is polarised, but even more important: there are no political coalitions between these parties. Instead, each department is run by an independent politician, who represents the views of their party. In this way, the city departments are very independent of each other and have their own policy. Interviewee 1 observed that the structure of the city of Antwerp's administration is "*difficult*", which made the discussion within this experiment difficult to navigate. Another impediment was, in the words of interviewee 1, "*that policy workers are asked to do something through an internal subsidy. This means that the policy worker [...] knows that they will have to leave [at some point] because then their subsidy is over. This creates a lack of continuity within the city administration*."

In conclusion, the city department's difficult and politically polarized structure, plus the heavy reliance on subsidies and henceforth lack of continuity, has made it difficult to have a conversation about responsibilities and roles around 'Renovation coaching for emergency buyers and residentsRenovation coaching for emergency buyers and residents'.

Experiment D: Rental of energy-efficient household appliancesRental of energy-efficient household appliances

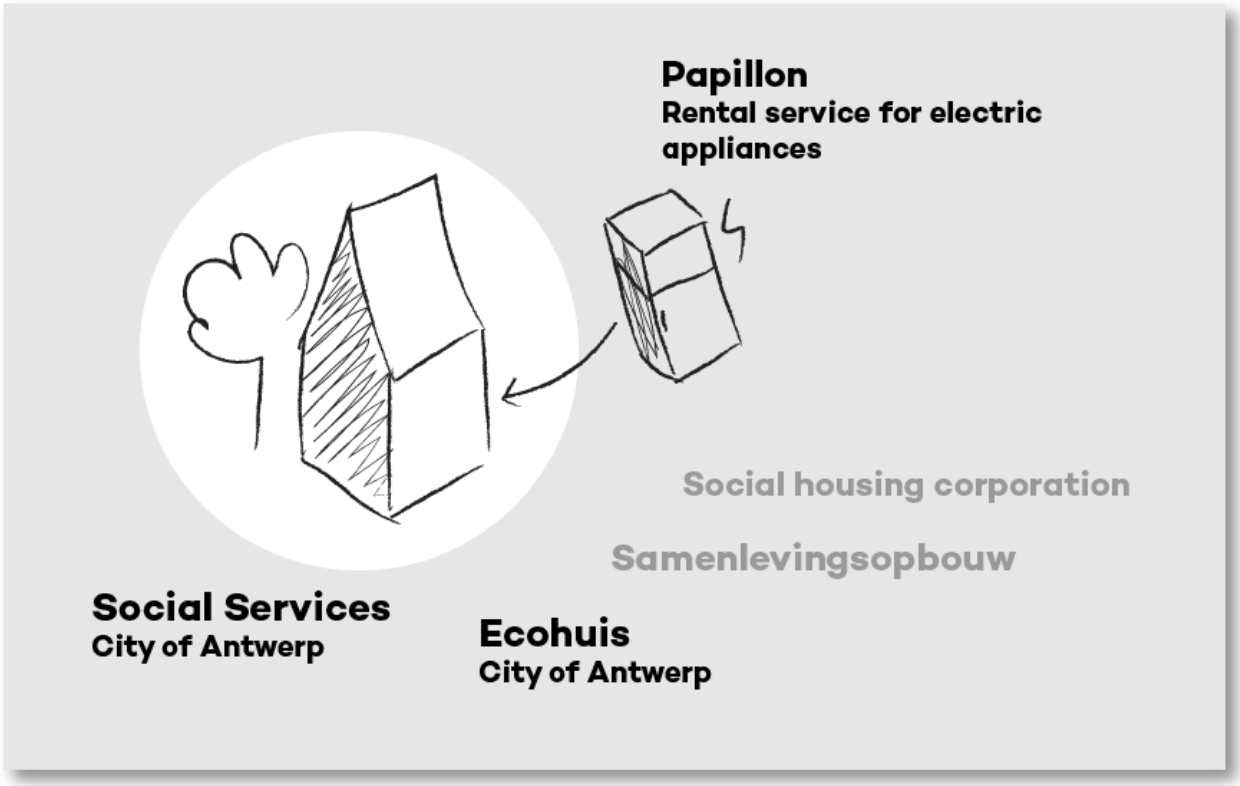

Figure 14 Experiment D: Rental of energy-efficient household appliances actor overview

The goal of the Rental of energy-efficient household appliances project was to decrease energy poverty by renting energy efficient electric appliances to those in poverty. The experiment was initiated by Gelijkstroom, and the cabinet gave political consent to roll it out. The experiment demonstrates an interesting financial construction, as the city's department of Social Services (NL: Sociale Dienstverlening) provided the funding, whereas the city's ecological service desk Ecohouse (NL: Ecohuis) will execute the experiment. This construction was possible because both these departments have the same political representative, who agreed to the financial construction. Ecohouse and Social Services have asked Samenlevingsopbouw (a foundation aimed at doing social projects) to assist them with practical support. A social housing company was involved at the beginning, but because the experiment was still evolving, it was decided that they would take a more passive role. Within the project, there were different views as to whether all the relevant actors were involved. According to interviewee 7 of Ecohouse, too little actors were involved: "*the project group was too small for me. […] If we would've done it again, we would've asked the whole sector to be involved through a market consultation. Appliance companies, federations, energy suppliers…*" interviewee 6 of the Social Services department believed that it was better to start with a smaller group, because it was more efficient.

5.1.2 Reflexivity of the process

This section will describe the **reflexivity** of the experiments. This is the capacity of the actors involved in the experiments to reflect and adjust their actions based on these reflections. In doing so, the following questions will be answered:

1. What surprises, shortcomings and obstacles did the experiments run in to?
2. How did they **adjust** their process to these obstacles?

Evaluation of reflexivity within the Gelijkstroom core team

The main surprises and obstacles of the Gelijkstroom core team were the **changing of the project team** throughout the project and **covid-19**. These obstacles are also mentioned and visualised in Figure 10.

The core team changed throughout the process. The process started with a team of 8. This team consisted out of 4 consultants from REBEL Antwerp and DRIFT, 2 reflexive monitors from DRIFT/SONNET, and 2 city representatives. As the project developed, half of the project team left in a time-span of under a year: the project lead and city department representative, the city's stadslab2050 representative, and two DRIFT consultants. Fearing a loss of learnings, and lack of direction, a learning session was set up around February 2021. The goal of this learning session was to share the knowledge from the old project team members, with those who would replace them. This session was facilitated and prepared by the reflexive monitoring team. Before the session, all project members leaving the project were asked to answer the learning questions that had been established at the start of the project (section 1.3). During the session, they were asked to share their takes on various themes of the project: inclusivity, embeddedness and anchoring, and the role of the city. Part of the meeting was also attended by representatives of other city departments, in order to further embed the learnings within the city. Whereas these steps were undertaken to facilitate the exchange of knowledge, multiple interviewees commented that they felt learnings were lost, they were not sure of what their role was within Gelijkstroom after all the changes that had happened, or that they lacked direction after the loss of the project lead.

