Towards energy transition in the built environment

The process towards energy efficient implementations
in large urban areas

Graduation Thesis, P4
Urban Development Management lab
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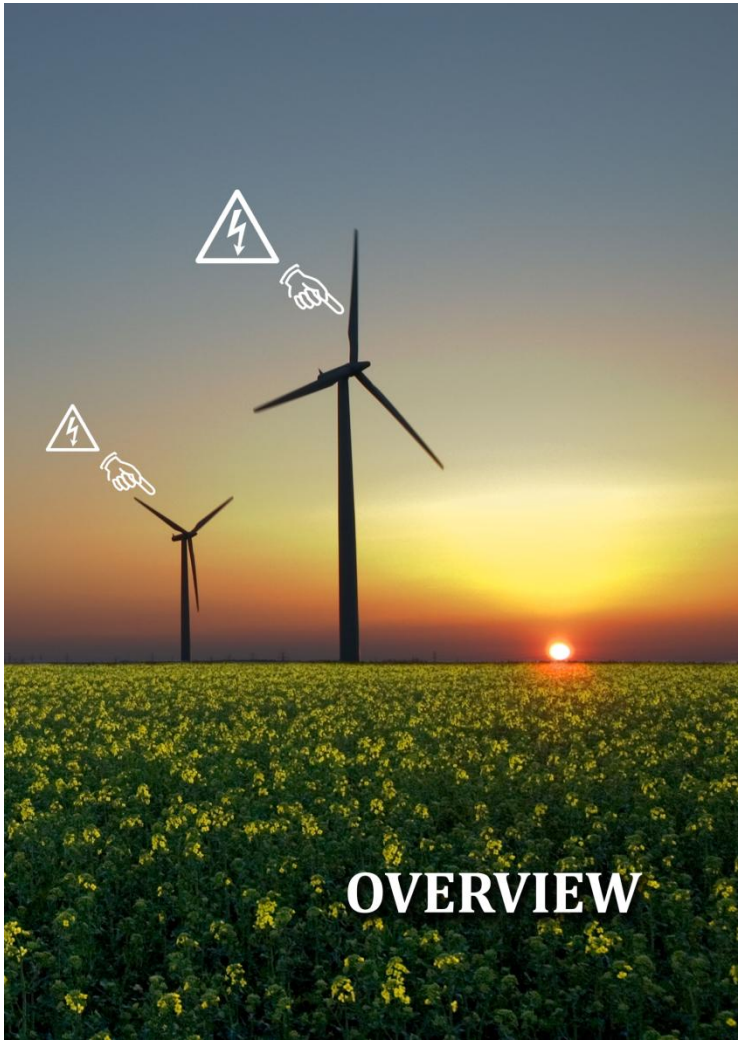


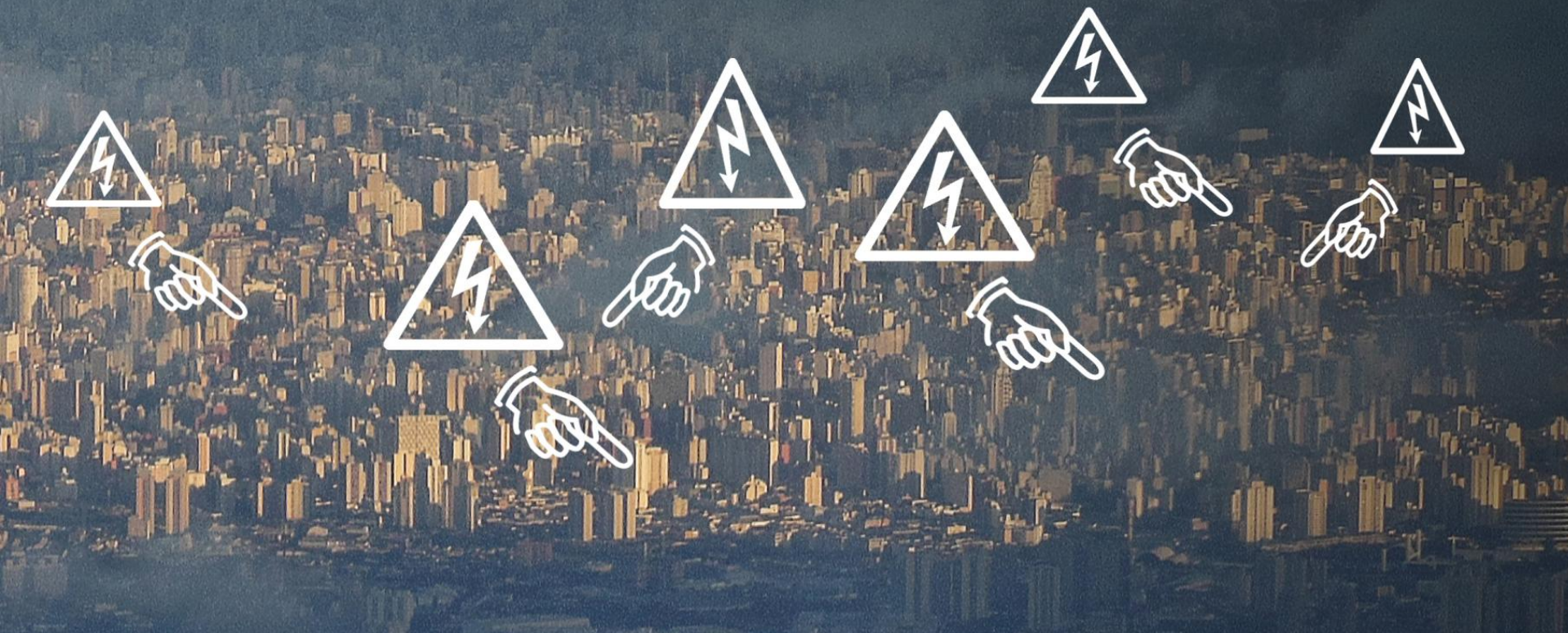
Introduction

- Goal Europe 2020: **20% more renewable energy** than in 1990. Large part of energy is used in the **built environment.**

- Need for: **energy transition,** but on a larger scale than is applied now. Urban areas comprise the largest concentrated source of greenhouse gas emmission.

