Dansk Miljøteknologi: Miljøpolitisk Topmøde

Taastrup 27. januar 2020

Danmark som grøn vindernation

- Hvor langt er vi og hvad mangler vi ?

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Nordic Green Growth

NordForsk

AARHUS UNIVERSITY (DENMARK)

Hovedpunkter

- Danmark i det globale felt
- Opskalering af grønne teknologier
- Transport og landbrug
- Nordiske styrke positioner
- Nye markedsvilkår for grøn teknologi

Climate Change Performance Index 2020

CAN CLIMATE ACTION NETWORK

GERMANWATCH

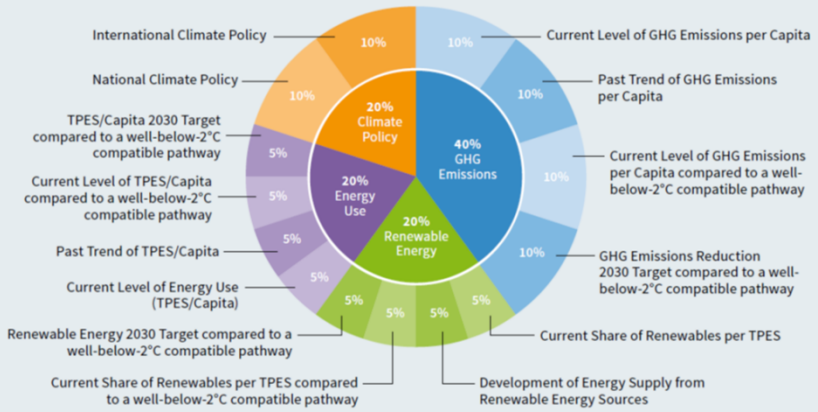
Top three performers:

Sweden is leading the group of *high* performing countries, as it has in the past two years.

Denmark moves up ten ranks to become the second best performing country in this year's CCPI.

Morocco falls one place in the overall ranking but keeps its overall *high* performance.

