



Practice oriented research into energy management
and use in non-residential buildings

The reliability gap framework

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Introduction



Global energy use

Buildings responsible for 40%

Building sector

High responsibility + large potential

Operational phase

80% of energy use

Energy reliability gap

Root causes

Technology oriented

Energy management and use

Deeper understanding needed in operational phase

Bringing together different perspectives and research disciplines

MINDER Project

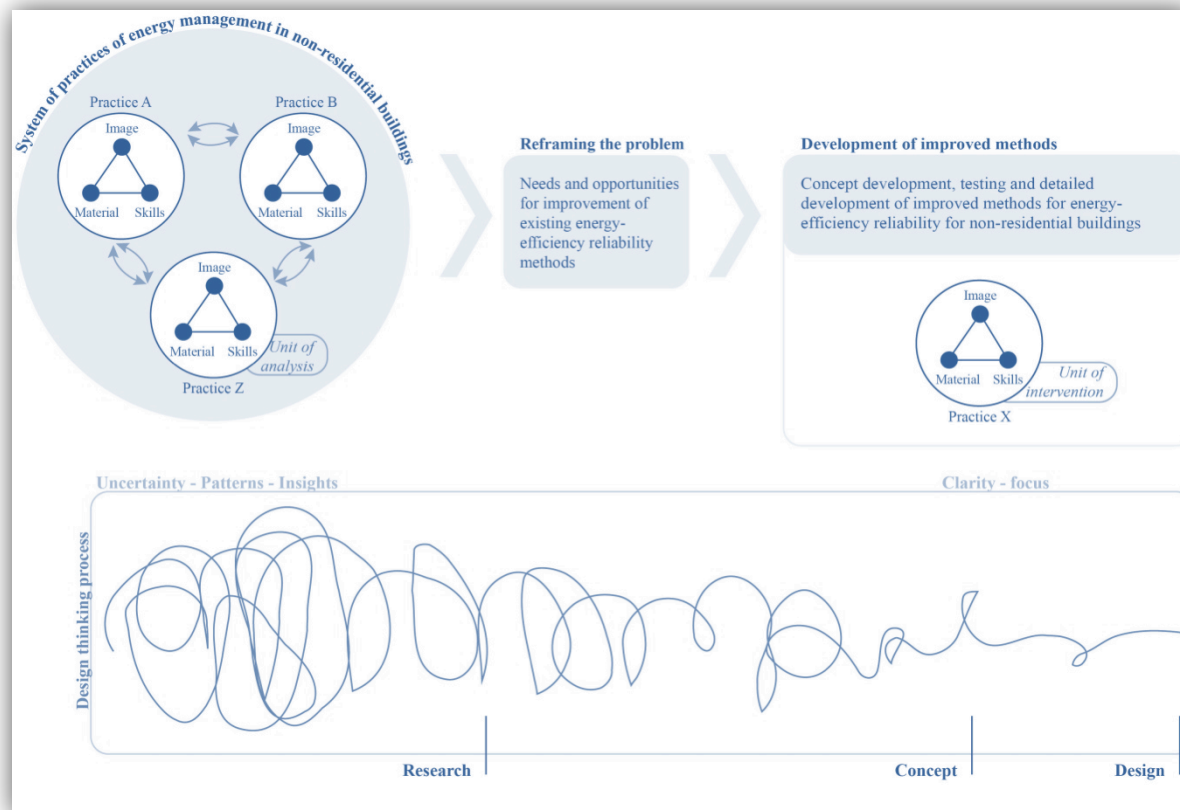


Aims

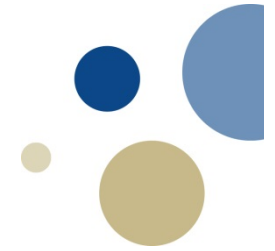
Reduce the energy reliability gap in non-residential buildings in Norway

- a) Mapping the implementation of concepts, methods and measures promising to help reduce the energy reliability gap
- b) Analyse potential for improvement
- c) Develop improved and extended methods that go beyond the state-of-the-art

MINDER Project stages



**Energy reliability
framework**



Facility management – social practice theory – design thinking

3 PERSPECTIVES

Facility management



‘A profession that encompasses multiple disciplines to ensure the **functionality of the built environment** by integrating people, places, processes and technology’

(Patanapiradej, 2006; Shah, 2007; Yao, 2013)

‘...contribute to the delivery of **strategic and operational objectives** of a building and of the organisation that uses it’

(Barret and Badry, 2003; Shah, 2007)

Facility management



Energy management

To enable the environment to **identify opportunities** for and to **realise energy savings** during operation!

