P5 Presentation

NAVIGATING THE HEAT TRANSITION

Effective Stakeholder Decision-Making in Dutch Low-Carbon Heating Projects

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Content

Dutch Climate Goals

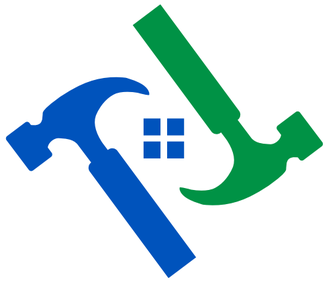
Climate Act aims for a 55% reduction by 2030 and net-zero GHG by 2050. But the country is not currently on schedule to reach the 2030 target due to its heavy reliance on fossil fuels.

2050

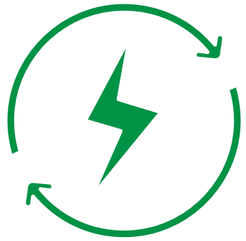
net-zero GHG emissions by phasing out natural gas

SUSTAINABLE HEATING SYSTEMS

A network of pipes that form a grid through which water that is heated, by means of renewable energy, flows



Not a new technology

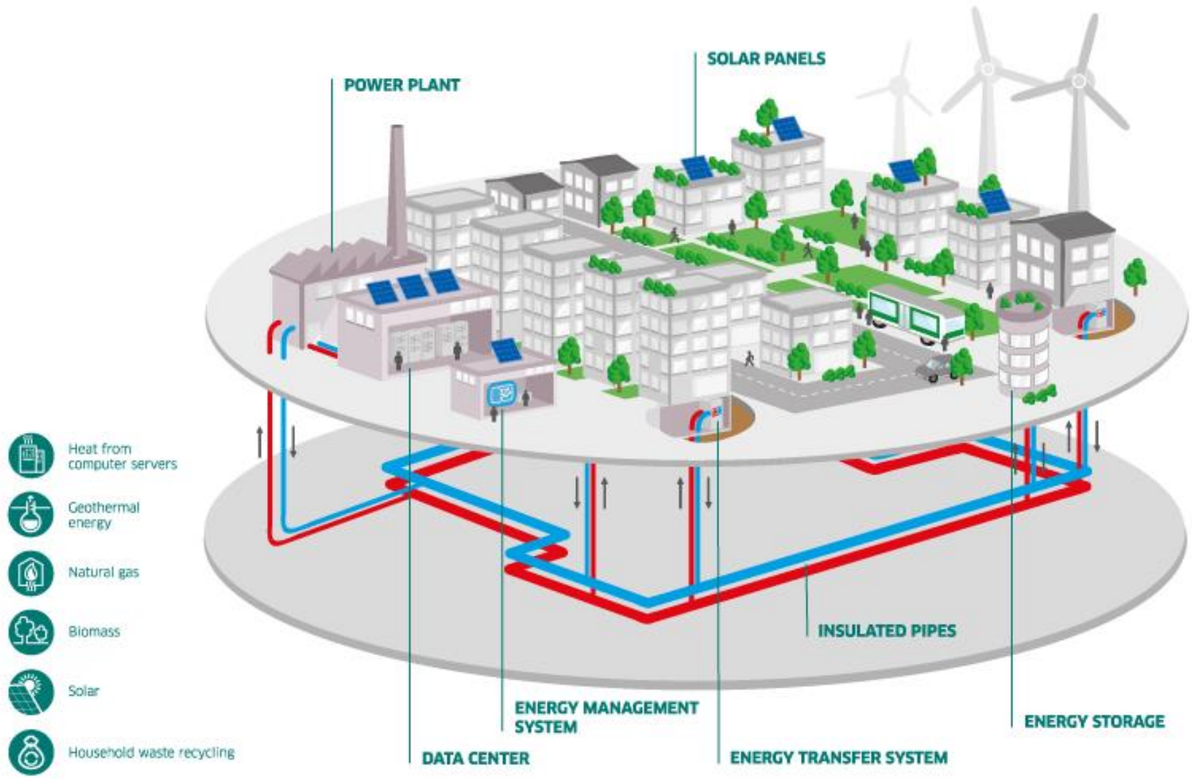


More energy efficient

Used in neighbourhoods

SUSTAINABLE HEATING SYSTEMS

A network of pipes that form a grid through which water that is heated, by means of renewable energy, flows



MIXED-USE NEIGHBOURHOODS


JAGELSI BEARS

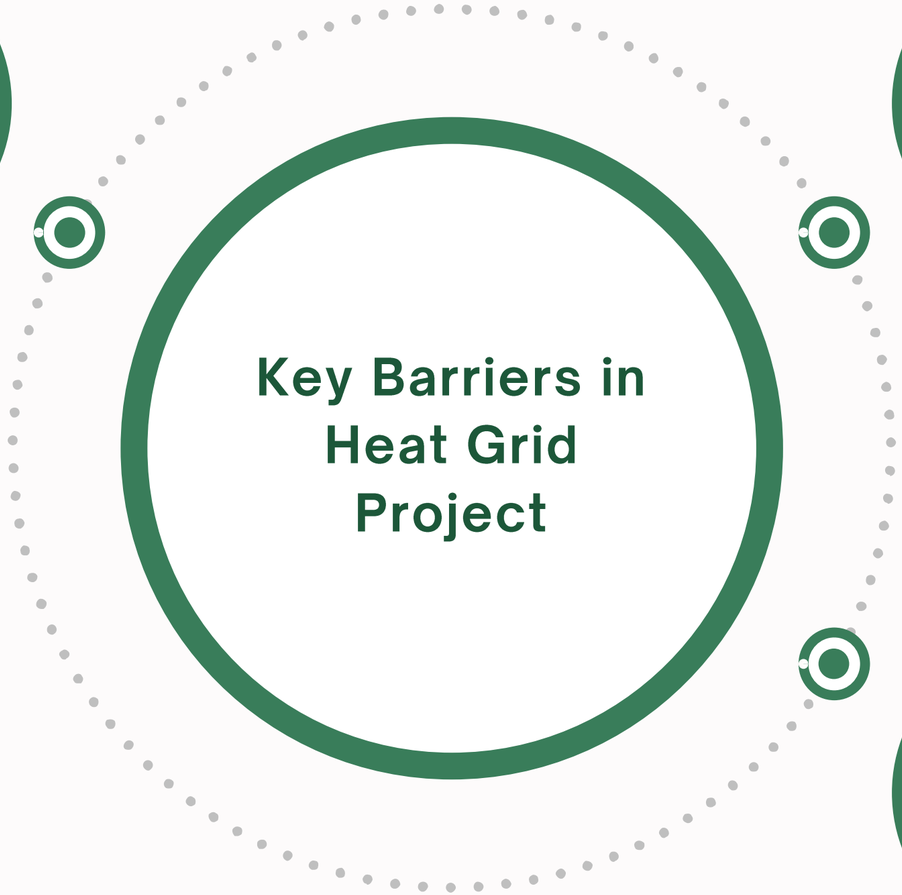
Key Barriers

Lack of Trust

Lack of Communication

Financing

Consequence: Project delays and cost overruns



Problem Statement

01

The Netherlands is not currently on track to reach their sustainability goals on time

02

Low-carbon heat grids are an important tool that can help with accelerating the needed change

03

Projects are often delayed due to a lack of top-down management making it difficult to overcome the key barriers

04

These barrier arise during the decision-making moments of the project

Research Gap

01
Lack of research on the impact of mixed-use neighbourhood typology on the decision-making process of district heating projects

02
Limited study on non-technical barriers influencing the efficiency and success of district heating projects

03
Insufficient investigation on strategies for implementing collective decision-making throughout the project process to overcome the barriers

Research Aims

01

A systematic overview of the stakeholders involved in sustainable heating grid projects in mixed-use neighbourhoods

02

Identify primary barriers to project success and outlining strategies for overcoming them

03

Propose a framework for enhancing collective stakeholder decision-making processes

Main research question

HOW CAN COLLECTIVE DECISION-MAKING BE ORCHESTRATED TO OVERCOME THE BARRIERS OF LOW-CARBON HEATING GRID PROJECTS IN MIXED-USE NEIGHBOURHOODS?

