



# VENTILATION AND IAQ IN NORDIC COUNTRIES STATUS, TRENDS AND OPPORTUNITIES

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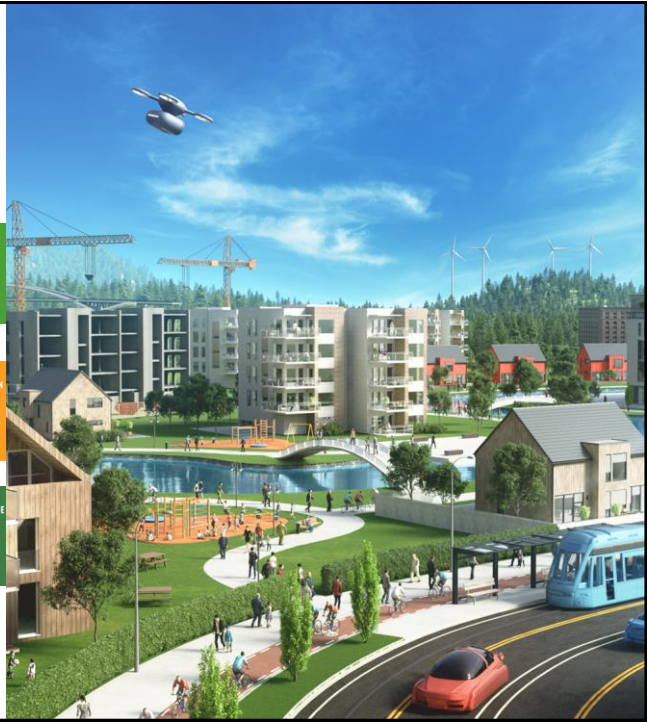
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## Urban development

- Energy efficient buildings and neighbourhoods
- Sustainability
- Urban homes – near public transportation and main roads (air quality and noise)
- Taller and compact



Ill.: Headspin

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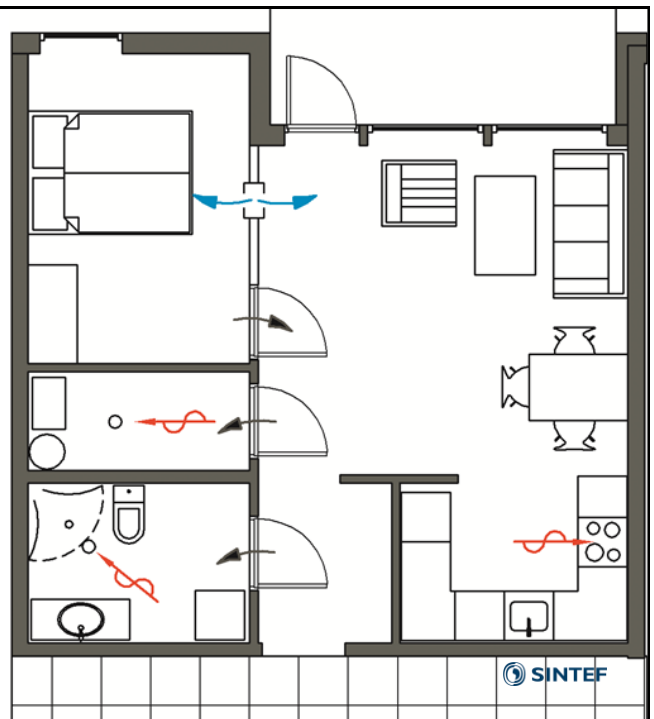
# Home

- New residential buildings are mostly apartment buildings
- Smaller apartments
  - 2-rooms, 3 rooms, studio, but fewer m<sup>2</sup>
- Flexibility and new layouts



# The Scandinavian way

- Cold climate
- Well insulated buildings (nearly Passive house level)
- Low infiltration ( $0,6 \text{ h}^{-1}$  at 50Pa)
- Balanced ventilation with efficient heat recovery. (>80%)
- No cooling, only shading
- No storage room



# Requirements

General: remove moisture, odour, pollutants

NO- 1,2 m<sup>3</sup>/h pr m<sup>2</sup> ( 0,33 l/s) average, minimum 0,7 m<sup>3</sup>/h pr m<sup>2</sup> (TEK17)

26 m<sup>3</sup>/h per person in bedroom

DK – 0,3 l/s pr m<sup>2</sup> (BR 2018)

S – 0,35 l/s pr m<sup>2</sup> in use, minimum 0,1 l/s pr m<sup>2</sup> empty (Boverket, BFS 2011:6 with corrections) + R1

	NO-Basic	NO-Forced	DK general
Kitchen	36 m <sup>3</sup> /h (10 l/s)	108 m <sup>3</sup> /h (30 l/s)	20 l/s
Bathroom	54 m <sup>3</sup> /h (15 l/s)	108 m <sup>3</sup> /h (30 l/s)	15 l/s
Toilet	36 m <sup>3</sup> /h (10 l/s)	36 m <sup>3</sup> /h (10 l/s)	10 l/s