Need for better insights

- The use and implementation of existing multi-methods
- Collaboration between different actors, in different phases, on different levels
- Occupancy and occupant behaviour

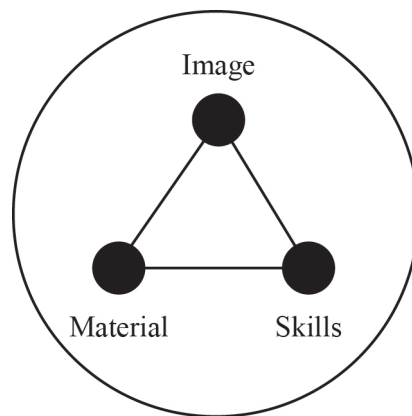
Social practice theory



‘A ‘practice’ is a **routinized type of behaviour** which consists of **several elements, interconnected** to one other:

forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.’

(Reckwitz, 2002, p. 249)



(Pantzar and Shove, 2010)



Example: light in a building
(Kjølbo Powerhouse)

Social practice theory



What actually goes on as energy is used and managed in a building?

What is energy used for?

What **activities** take place that impact energy use and management?

Which **people** have an impact?

Which **methods and tools** are being used?

Which **competences and skills** are used or needed?

What is the **motivation** of people in the practices in which energy is managed and used?

How does energy use and management **change over time**?

Practice = unit of analysis
→ unit of intervention

Design thinking



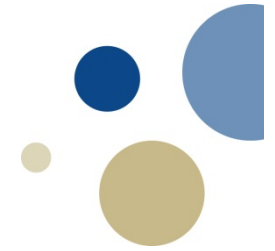
Tools and methods for facilitating **generative** processes,
with and for **different actors**