Covid-19 made physical meetings impossible. When restrictions were slightly lifted in the summer of 2020 and the late spring of 2021, some meetings were possible within the city of Antwerp itself and within the experiments, but the Gelijkstroom core team did not meet in person. Largely, this was due to the fact that the core team spanned across a country-line (Belgium, the Netherlands) which made travelling more difficult. The lack of physical interaction largely limited the connection between the different facets of Gelijkstroom: between the core team members, between the core team and the experiments, between the experiments, and between Gelijkstroom and its wider environment. According to interviewee 3 "*the problem with covid-19 was that people could not meet in person. This had ramifications for scaling up the project and learning in a wider network, because there was hardly any interaction.*"

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 837498.

Evaluation of reflexivity within the experiments

Experiment A: Stalinsstraat

The most dominant obstacles of the experiment in the Stalinsstraat were covid-19, a gap in financing the experiment, the cancellation of the national net metering policy and legal barriers around local electricity exchange.

Covid-19 led to difficulties around organising conversations with various stakeholders. As described in section 2.1.1, grid operator Fluvius was not involved because, as evaluated by interviewee 2, "*it was difficult to get the right nuance into online conversations with people [...] "Through real-life conversations, you can indicate subtly that there is a lack of trust.*" Moreover, covid-19 hampered the neighbourhood gathering they were planning. According to interviewee 3, the lack of gathering led to a lack of interaction between parts of the experiment: "*the two places where the batteries were placed wanted to have a conversation with each other, and other people in the street wanted to have conversations as well – getting them together in a neighbourhood gathering would've helped with that.*" In terms of reflexivity and reaction to this hurdle, the experiment team tried as best as they could to get the connection going through online meetings, but the same level of connection was not achieved.

Secondly, the experiment ran into a **financing gap**. The subsidy they had been granted by the city of Antwerp was coming to an end, but they still had to finance an electric sharing vehicle and more solar panels for the neighbourhood. Seeing this problem, the Gelijkstroom project lead tried to gather the funding through applying for funding via the climate fund. Through her influence, the climate fund call of 2021 was given the theme of 'social innovation in the energy transition'. The Stalinsstraat experiment applied for this funding, and they were granted an additional 60.000 euros by the city of Antwerp. In this way, the experiment Stalinsstraat was able to gather more funding for their electric vehicle despite their initial financing gap.

Thirdly, the experiment faced difficulties around policy changes, as the national **net metering policy was cancelled.** Net metering is an electricity billing mechanism that allows consumers who generate some or all of their own electricity to use that electricity anytime, instead of when it is generated. This is an important way to make solar panels profitable. The problem for the experiment of the Stalinsstraat was that, without net metering, solar panels would be more expensive, and the residents of the street were likely to be less enticed to join the experiment by purchasing solar panels. According to interviewee 2, "*we were thinking about: how are we going to bring this difficult story to the people of the street? [...] This was difficult, because net metering was cancelled, which made the time to get return on investment longer.*" According to interviewee 2, they did not change their plans after the cancellation of the net metering policy, in the sense that they still wanted to persuade residents to buy solar panels. "*We just asked for another round of feedback from the communication department of the city of Antwerp, to still give it [solar panels without solar panels] a positive twist. To find out what motivation people had to buy solar panels – only financial advantage, or also sustainability?*"

Lastly, the experiment faced legal barriers, in that they found that **exchanging electricity locally was not allowed in Belgium.** Even though this was not allowed at the time of the experiment, those in the experiment decided to "*push through, despite difficulties*" (interviewee 2), "*so that everything is ready to go whenever it is legally allowed.*"

Overall, the experiment was rather reflexive: through online meetings and a 'push through' mentality, the experiment coped with covid-19 and legal setbacks. The experiment team even managed to gather funding for their financing gap and involve residents in the experiment despite the cancellation of net metering policy. The reflexivity of this experiment is summarised in the table below, which shows the obstacles, its effects, the reaction of the experiment team towards the obstacle, and an assessment of the reflexivity. The experiment has an above average level of reflexivity, which might be explained by the overall attitude to 'push through' by the experiment team, the lack of financial risk for the parties involved, the available financial means to finance the technical installations and available time of the energy cooperative ZuidtrAnt, and the intrinsic motivation by one active resident in the street.

Table 2 Overview of the reflexivity of experiment A: Stalinsstraat

Obstacle	Effect	Attitude/reaction of experiment team	Reflexivity assessment*
Covid-19	Lack of connection between actors	Online meetings	1: the obstacle was noticed in the team and even though online meetings weren't ideal in terms of personal connection, it did allow them to continue the experiment
Financing gap	Not being able to finance parts of the experiment (shared electric vehicle)	Asked for a special call for social innovation in energy in the city's climate fund, applied for it, and received 60.000 euros in funding	2: the financing gap was noticed in the team, and they found a solution through lobbying and applying for alternative funding
Net metering policy stopped	Not being able to convince residents to take part in the experiment	Asked the communication department of the city for advice on how to convince people to buy solar panels	2: the team recognized the difficulty to involve residents after the cancellation of net metering, so they found a solution by adjusting their communication strategy
Legally prohibited to exchange electricity locally	Not being able to exchange electricity locally	"Push through anyway despite obstacles" (interviewee 2), because "it is just a matter of time when it will be possible" (interviewee 2)	1: while the legal barrier made electricity exchange impossible, the attitude of the experimenters was to just continue and to expect legislation to change in the future

** Reflexivity score explained: 0: the obstacle is not seen or leads to stagnation, 1: the obstacle is noticed in the team, the team changes course slightly to cope with the obstacle, 2: the team recognizes the obstacle and finds a solution.*

Experiment B: Collectief Goed

The experiment around Collectief Goed ran into obstacles around covid-19, the absence of a clear experiment lead, lack of data and legal barriers.

Like in the other experiments, **covid-19** made it difficult for the Collectief Goed experiment to extrapolate their learnings to a wider audience. Moreover, it was difficult to activate stakeholders in the process because of online meetings. Interviewee 3 argued that "*if we had approached the experiment more broadly, if we would have involved more people that would've helped the experiment*." The lack of connection between actors in Gelijkstroom due to covid-19 hampered housing cooperation Collectief Goed from learning from Stalinsstraat, which faced the same legal barriers. "*The Stalinsstraat was doing things nonetheless, while Collectief Goed was saying: we will wait until there are less uncertainties.*"

Moreover, there was a **lack of data** around the costs of a potential energy installation. Consultants of REBEL Antwerp had done a financial calculation of the cost and benefits of installing the solar panels, but because of a lack of data, this was stopped. According to interviewee 3, "*they could've done more with that. Sometimes, despite uncertainties, you can do an analysis anyway – make an assumption or ask a different question. That was a pity.*"