SUB-QUESTIONS

SQ 1

Who are the stakeholders of low-carbon heating grid projects in mixed-use neighbourhoods and what are their attributes?

SQ 2

What is the current decision-making process in place?

SQ 3

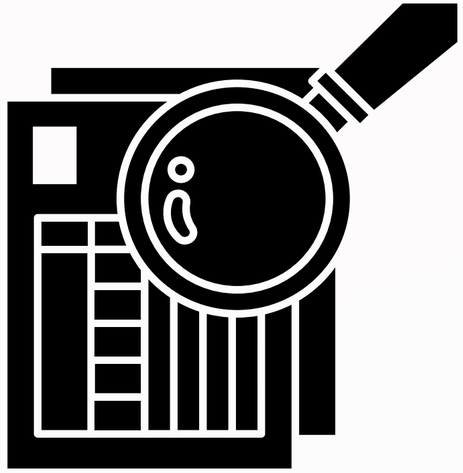
What are the barriers encountered in low-carbon heating grid projects in mixed-use neighbourhoods and when do they occur?

SQ 4

What is the role of the collective in low-carbon heating grid projects in mixed-use neighbourhoods?

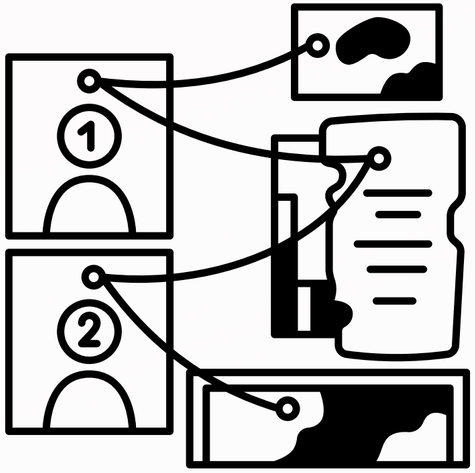
Methods

Literature Review



Data is collected through reading and analysing academic and scientific papers, and grey literature to develop the theoretical background.

Interviews & Case Study



Interviews address the current decision-making process and encountered barriers in heat grid projects. The case is chosen to analyse stakeholder collaboration and pinpoint problem areas.

Expert Interviews

Conducted with three key stakeholders of varying categories as a validation technique for the results and conclusions obtained from previous methods to increase credibility.

THEORETICAL RESEARCH

Mixed-Use Neighbourhoods

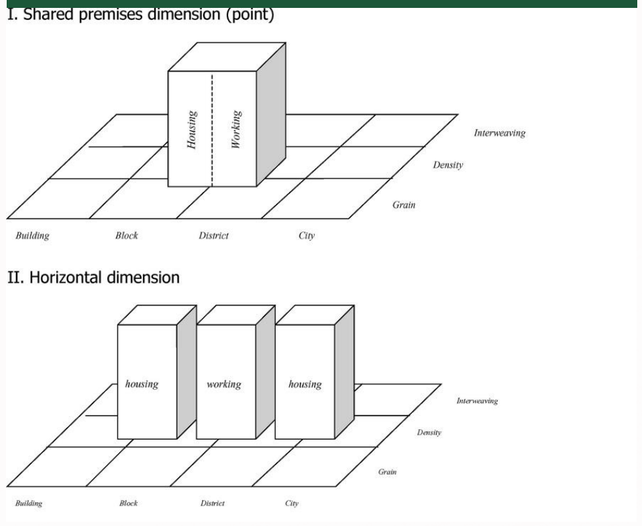
Stakeholders of Heat Grid Projects

Barriers in Heat Grid Projects

Collective Decision-Making

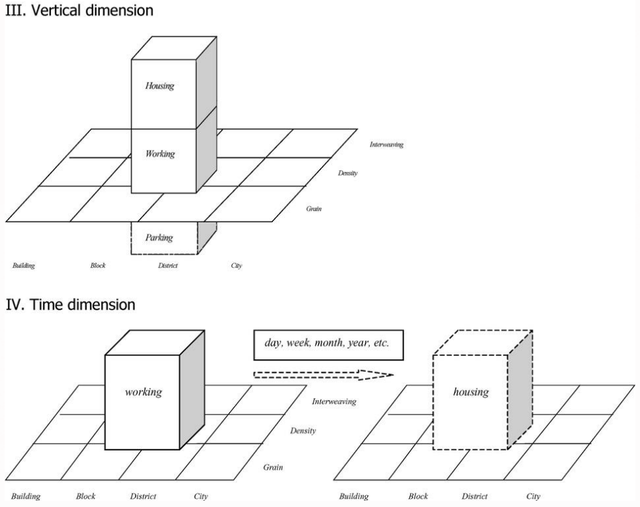
Mixed-Use Neighbourhoods

Land-Use Type



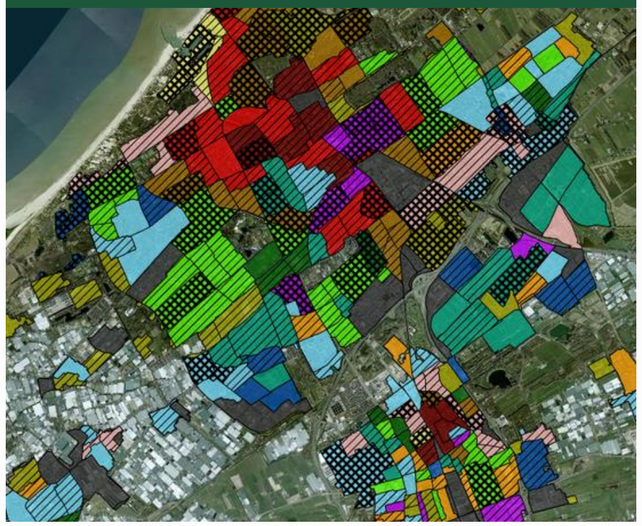
Mixed land-use is an area in which there is a combination of commercial, residential, office, industrial, or other type of land-use.

Ownership



Different land-use types can result in mixed ownership within the neighbourhood.

Dutch Context



Definition of mixed-use neighbourhoods in this research: a collection of multiple buildings which in combination consist of two or more land-use types.

Heating Grids in the Netherlands

18 major & 100 minor networks

40% of municipalities are committed to develop district heating using residual waste heat and geothermal heat.

WCW Act

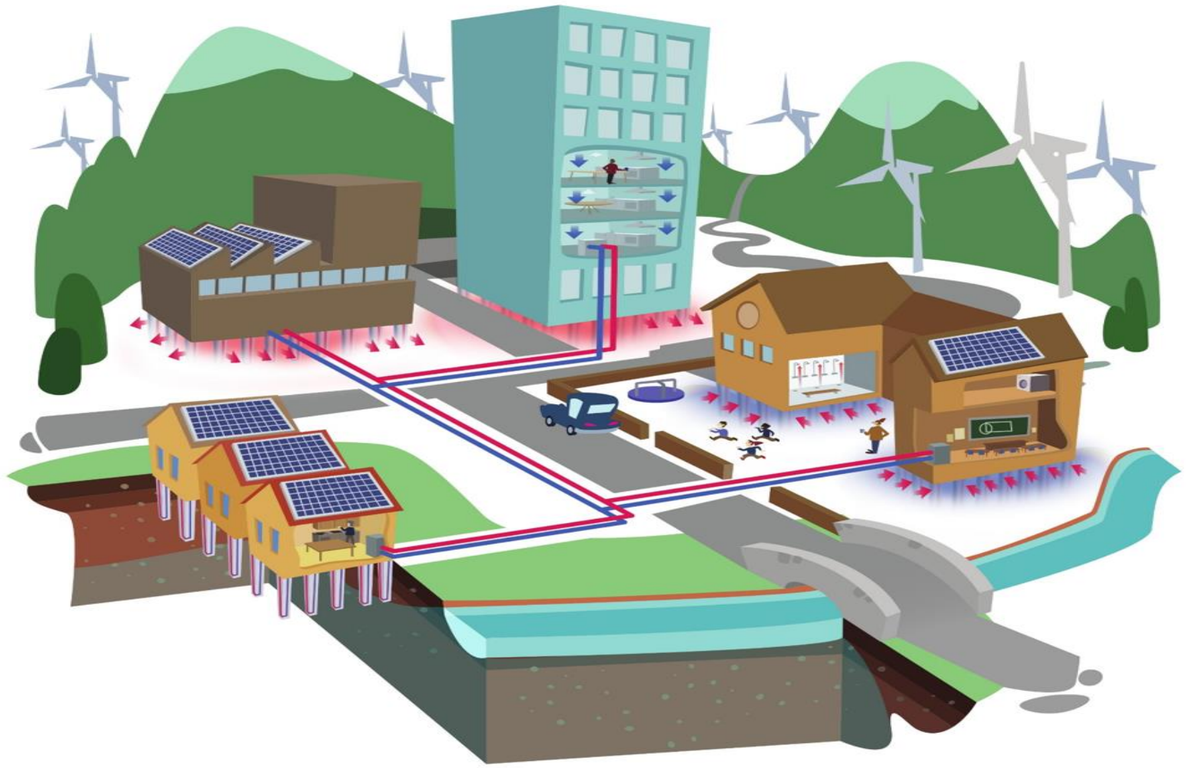
To protect consumers from monopolies, by regulating prices to make district heating more affordable.

