4th International Conference on Smart Energy Systems and 4th Generation District Heating
Aalborg, 13-14 November 2018

The role of Energy Management System for heating consumption in office buildings –

a case study of the Danish Building and Property Agency

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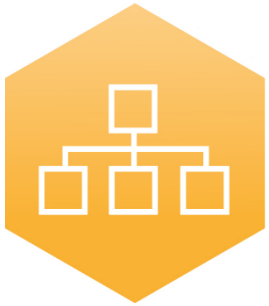
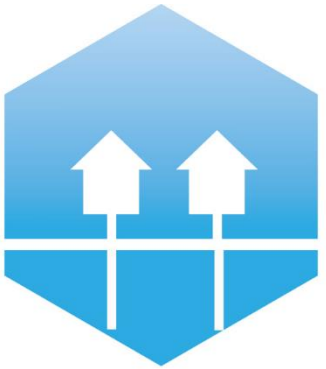
Technical University of Denmark

DTU

KMD

IT MED INDSIGT





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4DH
4th Generation District Heating Technologies and Systems

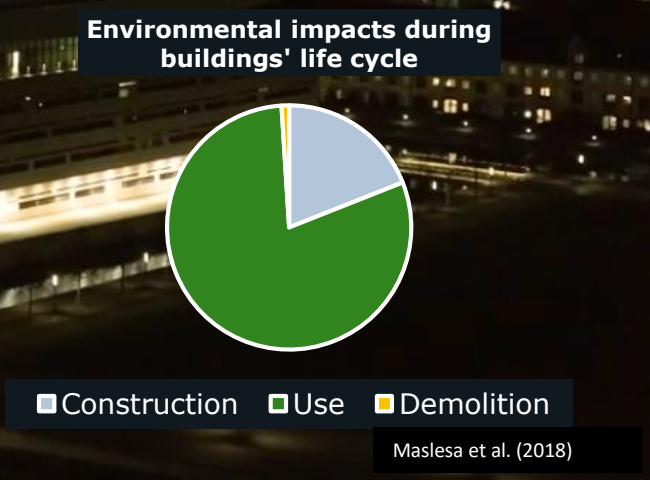
BUILDINGS

36% of global energy

40% CO2 emissions

NON-RESIDENTIAL

At least 40% higher



BYGNINGSSTYRELSEN

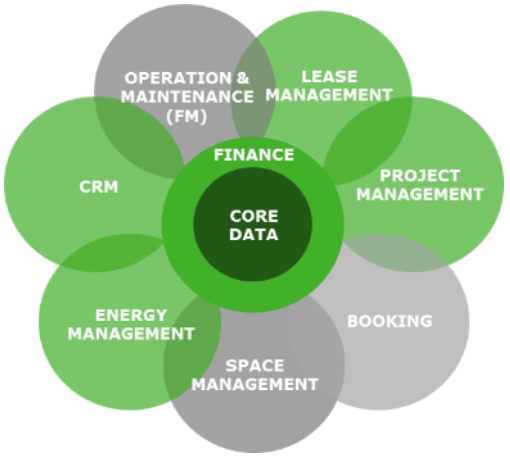
4DH
4th Generation District Heating Technologies and Systems

Governmental real estate agency

4.000.000 m2 – over 800 buildings

Universities, State properties, Private leases

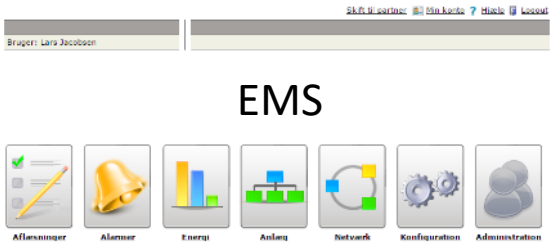
800.000 m2 office buildings



IWMS (5 modules) + integrations (EMS)

