The value of district heating in Denmark in relation to municipal energy transition

(ongoing study)

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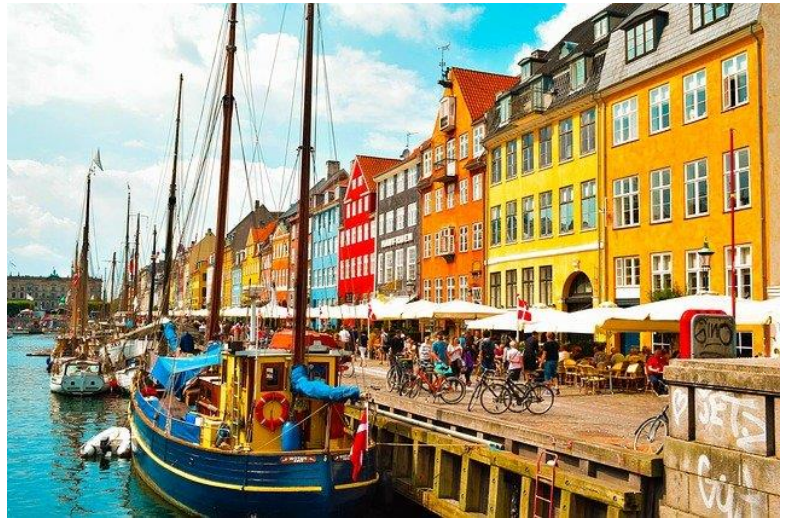
Background

- Majority of global **CO_2 emissions** originate from **urban areas**
- Global, national and local **emission reduction commitments**
- **Challenge for municipalities**:
  - achieving CO_2 neutrality, considering the social dimension
  - avoiding economic (rich vs. poor) and geographic (urban vs. rural) divisions
- How do we know that **energy strategies sufficiently address the challenges?**
  - progress in RES and EE implementation**,** CO_2 emission reduction
  - socioeconomic characteristics
  - **DH:** lever for municipalities to influence the choice of energy resources



Nyhavn, Copenhagen. Source: Pixabay.com

Objectives for this ongoing study

- Aim:
  - investigate **patterns in decarbonisation strategies** in municipalities **with and without DH**
  - use **indicators** to compare the decarbonisation path of Danish municipalities over a time horizon
  - depict **value of district heating and efficiency of heat planning**

- Expected results
  - **quantifying differences** between cities supplied with different shares of DH: CO_2 emissions, socioeconomic aspects etc.
  - highlighting **risks of unfair distribution of costs** related to the (two-speed) energy transition
  - informing policy makers, planners on the **opportunities** and **possible risks** linked to exploring DH

RQ1

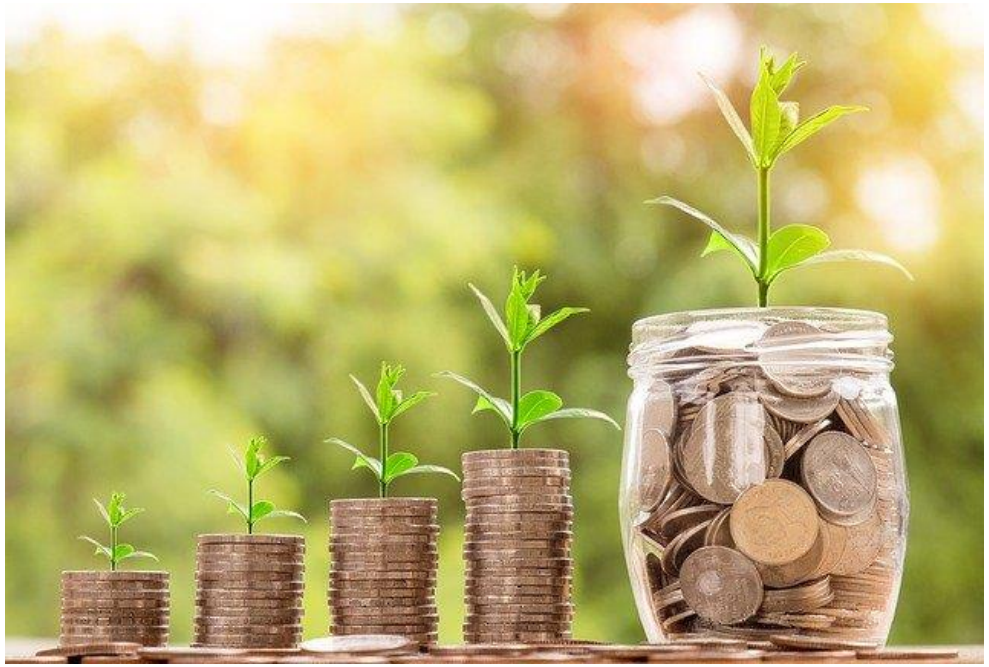
How do Danish DH areas compare to Danish natural gas areas in terms of selected indicators?

Stages of the analysis

WHAT	Areas with heat density >x kWh/km^2	Divide into supply-type: DH and natural gas	Identify data to overlay on those areas (e.g. income, house prices)	Analyse: What are the differences between these areas?
WHY	Obtain comparable (sub)urban areas	Distinguish between two comparable supply-types	Let the available data determine the indicators (inductively)	Answer the RQ
REQUIRES	Heat atlas, **Energy and CO_2 accounts**, Danish Statistics data, DH environmental declaration data, smart meter data…			Statistics-knowledge and skills

Value of district heating

- **Reduced CO_2 emissions**?
- Better integration of RES?
- Economic savings?
  – socioeconomic
  – private-economic for customer
- Improved energy efficiency?
- Comfort and security of supply?



Value of DH - preliminary insights from the CO_2 and energy accounts*

- online database for CO_2 emissions and energy consumption for Danish municipalities (beta version)

- selected **20 Danish municipalities with lowest CO_2 emissions** per capita in 2018
  – between (2.2 - 5.4 tCO_2 per inhabitant)

- Many municipalities in Eastern Denmark have **lower per capita CO_2 emissions** than in Western Denmark

- Low per capita emissions in municipalities with **highest DH share** e.g. Frederiksberg, Copenhagen (almost 100% DH)
  – exceptions!

*https://sparenergi.dk/offentlig/vaerktoejer/energi-og-co2-regnskabet

Value of DH - preliminary insights from the CO_2 and energy accounts (2)*

- **Similar CO_2 content of DH-supplied heat** in "the best 20" (as reported in environmental declarations) ca. 60-70 g/kWh

- Data is the new gold - but some **precautions**
  - open-access data may be **insufficiently validated**
  - many conversions to biomass and HP lately - may **not be mirrored in the stats yet**
  - be careful not to compare "apples and oranges" (years reported, CO_2 or GHG etc.)
  - correlation **or** causation?

*https://sparenergi.dk/offentlig/vaerktoejer/energi-og-co2-regnskabet

Further work

- Comparing **DH areas within** two (or more) **"similar" municipalities** and/or comparing **DH areas with NG areas in one municipality**?
- Cost analysis to evaluate the **impact of DH activities** over the years **on the energy bill** compared to other heat supply types
- Identify **cases that have resulted in limited success in low-cost** energy shift
- Income-related data: **risks of unfair distribution of costs** related to the energy transition as input for district heating tariff design analysis

Thank you for your attention! Questions?

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