- **Process** of energy transition of the built environment is complex and has currently many **bottlenecks.**

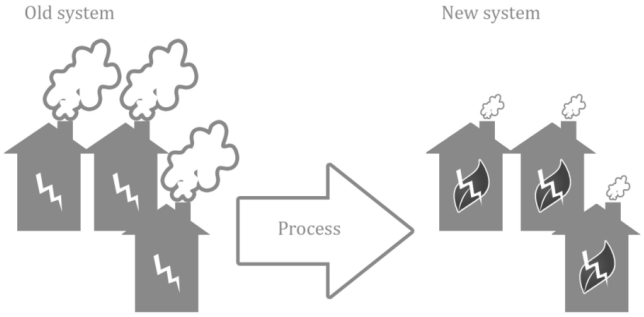
PROBLEM ANALYSIS



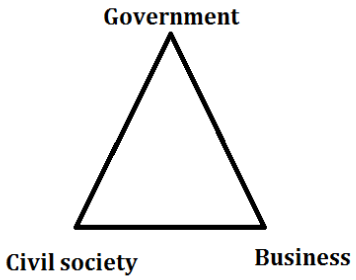
Problem statement

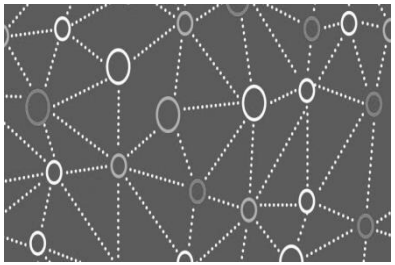
- The amount of **fossil fuel** will **decrease, new resourses** are necessary. But **urban areas** must **adapt** to be able to use the new resources.

- Currently only **little action** is taken, **big steps** are **necessary** to use renewable energy on a larger scale. **How to instigate** energy transition on such a scale is **vague** and **not clear.**



Problem statement





- Energy transition on a larger scale is linked to **cooperation and decision making with multiple actors.** Governments or municipalities (public sector) **cannot individually** steer and control these processes (Koppenjan & Klijn, 2004; p.1)
- Traditional planning tends to be **centralized**, **predictable** and **dominated** by one actor.
- Urban development tends to move more towards a network which is **decentralized**, deals with **uncertainty** and where the **structure is network.**

Problem statement

Two themes from problem statement:

1. **Process** of implementing energy efficient solutions
2. **Actor** involvement

Main research question

- **“How is the process of energy transition, in several European cities, obstructed by its political and institutional context, content, policies and actors, and how can actors influence the process to overcome these bottlenecks?”**

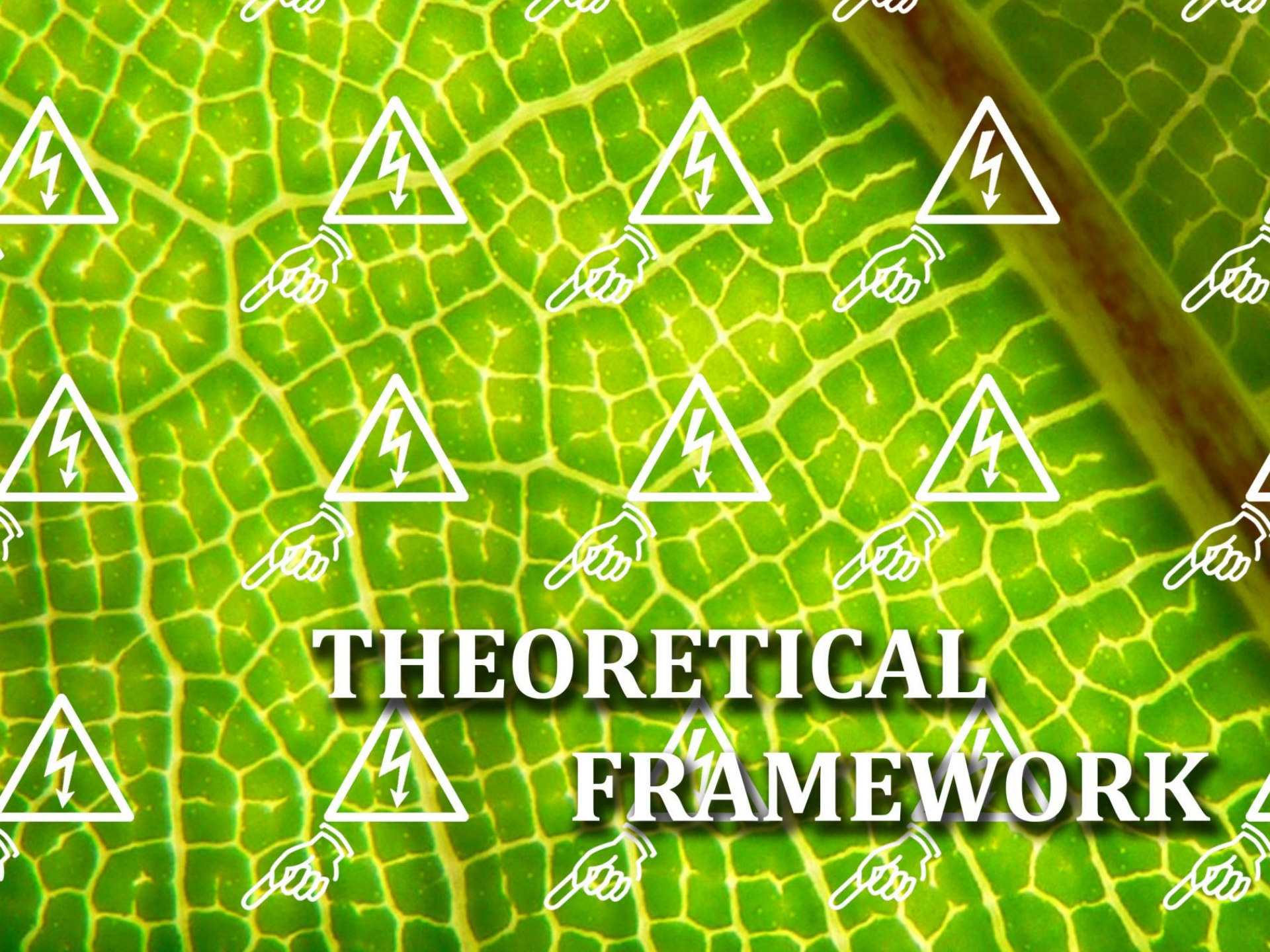
Research subquestions

THEORETICAL

- What is sustainable urban development and how is it related to energy transition?
- How can you analyse the process and the process's bottlenecks of energy transition in the built environment?
- Who are the actors in energy transition in the built environment and how can you analyse their involvement?

PRACTICAL

- What are the characteristics of the process of energy transition in large urban areas in different European cities? Why is energy transition a challenge in large urban areas?
- What are the characteristics of the phases of implementing energy efficient solutions?
- What are the characteristics of the political and institutional context in the process of energy transition?
- How does the political and institutional context contribute to the bottlenecks in the process of energy transition in large urban areas?
- What are the characteristics of the policies in the process of energy transition?
- How do policies contribute to the bottlenecks in the process of energy transition in large urban areas?
- What are the characteristics of the actors in the process of energy transition?
- How can the actors contribute to the bottlenecks in the process of energy transition in large urban areas?