Consistent, valid data across organisation

Knowledge-based decision making



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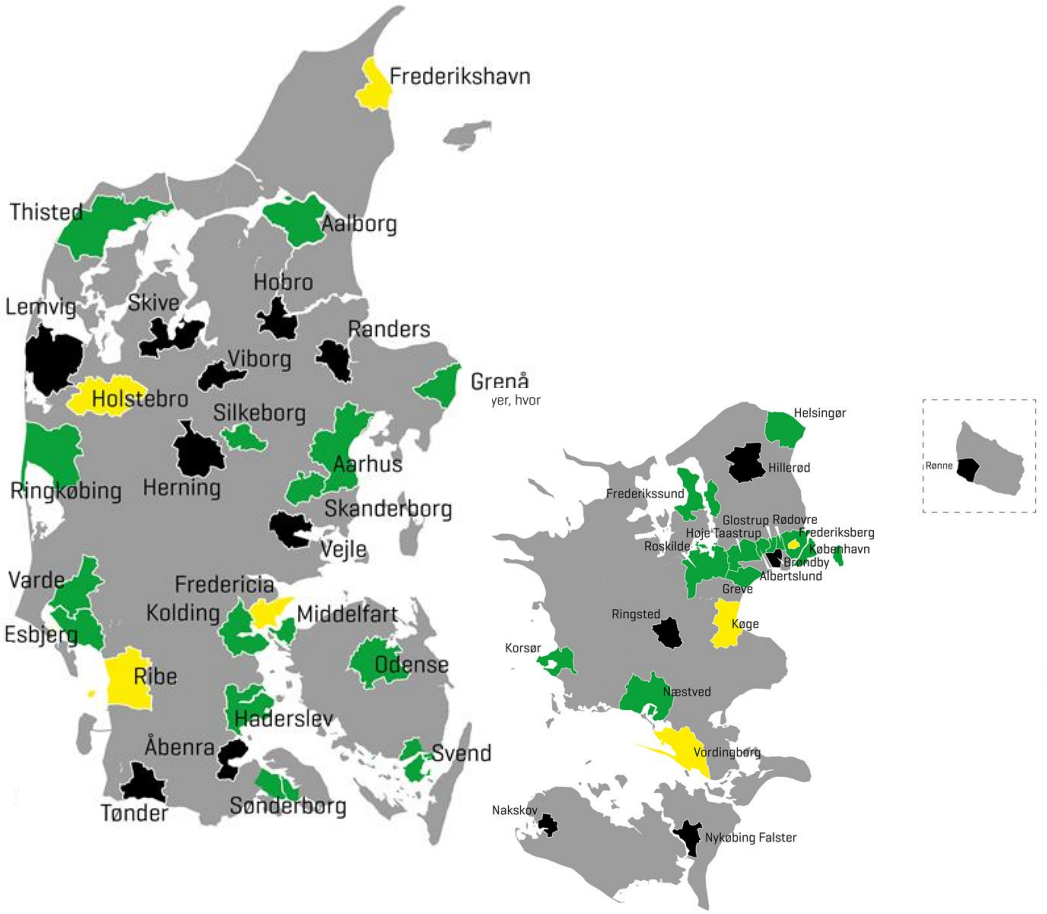
DATA COLLECTION

Status on heating data from the cities in which BYGST has its buildings

October 2018

Source: Bygningsstyrelsen
https://www.bygst.dk/viden-om/energi/digitale-energidata/