Components of the CCPI



GHG = Greenhouse Gases | TPES = Total Primary Energy Supply

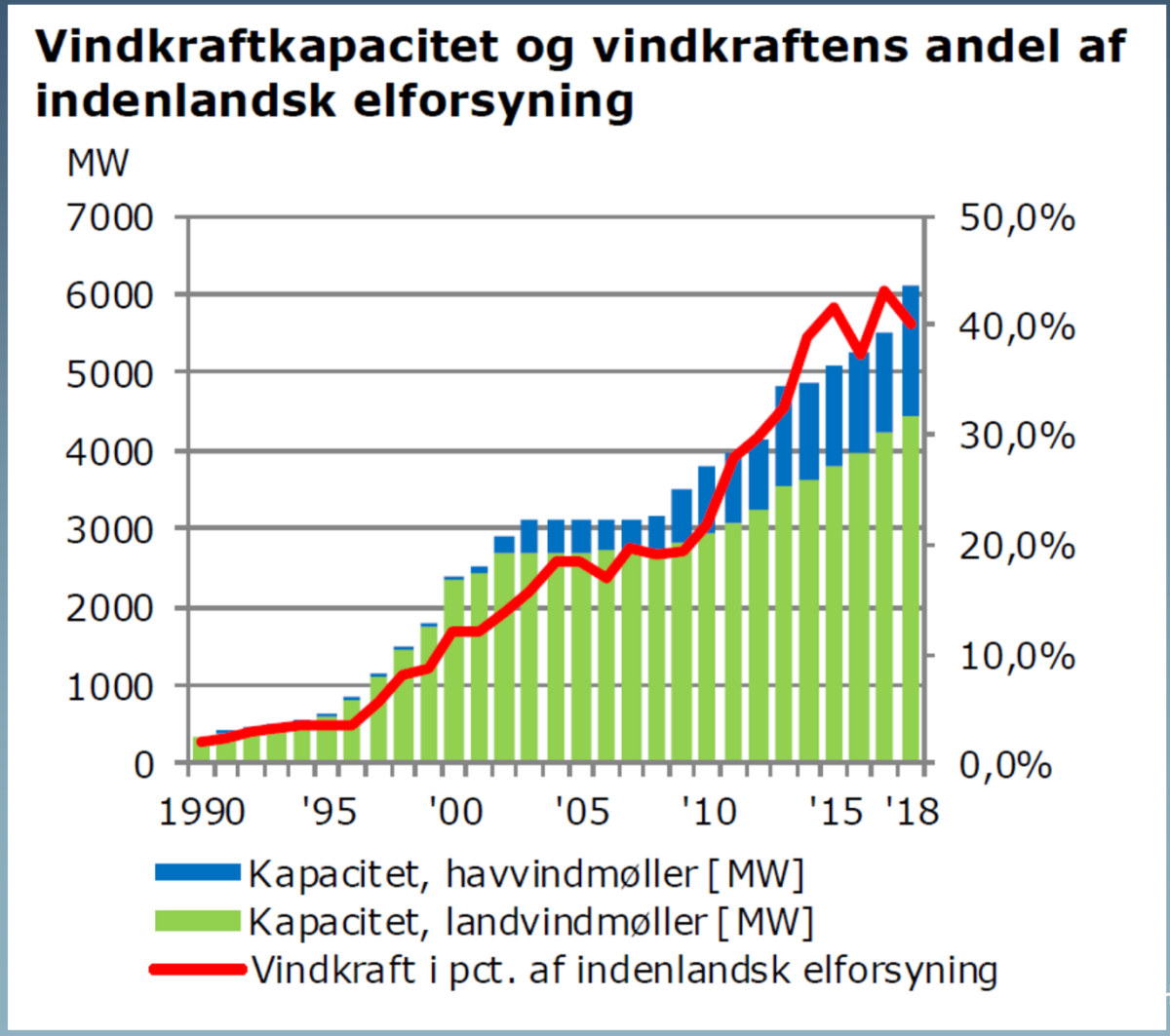
Rank		Country	Score***	Categories
1.*		–	–	
2.		–	–	
3.		–	–	
4.	–	Sweden	75.77	
5.	▲	Denmark	71.14	
6.	▼	Morocco	70.63	
7.	▲	United Kingdom	69.80	
8.	▼	Lithuania	66.22	
9.	▲	India	66.02	
10.	▲	Finland	63.25	
11.		Chile	62.88	
12.	–	Norway	61.14	
13.	▲	Luxembourg	60.91	
14.	▼	Malta	60.76	
15.	▼	Latvia	60.75	
16.	▼	Switzerland	60.61	
17.**	▲	Ukraine	60.60	
18.	▲	France	57.90	
19.	▲	Egypt	57.53	
20.	▼	Croatia	56.97	
21.	▲	Brazil	55.82	
22.	▼	European Union (28)	55.82	
23.	▲	Germany	55.78	
24.	▼	Romania	54.85	
25.	▼	Portugal	54.10	
26.	▼	Italy	53.92	
27.	▼	Slovak Republic	52.69	
28.	▲	Greece	52.59	
29.	▼	Netherlands	50.89	
30.	▲	China	48.16	
31.	▲	Estonia	48.05	
32.	▼	Mexico	47.01	
33.	▲	Thailand	46.76	
34.	▲	Spain	46.03	
35.	▼	Belgium	45.73	
36.	▲	South Africa	45.67	
37.	▲	New Zealand	45.67	
38.	▼	Austria	44.74	
39.	▼	Indonesia	44.65	
40.	▼	Belarus	44.18	
41.	▲	Ireland	44.04	
42.	▼	Argentina	43.77	
43.	▼	Czech Republic	42.93	
44.	▼	Slovenia	41.91	
45.	▲	Cyprus	41.66	
46.	▲	Algeria	41.45	
47.	▼	Hungary	41.17	
48.	▲	Turkey	40.76	
49.	▼	Bulgaria	40.12	
50.	▼	Poland	39.98	
51.	▼	Japan	39.03	
52.	–	Russian Federation	37.85	
53.	▼	Malaysia	34.21	
54.	▼	Kazakhstan	33.39	
55.	▼	Canada	31.01	
56.	▼	Australia	30.75	
57.	▲	Islamic Republic of Iran	28.41	
58.	▼	Korea	26.75	
59.	▼	Chinese Taipei	23.33	
60.	–	Saudi Arabia	22.03	
61.	▼	United States	18.60	