THEORETICAL
FRAMEWORK

Theoretical Framework

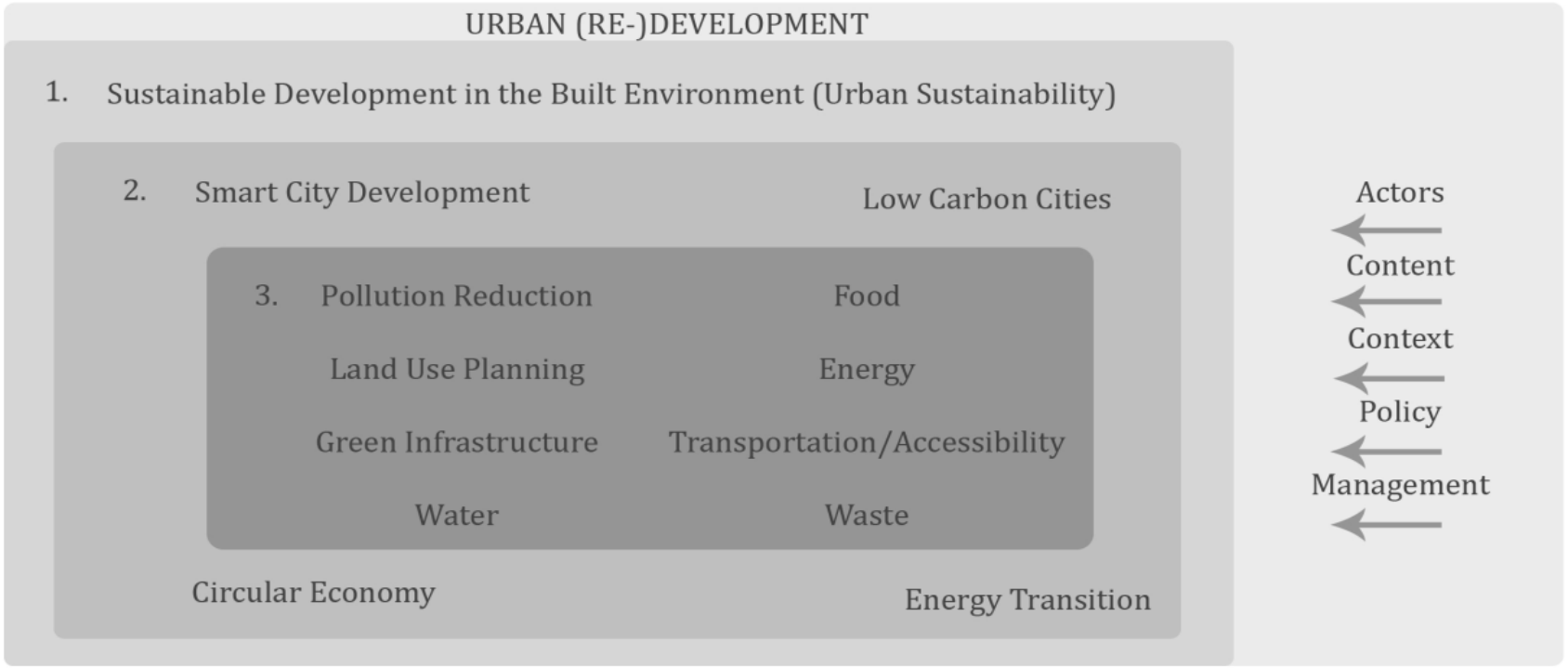


Figure 1 Conceptual model explaining the relation between the relations of urban (re-) development sustainable development in the built environment and eventually energy transition (Stern, 2011; Chourabi et. al., 2012; Zhilin et. al., 2009; Franzen et. al., 2011).

Theoretical Framework

Sustainable Urban Development	Characteristics
Energy Transition	• Transition from fossil fuel towards renewable energy
Smart City Development	• Uses digital technologies to enhance performance and wellbeing, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens.
Low Carbon City	• Integrates both elements of low-carbon economy and low-carbon society.
Circular Economy	• Industrial economy that is, by design or intention, restorative.

Shared goal: creating a sustainable environment

Theoretical Framework; process

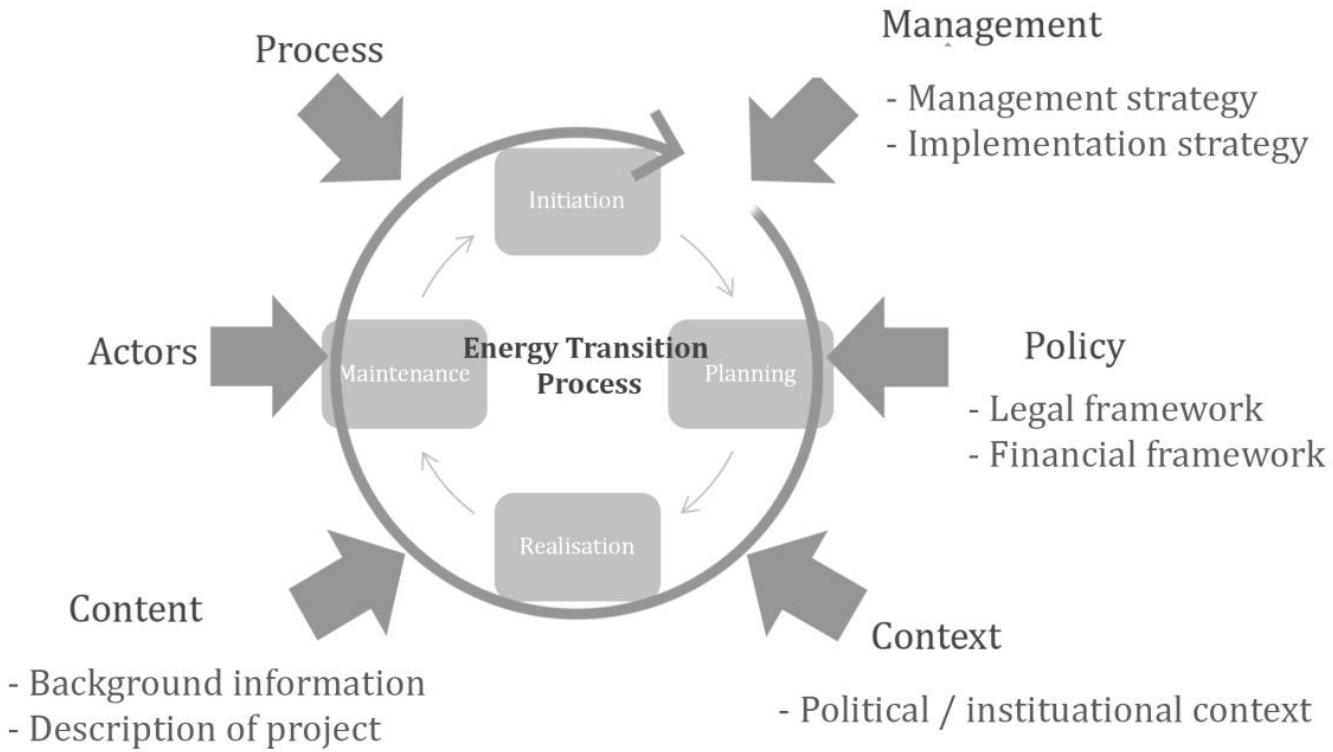


Figure 2 Relation between the energy transition process and its influential aspects identified from literature (own ill.)