- Delivers hourly data
- Ongoing negotiations
- Not ready to deliver hourly data

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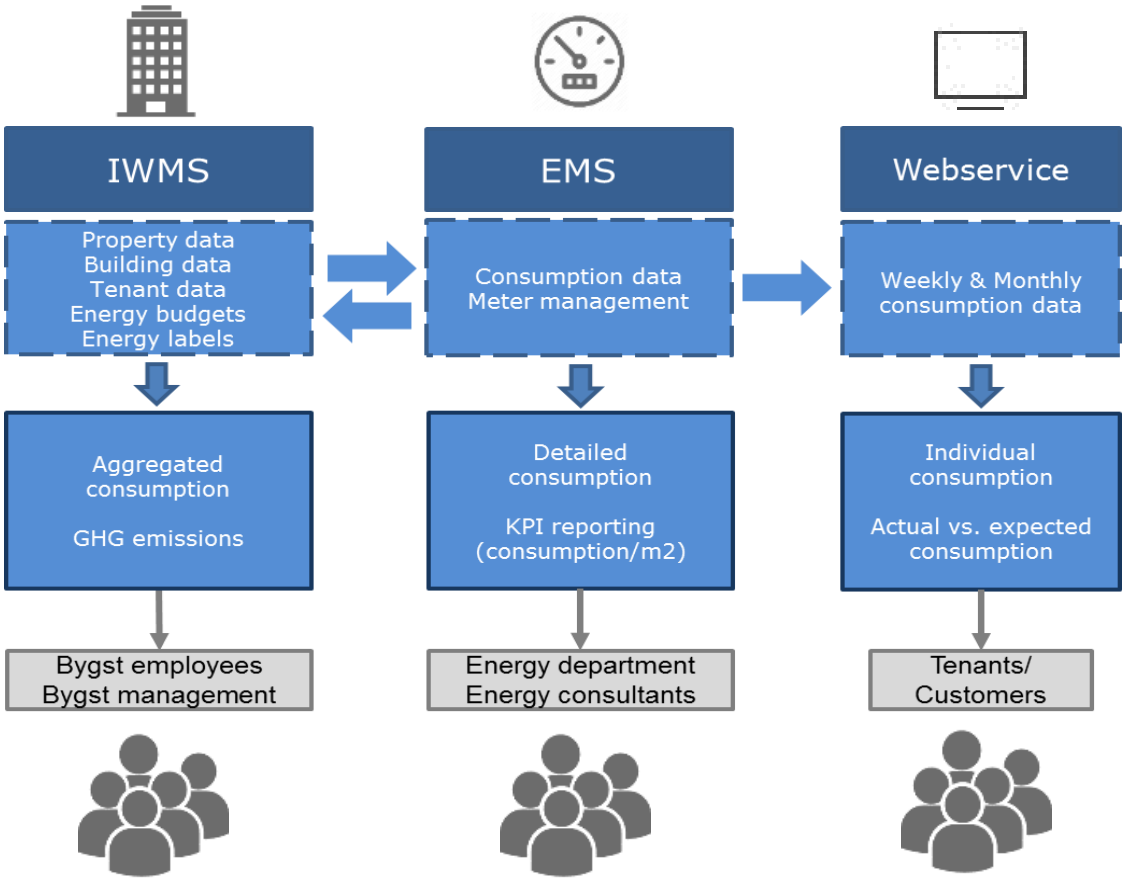
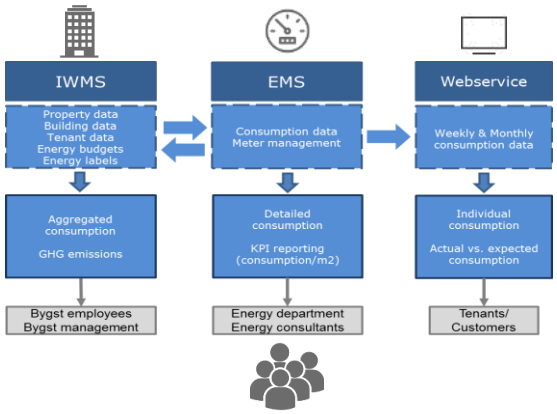
ENERGY MANAGEMENT



ENERGY MANAGERS (EMS)



