Combatting Climate Change through Public Procurement: A Big Data and Machine Learning Approach
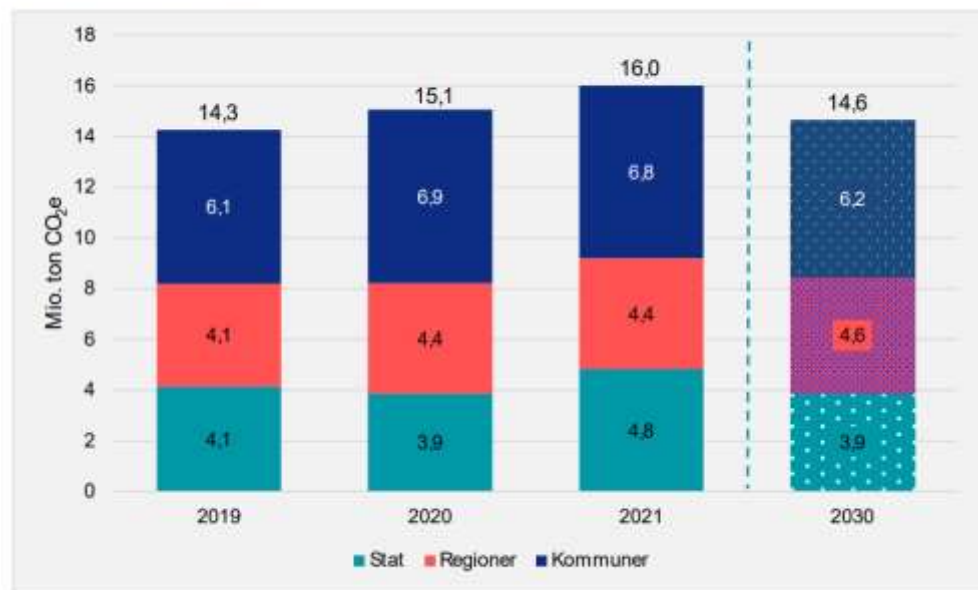
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Ole Helby Petersen, Roskilde University

Public procurement and the climate

Figur 1: Klimaaftrykket af statens, regionernes og kommunernes indkøb i 2019, 2020, 2021 og fremskrevet til 2030.

Kilde: Energistyrelsen

Nicolai Wammen, Minister for Finance:
"Public procurement holds great potential. Partly with concrete solutions that can reduce our emissions here and now and contribute to the climate goals, partly by pushing the development of more climate-friendly products and services in the long run... we are turning public procurement into an engine for green market development."

Theory: Negative externalities

Externality: An action by producers or consumers that affects other producers or consumers - but is <u>not</u> priced in the market

Externalities are market failures: The market <u>does not</u> account for the full welfare consequences of production and consumption

Green procurement corrects market failures: It prompts the market to price environmental and climate externalities in public sector consumption
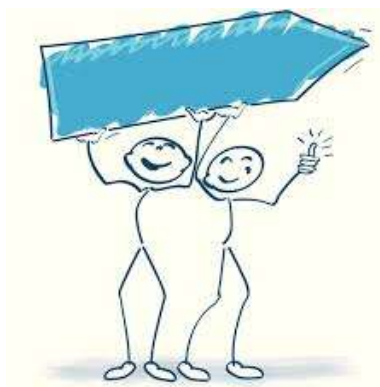
Theory: Demand and supply side apporaches

Demand-side approach	Minimum requirements, standards, labels, certifications	Low transaction costs, (risk of) low environmental/climate benefits
Supply-side approach	Award criteria: Qualitative descriptions, competition	High transaction costs, (chance of) high environmental/climate benefits

Collecting big contract text data

- Weekly collection of public procurement documents from January 1, 2021.
- Over 200,000 procurement documents and still counting