Regulations

Ex. Heat Roadmap Netherlands, RES, and Heat Transition Vision (TVW)

Initiatives & financial mechanisms

Ex. Natural Gas-Free Neighbourhoods Programme (PAW), Investment Subsidy Renewable Energy and Energy Saving (ISDE)



Stakeholders of Heat Grid Projects

	Housing Corporations	*Tenants/Homeowners*	*Local Governments*	*Grid Operators*
Initiator	✓		✓	
Coordinator	✓		✓	✓
Facilitator			✓	
Shareholder	✓	✓	✓	
Investor				✓
Heat Purchaser		✓	✓	
Financer			✓	
Owner	✓		✓	✓

Barriers in Heat Grid Projects

Barriers in Energy Transition Projects

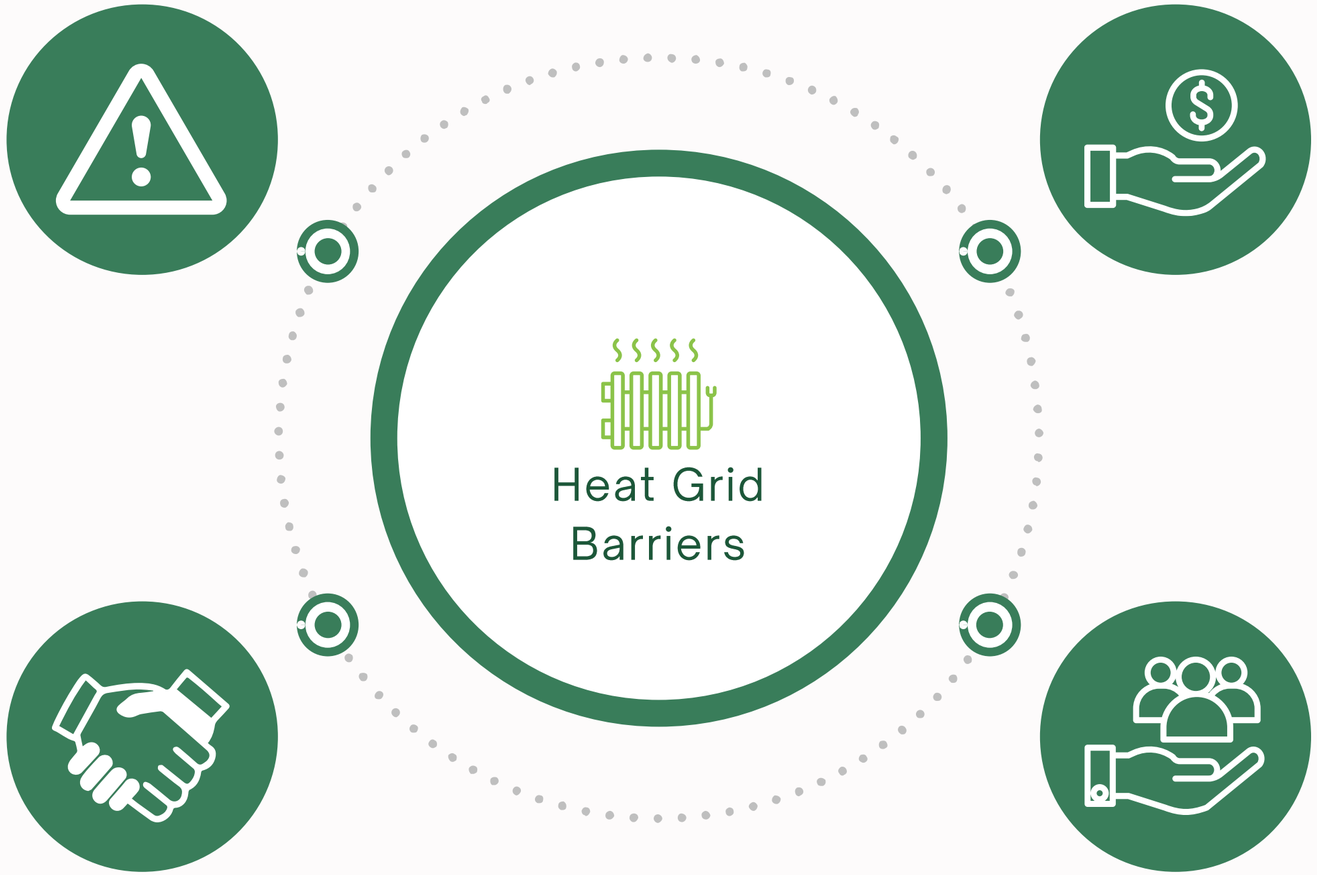
Including: lack of transparency & trust, financial restrictions, resistance, risk & uncertainty

Barriers in Heat Grid Projects

Including: immature technology, energy companies' resistance, biomass lock-in

Dutch Specific Barriers

Ex. monopolistic nature, stakeholder resistance, fragmented value chain, lack of experience, high initial investments with low ROI, high uncertainty & risk, unfavourable business case



Barriers Framework

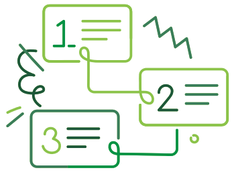
Categorisation	Barrier
Informational	Lack of information
	Lack of expertise (building owners)
	Lack of experience with group housing
	Lack of transparency and trust
Behavioural	Lack of awareness
	Perceived value of energy
	Inertia
	Ignorance
	Social acceptance
	Resistance to change
	Negative perceptions of the energy transition
	Lack of participation and cooperation
Organisational	Monopolistic position of DHN operator
	Fragmented value chain
	Unfavourable business case
	Resource scarcity
	Mismanagement
	Difficulty in decision-making
	Stakeholder conflicts
	Lack of well-defined direction
Economic & Financial	Profitability
	Electricity tax
	Market distortions
	Market functionings
	Long payback times
	Reduced long-term revenue for DHN operators
	Low ROI
	District heating prices uncertainty
	High initial investment and risks
	Connection fees
	Cost efficiency vs flexible network design
	Expensive transition costs
	High capital costs
	Sunk costs
	High construction costs
	Significant renovation costs for existing houses
Technical	Perceived risks and uncertainties from immature technology
	Future demand uncertainty
	Biomass lock-in risk
	Energy security
	Complex construction in existing building stock
	Renewable energy systems intermittency
	Complex energy systems
Legal	Regulatory risk and uncertainty
	Political-legislative uncertainty

Collective Decision-Making

The participation of multiple stakeholders in the decision-making process such that the decisions of the project are made as a team or collective to ensure maximal benefit for all project stakeholders