Index Categories

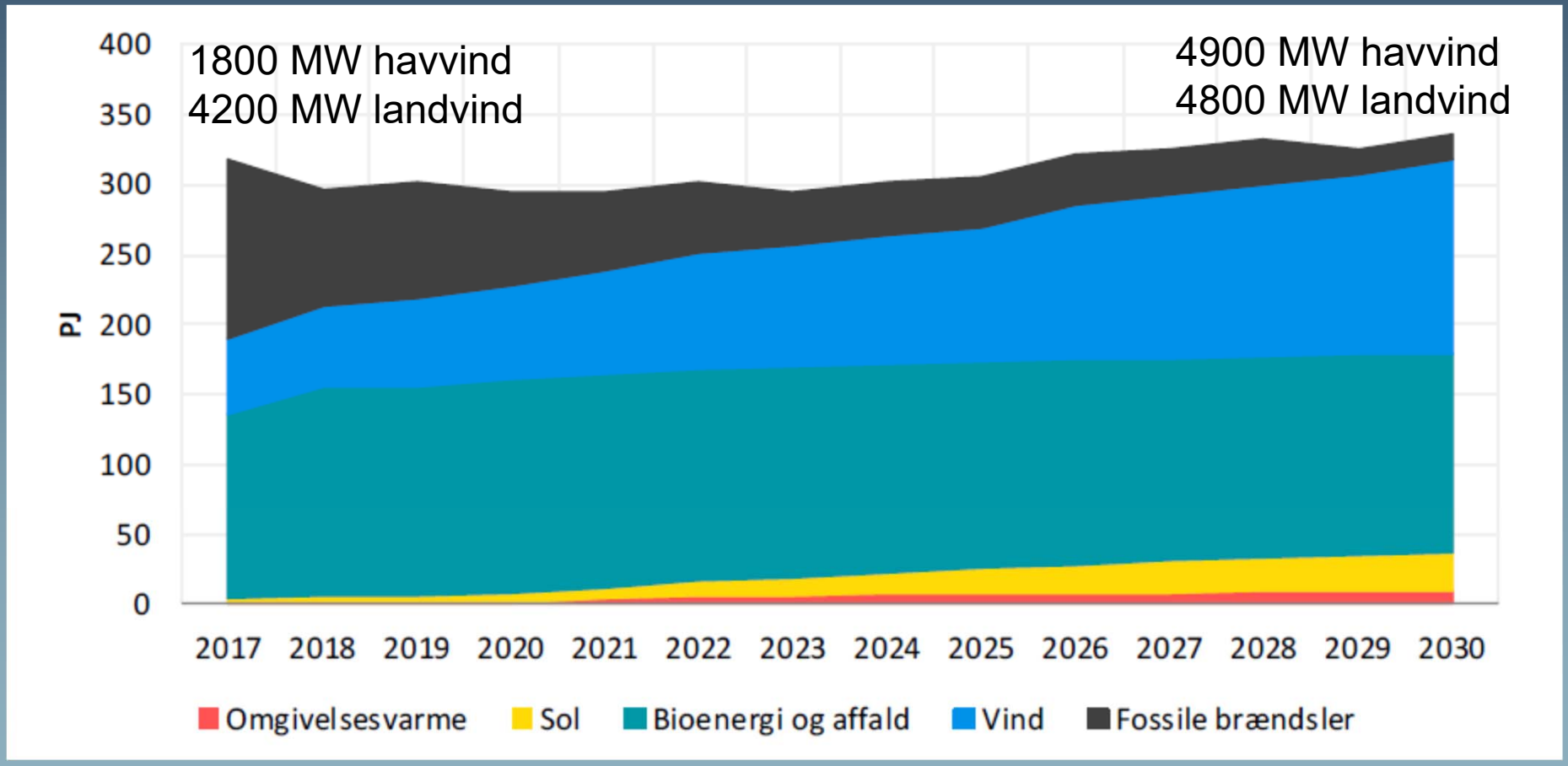
- GHG Emissions (40% weighting)
- Renewable Energy (20% weighting)
- Energy Use (20% weighting)
- Climate Policy (20% weighting)

* None of the countries achieved positions one to three. No country is doing enough to prevent dangerous climate change.