The experiment team considered **legal barriers around local electricity exchange** as the largest obstacle in the experiment. "*That was the biggest surprise*," said interviewee 4. Interviewee 5 added that "*when you start, you're naïve – you think, 'that sounds simple,that must be easy', until you realise that the legal framework is not there. Then, a simple idea becomes impossible*." When asked how they dealt with this legal barrier, the experiment team responded that they stagnated the activities of the experiment, until policy changes occur. "*Energy policy is very political in Belgium. Everything is a discussion between parties who are very polarised. […] Such a simple solar sharing concept is connected to difficult political discussions*." When asked about whether they did not simply 'push through' like the Stalinsstraat, interviewee 4 mentioned that "*Collectief Goed is a housing corporation, it simply does not have the means to experiment [like that]. Every euro they have, they have to turn upside down seven times. Collectief Goed can't take risk.*" Interviewee 2 of the Stalinsstraat experiment also noted that "*in the Stalinsstraat there is no risk for residents. We used subsidy, so the street is protected. With Collectief Goed, they would take direct risk for their residents.*"

Lastly, interviewees outside the experiment team noted that part of the problem of the experiment was that there "*was no one responsible for the experiment*". Interviewee 3, who was not involved in the experiment team herself, noted that in retrospect they should have appointed the new director of Collectief Goed to lead the experiment. In that way, there would be more agency for the experiment. She marked that as a missed opportunity.

Overall, the experiment was not very reflexive: most obstacles were noted, but no solutions were found to solve them. This low level of reflexivity might be explained by the lack of a clear experiment lead, thus no one taking time or responsibility on noting and overcoming obstacles.

Table 3 Overview of the reflexivity of experiment B: Collectief Goed

Obstacle	Effect	Attitude/reaction of experiment team	Reflexivity*
Covid-19	Lack of connection between actors, lack of actors involved, lack of learning from other experiments	Online meetings	1: the obstacle was noticed in the team and even though online meetings weren't ideal in terms of personal connection, it did allow them to continue the experiment.
Lack of data	Not being able to make financial cost calculation	Abandoned plan to make a financial cost calculation	0: the obstacle was noted in the team, but nothing was done to overcome it.
Legally prohibited to exchange electricity locally	Not being able to exchange electricity locally	Decided to wait until legislation changes before continuing experimentation	0: the obstacle was noted in the team, but nothing was done to overcome it.
Lack of an experiment lead	No agency within experiment team	Not noted or discussed as such within experiment team, but rather observed by other interviewees surrounding the experiment.	0: the obstacle was not noted by the team

** Reflexivity score explained: 0: the obstacle is not seen or leads to stagnation, 1: the obstacle is noticed in the team, the team changes course slightly to cope with the obstacle, 2: the team recognizes the obstacle and finds a solution.*

Experiment C: 'Renovation coaching for emergency buyers and residentsRenovation coaching for emergency buyers and residents'

As will be explained in chapter 4 of this report, the experiment around 'Renovation coaching for emergency buyers and residents' was unique in the sense that it wasn't really an experiment in the classical approach. There was nothing that was to be tested or experimented with. Rather, it traced an ongoing conversation between different city departments around roles and risk. The lack of experimentation means no assessment can be made about the obstacles, the adjustments and reflexivity of experimentation.

Experiment D: Rental of energy-efficient household appliances

The experiment 'Rental of energy-efficient household appliances faced only one notable obstacle: the **departure of the project lead, who also led this experiment, halfway through the experiment.**

Several interviewees of the experiment team noted that the most important obstacle was the departure of the Gelijkstroom project lead, who also led the Rental of energy-efficient household appliances experiment. As noted by interviewee 6, "*if the experiment lead disappears, there is a vacuum, and by the time a new lead is established... We could've had a better transfer of tasks and more open communication*." When asked how the experiment dealt with this obstacle, interviewee 6 noted that they "*picked [the project lead's] tasks up themselves*." However, interviewee 6 noted that while she took on these tasks, they weren't a priority for her, and they often ended up at the bottom of her to do list. When asked what could have helped them overcome this, she mentioned that "*it would've been nice if we had made agreements on who does what? What does the old project lead still do, what is picked up by the new one, and what do I do? Who do you contact for what?*"

Overall, the experiment did not run into many obstacles, but the one obstacle they ran into they noticed in the team and adjusted their behaviour accordingly.

Table 4 Overview of the reflexivity of experiment D: Rental of energy-efficient household appliances

Obstacle	Effect	Attitude/reaction of experiment team	Reflexivity*
Departure of old project / experiment lead	Miscommunication of tasks and roles within experiment team	Picking up tasks of the old experiment lead themselves	1: the obstacle was noticed in the team and they changed their actions slightly by picking up tasks that had previously belonged to the experiment lead.

** Reflexivity score explained: 0: the obstacle is not seen or leads to stagnation, 1: the obstacle is noticed in the team, the team changes course slightly to cope with the obstacle, 2: the team recognizes the obstacle and finds a solution.*

5.2 Ongoing evaluation of experiments

As discussed in section 1.2, the main evaluation objects as described in D4.1 were to study the **relevance** (whether actions undertaken addressed the goals that were set in the lab) and the **inclusiveness** (of communication and the team). As all the experiments are still running at the time of writing the evaluation, the evaluation will analyse the interim results in relation to the experiments' goals.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 837498.

Evaluation of the results in the Gelijkstroom core team

These are the answers to the learning questions of the reflexive monitoring trajectory and will be discussed below.

Relevance of results in relation to the lab's goals

The table below lists the goals of Gelijkstroom and an assessment of whether they have been achieved or not. This assessment is described in more detail in the subsections hereafter.

Table 5 Overview of the relevance of results in relation to the goals of the Gelijkstroom core team

Goal	Is this goal achieved?
New networks for a just energy transition	Limited
Learning about social innovation for a just energy transition; Specifically: involving disadvantaged groups in the energy transition	Largely achieved
More insight into the role of the city in a just energy transition	Largely achieved
Embedding in administration and politics	Unclear
Innovation and learning embedded in the daily practice of the city.	Unclear

New networks on social innovation in energy in Antwerp: limited

Four types of networks have emerged within the experiments[4]:

1. Between professional organisations: i.e. Rental of energy-efficient household appliances and the municipality of Antwerp (Rental of energy-efficient household appliances experiment)

[4] Source: terms of reference document, 2021

2. Between residents of different streets (Stalinsstraat experiment)
3. Between services of the city of Antwerp: the Department of Social Services and Ecohuis (Rental of energy-efficient household appliances experiment), and the Public Centre for Societal Wellbeing and the Department of Housing ('Renovation coaching for emergency buyers and residents' experiment)
4. Between residents and professional organisations: Stalinsstraat, the city of Antwerp, Energie ID, ZuidtrAnt (Stalinsstraat experiment)

However, the goal achievement is limited because of covid-19. While the attendance at facilitated networking sessions of Gelijkstroom was on par, for example, the kick-off was well attended (with 30 participants), various interviewees reflected that they felt distance from the project and got little network out of the meetings.

