SB13 Graz

Norwegian Smart Cities

- Towards cross-scale indicators

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Background – the Brøset project

- The municipality of Trondheim decided to develop a 35 hectare site, Brøset, into a “Carbon Neutral” settlement with 1200 dwellings.
- The whole projects have been developed with active participation of an NTNU-SINTEF research project.
- To reach these ambitious gals, the municipality announced an international planning competition with a twist – **parallel commissioning.**
- Four cross disciplinary teams was chosen, and worked in parallel, met at workshops for information exchange and discussions, in order to develop plans for how to develop a carbon neutral settlement at Brøset.

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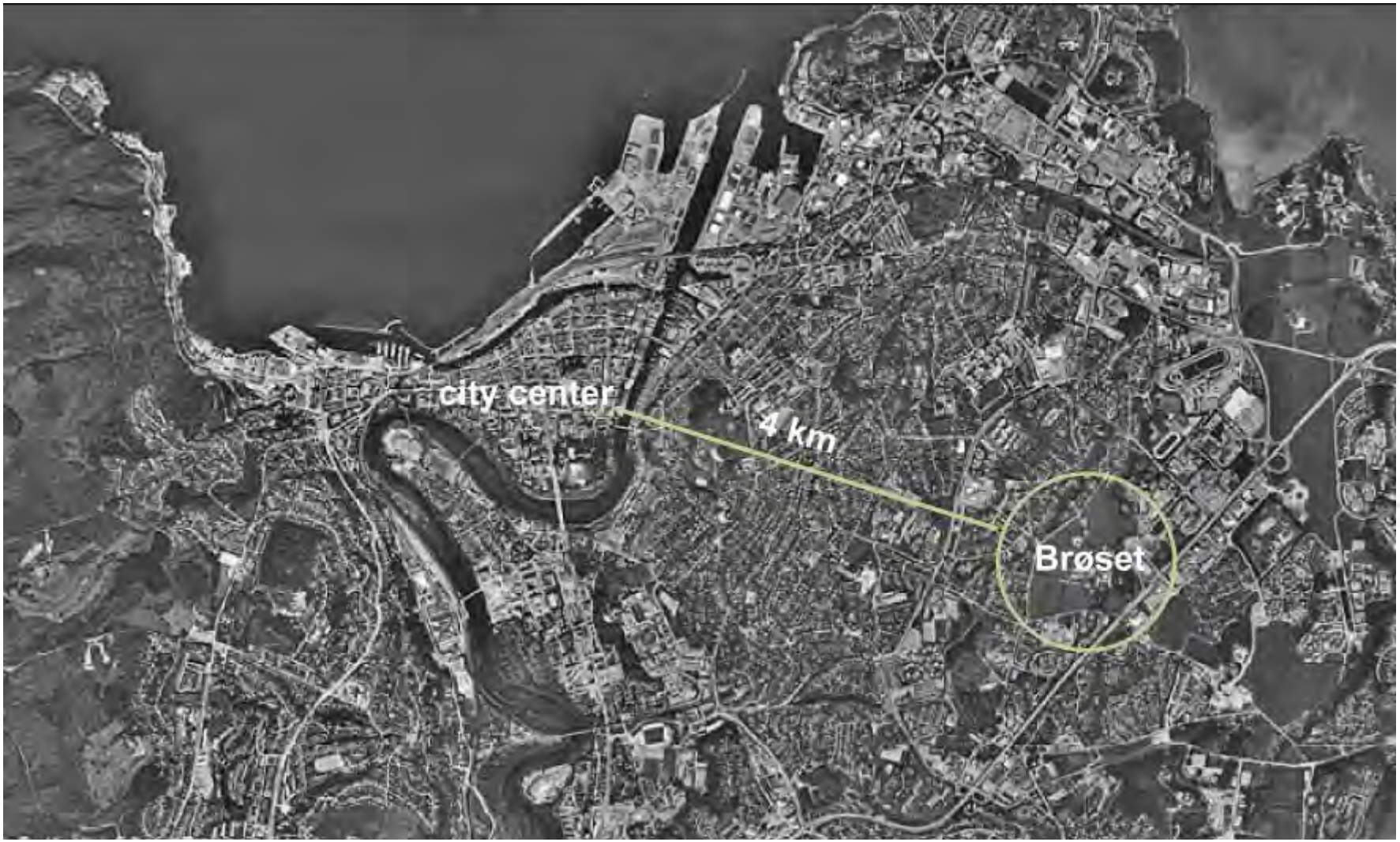

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Introduction:

The results of the Brøset parallel commissioning process

- it is possible to directly reduce carbon footprint with 3 to 5 ton of CO_{2eq} per capita from 12 to 7-9 tons CO_{2eq} (Norwegian conditions)
- This indicates that careful design of buildings and infrastructure alone will not lead to carbon-neutral, resilient neighbourhoods.
- Staying below 550 ppm CO_2 in the atmosphere (IPCCs 2-degree limit) requires far-reaching changes in built environment, energy systems, and people's lifestyles, and particularly in the interfaces between them.