Period	Budget	Adjusted Budget	Consumption	Savings	Savings [%]	Ref.	Cooling
May 2017	23,350.80	21,796.03	23,399.91	-1,603.88	-7.4	530.31 m³	37.9 °C
Jun 2017	11,949.15	8,262.12	7,600.09	662.03	8.0	194.39 m³	33.6 °C
Jul 2017	6,026.21	5,685.64	5,820.32	-134.68	-2.4	159.61 m³	31.4 °C
Aug 2017	6,618.50	4,308.56	5,469.72	-1,161.16	-27.0	151.09 m³	31.1 °C
Sep 2017	17,279.79	15,384.45	19,350.10	-3,965.65	-25.8	491.20 m³	33.9 °C
Oct 2017	33,567.87	28,918.36	37,029.79	-8,111.43	-28.0	964.70 m³	33.0 °C
Nov 2017	54,298.15	50,996.11	63,640.13	-12,644.02	-24.8	2,017.69 m³	27.1 °C
Dec 2017	68,809.34	61,612.97	74,740.24	-13,127.27	-21.3	1,709.00 m³	37.6 °C
Total	**484,847.08**	**435,864.39**	**502,920.41**	**-67,056.02**	**-15.4**	**12,407.09 m³**	**34.9 °C**
Prognosis	**484,847.08**	**435,864.39**	**502,920.41**		**-15.4**	**12,407.09 m³**	
kWh/m²	**88.46**	**79.52**	**91.76**			**2.26 m³/m²**	

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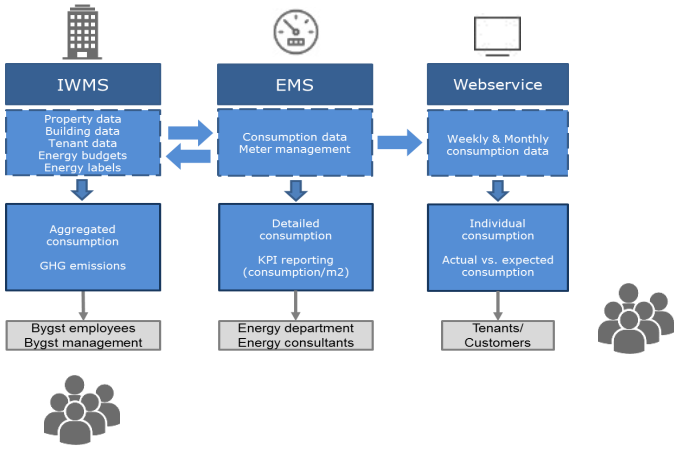
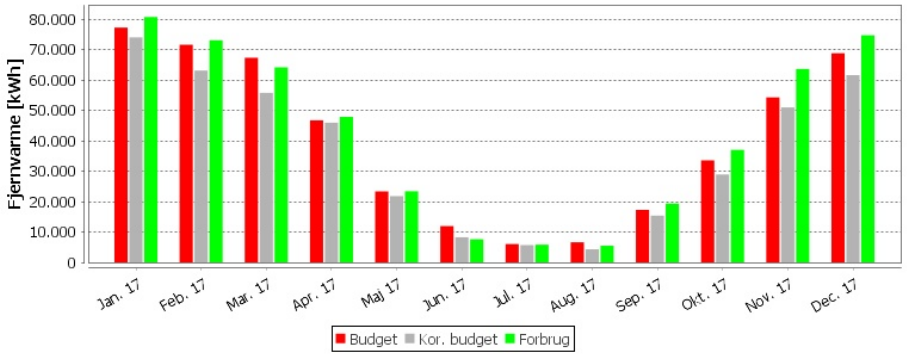
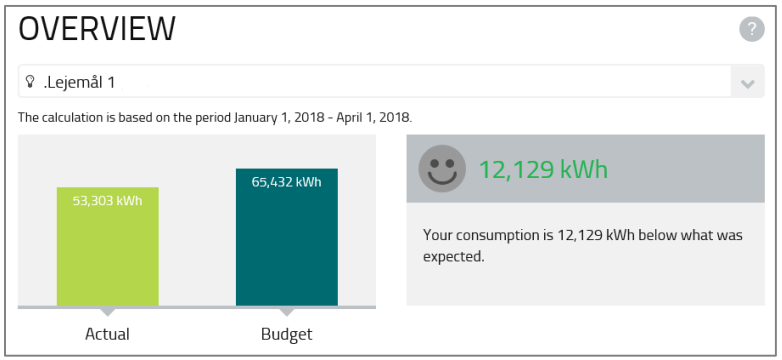
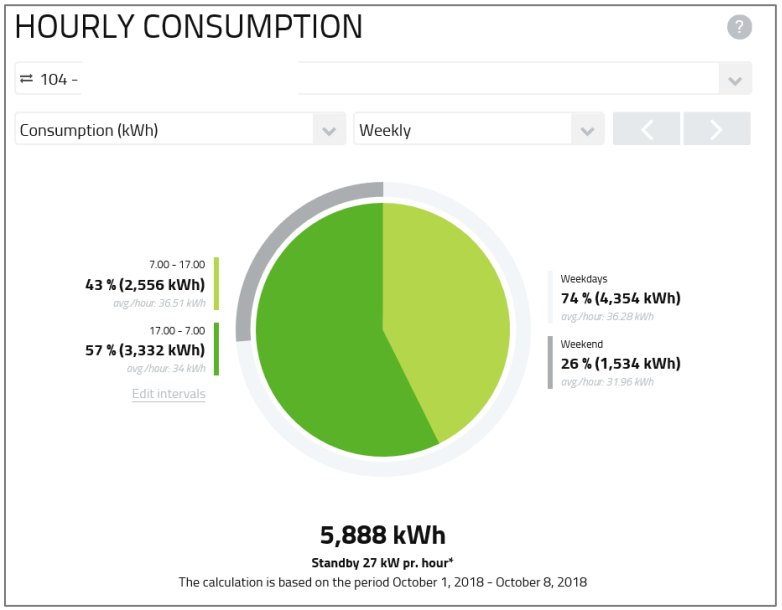
OTHER EMPLOYEES – MANAGERS – END-USERS