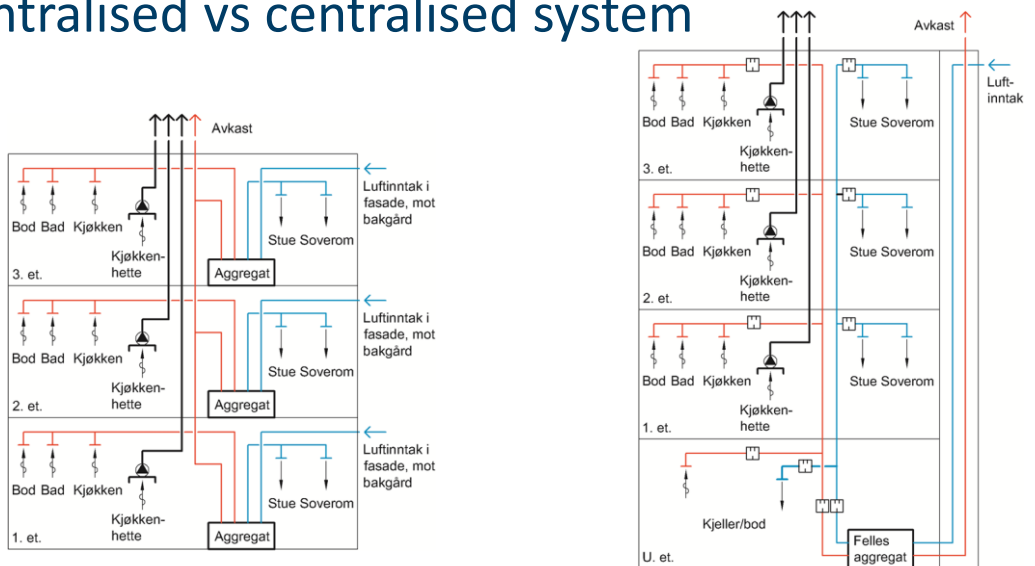
Too high ventilation rates for small apartments?



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# Decentralised vs centralised system



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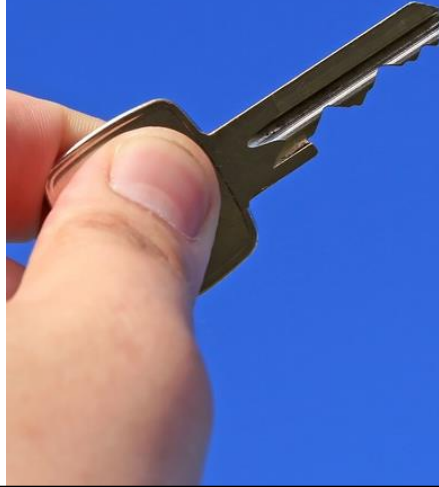
Lyddemær

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## Type of ventilation system and ownership

- Ownership often the reason behind type of system
- Decentralised preferred for control of IAQ
- Maintenance – access, understanding, time/ability. Tenant/owner

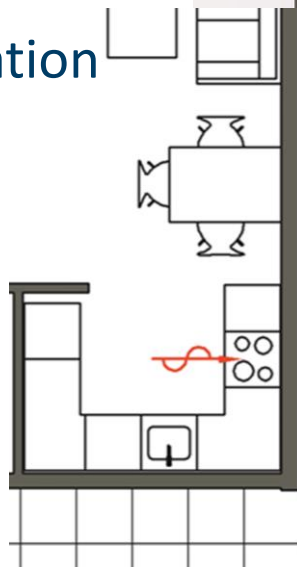
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## Kitchen ventilation

- Hot plate
- only some gas burners
- Placing of hood
- Capture efficiency
- Window and door?



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# Trends

- Kitchen island + open space living
- High airflow rates
- Downdraft
- Recirculation – odour, not moisture
- Noise
- Make up air?
- User profiles? Students, family, elderly
- One room apartments vs 4 rooms

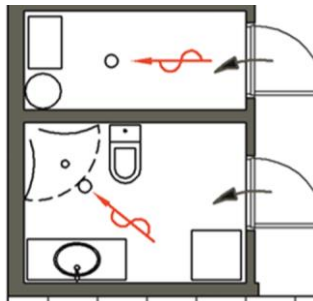


Ill: Norema & Rørros metall



# Moisture

- Bathrooms without windows  
-forced ventilation?
- Cold climate
- Small apartments
- High ventilation rates
- Buffering
- Regeneration



## Indoor temperature

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- 22-24°C
- Open window at night?
- Featherbed cover
- Bedroom?
- Cooling?

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## Ventilation rate and strategy adapted to apartment size and assumed user profile?

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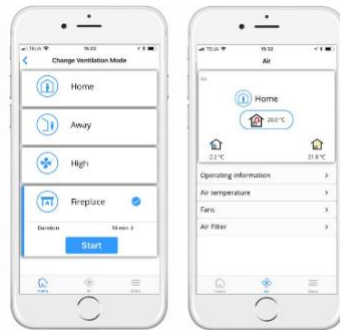
- Define archetypes of urban dwellings
- User profiles according to size/type
- Adapted ventilation strategies

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## App, Cloud and BMS

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## Reduction of power peaks

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- Maximum installed power



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# Healthy Energy-efficient Urban Home Ventilation.

Norwegian research project 2020-2024

WP1: Types and user profiles of urban dwellings

WP2: Advanced residential exposure studies

WP3: Moisture, ventilation and building physics

WP4: Assessment and recommendation

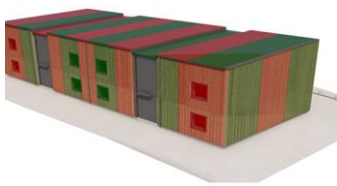
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## ZEN? Deep renovation is necessary

- Prefabrication.
- Integrated ventilation and RES
- Modules with technical room
- <https://4rineu.eu/demo-oslo/>



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— 70 år —  
1950-2020

Teknologi for et bedre samfunn

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