

A composite image representing a sustainable future. It features a snowy mountain range in the background. In the foreground, there are wind turbines on a rocky island, a modern city skyline with illuminated buildings, a satellite in space, an airplane, and an offshore oil rig. The scene is set against a blue sky with clouds and a clear sea.

ZERO EMISSION BUILDINGS AND NEIGHBOURHOODS

Steinar Grynning, Research Manager

SINTEF

One of Europe's largest independent research organisations



NOK 3.3 billion
Revenues

NOK 410 MILL
International sales



SINTEF COMMUNITY

Strategic research areas in SINTEF Community



Automated transport



Indoor climate



Architecture and urban planning



Climate adaptation



Energy and zero emission solutions



Building materials



Structures



Water



Social benefit

Research Centre on Zero Emission Buildings

- **Duration:** 2009 – 2017
- **Budget:** 280 MNOK
- **Objective:** Develop competitive products and solutions for existing and new **buildings** that will lead to market penetration of buildings with **zero greenhouse gas emissions related to their production, operation, and demolition.**
- www.zeb.no



Research Centre on Zero Emission Neighbourhoods in Smart Cities

- **Duration:** 2017-2024
- **Budget:** 380 MNOK
- **Objective:** Speed up **decarbonisation of the building stock** (existing and new), **use more renewable energy sources** and **create positive synergies among the building stock, energy, ICT and mobility systems, and citizens.**
- www.zenresearchcentre.com



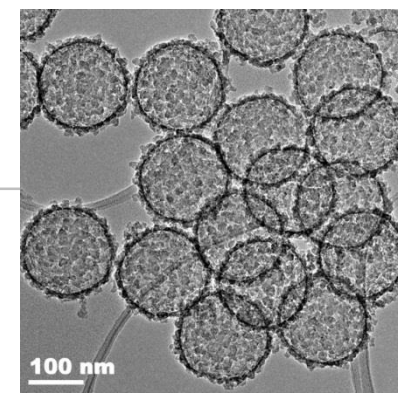
ZEB research activities

ZEB focuses its work in areas that interact and influence each other:

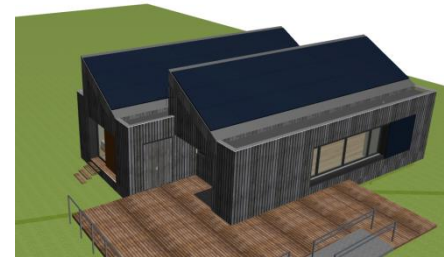
- **WP1** Advanced materials technologies
- **WP2** Climate-adapted low-energy envelope technologies
- **WP3** Energy supply systems and services
- **WP4** Use, operation, and implementation
- **WP5** Concepts, strategies and demonstration buildings
- **Laboratories**