EMPIRICAL RESEARCH

Stakeholder Interviews & Case Study



Decision-Making Process

Barriers in Heat Grid Projects

Collective Decision-Making

Interview Data Collection

12 Interviews of varying stakeholder groups for analysis

3 Expert Interviews of varying stakeholder groups for validation

Expert Stakeholder Category	Number of Interviewees
Regional Government	1
Energy Company	1
Consultancy Bureau	1

Stakeholder Category	Number of Interviewees
Regional Government	1
Local Government (Municipality)	2
Energy Company	2
Housing Corporation (Association)	2
Energy Cooperative	2
Consultancy Bureau	3

Case Study Selection

	Criteria
Required	Heat grid project in the Netherlands
	Renewable energy source connected to the grid
	Located in a mixed-use neighbourhood (min. 2 different functions)
Desirable	Currently being developed or already completed
	Heat from grid supplied to multiple stakeholders
	At least one barrier encountered that require a solution through decision-making

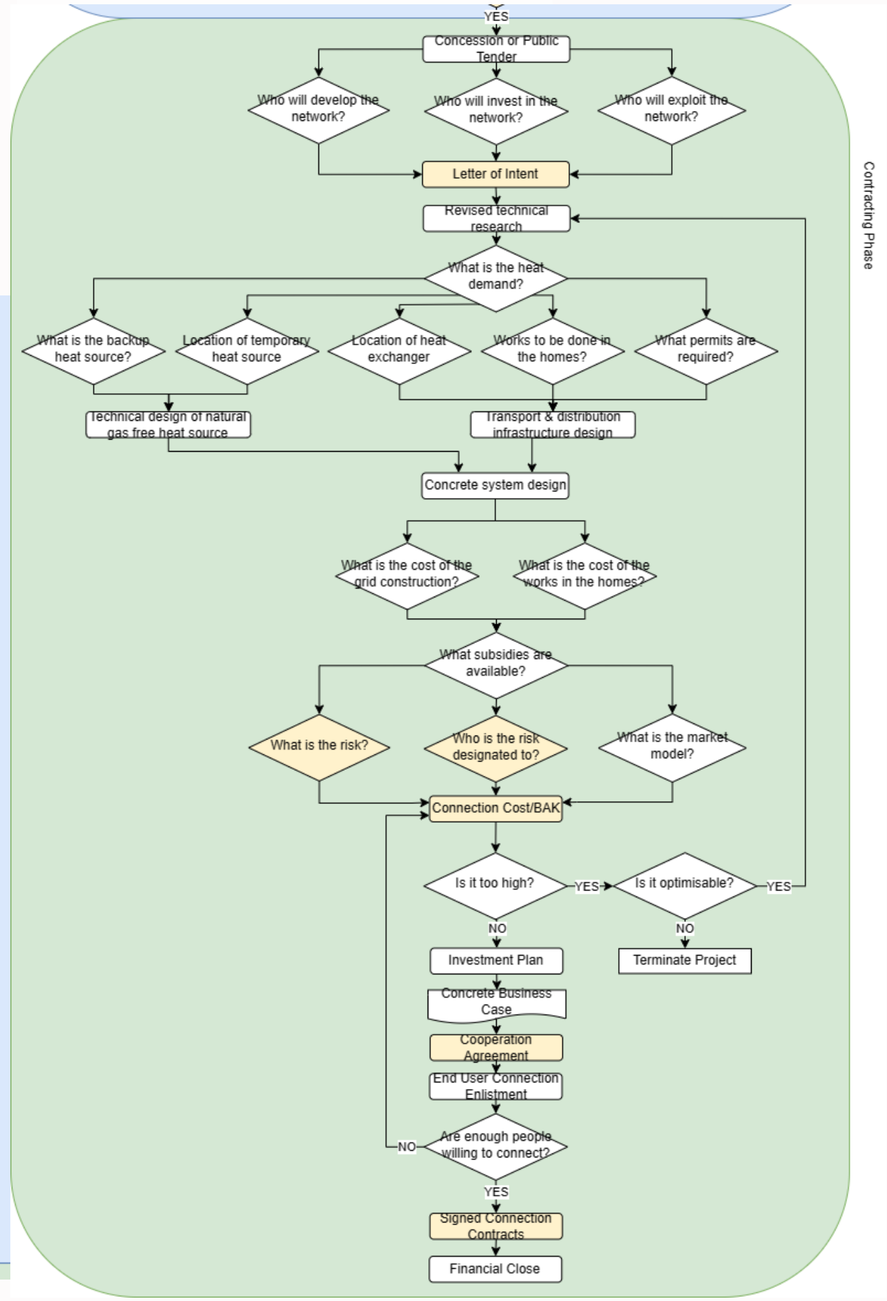
Case	Project Phase	Project Initiator	Heat Source	Building Typologies	Stakeholders Involved	Stakeholders Interviewed
Groenoord	Development	Housing Association & Municipality	Residual Heat from Biomass & Waste Incinerator	Residential (social and private), municipality-owned, leisure	Housing Association, Municipality, Energy Company, Residents, Consultancy Bureau, Regional Government	Housing Association, External Project Manager, Regional Government Representative

Generic Decision-Making Process

Initiation Phase

Feasibility Phase

Contracting Phase



Generic Analysis of Barriers

Top Barriers

Most reoccurring barriers in the interviews include: political-legislative uncertainty, lack of transparency & trust, and lack of participation & cooperation

Top Barrier Category

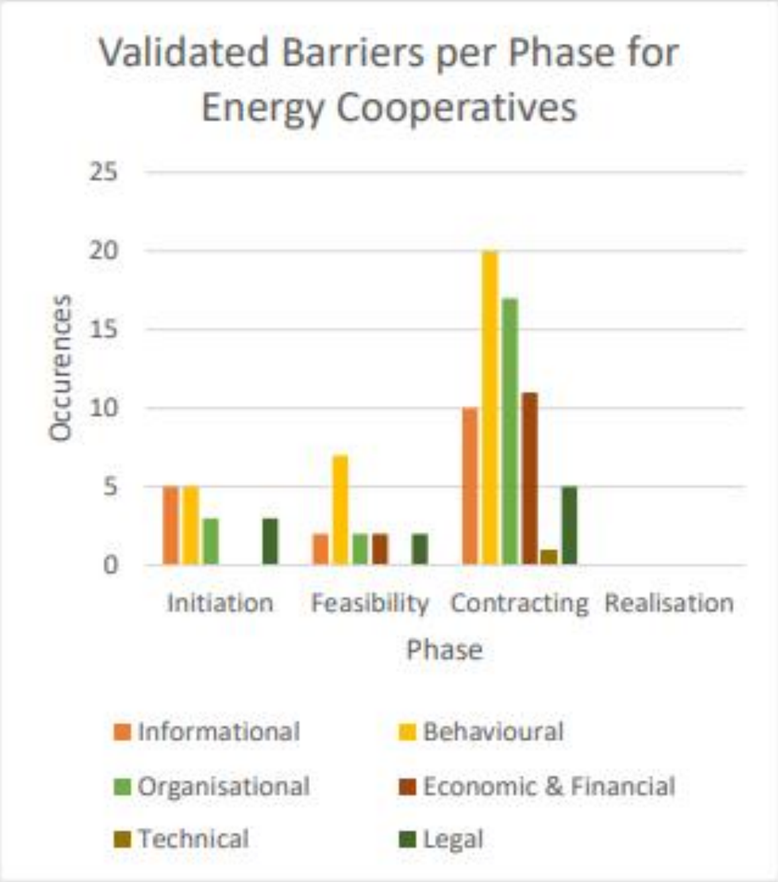
Most reoccurring barrier category: behavioural barriers

