

# A Norwegian zero emission neighbourhood (ZEN) definition and a ZEN key performance indicator (KPI) tool

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## Background

- Planning Instruments for Smart Energy Communities
- Horizon 2020 Smart Cities and Communities
- Positive energy blocks (PEB)
- BREEAM Communities
- CITYKeys
- ZEN partner workshops on design and planning, energy supply, and buildings and materials.

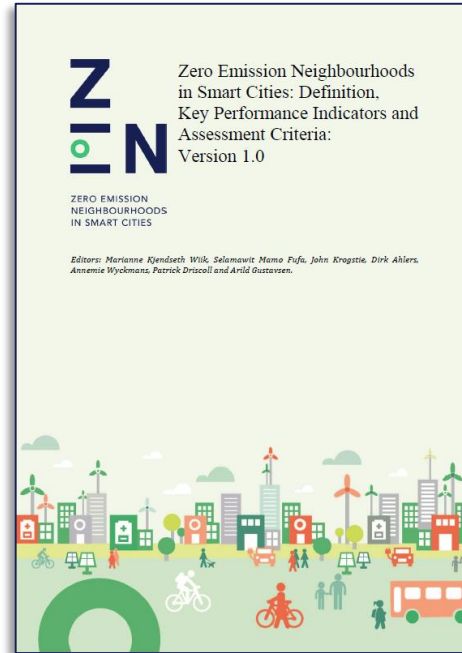
## Harmonise with existing standards:

- NS-EN 15978: 2011
- NS 3720: 2018
- NS 3457-3: 2013
- NS 3451: 2009
- ISO 52000: 2017
- SN/TS 3031: 2007
- NS 3454: 2013
- NS-EN 16627: 2015
- ISO 15686-5: 2017
- NS-EN 16258: 2012

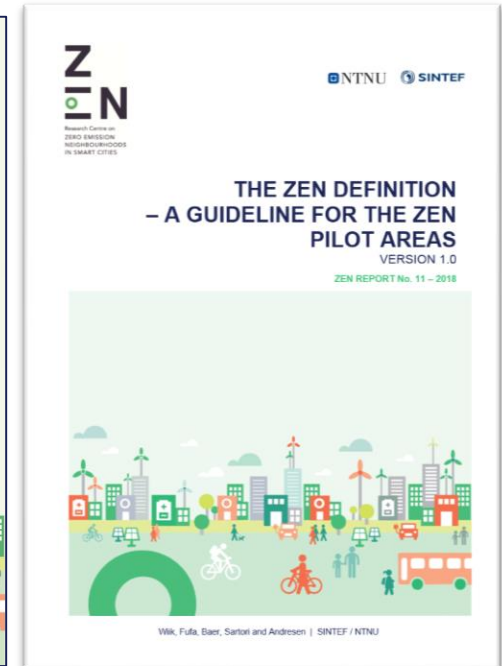


## ZEN definition and guideline reports

- Contributions from a large range of researchers, experts and input from ZEN partners.
- Will be revised throughout the duration of ZEN centre.
- [https://www.sintefbok.no/papers/index/50/zen\\_reports](https://www.sintefbok.no/papers/index/50/zen_reports)



(M. Wiik et al. 2018)



(M. Wiik et al. 2019)

# What is ZEN?

A zero emission neighbourhood aims to reduce its direct and indirect greenhouse gas (GHG) emissions towards zero over the analysis period

A zero emission neighbourhood should:



**Plan, design and operate buildings** and associated infrastructure components towards zero life cycle GHG emissions;



Become highly **energy efficient** and powered by a high share of new **renewable energy** in the neighbourhood energy supply system;



**Manage energy flows** (within and between buildings) and exchanges with the surrounding energy system in a smart and flexible way. Flexibility should facilitate the transition to a decarbonised energy system and reduction of power and heat capacity requirements;

# What is ZEN?

A zero emission neighbourhood should :



**Promote sustainable transport patterns** and smart mobility systems;



Plan, design and operate with respect to **economic sustainability**, by minimising total life cycle costs;



Plan and locate amenities in the neighbourhood to provide **good spatial qualities** and stimulate **sustainable behaviour**;



Development of the area is characterised by innovative processes based on new forms of cooperation between the involved partners leading to **innovative solutions**.

