AAR 8440 - GETTING TO KNOW EACH OTHER AND THIS PHD COURSE

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ABOUT

TODAY: BEFORE LUNCH

- Introduction
  - about the course
  - about you
- Definitions
  - Your definitions: an exploration
  - Inger Andresen on the state of definitions in ZEN’s work

AFTER LUNCH

- Work package leaders on why their research is important for ZEN and why ZEN is important for their research
- Discussion with work package leaders: What difference can ZEN make?

ME

- Prof in Science and Technology Studies (STS)
- WP leader in ZEB: Use, operation, implementation
- Resource in ZEN: End-users/Living labs

THE COURSE

- FME Research Centre on Zero Emission Neighbourhoods in Smart Cities (ZEN)
  - 8 years, applied research in pilots, method development, some fundamental research
  - Interdisciplinary with a focus on buildings and energy systems
- ZEN and this course
  - Centre = Projects and Deliverables + Network
  - The course: One of the main places where ZEN is performed as centre

MORE SPECIFICALLY

- AAR 8440: Re-use of ZEB course
- Two modes of participation:
  - Written final report (15-20 pages) based on literature used in lectures and your own project
  - Participation in 66% of meetings + conference paper (8-10 pages) + presentation of paper in final “conference”
- In both modes the deliverable has to be connected to one of ZEN’s pilot areas

THE PROGRAM I & II

- Meeting 1: Getting to know ZEN and ZEN management group (today)
- Meeting 2: Basic knowledge: from buildings to the European power system (tomorrow)
- Meeting 3: Cities, city planning, smart cities (07.03.)
- Meeting 4: The pilots (08.03., in Evenstad)

THE PROGRAM III

- Meeting 5: Research, innovation, business models (in May)
- Meeting 6: Final “conference” in May (suggestions for a key note speaker?)

COURSE DESIGN

- A core of basic knowledge
- Meta knowledge useful for everyone: context, background
- Different traditions of writing a PhD: No specific training in PhD writing
- Not advanced in the sense of depth but scope
- Learning through interaction (discussion, collaboration) as main teaching goal

THE PROGRAM X

Anything missing? Suggestions?

YOU

- Basic demographic variables: gender, formal education, income, **age**, **birth place**
- How long have you lived in Norway?
- How many months have you worked with your PhD already?

MORE ABOUT YOU

- Your background
- Your affiliation (department, supervisors)
- Your PhD project - the 1-min version

WHAT’S IN A ZEN?

CORE TERMS

- emissions (21)
- energy (15)
- zero (12)
- buildings (10)
- neighbourhood (10)
- emission (9)
- area (5)
- urban (4)

BI-GRAMS

STIAN

A neighborhood where the total heat and electricity consumption related to the **operation of the buildings** is minimized through synergies and collective systems.

The energy purchased to operate the buildings is produced by energy resources with minimal emissions.

The allocation of the energy from source to sink is done with high efficiency, and the *users* are stimulated to minimize spillage.

As a consequence, the emissions related to the neighborhood are approaching zero.

DIMITRI

A Zero emission neighborhood (ZEN) is a part of an urban area that has net zero emissions of carbon dioxide on an annual basis.

It relies on efficient buildings as well as on suited heat and electricity technologies to reach this goal.

The *community of inhabitants* of a ZEN also has an active role in ensuring its sustainability.

The scale, boundary and included stages in the lifetime of ZENs can vary between projects and is **up for discussion**.

The emission balance is often reached with the help of on-site renewable energy production.

MARIA

A ZEN is a neighbourhood where *all the emissions* are considered.

Emissions are balanced by high efficient buildings that consume very little energy and produce a large share of renewable energy that can be utilized either locally or within a short distance in less efficient buildings.

A neighbourhood is defined as a **group of housing and commercial buildings (from five interacting buildings)**

EIRIK

A Zero Emission Neighborhood in **an urban area** that through design, planning, and retrofitting causes a low amount of operational and embodied greenhouse gas emissions through its life cycle.