Increased insight on social innovation for the just energy transition: largely achieved

Social innovation involves a change in the social fabric of the city. We learned that social innovation consists of new ways of doing, thinking and organizing in the energy transition, which changes social relations within the city of Antwerp (for example: a social housing company works together with an energy cooperative).

Increased insight into the role of the city: largely achieved

The role of the city is different in each experiment. The roles of the city are:

- **The City as a guide** – Informing people so that they might arrive at the right solutions that fit their needs (i.e., municipal service desk Ecohuis, or the active facilitating role of the city in the Stalinsstraat experiment)
- **The city as conductor** – Setting up solar sharing communities, providing space, providing staff, actively leading the project (i.e., the role of the city in the Collectief Goed experiment)
- **The city as provider of guarantee** – Provide guarantee for those who have a risky financial profile so that they might participate in energy cooperatives or other initiatives
- **The city as a representative of local needs in supralocal policy** – Representing the local needs in the larger regional or national policy context (i.e., the city of Antwerp actively represents the interests of the split-incentive rental market and apartment buildings in the Flemish context)
- **The city as an example** – Leading by example by investing in its patrimony (i.e., the city of Antwerp making schools, parking areas and municipal buildings energy efficient)
- **The city as financier** - The city can provide subsidies to projects that aspire to a social and just energy transition. For example, the city of Antwerp has released a subsidy for project fund of 60000 for projects in the theme of social innovation in energy.

Embedding the process (and its outcomes) in administration and politics: unclear

The project's experiments are still running and the Gelijkstroom team is currently developing activities for further embedding.of outcomes in administration and politics. Multiple interviewees mentioned that covid-19 has made this aspect of the project more difficult, as it was harder to inspire and reach other city departments with Gelijkstroom. The Gelijkstroom core team expressed that this goal was not yet achieved, and that it was difficult to assess at this stage of the process.

Creating a culture of learning and innovation in administration and politics: unclear

While one member of the core team observed that "*many things have been set in motion, there is a dynamic*", the level at which this dynamic has affected the culture and way of working in the administration is still unclear.

Inclusiveness of the process

Gelijkstroom fostered paradoxical goals: on the one hand, it was to be an inclusive process, on the other hand, its target group needed to be unburdened as much as possible. In balancing these goals, the Gelijkstroom core team decided in its second learning session 2 on 26/11/2020 that the target group would not be directly involved in the project, mainly to unburden them from the technical jargon and the time investment. In the words of interviewee 3, summarizing this logic: "*participation is a luxury – you have to put time into it and you get very little in return*." However, later multiple interviewees reflected that it would have been more inclusive to have had the opportunity to reflect with the target group about the project. In retrospect, a soundboard with members of the target audience would have been more inclusive, according to multiple interviewees (interviewee 1, interviewee 3, interviewee 5). Another point in which Gelijkstroom actor composition was less inclusive, was the fact that the experiments were selected by the Gelijkstroom core team itself without an open-call. This made the Gelijkstroom process highly top-down, as reflected in the second learning session by multiple members of the core team.

Overall, the top-down strategy of the core team in selecting the experiments and experiment leads, and because of the lack of involvement of the target audience made the process less inclusive as it could have been.

Evaluation of the results of the individual experiments

The following sections will describe the relevance and inclusiveness of the city lab experiments. The table summarises these sections. The table shows that most experiments were not inclusive, or only so to a limited extend. It also shows that the goals of most experiments have not been achieved (yet), mostly because 3 out of 4 experiments are still running. Those experiments that are still active are mostly promising in regard to realising their goals.

Table 6 Overview of the experiments' goals in relation to their achievements and their inclusivity.

Experiment	Goal	Has the experiment achieved this goal?	Was the experiment inclusive?
A: Stalinsstraat	Create a local energy sharing system for the residents of the Stalinsstraat through solar panels, batteries and electric vehicles	Promising: The goal is not achieved yet, but the experiment will continue after the SONNET city lab ends and the prospects are promising.	Yes: diverse actors (i.e. street residents) were actively involved in the process and the experiment team's decision making had an open dialogical atmosphere.
B: Collectief Goed	Install solar panels on the roofs of Collectief Goed's patrimony and allow residents to exchange electricity amongst each other	No: experiment stopped prematurely	Limited: While there was an open atmosphere within the experiment team and space for dialogue, tenants were not involved so as not to burden them with the complexity level and time investment.
C: 'Renovation coaching for emergency buyers and residents'	Find out how Renovation coaching for emergency buyers and residents might be supported by the city, and how the city might collaborate to divide roles and risks around helping this group of people	Limited: while more knowledge has been gained, they are still working on finding a way to collaborate within the city	Limited: the topic is sensitive in nature, thus online meetings because of covid-19 made an open dialogical atmosphere in the experiment team difficult. Moreover, the target audience is not involved in this conversation, making it less inclusive.
D: Rental of energy-efficient household appliances	Offer affordable electrical appliances to those in energy poverty to increase energy savings	Promising: the goal is not achieved yet, but the experiment team is actively carrying on with the experiment after SONNET.	Limited: the target audience was not involved, and market players were involved in a very targeted manner.

Experiment A: Stalinsstraat

Relevance of results in relation to the experiments' goals: The goal of the Stalinsstraat experiment was to create a local energy sharing system for the residents of the Stalinsstraat through solar panels, batteries and electric vehicles. In the words of interviewee 2, ZuidtrAnt liked the idea of realizing 'renewable energy for everyone'. Social, technical and economic results have been achieved. Firstly, in January 2021, a conversation has been facilitated between residents in the neighbourhood to raise awareness about the project. In the words of interviewee 2, a large part of the project has been figuring out "*how to bring this complex story to people*." As discussed in the previous section, they have had a setback with the abolishment of net metering policy as of January 2021. This makes solar sharing less profitable and thus less attractive to potential participants in the experiment. They have asked the city communication department for help to make the story clear to residents in the street. Meanwhile, they have

used the first 15 000 euros of the first subsidy to install 1 set of solar panels on the roof of one resident as well as 3 batteries. Currently, they are looking for a location for an electric vehicle. They have been granted 60 000 euros from the city's climate fund, to buy and install an electric sharing vehicle. In sum, the goal to create an electricity sharing system for the residents of the Stalinsstraat has not been reached yet. However, the fact that the project has gained subsequent subsidy of 60 000 euros from the city of Antwerp to further realize its goals is promising. This will allow the project to continue after the end of Gelijkstroom.

Inclusiveness of the process The experiment team of the Stalinsstraat involved a wide range of people (residents, local school, a local brewery, and other organisations such as housing corporations). As such, the process is considered inclusive by multiple interviewees. Moreover, while there were sensitivities and disagreements in the process, the team has been able to voice these concerns. "*Especially the tensions show the experiment is inclusive*," argued interviewee 3. "*The tensions were voiced, from the idea that 'it would be good if you know this.' People could always talk to each other openly.*" For example, ZuidtrAnt voiced concerns about the lack of their communication capacity to contact residents of the streets. While they had to flag this concern multiple times, it eventually led to increased communication capacity of the city department. Overall, the process was dialogical and inclusive.