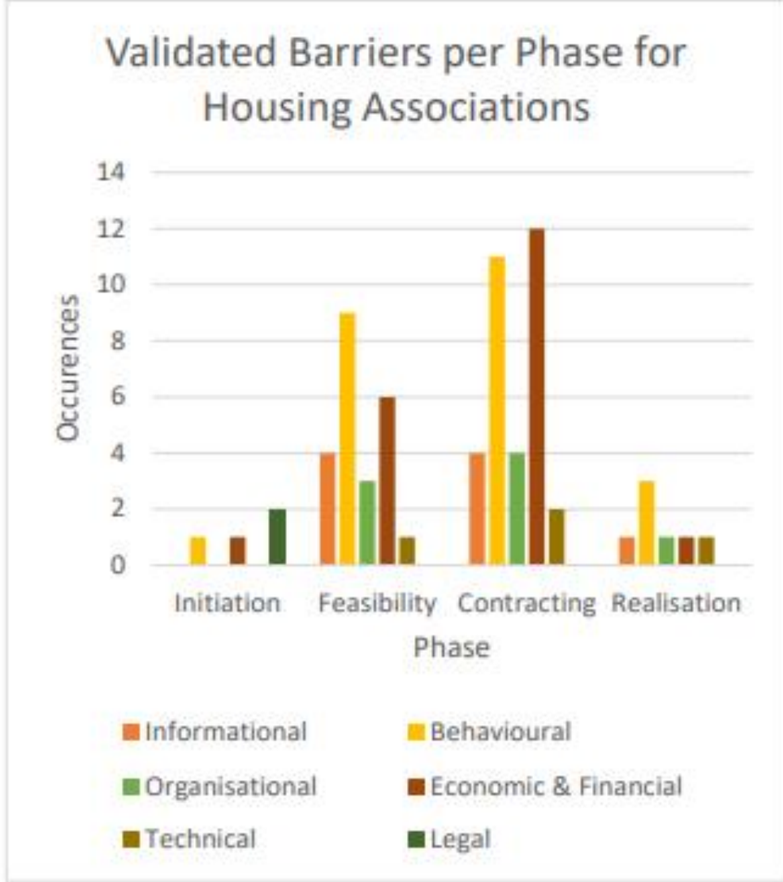
Barriers in Mixed-Use Neighbourhoods

Categorisation	Barrier	Degree	Totals
Informational	Lack of expertise	1	2
	Lack of information	1	
Behavioural	Willingness to connect	1	2
	Cooperation	1	
Organisational	Fragmented value chain	1	3
	Mismanagement	1	
	Iterative process & time	1	
Economic & Financial	Connection fees	1	7
	High initial investment and risks	2	
	Reduced long-term revenue	1	
	Tax system	2	
	Unreliable government funding	1	
Technical	Organisation of infrastructure	1	1
Legal	Political-Legislative uncertainty	1	4
	Regulatory uncertainty	3	

Categorisation	Barrier	Deg.	Totals
Informational	Lack of information	60	189
	Lack of expertise	40	
	Lack of experience in DHN	16	
	Lack of transparency and trust	63	
	Lack of experience with energy cooperatives	10	
Behavioural	Lack of awareness	47	257
	Perceived value of energy	12	
	Inertia	16	
	Ignorance	12	
	Social acceptance	6	
	Resistance to change	15	
	Negative perceptions of the energy transition	4	
	Lack of participation and cooperation	63	
	Willingness to connect	26	
	Interorganisational resistance	32	
	Individualism for collectivity	24	
Organisational	Monopolistic position of DHN operator	10	224
	Fragmented value chain	31	
	Unfavourable business case	8	
	Resource scarcity	10	
	Mismanagement	18	
	Difficulty in decision-making	25	
	Stakeholder conflicts	30	
	Lack of well-defined direction	43	
	Chicken & Egg scenario	9	
	Long project duration & changing actors	10	
	Iterative process & time	30	
Economic & Financial	Profitability	4	149
	Tax system	2	
	Market distortions	3	
	Market behaviour	3	
	Long payback times	3	
	Reduced long-term revenue for DHN operators	2	
	Low ROI	2	
	District heating prices uncertainty	18	
	High initial investment and risks	40	
	Connection fees	3	
	Cost efficiency vs flexible network design	7	
	Expensive transition costs	15	
	High capital costs	7	
	Sunk costs	2	
	High construction costs	1	
	Significant renovation costs for existing houses	6	
	High process costs	7	
	Ensuring affordability for all	7	
	Unreliable funding	17	
Technical	Perceived risks and uncertainties from immature technology	6	46
	Future demand uncertainty	25	
	Energy security	1	
	Complex construction in existing building stock	1	
	Complex energy systems	5	
	Organisation of infrastructure	8	
Legal	Regulatory risk and uncertainty	23	94
	Political-legislative uncertainty	71	

Barriers in Context





Generic Collective Decision-Making Views

Regional Government

- Prioritizing collective choices over individual interests
- Requires cooperation, open-mindedness, and ‘greater-good’ view
- Multi-municipal collaboration

Municipality

- 58% positive, 42% negative
- Balancing involvement is crucial
- E-U involved early, then continuous communication
- Full ownership of system

Energy Company

- 86% positive
- Collaboration between E-U, M, and HA required
- Energy companies must engage with E-U
- Optimal group size and involvement timing is critical

Generic Collective Decision-Making Views

Housing Association

- 75% positive
- Transparency and early collaboration are crucial
- Inclusivity = voluntary engagement
- True representation and meaningful involvement is a challenge

Consultancy Bureau

- Transparency & complete information
- Tension between individualism and collectivism
- Designated lead is needed on challenging topics
- Caution for big groups

Energy Cooperative

- CDM, linked to collective ownership, can democratize energy infrastructure
- Clarity needed on legal responsibility & DM power
- Shared purpose transcends personal gain