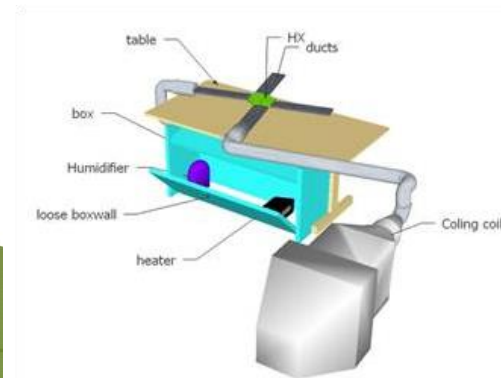
VIP Leca Isoblokk



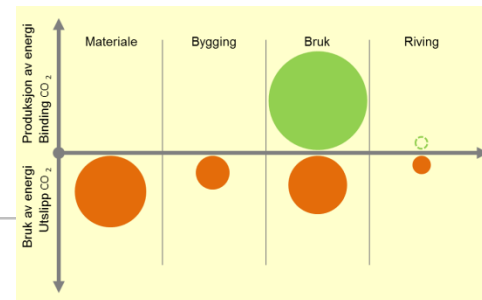
Nano insulation material



ZEB Living Lab



Membrane heat exchanger

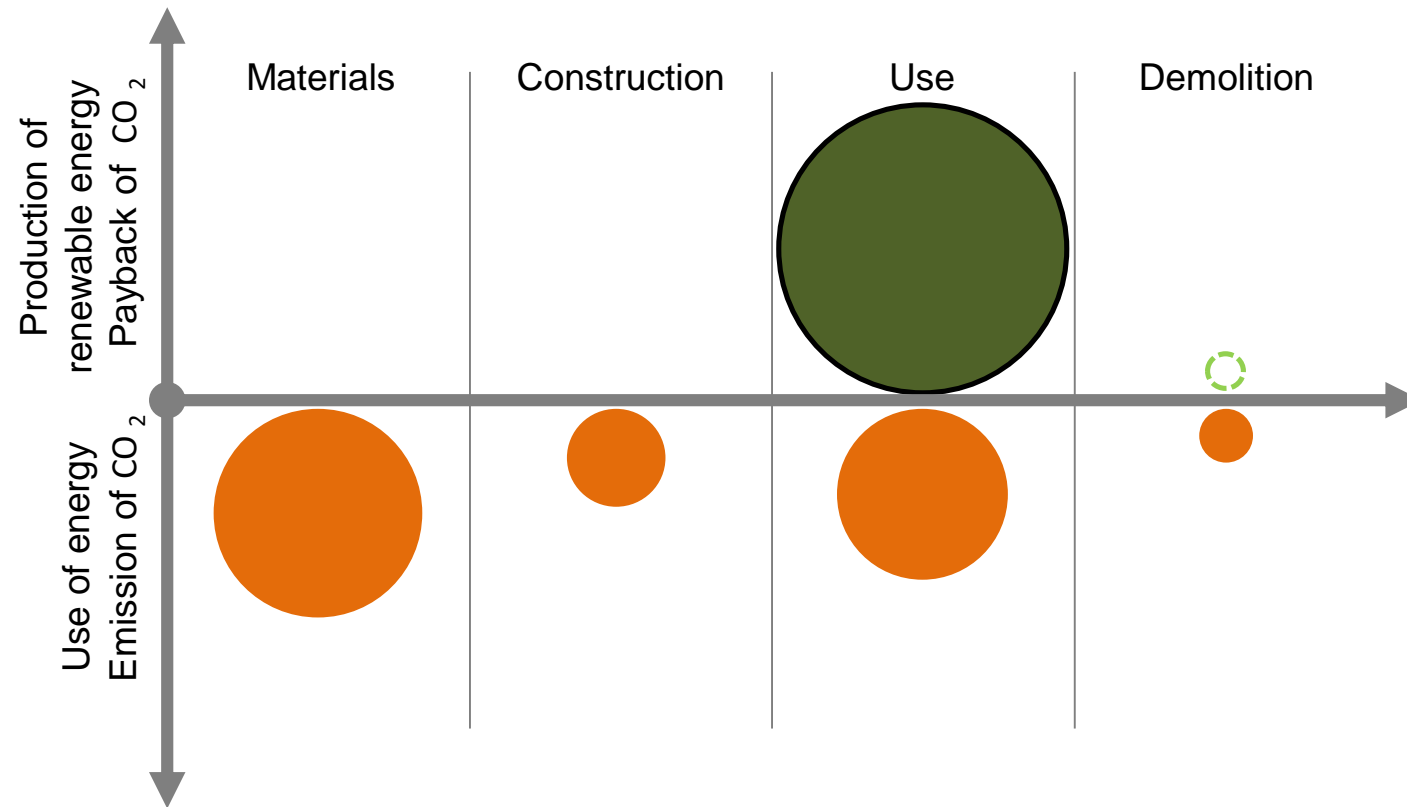


ZEB Definition

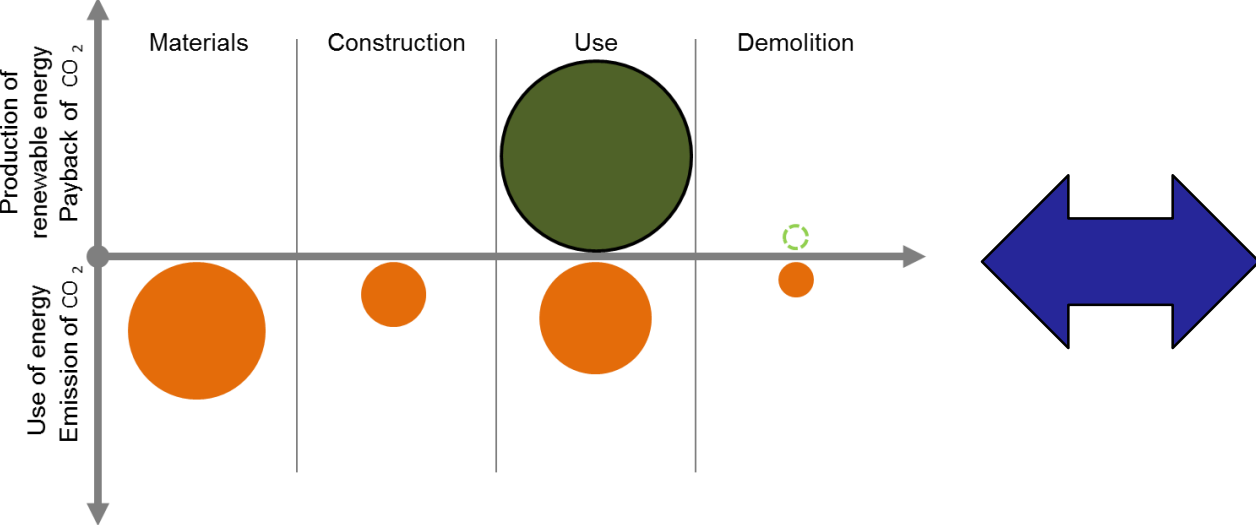
ZEB demonstration buildings



Definition of Zero Emission Buildings



ZEB Centre – From vision to real buildings in 8 years



Overall milestones from ZEB

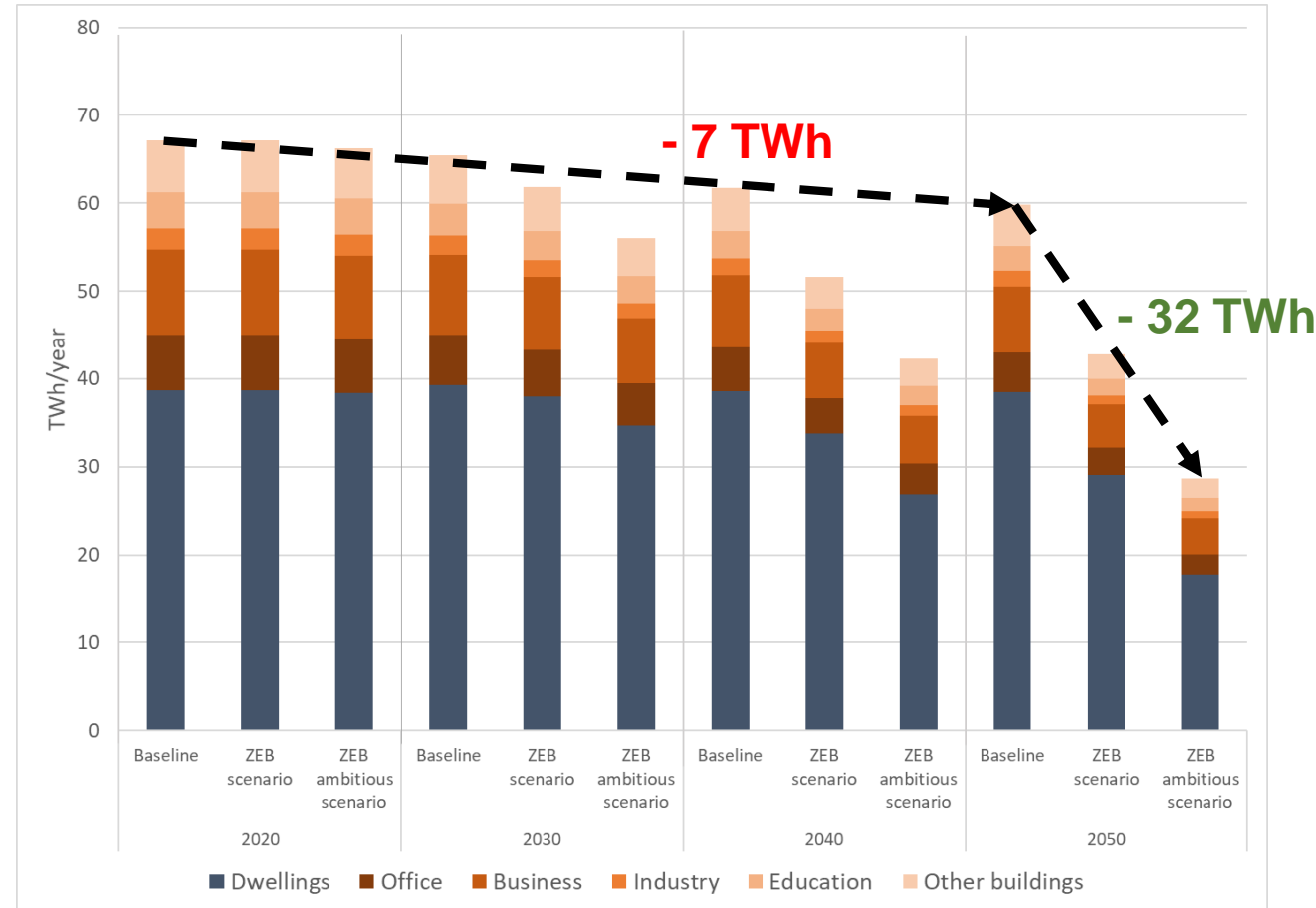
- Shown how to construct zero emission buildings
- Started the development of new technologies for future zero emission buildings
- Implemented research tools for this development, i.e. laboratories, definitions, pilot buildings
- Educated MSc- and Ph.D.-candidates for the building industry and the research community
- The partners in the ZEB Centre are implementing (the art of) zero emission buildings in their business strategies
- Results from the ZEB Centre are included in a national standard on calculation of GHG emissions in buildings.
- Some of the larger cities in Norway have started to implement solutions for the low carbon society in their master plans on environment by looking at the possibilities demonstrated by the ZEB Centre. Further developments are expected, due to activities in pilot areas in the new ZEN Centre.
- Shown the way towards the development of the zero emission society (i.e. The Research Centre on Zero Emission Neighbourhoods in Smart Cities – ZEN Centre).