Mercell Danmark A/S data source

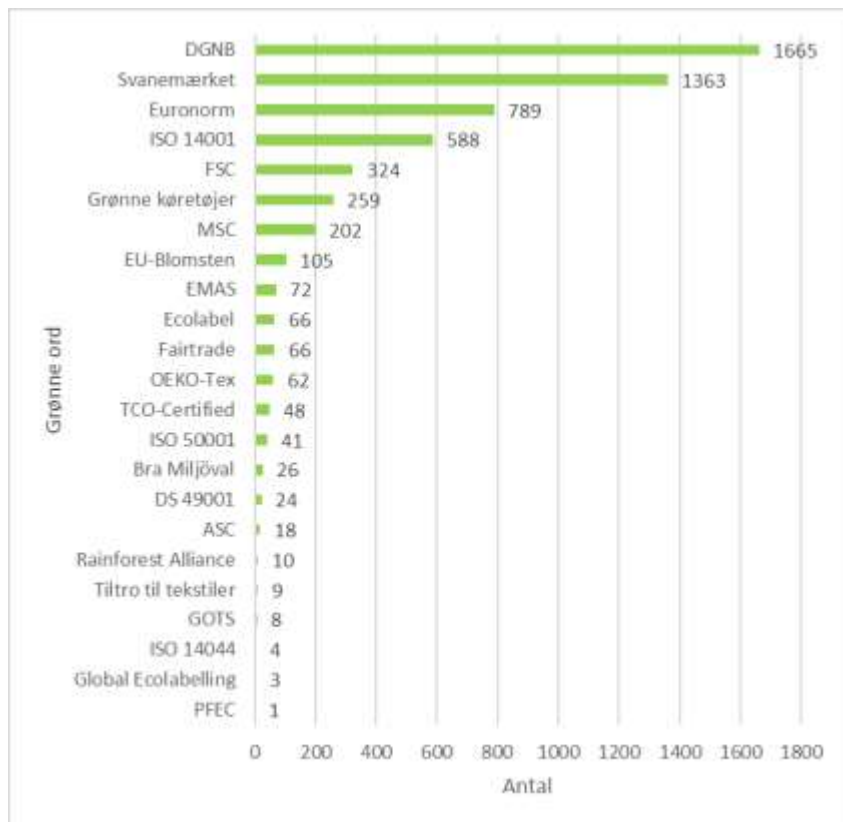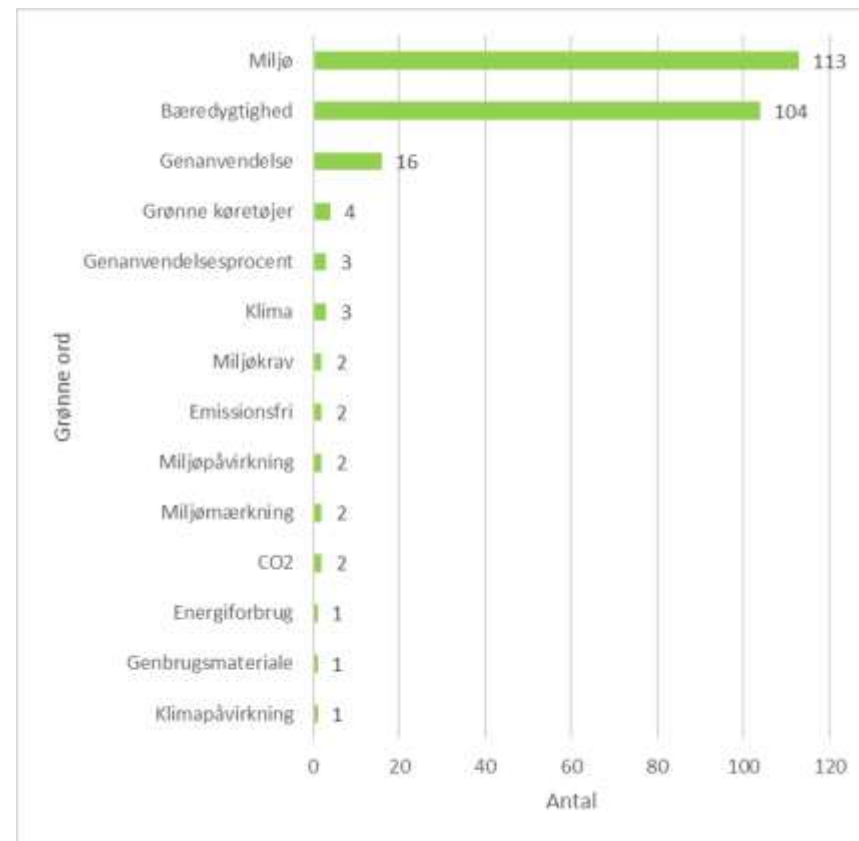# Analyzing contract text data: AI and Natural Language Processing