Future oriented

User involvement

Design process

Visualisation and prototyping
to **create meaning**

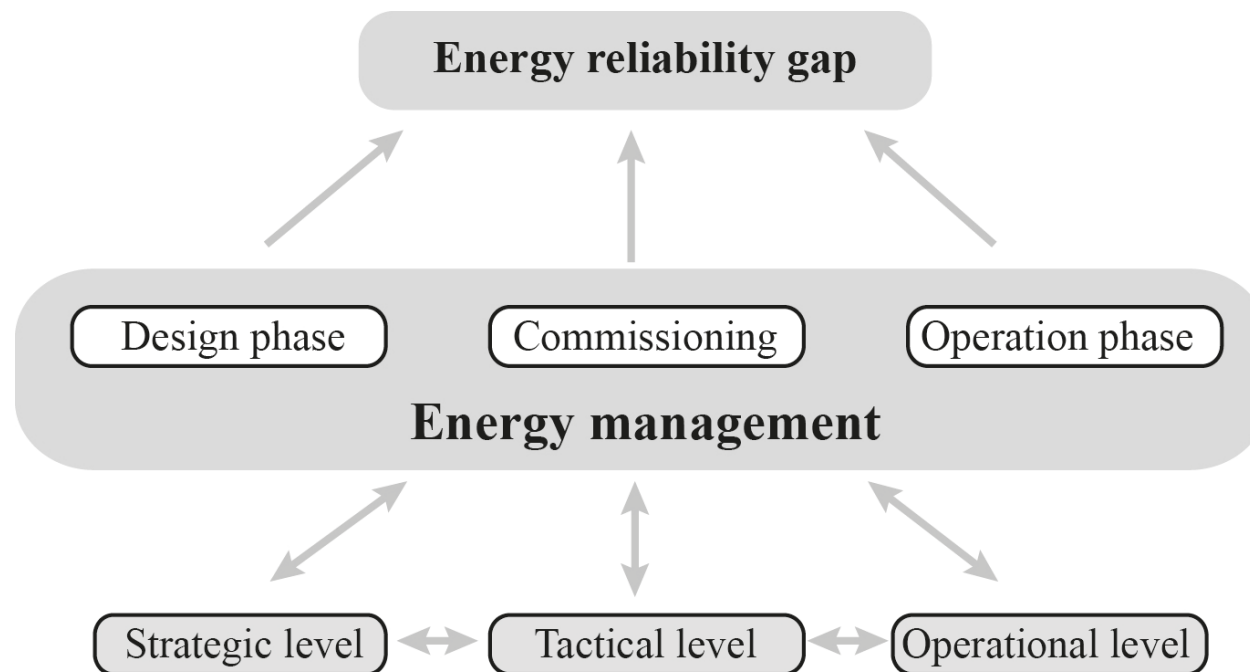


Bringing the 3 perspectives together

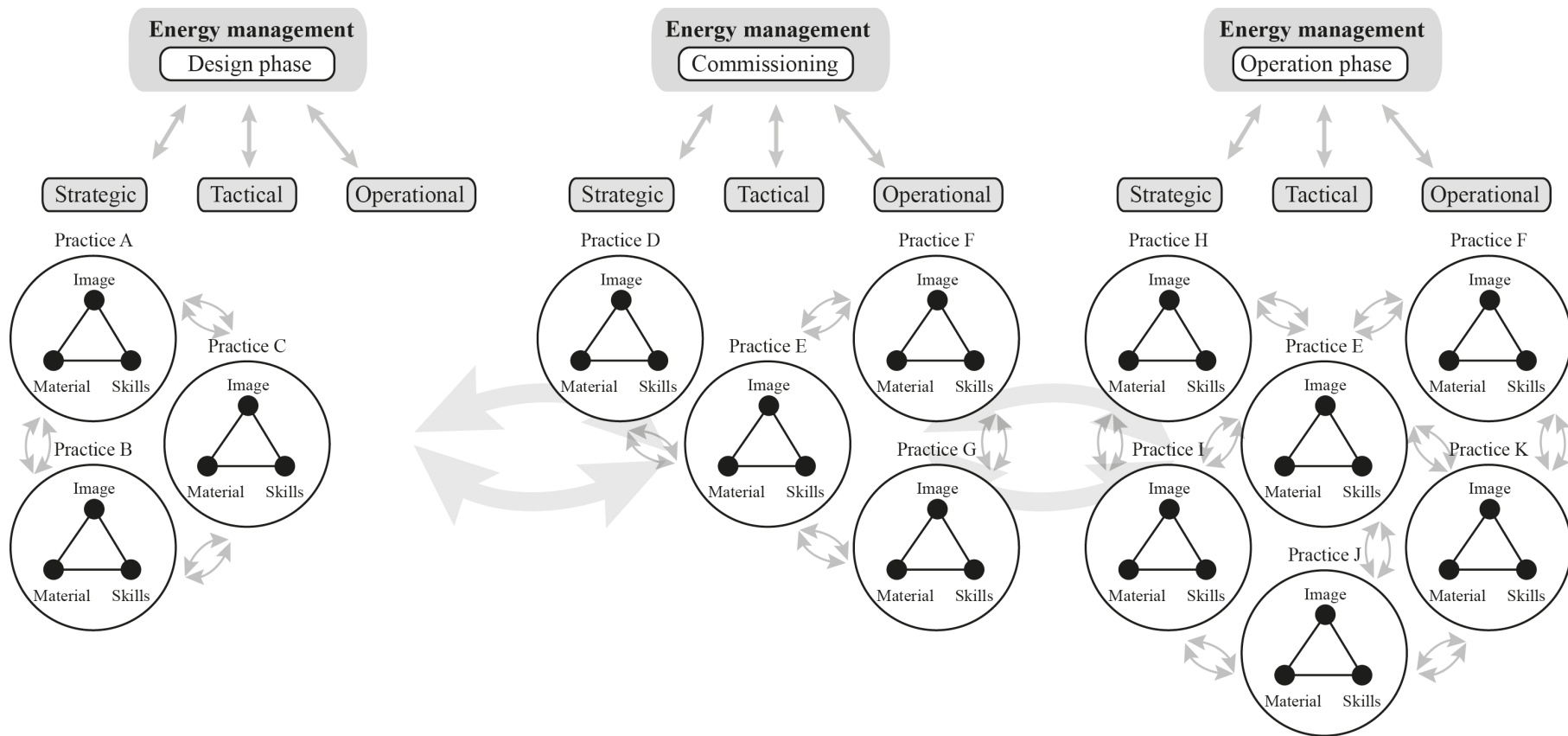
THE FRAMEWORK

Energy management

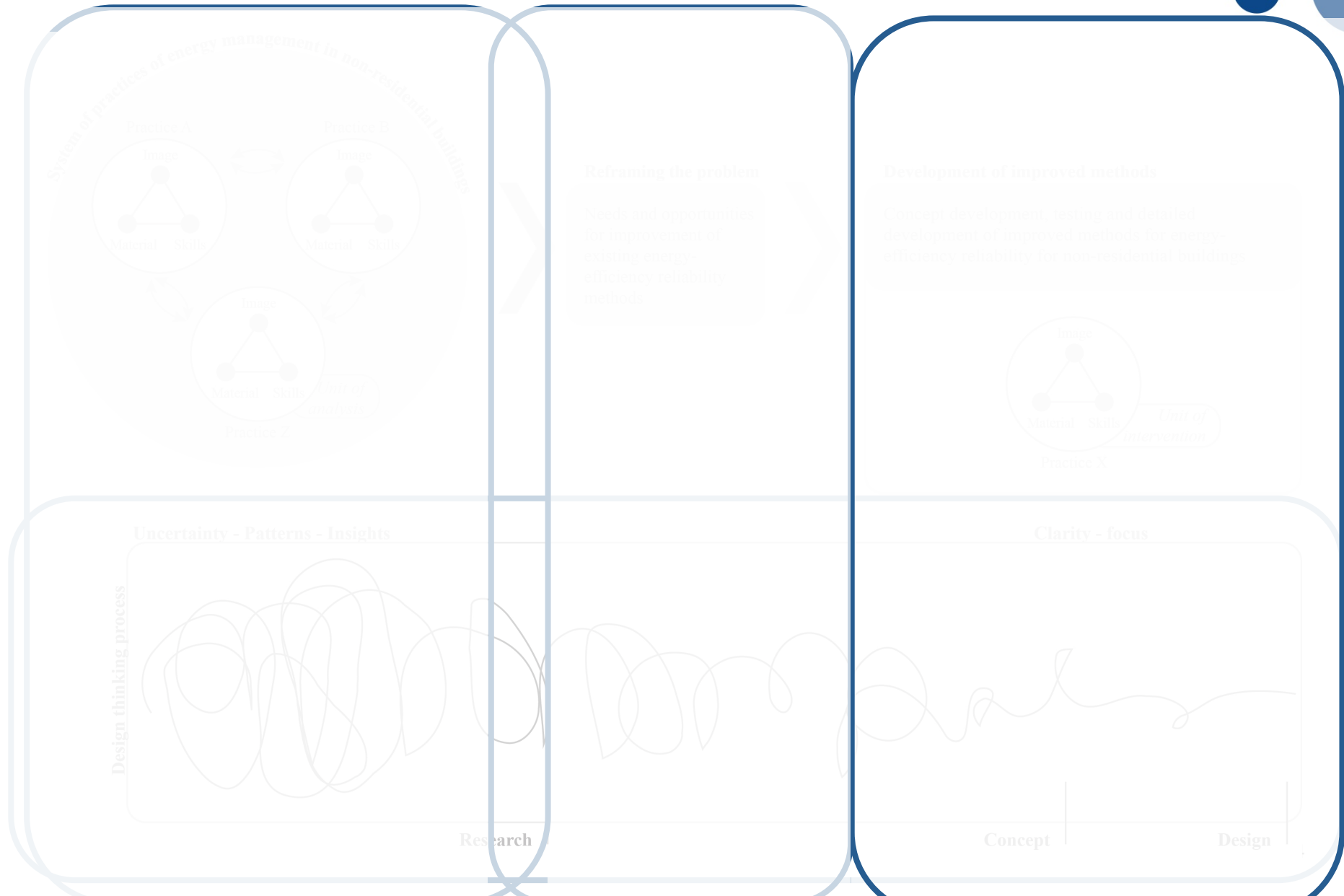