The pilot areas consist of 1 million square meters of development for more than 30,000 inhabitants. They require methods, tools and KPIs that allow them ...

...to plan,

...to construct,

...to measure and report

Strategic planning  
phase

Implementation  
phase

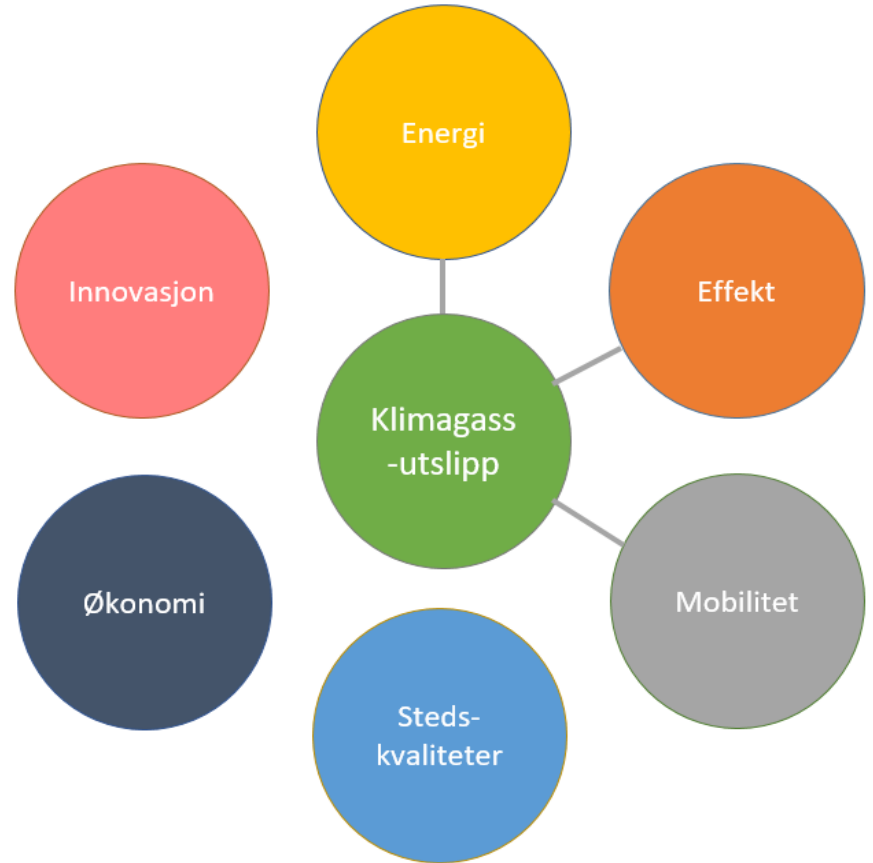
Operational phase

**ZEN**

... as well as analyse, visualise and engage!

## ZEN categories

- Consists of quantitative and qualitative assessment criteria and key performance indicators (KPI)





## Method

- Map existing tools used by ZEN stakeholders.
- Develop a ZEN KPI conceptual framework.
- Theoretically test the ZEN definition with real data from pilots.