1. **Green award criteria**
- Keyword search and manual coding
- Classification with OpenAI's language model

2. **Green minimum requirements**
- Dictionary method
- Based on qualitative exploration, interviews, government reports

Filename	Raw text	Data cleaning	Word Tokenization	Lemmatization	Green Dictionary
8 Indkøbs og udbudspolitik 181135-2021 .docx	Ejendomme & Indkøb \n\n\n\n\n\n \nINDKØBS-OG...	ejendomme & indkøb indkøb og udbudspolitik fo...	[ejendomme, &, indkøb, indkøbs, og, udbudspoli...	[ejendom, &, indkøb, indkøb, og, udbudspolitik...	[svanemærke, EU-blomst, DGNB]
Udbudsbrev ny lagerhal 0277267217 .pdf	Udbudsbrev - Hovedentreprise\r\nEtablering af ...	udbudsbrev hovedentreprise etablering af ny la...	[udbudsbrev, hovedentreprise, etablering, af, ...	[udbudsbrev, hovedentreprise, etablering, af, ...	[iso 14001]
Udbudsbetingelser 189736-2021 .pdf	Udbudsbetingelser\r\nom\r\n Vandmålere og fjern...	udbudsbetingelser om vandmålere og fjernaflæsn...	[udbudsbetingelser, om, vandmålere, og, fjerna...	[udbudsbetingelse, om, vandmåler, og, fjernafl...	[iso 14001]

Frequency of green procurement

Frequency of green *minimum requirements*

Frequency of green *award criteria*

Time trends 2021-2022

Minimum requirements, share of contracts

1. kvartal	2. kvartal	3. kvartal	4. kvartal	2021	1. kvartal	2. kvartal	3. kvartal	4. kvartal	2022
30%	30%	28%	26%	28%	32%	33%	27%	32%	31%
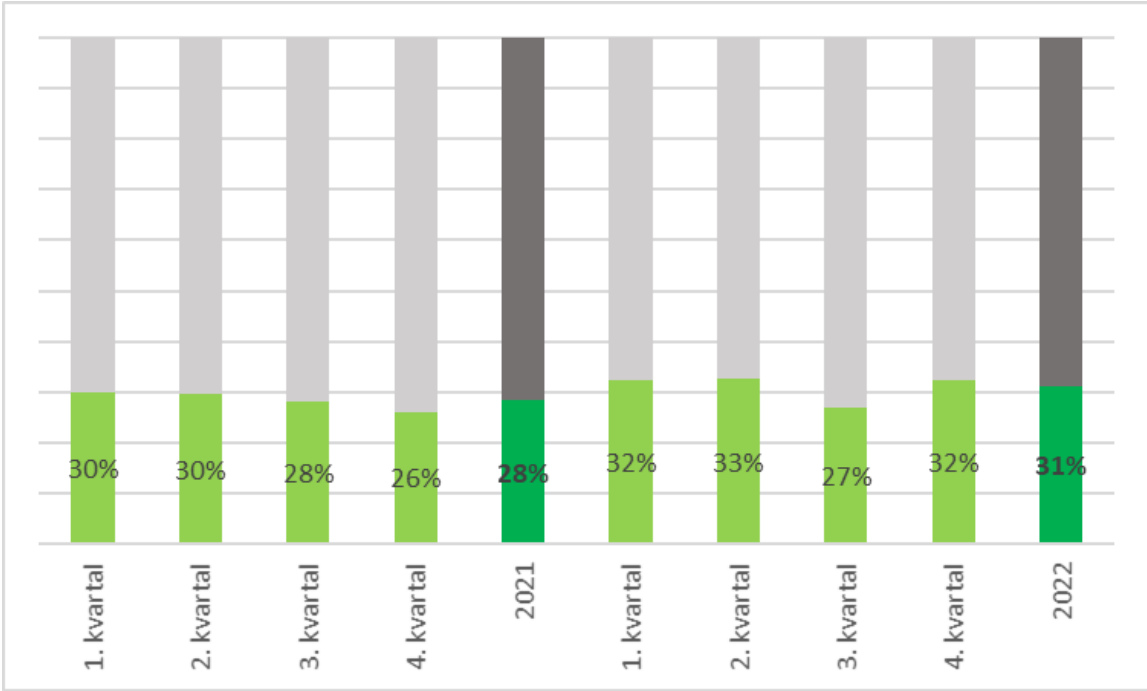
Award criteria, share of contracts