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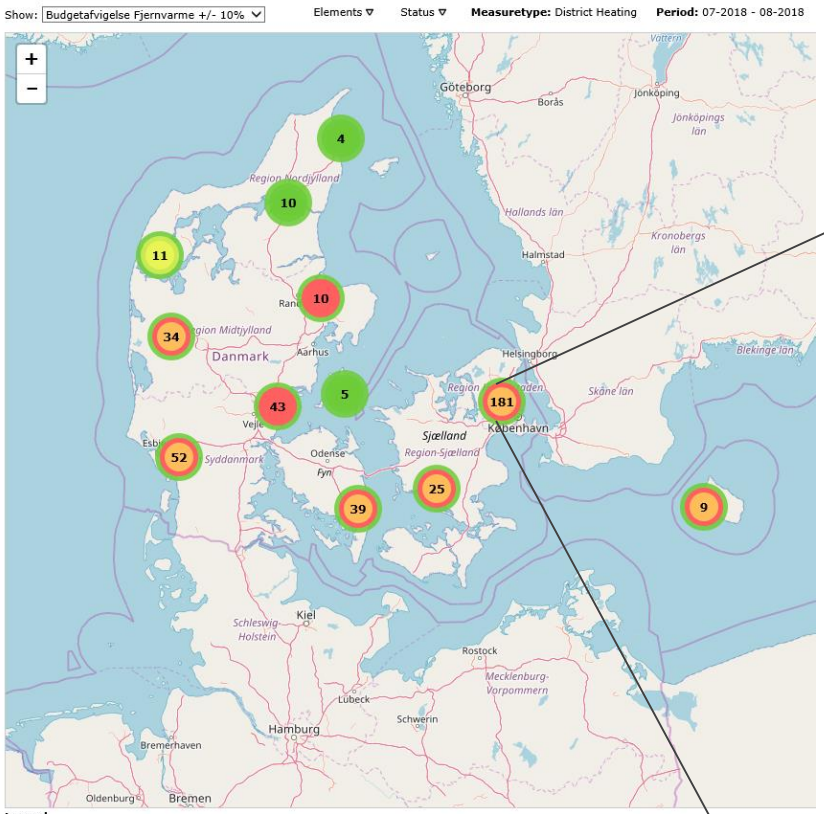