Experiment B: Collectief Goed

Relevance of results in relation to the experiments' goals The goal of Collectief Goed was to install solar panels on the roofs of their patrimony and allow residents to exchange electricity amongst each other. This goal has not been reached so far. The process stagnated on multiple accounts, mostly because of a lack of data and legal setbacks. Firstly, a financial business plan was started to evaluate the profit margin of the project. However, this segment of the project was abandoned when it was apparent that not enough data was available to do the calculations. In the words of interviewee 3 this was a missed opportunity: *"they could have learned much more from that. Sometimes you can do an analysis anyway, despite unclarities.*" Secondly and more importantly, when Collectief Goed, ZuidtrAnt and Samenlevingsopbouw learned that exchanging electricity locally is legally prohibited, they decided to wait for the legal framework to change until it would be legally allowed. This is in stark contrast to experiment A: Stalinsstraat, where they decided to install everything to "*make sure everything is ready to go for when the policy changes*" (interviewee 2) and had an attitude of "*rolling up their sleeves*" (interviewee 3). In the words of interviewee 3, it is important to "*find a way to make steps, go forward, without it being clear what the end is going to look like*". As assessed by multiple interviewees, this difference in attitude can be explained because Collectief Goed is a housing corporation with very little funds. Interviewee 5: "*we have to turn every euro on its head.*" Thus, they thought the investment was too risky for them, whereas the Stalinsstraat experiment ran on subsidies and had very little financial risk so they had more space to innovate. Eventually, in the words of interviewee 5, the main result is that they have "*gained knowledge, that's most important. Just [knowing that] it would be technically possible.*" Interviewee 3 concurred in saying that "*the idea of this experiment was to do more than what you are required to do by*

law, and how can we pioneer in the energy transition. That has not succeeded. But a seed has been planted, if we water it enough, something might still come out of it."

Inclusiveness of the process The experiment team decided not to involve the tenants, because they argued the story would be too complex and they didn't want to promise things to the tenants that eventually wouldn't happen. "*But it would've been interesting to have had conversations with tenants*," argued interviewee 3, "*to ask them: what is your attitude towards this? How much are you even interested in climate and energy?*" Because the experiment was stopped prematurely, it didn't mature to a level of involving residents. Nevertheless, the experiment team assessed that the process was highly dialogical and inclusive.

Experiment C: 'Renovation coaching for emergency buyers and residents'

Relevance of results in relation to the experiments' goals The goal of the experiment around 'Renovation coaching for emergency buyers and residents' was to find out how the city supports this target group and find a way to collaborate across city departments to do so. Most results of the experiment have been increased knowledge within the city department: "*They [the city departments] have gained more insight into that: namely, that they currently support them very little, and if there is support, there is limited collaboration between city departments*," reflected interviewee 1. The experiment team is currently working on increasing the collaboration between departments, but the experiment is still running and they are currently in the middle of this process.

Inclusiveness of the process According to interviewee 1, the experiment faced difficulties in establishing an open, dialogical atmosphere, because of the sensitive nature of the topic at hand and the difficulty to address these sensitivities through an online meeting. Moreover, the target group itself was not represented in the conversations of the experiment. In retrospect, interviewee 1 reflected that it would have been good to "*argue from the viewpoint of the target group, and to involve them as much as possible*."

Experiment D: Rental of energy-efficient household appliances

Relevance of results in relation to the experiments' goals The goal of "Rental of energy-efficient household appliances" was to offer affordable electrical appliances to those in energy poverty to increase energy savings. This goal has not yet been achieved, as the experiment is still running (and will continue after SONNET). However, the experiment has made multiple steps towards its goal: they have had a political green light to start the project, made a budget, launched an open call to find a project executor and subsequently selected one (Samenlevingsopbouw, a social enterprise).

Inclusiveness of the process The inclusiveness of the experiment was limited, because the launched tender to find a project executor was not widely distributed by the team, and henceforth only led to one response (Samenlevingsopbouw). In retrospect, interviewee 7

wondered whether they should have distributed the call more widely. The target group has also been very little involved so far, but the experiment team reflected that this would change once the experiment developed in the future. Overall, the experiment team experienced an open, dialogical atmosphere within the experiment team.

5.3 Methods evaluation

Various methods have been used throughout the process. This section evaluates which methods worked best for which purposes.

A **scoping system analysis** at the beginning of the process was deemed helpful to get a grip on the dynamics and initiatives related to the social dimensions (specifically energy poverty) of the energy transition that were already at play in Antwerp. This scoping document gave insight to the Gelijkstroom core team and allowed them to pick the initiatives that were most relevant to do experiments with in Gelijkstroom.

Furthermore, **reflexive monitoring** allowed the Gelijkstroom core team to continuously reflect and learn about their process and adjust their actions if required.

The nested **city lab** format, with multiple experiments running at the same time, was chosen as a method because it would allow learning between experiments. However, mainly due to covid-19, the learning exchange amongst experiments was hampered as experiments and a sense of community was lacking. Rather, experiments expressed in the evaluation interviews they didn't feel the city lab added much value to their work "*other than the active time invested by the project lead*" (interviewee 6). According to interviewee 6, "*there was hardly any interaction between the experiments" and the co-creation day that was organized between experiments "did not really do anything for them*" (interviewee 6). Interviewee 3 summarised this reflection as follows in the second learning session of the Gelijkstroom core team: "*It is not very clear to all actors in the experiments what the role of the city is in such a process and what the added value is of being 'incorporated'. in an urban lab2050 trajectory.*"

In the individual experiments, the methods to achieve their goals differed widely. Interviewee 1 mentioned that in the 'Renovation coaching for emergency buyers and residents' experiment, the main method was to "*analyse what goes wrong and draw learning lessons from these, and organise a few sessions around this [with city departments].*" In the Collectief Goed experiment, the main take-away from the experiment was that "*one ought to find out how things work legally before you get started*", because "*you should not get into anything unprepared because you'll face uncomfortable surprises like we did*" (interviewee 5). As reflected upon earlier in this report, the Stalinsstraat experiment had a different approach to the same legal issue, stating that they just wanted to "*roll up their sleeves and get things done and do as much as possible, so that if it becomes legally allowed to exchange electricity locally, we have already put everything in place to make it happen*" (interviewee 2).

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6 OUTCOMES EVALUATION

6.1 Evaluation method

6.1.1 Interviewee and document analysis

This evaluation is based on document analysis and interviews with the experiment leads (Table 7). For each interview an interview summary was produced. These summaries were organised along the following themes: reflexivity, goals in relation to the results, embedding and scaling up after Gelijkstroom and involvement of actors. The evaluation also relied on a review of project documentation, including the terms of reference for the reflexive monitoring and minutes from reflexive monitoring sessions within the Gelijkstroom core team and one session involving all experiments (

Table 8).