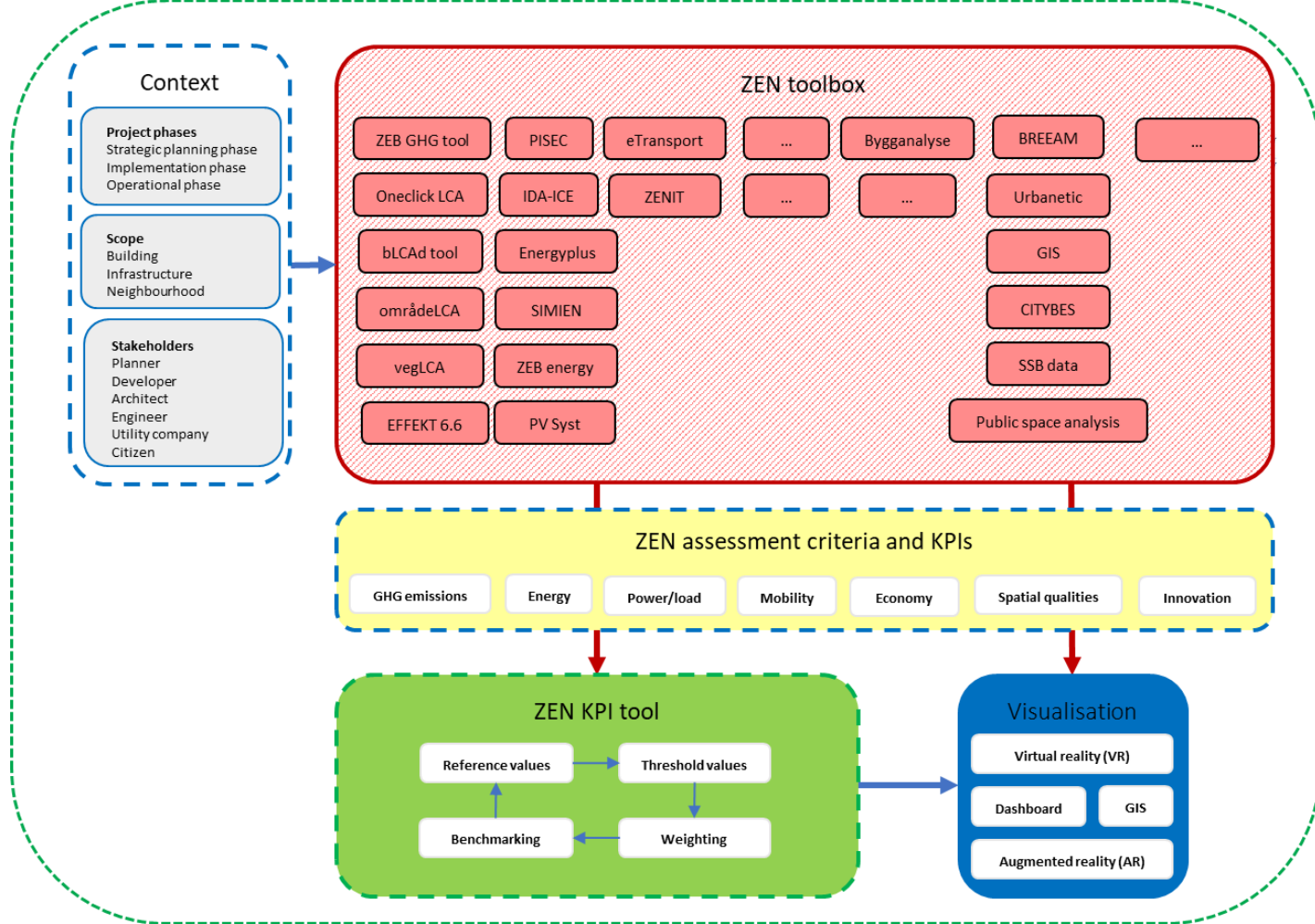
Continuous, iterative process to obtain:

Ambition levels, reference values, threshold values, weighting and benchmarking.

## Results: ZEN KPI tool specifications

- Operationalise ZEN definition
- Aid stakeholders through planning, implementation and use phases
- Flexible for a range of conditions
- Easy to understand
- Clearly communicate output of results
- Transparent and facilitate for comparisons at component, building, neighbourhood level
- Process large amounts of data
- Harmonise various standards, methods, databases, tools, system boundaries, interpret quantitative and qualitative measures
- Norwegian and english
- Dynamic, robust and withstand future changes
- Avoid problem-shifting and double-counting

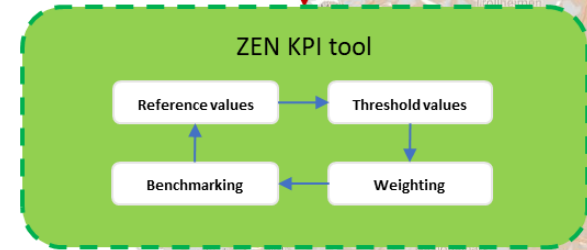
# ZEN KPI tool conceptual framework



## NB: ZEN Case preliminary results

### Example: CO2 requirements in TEK

- Collect NO building LCA case studies
- Perform a statistical analysis to ascertain reference and threshold values
- Weight life cycle modules according to attribution to GHG emissions
- Set benchmarks according to results from statistical analysis and ISO 21678 (limit, reference and target values)
- Revise periodically



**Thank you!**