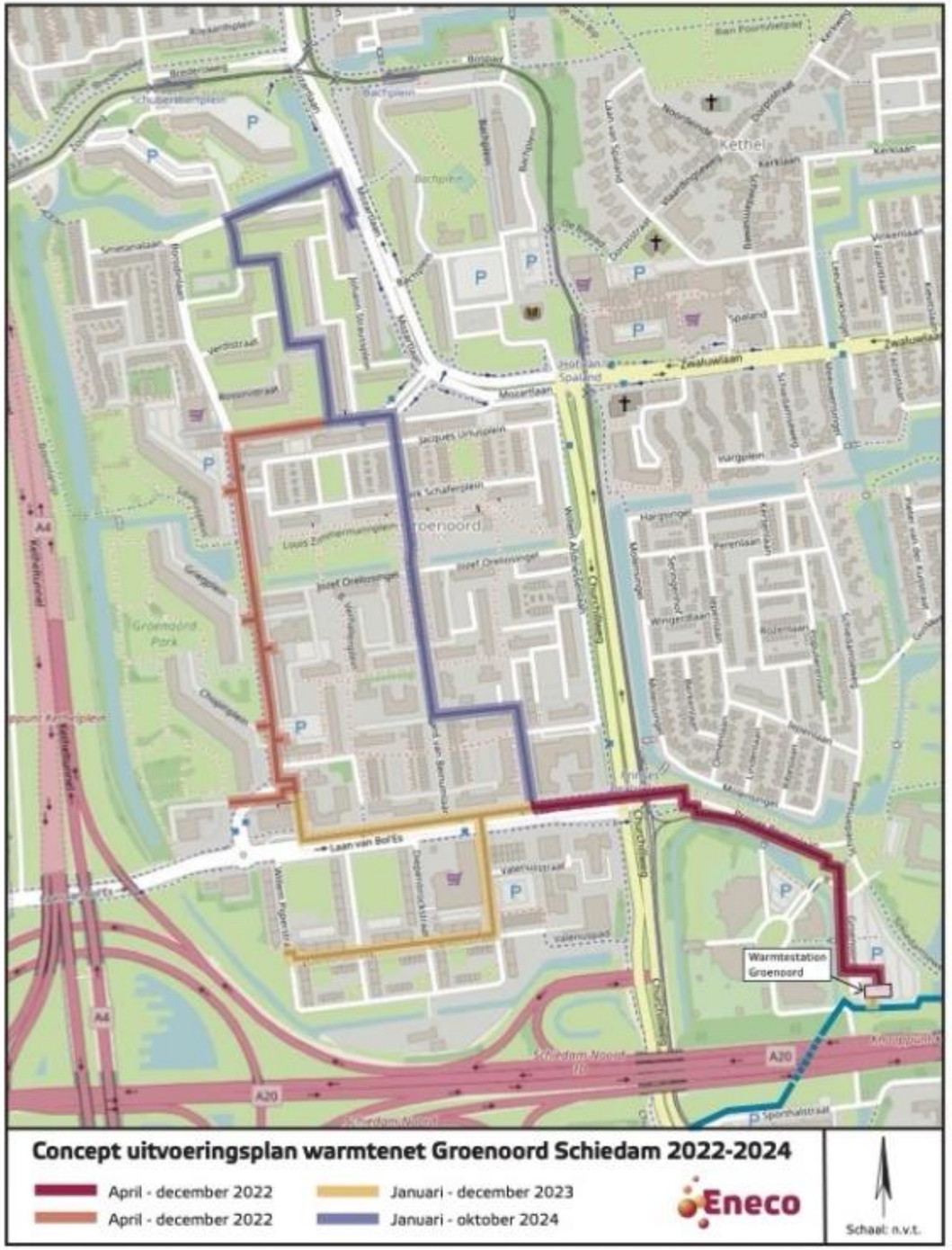
Case Study: Groenoord

Heat Grid

- Goal: connect Groenoord to Eneco’s existing heat transportation pipeline (Leiding over Noord)
- Source: residual heat from biomass & waste incineration by waste management company AVR.
- Timeline: between 2022 and 2024.

Mixed-Use in Groenoord

- 4 schools
- various leisure facilities (sports complex, bowling alley...)
- 2 shopping centres
- some medical practices
- 2500 social housing homes owned by the housing association Woonplus
- 2500 privately owned homes that are part of the homeowners association (VvE)



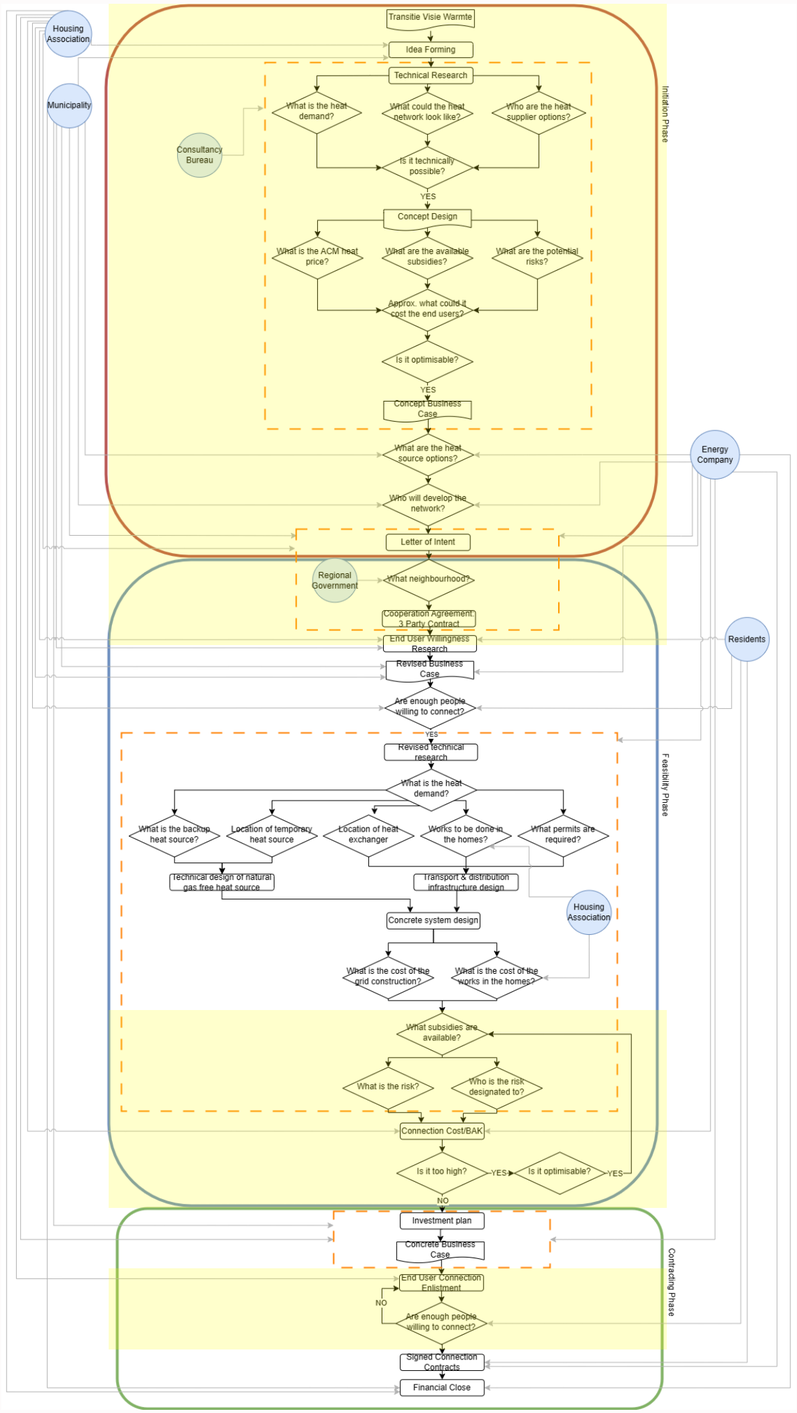
Case Study: Groenoord

Barriers

1. Lack of transparency and trust in the feasibility & contracting phases
2. Lack of participation and cooperation in the contracting phase
3. Political-legislative uncertainty in the initiation & feasibility phase

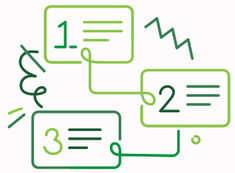
Decision-Making Process

Due to the pre-existing Eneco heat transportation pipe in the area, the decision-making process differs from the generic process, specifically in the initial phase.



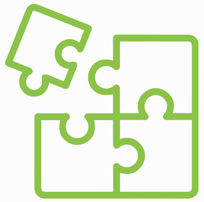
DISCUSSION

Validation, Synthesis, & Interpretation



Validated Decision-Making Process

Barriers in Decision-Making



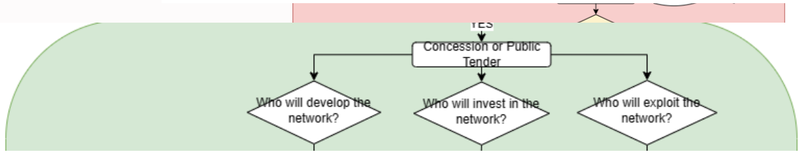
Solutions to Barriers

Collective Decision-Making Approach

Validated Decision-Making Process

Feasibility Phase

ORIGINAL



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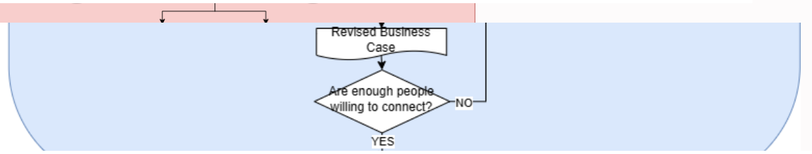