Table 7 List of interviewees

Code	Type of interviewee	Organisation	Experiment	Datum interview
Interviewee 1	Gelijkstroom core team	REBEL	Renovation coaching for emergency buyers and residents	23.6.21
Interviewee 2	Experiment lead	ZuidtrAnt	Stalinsstraat	28.6.21
Interviewee 3	Gelijkstroom core team	REBEL	Collectief Goed and Stalinsstraat	28.6.21
Interviewee 4	Experiment lead	Samenlevingsopbouw	Collectief Goed	29.6.21
Interviewee 5	Experiment lead	Collectief Goed	Collectief Goed	29.6.21
Interviewee 6	Experiment lead	Stad Antwerpen	Rental of energy-efficient household appliances	5.7.21
Interviewee 7	Experiment lead	Stad Antwerpen	Rental of energy-efficient household appliances	5.7.21

Table 8 Overview of the reflexive monitoring moments of Gelijkstroom

Date	What	Goal	Attendees
25.6.2020	Learning session 1	Collect learning questions for Gelijkstroom, adjust goals, and find the impeding and stimulating factors	Gelijkstroom core team
26.11.2020	Learning session 2 part A	Discuss which results have been achieved at the point of the session, discuss learnings based on learning questions, discuss impeding and stimulating factors,	Gelijkstroom core team
13.1.2021	Learning session 2 part B	Transfer knowledge and learnings from the previous Gelijkstroom core team members (Jana, Gert) to the new team members (Lina, Luk)	Gelijkstroom core team
28.5.2021	Learning session 3	Discuss the analysis DRIFT made to answer to the learning questions, discuss whether there are any questions we didn't answer and whether our goals are still the same as before	Gelijkstroom core team
21.10.2021	External learning session	Disseminate knowledge and learnings beyond the Gelijkstroom core team and the trekkers	Forthcoming: members of the Gelijkstroom core team, participants from housing cooperatives, local governments, energy cooperatives, etc.

6.1.2 Operationalisation of assessment criteria

This report analyses the city lab through various concepts. To do so, each concept has been operationalised as follows:

- **Inclusiveness** The extent to which 1) the experiment was accessible to all (disadvantaged groups, stakeholders, interested parties), and 2) there was an open, dialogical atmosphere within the team that enabled team members to feel represented by the outcomes of the experiment. The inclusiveness of each experiment was assessed on a scale: limited (the experiment was not accessible to a wide audience beyond the direct project team, or the project team hand-selected participants), average (the experiment tried to reach out to a wider audience and/or the atmosphere in the team was open and dialogical) or inclusive (the experiment successfully reached out to a wider audience and the atmosphere was dialogical).

- **Relevance** The extent to which the results of the experiments matched the goal of the city lab. The relevance was assessed on a scale: limited (no results are made that achieve the goals of the experiment, not clear as to whether that will change in the future), promising (no results are made that achieve the goals of the experiment, but this is likely to happen in the future), or relevant (the goals and the results of the experiment align).
- **Reflexivity** The capacity of the experiment team or the core Gelijkstroom team to recognise obstacles and adjust their behaviour accordingly. The reflexivity of each experiment was assessed on a scale from 0-2 (0, 1, 2) as follows: 0 Low: the obstacle is not seen by the experiment team, or leads to stagnation, 1 Average: the obstacle is noticed in the team, the team changes course slightly to cope with the obstacle, 2 Above average: the team recognizes the obstacle and finds a solution.

6.2 City lab results

This section will discuss the results of the city lab. As discussed in section 1.3 *Learning questions of the city lab*, the learning questions are used as indicators to measure these results.

Learning questions about the city lab Stadslab2050

How can the city lab use social innovations as a lever for the just energy transition especially regarding the involvement of disadvantaged groups?

The first thing to note is that this question is very tailored to incite imperative answers: 'when you would do the following, you can create social innovation.' However, social innovation is not something you can create through a simple list of bullets. Thus, the following paragraphs require a disclaimer that whereas the following elements might contribute to a just energy transition, they are highly dependent on the specific type of city lab, the project, the topic, and the location and people involved in the lab. Therefore, this section will not provide an imperative list, but rather list a number of guiding principles that aided the city lab in acting as a lever for the just energy transition.

1. **By creating new networks that convey a clear shared story to aid citizens in overcoming their knowledge gap.**

The city lab can act as a lever and create new networks around a shared, clear, story, so that citizens can overcome the knowledge gap around the energy transition. The energy transition is a difficult story for most citizens in Antwerp, who perceive the transition to be complex and technical. The Gelijkstroom city lab revealed the importance of clear communication and a single point of contact towards citizens. The city lab's role was to facilitate the social learning process around creating this story. This was especially evident in experiment A: Stalinsstraat, where Gelijkstroom facilitated the network between the citizen from the Stalinsstraat, the city of Antwerp's communication department, and Zuidtrant energy cooperative. The goal of the

experiment was to activate citizens to start solar sharing – which was difficult to realise, because of the lack of knowledge on the energy transition and because the net metering policy was cancelled which made the financial proposition less appealing. The city lab linked the initiator, the citizen from Stalinsstraat, to ZuidtrAnt energy cooperative and the city of Antwerp's communication department. After that, these parties worked together to create a shared story to aid citizens in overcoming their knowledge gap and to invest in the energy transition. In sum, the city lab may act as a lever for the just energy transition by bringing people and organisations together, and facilitating the creation of a shared, clear story towards citizens.

2. **Facilitating new networks between people and organisations that are win-win collaborations**

The city lab can act as a lever by facilitating win-win collaborations. In Gelijkstroom city lab, this is evident through experiment A: Stalinsstraat and experiment B: Collectief Goed. In the latter experiment, for example, a housing corporation that works together with an energy cooperative to supply green energy to social tenants (Collectief Goed / ZuidtrAnt experiment): Collective good wants to offer affordable homes for families (max. EUR 600). To be able to do this, the cost of renovation must be kept as low as possible. There is no financial room to invest in solar panels. A third party that invests is therefore ideal. Advantage at Collectief Goed is 1 point of contact for a wider portfolio + recently renovated, so structurally good and insulated roofs.

3. **Replicating successful socially innovative projects to accelerate the energy transition and better involve vulnerable target groups**

The city lab can act as an accelerator of promising innovations by replicating successes made elsewhere. This was especially evident in experiment D: Rental of energy-efficient household appliances. The city lab team lead at the time, Jana Deforche, had heard positive results about the Rental of energy-efficient household appliances project by BSH Home Appliances, which brought energy saving appliances to social housing tenants. The city lab gave the time and space to replicate the Rental of energy-efficient household appliances project in Antwerp. As such, the city lab can act as a lever for the just energy transition through replicating other projects that have done so.

What are the roles (i.e. activities, expectations, responsibilities) of the city administration in relation to just energy transition?

See section "increased insight into the role of city" on page 62.

How can the insights from the city lab be embedded in the city strategy and the city administrations daily practice?