1. kvartal	2. kvartal	3. kvartal	4. kvartal	2021	1. kvartal	2. kvartal	3. kvartal	4. kvartal	2022
7,2%	3,9%	5,5%	6,7%	5,8%	6,6%	6,9%	8,4%	6,1%	7,0%
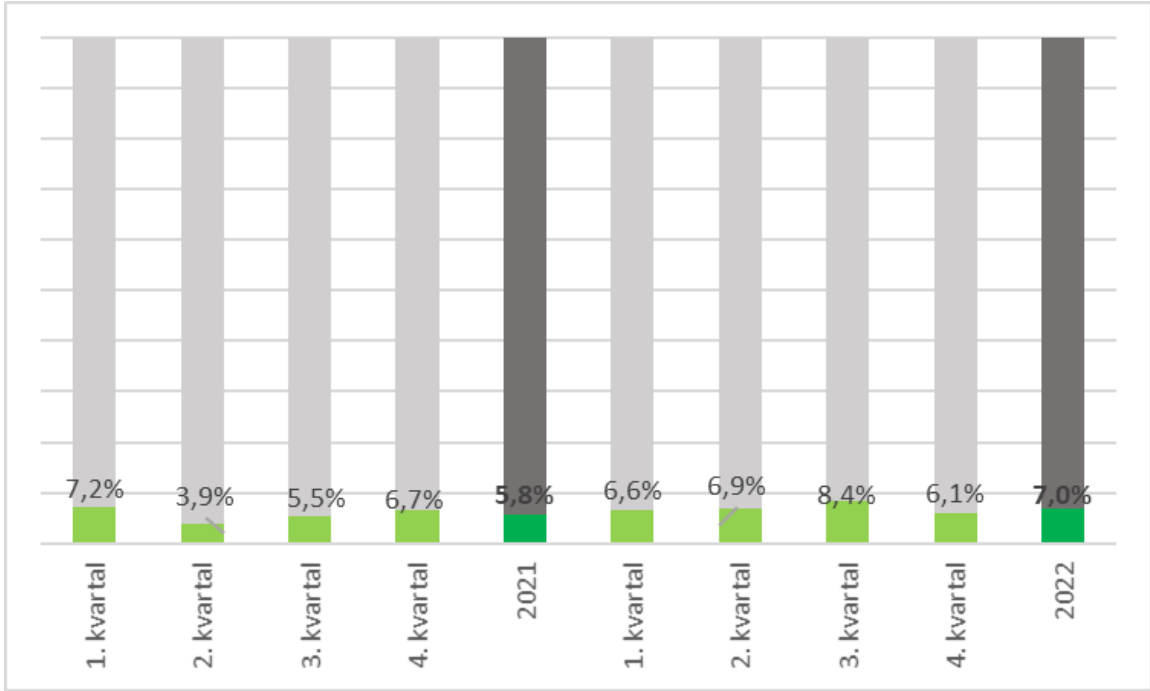
Factors associated with green public procurement

H1: Administrative capacity
H2: Fiscal capacity

Administrative capacity (-)

H3: Political ideology

Right-wing governments (-)

H4: Measurement difficulty
H5: Asset specificity

Complex products (-)

Propensity for using:
- green award criteria
- minimum standards

Estimated in four models (logit, fractional, poison with two-way clustering)

Thank you!