Theoretical Framework; actor

Step	Description
Actors in relation to the phases	Identify all actors that will be or were active in the process
Actor information	An indication of each actor's problem perception, individual goals and available resources
General interests and norms	Identify the general interest and norm of concerning actors in each phase.
Create network structure	Make a schematic overview of the relation of each actor by their common interest
Create a power interest grid	Place actors in the grid by their interest and power and identify their position (subject, players, context setters or crowd)
Create support and opposition grid	Place actors in the grid by their attitude towards the problem; support or oppose, compared to their power.
Identify actor's dependency	Place actors in the grid by their replace ability and importance.

Table 1 Step by step plan to analyse actors in a process (Koppenjan & Klijn, 2004; de Bruijn & ten Heuvelhof, 2009; Daamen, 2010)

Theoretical Framework; actor

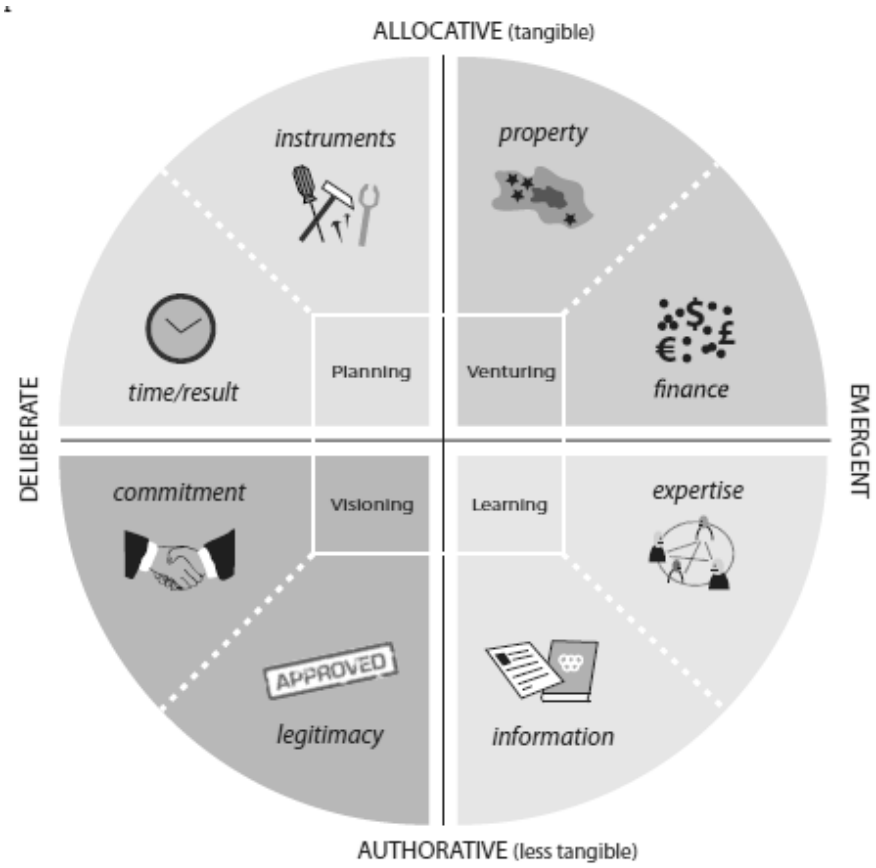


Figure 2 Categorisation in processes of strategy formation (Daamen, 2010)


RESEARCH METHODS

Main research question

- **“How is the process of energy transition, in several European cities, obstructed by its political and institutional context, content, policies and actors, and how can actors influence the process to overcome these bottlenecks?”**

Conceptual Model

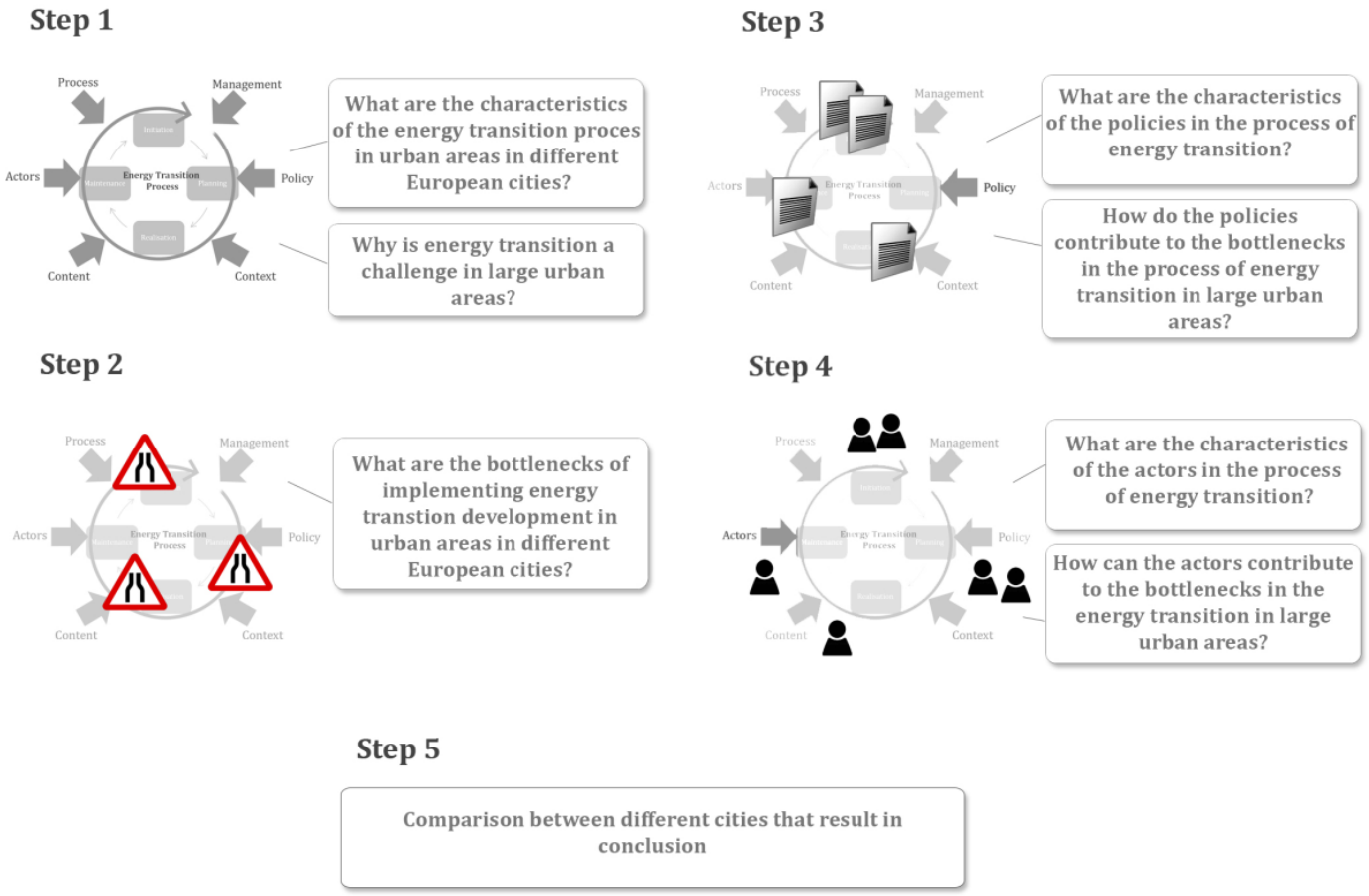


Figure 3 Conceptual model, own illustration.