Other emissions that cause *environmental and health impacts* are also limited. These impacts should be low in comparison to the current standard emissions for an urban area serving the same consumer functions, but also low in absolute value.

EIRIK (CONT.D)

In addition to causing little impact, emissions outside the urban area can be offset by exporting locally produced renewable energy or by carbon capture and storage.

To reach the zero emission benchmark, the offset must be as big as or bigger than the impacts.

It is doing so while maintaining high living standards, providing public spaces, and public services.

JAKUB

Zero Emission Neighborhood it is a concept that can be described as a **group of buildings**, which implements self-balancing rules regarding total CO2 emissions.

It is capable of reducing overall requirements and delivers resources, that compensates its demands.

JAKUB (CONT.D)

It is a *holistic concept* that captures inside its investigation membrane whole potential sources of CO2 emission, which includes requests for energy, supplies, transportation, and maintenance.

At the same time, it holds information of all possible reductions of CO2 emissions, and balance it, towards zero emission value.

SHABNAM

Zero Energy Neighbourhood is described as a **neighbourhood** that produces zero net emissions through the way it is used, i.e. the way people live, work and play within the neighborhood .

ZEN can has different ambitions that considers the definition in *different levels* of neighbourhood's life cycle like construction process, materials and operation.

NIELS

A **network of buildings** where their interconnections enable them to exploit common resources and satisfy the expectations of their occupants *without external energy supply to the network*. (Key topics: => Energy resource/ - consumer logistics -> Communication -> Digitalization)

BILJANA

Zero emission neighborhood is **a kind of settlement on a specific defined area** that is an independent and neutral cell to its environment. The settlement cell will (and must) meet its energy needs by *producing all energy on its territory*. The green house gasses that are produced during the hole cradle to grave process has to be neutralized with in the same defined territory.

CARINE

A zero emission neighbourhood is **geographically delimited by a set of buildings** (dwellings, schools, offices, etc). The emissions generated by the neighbourhood is *a function of its inhabitants*, which require certain conditions to live such as a shelter, mobility, food, access to job and leisure. The total emissions is directly correlated to the carbon intensity of the energy system in place, and to the final demand of the inhabitants. The term 0 is somehow difficult to grasp/define.

ELENA

A Zero Emission Neighborhood (ZEN) is **a grid connected system** where multiple factors (energy efficient/neutral **buildings**, energy production, on-site distributed energy resources, etc) contribute at reaching the zero energy balance.

By “zero energy”, it is meant that the building delivers as much energy to the supply grids as it draws from them on a yearly basis.

ELENA (CONT.D)

The combination of passive and active technical solutions for give the chance to achieve energy neutrality. Passive solutions include improved construction materials and solar design. Active solutions for electricity generation consist of roof-integrated PV systems, on-site wind turbines etc.

For the production of domestic hot water thermo-solar systems are widely diffused, while for heating applications, the most common solution are ground-source heat pumps or biogasfed cogeneration units coupled with highly efficient, low temperature terminal systems.

ELENA (CONT.D)

In this framework, not only households consumptions but also *electric transportation* are counted in the energetic balance; this is why charger for plug-in electric vehicles are usually installed in a ZEN.

RUSLAN

Zero Emission Neighborhood is a **spatially-defined element of urban system** that, by means of on-site renewable power generation and enhanced energy efficiency, during its operation not only satisfies own energy needs but produces surplus energy which can consequently compensate for environmental impacts that occur at the other life cycle stages of the neighborhood.

SUMMARY

- The core of the definition: some kind of balance between energy use and renewable energy production
- (Slight) differences
  - What is optimized (group of buildings, everything in the neighbourhood)?
  - To which degree and under which conditions do we allow for exchanges with the outside?
  - Can there be different levels of “0”?
  - Additional factors that should be considered: users’ activities, health, transport, food, specific technologies, etc