- By directly involving city departments into the city lab while the city lab process is ongoing, so that they convey their learnings to their colleagues. For example, Gelijkstroom involved policy workers during learning sessions where lessons were shared about the city lab. It also involved them directly into the experiments.

- By presenting the results of the city lab to policy workers in other city departments. For example, Gelijkstroom presented its reflexive monitoring approach to members of the innovation department of the city of Antwerp.

How can the benefits of such an integrated approach be made visible for different policy domains (e.g. CO2 reduction, inclusion, etc)?

This aspect has remained underlit throughout Gelijkstroom. Thus, not a clear answer can be given. However, our findings show that:

- Linking inclusion and energy is not self-evident - it is a political choice that is felt by the socialist political branch within the city. However, the liberals do not see this urgency, they prefer to look at the port and other industrial large users around the energy transition theme.
- Cherry on the pie: it often came up during the Gelijkstroom that energy issues were 'the cherry on the pie' to actors working on social services or poverty.

Learning questions for SONNET

How and to what extent is the city lab process inclusive, dialogical and actions relevant?

See section 5.2.

How and to what extent are results socially innovative and disruptive in relation to the status quo?

Disruptive might be seen as a radical new way of doing, thinking or organizing as compared to the status-quo. Some experiments have the potential to be disruptive standard ways of doing, thinking and/or organizing the energy system; e.g. through exchanging electricity locally (Stalinstraat, Collectief Goed) or through providing energy-efficient appliances as service (Papillion). While one was more focusing on optimization of e.g. the communication between city departments ('Renovation coaching for emergency buyers and residents'). However, most experiments are still running and have to still live up to this potential. Regardless, most interviewees concurred that "*if this is actually going to happen, it will be very disruptive*" (interviewee 1).

To what extent is Stadslab2050, being a social innovation in itself, an effective means to foster an inclusive and just energy transition in Antwerp? And what conditions enable or hinder it in doing so?

A lab or innovation space in itself can be a means to support inclusive and just energy transition but will never be the only means; it is an exploratory and investigative instrument. A specific format to allow for multi-actor collaboration with the potential to change social relations and new ways of doing, thinking and/or organising. This must be assisted by other policy instruments that work in a complementary way (regulations, additional financing, additional

organization from the government). A lab works best in tandem with more standard policy instruments.

Impeding factors:

- Disadvantaged groups are difficult to involve due to the low urgency and complexity of the subject.
- The website and communication of Stadslab2050 have been taken offline, making communication (with the city and target group) difficult.
- The theme of energy poverty is difficult to quantify in relation to climate targets or environmental policy e.g. in terms of CO2 reduction policy.
- The corona crisis has made it more difficult to meet in person.
- There was no financial support from the city for the experiments – a factor that has been partly addressed through having a funding stream on 'social innovation in energy' as part of the climate fund.
- Compartmentalization within the city organization (environmental and social remain separate worlds), making it difficult to embed Gelijkstroom within the city administration.

Learning questions about the experiments

How can social innovation initiatives in energy be accessible to all?

From the interviews with the experiment teams, three key elements followed that would make social innovation initiatives more accessible to all:

- Share electricity with neighbours. For this, you would ideally have flexible tariffs (interviewee 2) that allow lower electricity prices for taking electricity from neighbours.
- Showing that social innovation initiatives in energy are possible and sharing their stories with a wider audience.
- Involve social enterprises to scale up experiments. In the words of interviewee 3: "*Klimplant (red: a climate organization in Antwerp) has been involved, a citizen initiative that wants to work around energy and climate in Antwerp. There are people working on these themes. If such a party sees: it works somewhere, if they have that knowledge build-up, they can have an important role in scaling up experiments.*"

What are possible business models for just energy transitions and their enabling and impeding conditions?

From the interviews with the experiment teams, key elements of business models for the just energy transition were as follows:

Business models for solar sharing:

- At the moment, local solar sharing is not profitable or possible without subsidies. Ideally, there would be flexible tariffs that would allow neighbours to exchange electricity locally at a reduced fee. At the moment, the business model for solar sharing is highly dependent on the grid operator (distribution grid tariff and capacity tariff) and the price of batteries. Interviewee 2 noted that the profitability of batteries is still to be seen: "*How fast batteries would be profitable? You cannot make this estimate at the moment*."
- In Gelijkstroom, energy cooperative ZuidtrAnt was involved in both solar sharing experiments. In the words of interviewee 3: "*whilst they are strong promoters of societal value, they also have to make profits*." It is difficult to make solar sharing profitable and to cater to the target group in energy poverty, because those in energy poverty carry more financial risk. "*[Energy] communities are nice*," interviewee 3 noted, "*but they are not stimulated to make the target group more diverse*."

Business models for split incentive problems:

- Housing owners are generally not the ones to pay the electricity bill. Therefore, there is no incentive at the housing owner to invest in increasing energy efficiency. This phenomenon is called the 'split incentive' problem, where residents of social housing complexes end up paying high bills for fossil energy.
- Experiment B tested a business model where a third party (energy cooperative ZuidtrAnt) was involved and responsible for the solar panel installation through budgets of the city. "As an energy cooperative, you should get a part of the profit, but that is hard, which is why you have to get external funding from the city, or organisations like the grid operator," said interviewee 5.
- Another option of a split incentive business model was found in Gent, Belgium, through the Social Housing Office (NL: Sociale Verhuur Kantoor, SVK). Through the rental agreement, residents paid an allowance for electricity, to compensate for the solar panels. However, these costs are predicted values, and thus uncertain. "There is an uncertainty in that [...] the costs are difficult to predict," said interviewee 5. The Collectief Goed experiment stopped prematurely and thus didn't experiment with this construction within Gelijkstroom.

What is the value of carrying out the experiment as part of the city lab?

The main value of the city lab was the fact that most experiments were **initiated** or pushed through by the city lab. As said by interviewee 5, "*there would've been no experiment without Gelijkstroom*."

Another value was the **offered (theoretical) background on social innovation and energy poverty in Antwerp** at the start of the trajectory through the scoping exercise**.** "*The breadth of the discussion around energy poverty became clear because of that*," mentioned interviewee 1. Moreover, the **stimulus to think on a deeper level** was appreciated by interviewees. As said by interviewee 3 "*you were really stimulated to think just a little further*." For example, in the

Collectief Goed experiment, the framing of the city lab urged the experiment team to think "*how can we integrate this experiment in our way of working?*" (interviewee 3). In the Stalinsstraat experiment, the main value of the city lab was the **financial support** through the climate fund. Moreover, the city lab "*provided the **right kind of glue**, giving direction to the process, facilitating them and bringing people together in an official trajectory*" (interviewee 3). The experiment team of Collectief Goed mentioned that the value of Gelijkstroom was that it provided **means to invest in innovation that the organization itself did not have.** Interviewee 5: "*we are limited in manpower and means, so if someone from a trajectory like Gelijkstroom comes and offers you a project on a serving plate, that's a great advantage.*"

The goal of the city lab was for the experiments to exchange learnings with each other. However, multiple interviewees mentioned that this did not occur. Rather, they experienced them to have "*a small task within a sub-project*" and just wanted to execute their task (interviewee 7). "*We didn't get a lot out of the moment when we shared experiences with the other experiments*" mentioned interviewee 7. See section 2.1.1 on page 47 for more information on this.