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Trondheim municipality's political priorities, legislation and planning practice

- Creating a holistic vision for integrated energy design of the Brøset neighbourhood;
- Establishing well-defined Key Performance Indicators (KPI) and benchmarks that allow the city to plan Brøset neighbourhood design and monitor its performance;
- Ensuring support by measurements, simulations and qualitative methods, in co-operation with knowledge institutions;
- Devising an implementation plan for translating the design into practice;
- Exploring synergy effects with other municipal priorities such as climate change adaptation (resilience, capacity to respond to crises), health, mobility and commercial development;
- Setting up governance structures to support planning, implementation, monitoring and transferring of experiences to other projects, both within the municipality and to others

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Strategic energy planning:

interfaces between urban form, infrastructure, and buildings

- Building design for optimised interactivity with surrounding site, microclimate, people and cultural heritage, in order to optimise energy efficiency, enable generation of renewable energy, and support energy efficient lifestyles;
- Building envelope materials and technologies that can optimise the interface between buildings and their surroundings;
- Energy interface between buildings and the grid;
- Interface between buildings and users: how to include users and user behaviour in designing and monitoring energy measures;
- Buildings as disseminators, which can create awareness and a multiplier effect.

the Status Quo Bias

- Anchoring relates to the fact that, when making a decision, people start from something they know, and adjust this “anchor” in a direction they think is appropriate in the given context.
- A second factor that guides people’s choices is representativeness: is the situation and context representative of what one oneself has experienced or thinks is relevant?
- The third factor, availability, is related to the ease with which people come up with relevant examples. The more readily available relevant examples are, the more likely it is that these will influence people’s decision making – for better or worse

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Cross-scale energy measures

	Scale 1: Integrated urban energy planning and transformation processes	**Scale 2: Infrastructure networks**	**Scale 4: Energy-efficient buildings as interactive elements of the urban energy system**
Step 1: Establishing the principle of development			
Step 2: Determining the layout of the development			
Step 3: Designing the details			
Innovation			

Overview of the steps in BREEAM Communities 2012 and the scales approach in the Brøset project

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Scale 1: Integrated urban energy planning and transformation processes

Make best possible use of local climate and site conditions to optimise energy efficiency and create an attractive outdoor space

- Robust energy solutions that can tackle impact by climate change
- Making energy efficient solutions the most accessible and attractive alternative
- Reducing embodied energy and transport by providing local products, services and service agreements
- Finding synergies between integrated urban energy planning and other municipal priorities

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Scale 2: Infrastructure networks

- Smart coupling of energy generation, consumption and storage
- Promoting renewable supply technologies integrated into urban infrastructure
- Increased energy efficiency through synergies with water and waste management systems

Scale 3: Energy-efficient buildings as interactive elements of the urban energy system

- Set minimum standards for individual building energy performance
- Robust bioclimatic design
- Diversity, flexibility, generality, elasticity
- Reduce energy needs per person through reduction of built area per person
- Creating awareness about energy efficiency and renewable energy systems

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Discussion

- The Brøset projects is different from other assessment methods in that the project tries to limit the overall emissions from the development at by 3tons CO_{2eq}/capita*year.
- the Brøset projects are the first project worldwide that tries to limit the overall emissions from an area
- This in return leads to an optimization of material consumption (embodied energy/emissions) and area per capita.
- Area efficiency is crucial in order to achieve the goals set for Brøset.

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Conclusion

- The measures proposed by the parallel commissioning teams provide a **plethora of robust, diverse and adaptable solutions and methods** for integrated energy design at Brøset that can **avoid lock-ins, provide adaptability** to uncertain challenges, and create an attractive built environment.
- The parallel commissioning process clearly **showed the importance of being able to describe correct and measurable goals**, and **exposed the lack of science-based, planning-friendly decision-making tools for the early design phases** of a neighbourhood project
- In the parallel commissioning process relatively few solutions were proposed for interaction between buildings and networks, including any smart or ICT systems, responsive building facades, or seasonal bioclimatic solutions.
- This type of interaction should be further developed to create energy efficient, integrated energy planning (building-grid-user) for the entire neighbourhood, and avoid potential redundancy or incompatibility among the various systems.

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Thank you for the attention!

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