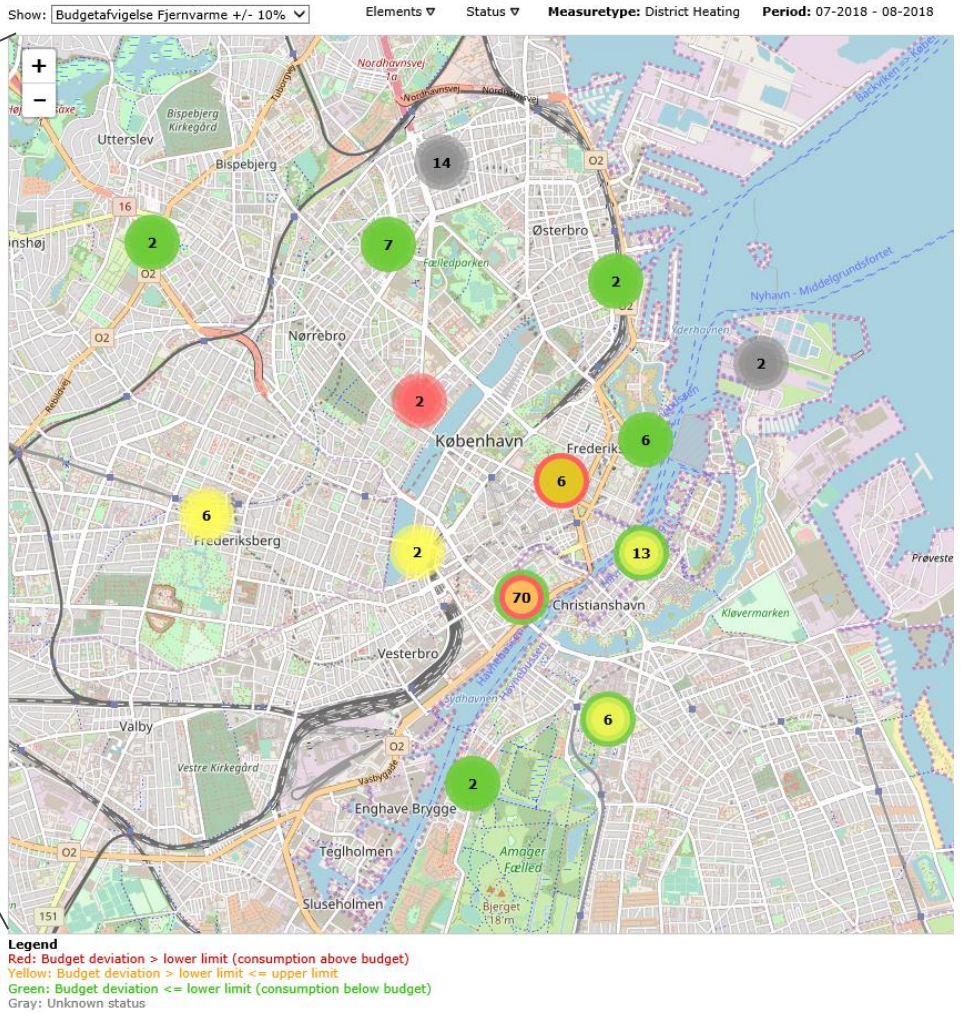

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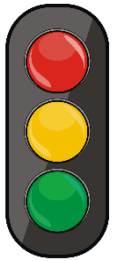
Traffic light model