Qualitative research

- Exploration of a phenomenon and a description of the process
- Literature review
- Explorative chats with some experts
- Thorough analysis documents from “TRANSFORM” on implementation and actors
- With qualitative research theories are mostly generated and not tested (Bryman, 2012).

CASES

Copenhagen; background

- Nordhavn
- Formal industrial port
- 2,5 km2

Copenhagen; description project

- Development of **new** area with 40,000 dwellings and 40,000 workplaces.
- Incorporation of the Copenhagen Climate Plan, **CHP2025**
- **Electricity** as main source for heating
- **Higher standard** for new built buildings

Copenhagen; context

- Above municipality “Greater Copenhagen” **authority**
- Municipality of Copenhagen has the **formal responsibility** for energy planning based on project-by-project proposals elaborated by **HOFOR.**
- The municipality could **force** the utility company to offer any kind of heat supply.

Copenhagen; policies, frameworks

- 95% of infrastructure is **owned** by city of Copenhagen
- More **bugdet** for social housing and **investment** on sustainable housing.
- **National Heat Supply Act**
- **National Building Regulation**

Copenhagen; Management

- Master plan is set up by **higher** governmental bodies.

- Municipality of Copenhagen tries to get **other actors aligned** with the higher plan of sustainable development by **early dialogues** with the actors and arranging workshops.

Copenhagen; Actors

- **Voluntary Energy Partnership**, which found that early discussion on vision and understanding of each partner's strategy, is positive.
- Developers have **no incentive** on achieving a high score in the DGNG certification scheme.
- There is **no clear business case** for higher levels of sustainable buildings.

Copenhagen; Actors

Actor	Power (+, +/-, -)	Interest (+, +/-, -)	Resources (+, +/-, -)	Information (+, +/-, -)	Interdependence (+, +/-, -)
City of Copenhagen	+/-	+	-	+	+
CCPD (Copenhagen City & Port Development)	+	+	+/-	+/-	+
HOFOR, Greater Utility of Copenhagen	+/-	+	+	+/-	+
DONG	+/-	+	+	+/-	+
Developers	+	-	+	+/-	-
Citizen	+/-	+/-	+/-	-	-

Grand Lyon; background

- Part-Dieu
- Main business district
- 1,35 km2

Grand Lyon; description project

- Redevelopment of **existing** area, increase of dwellings from 3,500 to 5,000.
- **Double net floor area**, but maintain same overall **energy consumption.**
- **Economically and socially attractive** area.

Grand Lyon; context

- Master plan: urban project **Part-Dieu 2030.**
- **Large role** of the development department of the municipality of Grand Lyon (Greater Lyon).
- **Parliament** is still discussing **law on energy transition**, but does not influence project.

Grand Lyon; policies, frameworks

- **MAPAM law** aims to clarify the competences of local authorities, by particularly **reorganising the legal system** of the most integrated French inter-municipal communities, the metropolises.
- MAPAM Law **does not** effect project yet.
- **Eco loan** provides financing for energy saving initiatives; local level.

Grand Lyon; Management

- Intense **priority** on gathering and analysing **data** for decision making.
- **Development department** of Greater Lyon is responsible for the **management** for the ambition of the project .
- But! **Other department** is responsible for **energy efficiency** in project.
- More **project management** approach.

Grand Lyon; Actors

- Change of **position** municipality; where it must **collaborate** with **non-traditional** actors.
- **Difficulty** on reaching **investors** to persuade them that substantial intervention was worthwhile.

Grand Lyon; Actors

Actor	Power (+, +/-, -)	Interest (+, +/-, -)	Resources (+, +/-, -)	Information (+, +/-, -)	Interdependence (+, +/-, -)
Part-Dieu Commission	+	+	+/-	-	+
The Energy Commission	+/-	+/-	+	+/-	+/-
ERDF	+	+	+	-	+
The City of Lyon	+/-	+	+/-	-	+
Heating and cooling network operator	+	+/-	+	-	-
Real Estate Developers	+/-	+/-	+	-	-
Owners/Occupiers of the office buildings Part-Dieu (Club Part-Dieu)	+	+/-	+	-	-

Amsterdam; background

- Zuid-Oost (South East)
- Mixed area of housing, offices, retail and industry
- 22 km2

Amsterdam; description project

- **No plan** to (re)develop area, but municipality wants to set up a **project organisation** that will result in a public private partnership.

- **Creating an energy atlas** as basis for decisions and definition of goals of the implementation.

Amsterdam; context

- **Ambition** municipaltiy come from **EU 202020** goals.
- **Driving force** from participation EC funded program.
- **Less local formal power**.

Amsterdam; policies, frameworks

- Possibility of **funding** through **investment funds** of 60-100 million for which **sustainable projects** can apple and compete.
- **Subsidy** on retrofitting social housing (local level).
- **Subsidy** for sustainable energy (national level).

Amsterdam; Management

- More focus on **process management**, instead of project management.
- **Very open discussion** with stakeholders on the future outcome.
- **Developing data on energy use**, which can be used in decision making.

Amsterdam; Actors

- During a **dinner** ("Captians Dinner") the main actors in the area **committed** themselves to continue together to **create a more sustainable area.**
- **Small part** of addressed building owners and companies continued in the dialogue and collaboration.
- Who will take the **leadership** after setting up partnership is **unclear.**
- **No clear business case**.