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7 ANALYTICAL REFLECTION AS A SUMMARY

Sonnet aims to generate novel understandings in the **diversity, processes and contributions** of social innovation in the energy sector and critically evaluate and assess their **success and future potential** towards supporting sustainable transitions of energy systems. To this end, it posits: how do city labs result in new breakthroughs, or do they help break through barriers towards a sustainable energy transition (such as little citizen participation, or slow acceptance of new technology)? In the following, we a) ponder on barriers and drivers for the implementation of Gelijkstroom, b) highlight some of the socio-economic, socio-political and socio-cultural aspects that were important in relation to Gelijkstroom, and c) reflect on the extent to which Gelijkstroom can be considered a social innovation in energy.

Barriers and drivers for the implementation of Gelijkstroom

In the context of Gelijkstroom, citizens, professionals, energy cooperatives, housing corporations, city departments and other organisations collaborated to find new ways of doing, thinking or organizing energy and contribute to more just and sustainable energy transitions. The implementation of Gelijkstrom was influenced by multiple aspects. These can be identified both, in the broader societal context (i.e. covid-19) and in the project organisation (i.e. project team). Firstly, **covid-19** hampered interaction between segments of the project, such as for example between experiments, or between the core team members. As a result, the envisaged learning exchange between experiments and their scaling suffered. Secondly, 50% of the Gelijkstroom team changed throughout the process. This had consequences for the sustainability and embedding of lessons learned especially within the administration of Antwerp, but also for the collaboration and the (un)clarity of role understandings within the project team.

Socio-economic, socio-political and socio-cultural aspects of Gelijkstroom

Socio-economically, Gelijkstroom reveals the importance of government funding around issues of energy poverty. This is demonstrated by the Collectief Goed and Stalinsstraat experiments – whereas the Collectief Goed experiment was ended prematurely because of risk-aversion and tight budgets, the Stalinsstraat experiment flourished through substantial funding from the city government. It has been argued by multiple members of the Gelijkstroom core team that issues of energy poverty will always have to be subsidized in some way, because the market does not solve these issues by itself.

In these experiments in particular, **socio-political** factors greatly affected its outcome. The Stalinsstraat and Collectief Goed experiments both experienced a set-back when the national policy of net metering was abolished in January 2021. This made the business model for solar sharing less profitable. Moreover, these experiments both faced legal boundaries as they found out that solar sharing was not yet possible in Belgium.

What we also discern is a great **difference in cultures**, specifically attitudes between these two experiments, that had an effect on the extent to which they achieved or also in future might

achieve their aspired results. While Collectief Goed, who self-identified as risk-averse, learned of the legal boundaries, they stopped the experiment. However, the experiment team of the Stalinsstraat saw these boundaries as fluid, thinking they might change in the future, and that if they did they would already make sure that everything was in place, so that they can start immediately. This difference in attitude lead to a difference in dealing with the obstacle: while Collectief Goed ended prematurely, the Stalinsstraat experiment continued.

Reflection on social innovation in Gelijkstroom

In SONNET, we think of social innovation in energy as a change in social relations involving new ways of doing, thinking or organizing energy. Gelijkstroom itself is a social innovation in energy in that it is a multi-actor (city, consultancy, research institute) collaborative format through which new solutions for energy poverty are incubated. It corresponds to one of the types of social innovations that SONNET distinguishes: participatory experimentation and incubation.

These different solutions were incubated as 'experiments', each also including novel multi-actor collaborations to address specific sub-aspects of energy poverty. When we asked the experiment leads what they thought was innovative about their experiments, they tended to think that the goal of the experiment was innovative: increasing the inclusivity of the energy transition. Focusing more on the process towards achieving this goal, we can describe each of the experiments as a social innovation:.

- Experiment A: Stalinsstraat concerns the development of street-level energy production and storage facilities implemented by a novel actor constellation, including the city administration, citizens, and an energy cooperative. The experiment combined new ways of doing (installing a community battery and shared solar panels) with new ways of thinking (the belief in an inclusive energy transition as well as the belief that citizen engagement is key in realizing this) and new ways of organizing (a multi-actor constellation). This actor constellation includes actors coming from different institutional logics: the city department (state) working together with citizens (state) and an energy cooperative (hybrid sphere). In doing so, this constellation moves energy production and consumption out of the market logic that is usually governing the sector.
- Similarly, experiment B also concerned the development of shared energy production and storage facilities implemented by a novel actor constellation. However, this experiment did not center around citizens and citizen engagement, but rather focused on a social housing organization, who closely collaborated with an energy cooperative and were facilitated by the city department in their endeavors. Though stopped prematurely due to legal setbacks, the experiment attempted to combine new ways of doing (installing a shared solar panel system) with new ways of thinking (a belief in the importance of making social housing residents part of the energy transition) and new ways of organizing (the solar sharing organizational model and the multi-actor constellation including the city, a social housing organization and an energy cooperative, closely collaborating to experiment with the energy transition).Whereas experiment A has actually installed batteries and solar panels, this

experiment was prematurely stopped. Therefore, it mainly offered new ways of thinking and organizing, rather than new ways of doing.

- Experiment C: Renovation coaching for social housing tenants involved ongoing increased communication between two previously unlinked city departments, about who would be responsible to pick up the renovation coaching for social housing tenants. In doing so, it combined new ways of doing (renovation coaching for social housing tenants) with new ways of thinking (the idea that social housing tenants are to be part of this transition, and the knowledge exchange between city departments about their different approaches towards this topic) and new ways of organizing (a collaborative approach across departments). As the conversations between city departments are ongoing and haven't led to tangible outcomes in regard to renovation coaching, this experiment is currently mainly focused on offering new ways of thinking and organizing.
- Experiment D: Rental of energy-efficient household appliances involved the offering of rental housing appliances to social housing tenants who could otherwise not afford energy-efficient appliances (i.e. fridges). In doing so, the experiment involved new ways of doing (renting out energy-efficient household appliances), new ways of thinking (the idea that social housing tenants ought the be included in the energy transition) and new ways of organising (a city department initiating the rental of appliances and working together tightly with other organisations to make this happen).
- Lastly, the Gelijkstroom core team might also be seen as a socially innovative, because it involved new ways of doing (experimenting with energy poverty) with new ways of thinking (knowledge build up around social innovation, energy poverty and city labs) and new ways of organising (a city department and researchers working together in unison, collaborating across their usual disciplines).

In conclusion, Gelijkstroom city lab testifies to the perspective of social innovation as a process with actors finding each other and collaborating across discipline (researcher, city official, business, citizen), societal sphere (market, state, community) and domain (social, housing, energy and climate).