HOFOR & Bygningsstyrelsen

Red, Yellow, Green and Green plus



Red > 130 kWh/m2
Yellow = 100-130 kWh/m2
Green = 70-100 kWh/m2
Green Plus < 70 kWh/m2

Varmemærker 2017

Ejendom	Adresse	Mærke	Forbrug	Tendens	Areal
	Zahrtmannsvej 44 3700 Rønne		47 kwh/m²	52 kWh/m² 47	2.762 m²
	Howitzvej 32 2000 Frederiksberg		41 kwh/m²	41 kWh/m² 41	9.011 m²
	Birkelundsvej 2 2620 Albertslund		77 kwh/m²	85 kWh/m² 77	10.276 m²
	Egegårdsvej 75 2610 Rødovre		134 kwh/m²	153 kWh/m² 134	1.264 m²
	Artillerivej 131 2300 Københanv S		160 kwh/m²	162 kWh/m² 160	756 m²
	Adelgade 11-13 1304 København K		86 kwh/m²	89 kWh/m² 86	5.653 m²
	Amaliegade 44 1256 København K		71 kwh/m²	77 kWh/m² 71	9.558 m²
	Asiatisk Plads 2 1402 København K		109 kwh/m²	110 kWh/m² 109	35.353 m²
	Bredgade 59 1206 København K		179 kwh/m²	165 kWh/m² 179	4.172 m²

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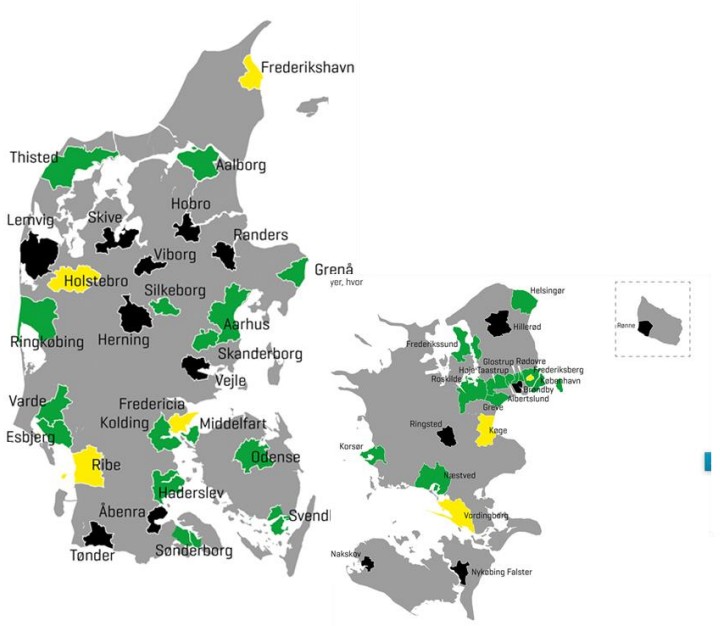
CURRENT PRACTICE

Data maturity levels:

- **Electricity: national datahub**
- **Heating: ? (mixed picture)**
- **Water: ? (backlog)**



Energy efficient building operation requires efficient consumption data!

Karl et al. (2019)

ISSUES AND POTENTIALS

- **Utility companies have data, but the building owners do not**
- **Lack of act on data**
- **Building operation according to customer needs/usage patterns**

THANK YOU

- **REFERENCES/RELEVANT PUBLICATIONS:**

Indicators for quantifying Environmental Building Performance: A systematic literature review.
Maslesa, Esmir; Jensen, Per Anker; Birkved, Morten.
In: Journal of Building Engineering, Vol. 19, 2018, p. 552-560.

Environmental performance assessment of the use stage of buildings using dynamic high-resolution energy consumption and data on grid composition.
Karl, Asger Alexander Wendt; Maslesa, Esmir; Birkved, Morten.
In: Building and Environment, Vol. 147, 2019, p. 97-107.

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