Grand Lyon; Actors

Actor	Power (+, +/-, -)	Interest (+, +/-, -)	Resources (+, +/-, -)	Information (+, +/-, -)	Interdependence (+, +/-, -)
The Amsterdam Energy and Climate Office	+/-	+	-	+	+
Amsterdam ArenA	+	+/-	+	-	+/-
AMC Hospital	+	+/-	+	-	+/-
Other building owners (ING, ABN AMRO, ROC, IKEA, Equinix)	+	-	+	-	+/-
Nuon	+	+/-	+	+	+/-
Real Estate Developer	+/-	+/-	+	+/-	-


SYNTHESIS

Political and institutional context

- **Clustered governmental parties**; high power and driving force
- **Large gap** between central and local; less action on local level
- **Driving force** from higher governmental body is necessary
- Actors **act upon stated laws**; not less, not more
- **Rigid** institutional context
- Energy transition is **not a common goal** of all politicians nor all governments in Europe

Policies, legal and financial framework

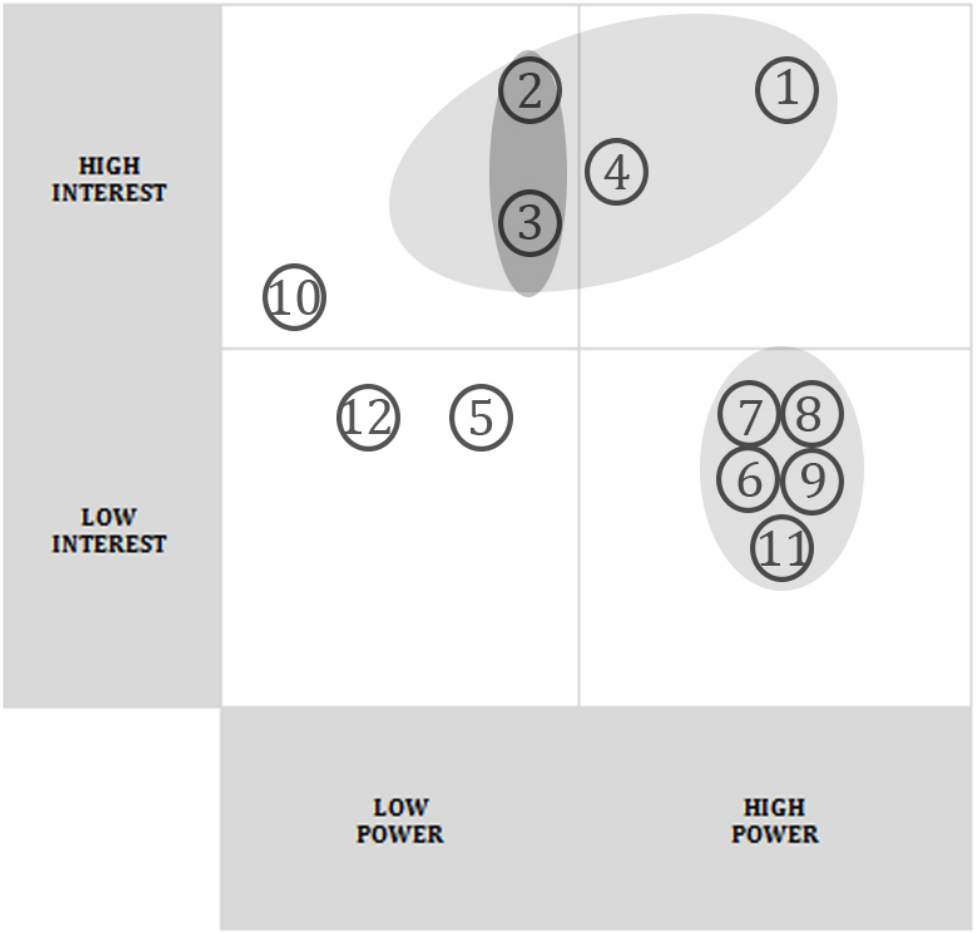
- **Not many policies exist** on implementing energy efficient solutions
- **Lack of laws** on implementing energy efficient solutions
- **No sound business case**
- Actors tend not to think in a **different financial framework** and prefer short term investments with quick returns

Identified actors

Public sector	General description and role in process
1. Higher governmental bodies	Central government, city ministry, investor, policy maker and initiator
2. Municipalities	Executer, coordinator, designer, (sometimes) investor
3. Departments of municipalities	(Sometimes) executer or coordinator, informer
4.Governmental owned utility companies	Energy provider
5. Housing associations	Social housing provider
Private sector	**General description and role in process**
6. Investors	Financer
7. Developers	Builder, developer
8. Network owners	Owner network, investor
9. Utility companies	Energy provider
10. Researchers	Informer, researcher, innovator
11. Building owners	Owner building, investor
Civic sector	**General description and role in process**
12. Civilians	Inhabitant, renter or owner building