Scenario results: delivered energy

Energy saving potential 2020-2050:

- Baseline: 7 TWh
- ZEB 1: 25 TWh
- ZEB 2: 39 TWh (7+32)





2017 – 2024:
THE RESEARCH CENTRE ON
**Zero Emission
Neighbourhoods
in Smart Cities**

BUILDINGS – USERS – ENERGY SYSTEMS – PILOT PROJECTS

ZEN Research Centre Partners

11 public partners	<p>Oslo, Bergen, Trondheim, Bærum Bodø, Elverum, Steinkjer Trøndelag fylkeskommune Statsbygg NVE – Norges vassdrag og energidirektorat DiBK – Direktoratet for byggkvalitet</p>
21 industry partners	<p>ByBo, Elverum Vekst TOBB Snøhetta, ÅF Engineering, Asplan Viak Multiconsult, SWECO, Civitas FutureBuilt Energi Norge, Norsk Fjernvarme NTE – Nord-Trøndelag Energiverk Statkraft Hunton Moelven Norcem Smart Grid Services Cluster Skanska GK, Caverion</p>
2 research partners	<p>NTNU SINTEF</p>



The ZEN Centre's vision:

Sustainable
neighbourhoods
with zero
greenhouse gas
emissions



Main Objectives

1. Develop neighbourhood design and planning instruments while integrating science-based knowledge on greenhouse gas emissions;
2. Create new business models, roles, and services that address the lack of flexibility towards markets and catalyze the development of innovations for a broader public use; This includes studies of political instruments and market design;
3. Create cost effective and resource and energy efficient buildings by developing low carbon technologies and construction systems based on lifecycle design strategies;
4. Develop technologies and solutions for the design and operation of energy flexible neighbourhoods;
5. Develop a decision-support tool for optimizing local energy systems and their interaction with the larger system;
6. Create and manage a series of neighbourhood-scale living labs, which will act as innovation hubs and a testing ground for the solutions developed in the ZEN Research Centre.

Research Areas





Technology for a better society