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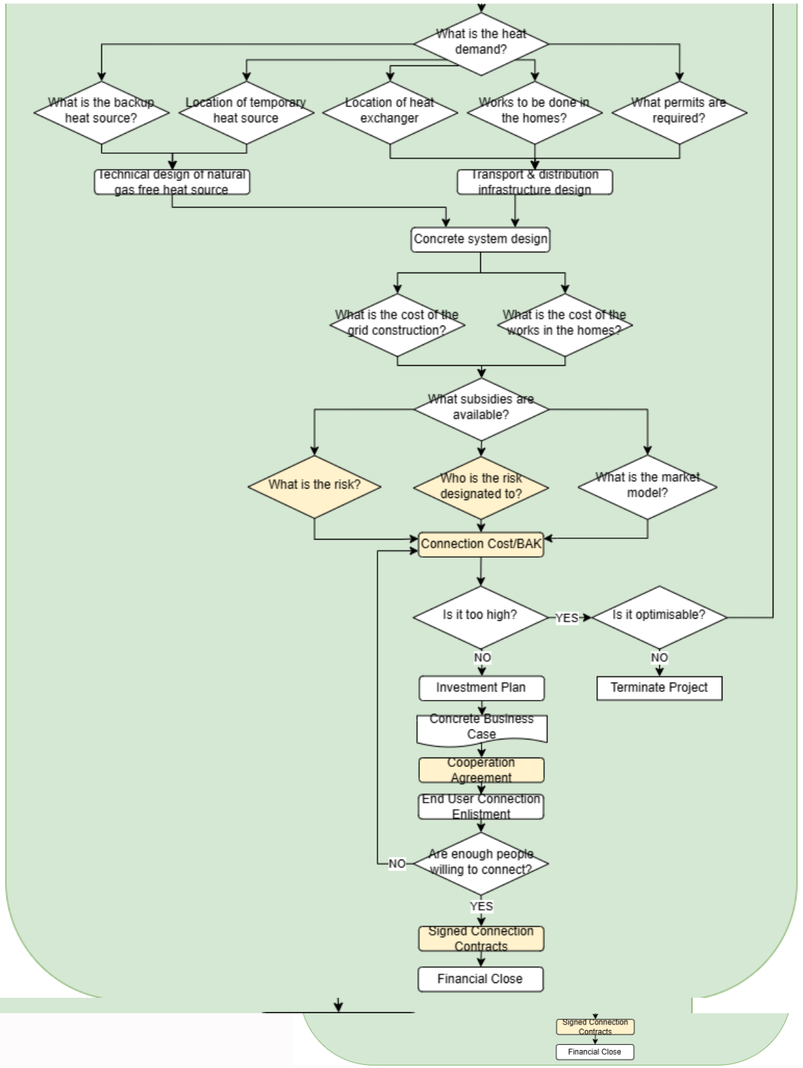

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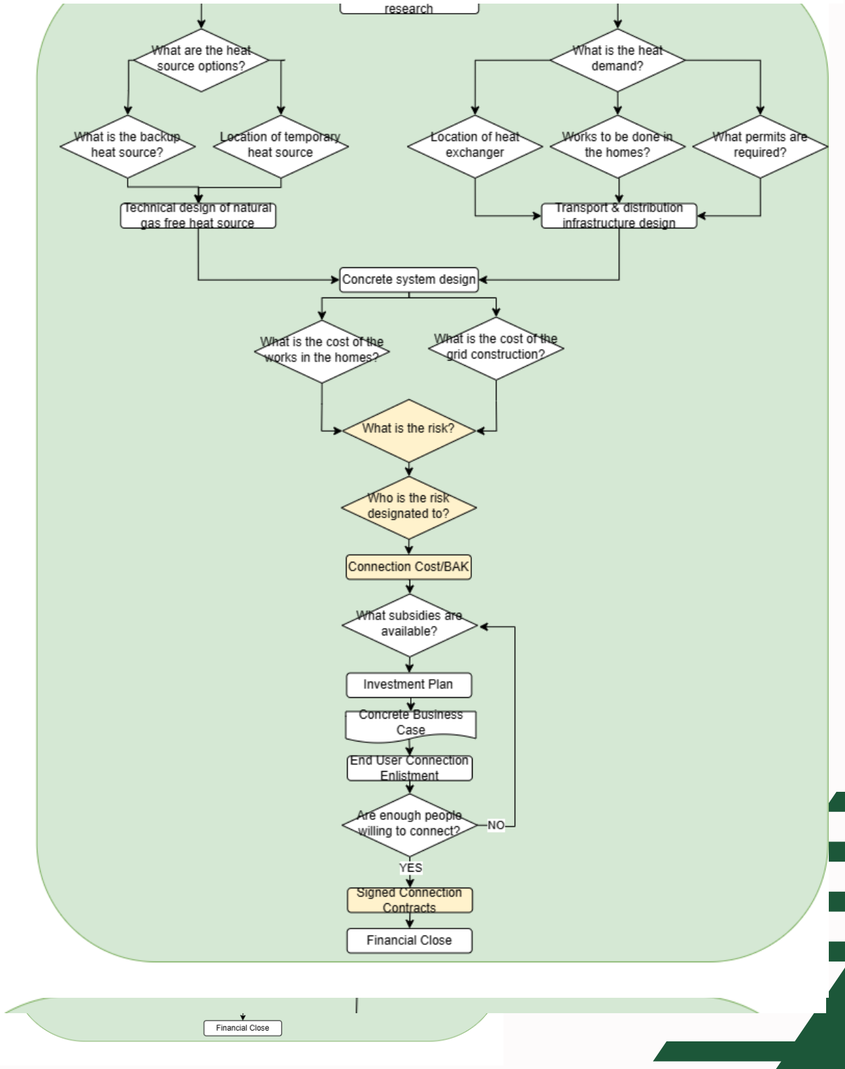
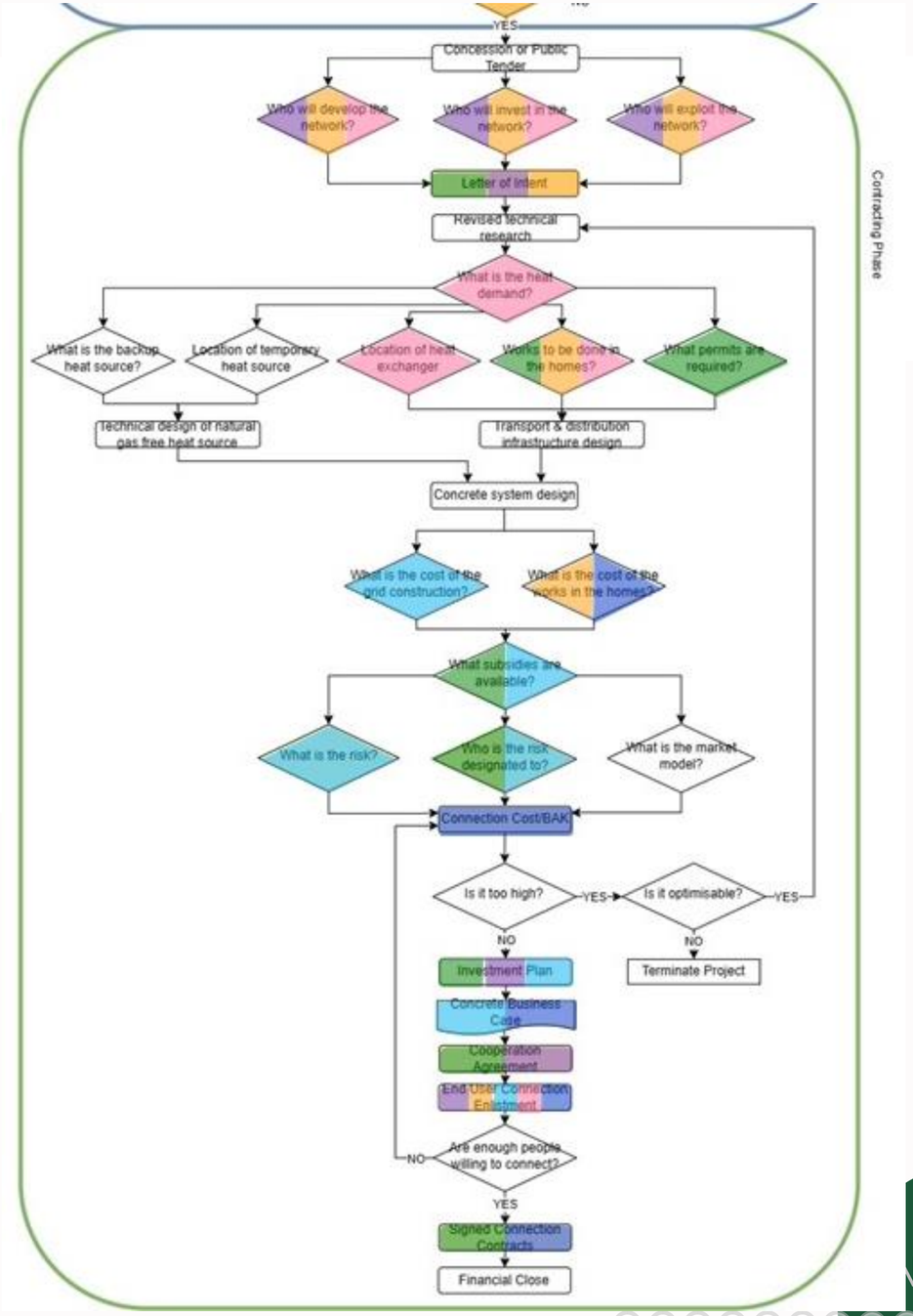