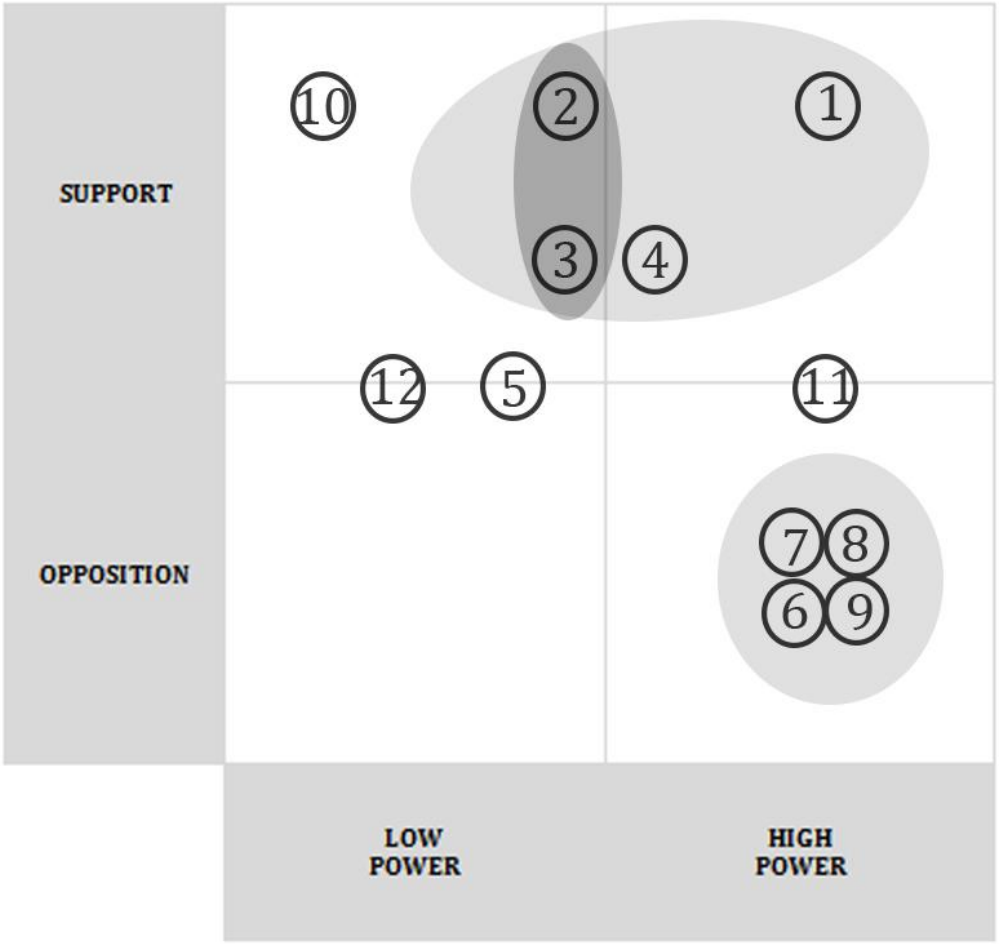
Power interest grid

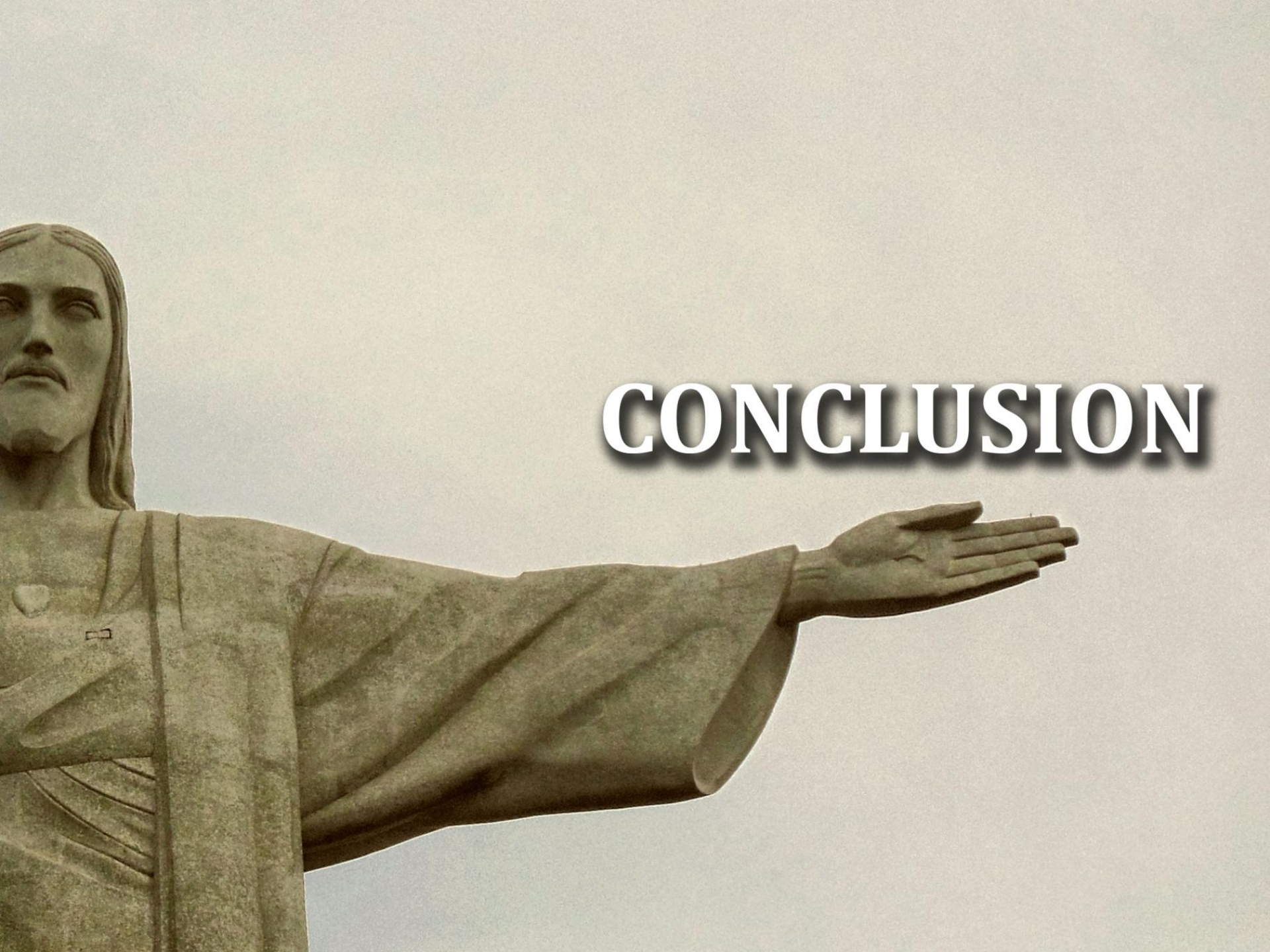
Table 3 Power and interest grid created from information of the case study