Main aspects from facility management



Energy management + social practices perspective



The reliability gap framework



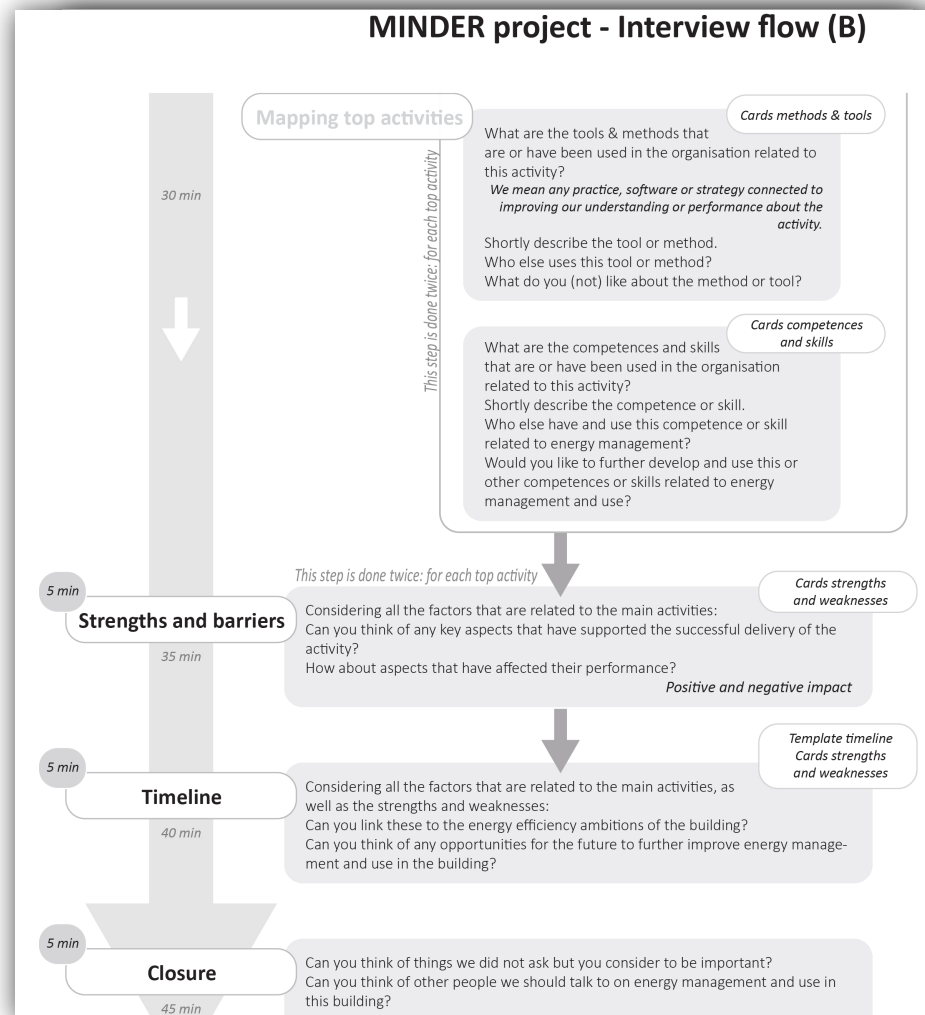
Applying the framework



Interview guide – data gathering

MINDER project - Interview flow (B)

Data analysis





Questions, feedback or experiences?

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12 selected cases



Charlottenlund videregående skole



Grøtte barneskole



Kjørbo Powerhouse



Kunnskapssenteret St. Olav



Marienlyst skole



Miljøbygget



Miljøhuset



Nardo skole



NINA hovedkontor



Papirbredden 2



Sparebank 1 SMN



Tiller videregående skole