Barriers in Decision-Making Process

Barriers	
Political-legislative uncertainty	High initial investment & risks
Lack of information	Lack of transparency & trust
Lack of participation & cooperation	Lack of awareness
Lack of well-defined direction	Willingness to connect



Solutions

Solutions were generated for the top reoccurring barrier per category and the added barriers found from the interviews.

	Barrier	Category
1	Lack of transparency & trust	Informational
2	Lack of experience with energy cooperatives	
3	Lack of participation & cooperation	Behavioural
4	Willingness to connect	
5	Interorganisational resistance	
6	Individualism for collectivity	
7	Lack of well-defined direction	Organisational
8	Chicken & Egg scenario	
9	Long project duration & changing actors	
10	Iterative process & time	
11	High initial investment & risks	Economic & Financial
12	High process costs	
13	Affordability for all	
14	Unreliable funding	
15	Future demand uncertainty	Technical
16	Organisation of infrastructure	
17	Political-legislative uncertainty	Legal


B. Individualism for collectivity
7
I. Lack of experience with energy cooperatives
11
O. Lack of well-defined direction
14
O. Long project duration & changing actors
8
I. Lack of transparency & trust
17
B. Lack of participation & cooperation
19
O. Iterative process & time
11
B. Interorganisational resistance
17
B. Willingness to connect
11
E&F. High process costs
7
O. Chicken & Egg scenario
11
L. Political-legislative uncertainty
6
E&F. High initial investment & risks
13
E&F. Unreliable funding
3
T. Organisation of infrastructure
5
T. Future demand uncertainty
8
E&F. Affordability for all
4
Engage end-users through goal-setting, feedback, etc.
6
Invest in team alignment
6
Invest in community building
5
Scope frozen
3
Build partnerships with community organisations
5
Contractual & relational governance
4
Keep team motivated
3
Develop detailed & representative roadmap
5
Data-driven decision-making
5
Encourage stakeholder feedback
5
Alliance delivery model
6
Involve end-users in initiation, keep informed in feasibility
5
Pilot projects or phases
6
Plan of approach with policy makers & experts
7
Knowledge governance strategy
7
Formal & informal knowledge sharing moments
9
Exhaustive & separated business case
4
Resource procurement & allocation plan
7
Appoint project manager (eg municipality)
6
Simple contracts with long-term planning
8
Risk assessment & contingency plan
11
Price district heating advantages
3
Decouple heat transportation & delivery
6
Monitor split incentives and aim for shared incentives
5
Collaborate with research institutions
6
Political-legislative uncertainty impact assessment
5
Increase government interventions
7
Reorganisation of heat costs for end-users
2
Transition from fixed price model to more flexible
2
Policies to favour scaling up
4
Increase R&D for flexible systems and demand forecasts
3
Improve heat price regulations
4
Improve heat market policies
2

Collective Decision-Making Approach

Phase	Decision or Moment	Barrier Intensive	#	SH Intensive	#	CDM Among Who	Lead
Initiation	WcW law	X	3			NGov, RGov, CB	NGov
	Idea forming	X	2			E-U, HA, M	M
	What neighbourhood?			X	4	RGov, M, HA	M
	What are the heat source options?			X	2	RGov, M, CB	M
Feasibility	What are the available subsidies?	X	2			RGov, M, HA, CB	CB
	What are the potential risks?	X	3			M, HA, CB	CB
	Approximately what could it cost the end-user?	X	2			M, HA, CB	CB
	Are enough people willing to connect?			X	2	M, HA, CB	CB
	Concept business case	X	2			M, HA, CB	CB
	End-user willingness research	X	2	X	3	M, HA, E-U	HA
	Revised business case			X	3	M, HA, CB	CB
Contracting	**Who will develop, invest, exploit the system?**	X	3	X	2	RGov, M, HA	M
	Works to be done in the homes?	X	2	X	2	HA, EC, E-U	HA
	What is the cost of the works in the homes?	X	2	X	2	HA, EC	HA
	What subsidies are available?	X	2			M, HA, EC	M
	Who is the risk designated to?	X	2			M, HA, EC	M
	Letter of intent	X	3	X	3	M, HA, EC, CB	M
	Connection cost/BAK			X	2	M, HA, EC, CB	M
	Investment plan	X	3	X	3	M, HA, EC, CB	M
	Concrete business case	X	2	X	3	M, HA, EC, CB	M
	Cooperation agreement	X	2	X	3	M, HA, EC, CB	M
	End-user connection enlistment	X	4			M, HA, EC, E-U	HA
	Signed connection contracts	X	2	X	2	M, HA, EC, E-U	HA
	Financial close			X	3	M, HA, EC, CB	M

Conclusions

HOW CAN COLLECTIVE DECISION-MAKING BE ORCHESTRATED TO OVERCOME THE BARRIERS OF LOW-CARBON HEATING GRID PROJECTS IN MIXED-USE NEIGHBOURHOODS?

SUB-QUESTIONS

SQ 1

Who are the stakeholder of low-carbon heating grid projects in mixed-use neighbourhoods and what are their attributes?

SQ 2

What is the current decision-making process in place?

- National Government: impacts regulations and financial mechanisms
- Regional Government: contribute technical and regulatory expertise
- Municipality: project initiator, investor, facilitator
- Housing Association: project initiator, manages project impacts on tenants, investor
- Energy Company: investor and decision-maker on grid engineering
- Consultancy Bureau: facilitator, provide support
- Energy Cooperatives: encourage local ownership
- End-User: decision makers on connection to grid

SQ 3

What are the barriers encountered in low-carbon heating grid projects in mixed-use neighbourhoods and when do they occur?

SQ 4

What is the role of the collective in low-carbon heating grid projects in mixed-use neighbourhoods?

Conclusions MRQ

Hexagonal Approach

- lessons learned approach,
- contracts & delivery models standardisation,
- boosting initiation & planning,
- community engagement,
- increased research & development,
- financing & legislation adaptation

CDM Moments & Actors

Barrier and stakeholder intensive moments are critical CDM moments, and who should be involved was outlined.

Conclusion

By considering the proposed solutions, the moments in which collective decision-making is particularly important, and who should be involved in such, collective decision-making can be orchestrated in low-carbon heating grid projects in mixed-use neighbourhoods to overcome the experienced barriers

Limitations & Recommendations

Lack of end-user, VvE, and commercial owner representation

Further research needed on their perspectives to fully understand all views

Inconsistency in interview questions, so different foundations

Larger amount of interviews or reinterviewing could mitigate this

Case: unconventional initiation

Further research needed to evaluate differences in initiation process

Limitations & Recommendations

Case: not all stakeholder groups interviewed

Can be mitigated by a more stringent case study approach. Further research needed on those perspectives.

Results may vary when WcW law is enacted

Was considered during the analysis and discussion, but it is a risk to be noted.

Relevant and complex topic with many areas for further research

Incl. impact of internal governance on multi-party collaboration, solutions for financial barriers, and more.

THANK YOU

Questions?