Support and opposition grid

Table 4 Support and opposition grid created from information of the case study




CONCLUSION

Phases

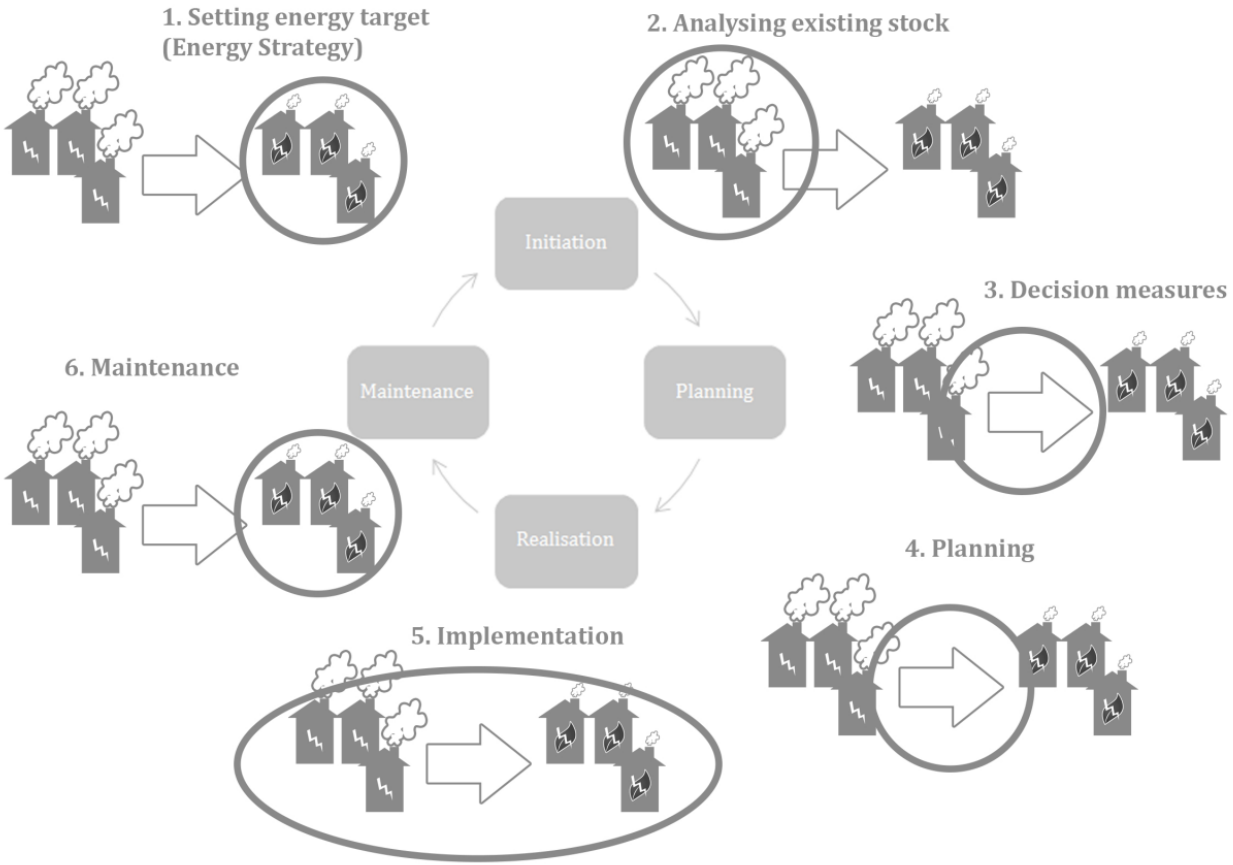


Figure 4 Phases in transforming existing stock towards usage of renewable energy and energy efficiency (own ill.)

Bottlenecks

- Municipalities or higher governmental bodies that coordinate implementing energy efficient solutions in urban (re-)development **do not know well** how to act differently from their traditional, high hierarchal position.
- There is a **lack of aligning the objectives** of other, important, actors with the (re-)development of urban areas, considering implementing energy efficient solutions.
- **Higher governmental bodies need to acknowledge** the importance of implementing energy efficient solutions and instigate the movement.
- **The institutional context of municipalities** and governmental bodies is **rigid** and not flexible to the inconstant environment of energy efficient solutions.
- The political and institutional context is not designed yet to **always have implementing energy efficient solutions on the agenda**.

Bottlenecks

- **Not many, or unclear, policies exist** on implementing energy efficient solutions, because it is a quite novel movement.
- Without laws no or little action is taken by actors: **implementing energy solutions is not a standard objective of private actors.**
- **The business case** of implementing energy efficient solutions **is not sound.**
- Most actors tend to think traditionally and in the **old financial framework** with short investments and quick returns.

Actors; private actors

- **Change the position of the private actor** cluster, where they should become more interested in the problem.
  This could be done by changing or **broadening the problem statement** or **new types or ways of financing** could be thought of and have a more **collaborative approach**.

- This means that the manager or coordinator of the process should find **a way of aligning the private parties**.
  This could mean **trade-offs** or giving those actors something in another problem, which they are dealing with. On the other hand there is the solution of **not collaborating with the actors.**

Actors; private actors

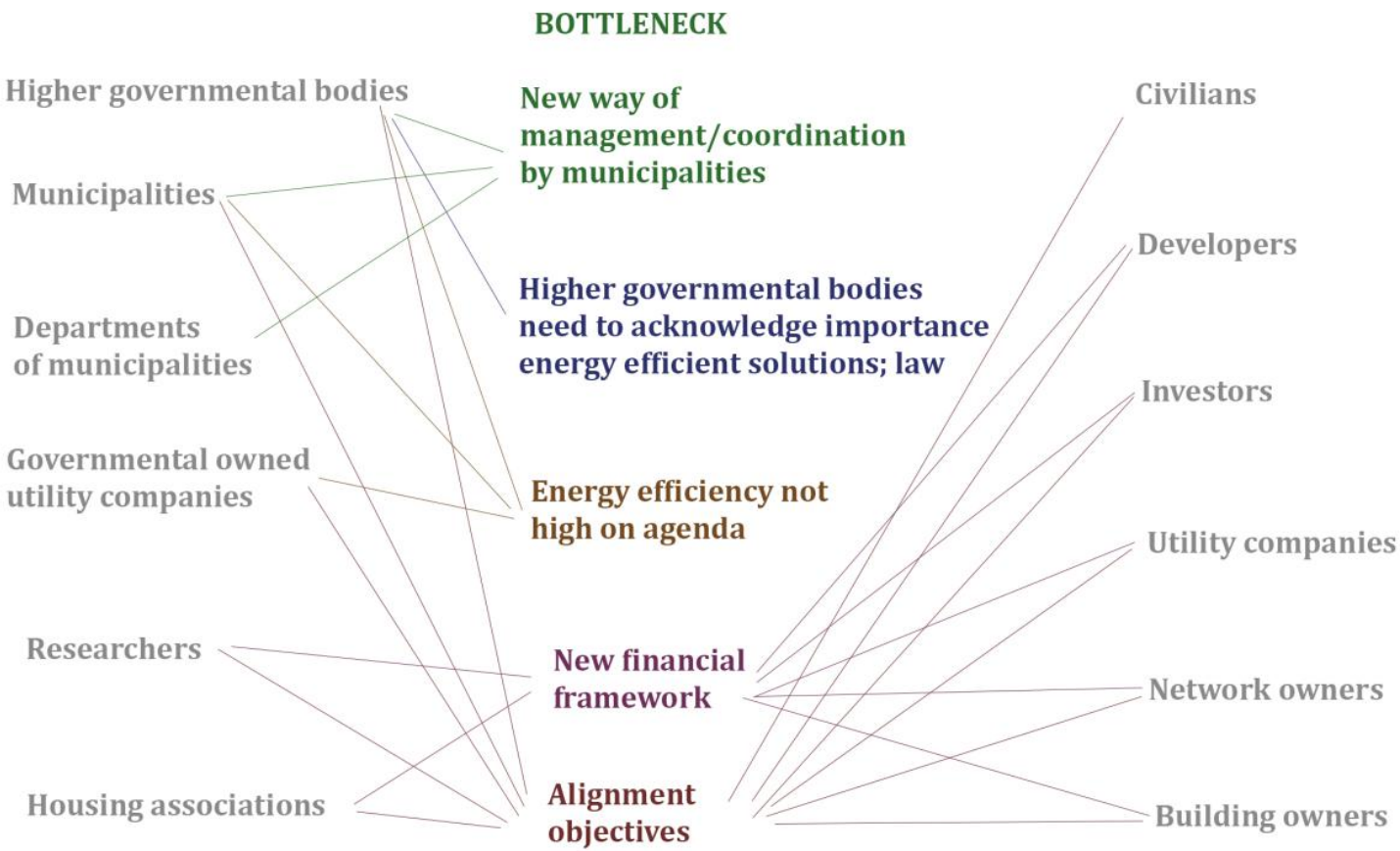


Figure 5 Network diagram in relation to bottlenecks (own ill.)

Actors; solutions

- New way of management/coordination by municipalities
- Higher governmental bodies need to acknowledge importance energy solutions; laws
- Energy efficiency not high on agenda
- New financial framework
- Align objectives

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