Vindkraftens andel af indenlandsk elforsyning

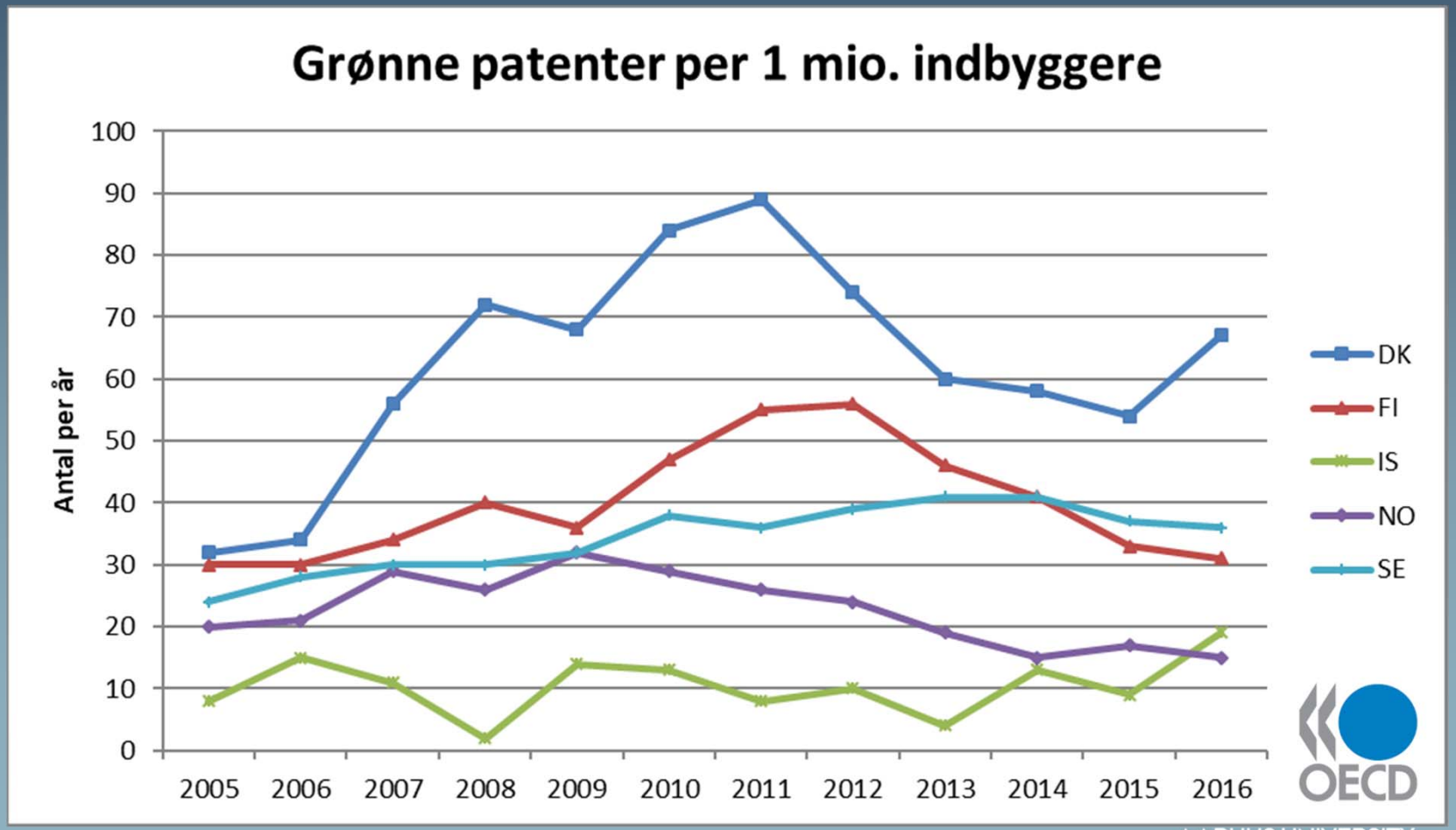


El- og fjernvarmesektorens forventede omstilling til vedvarende energi 2017-2030

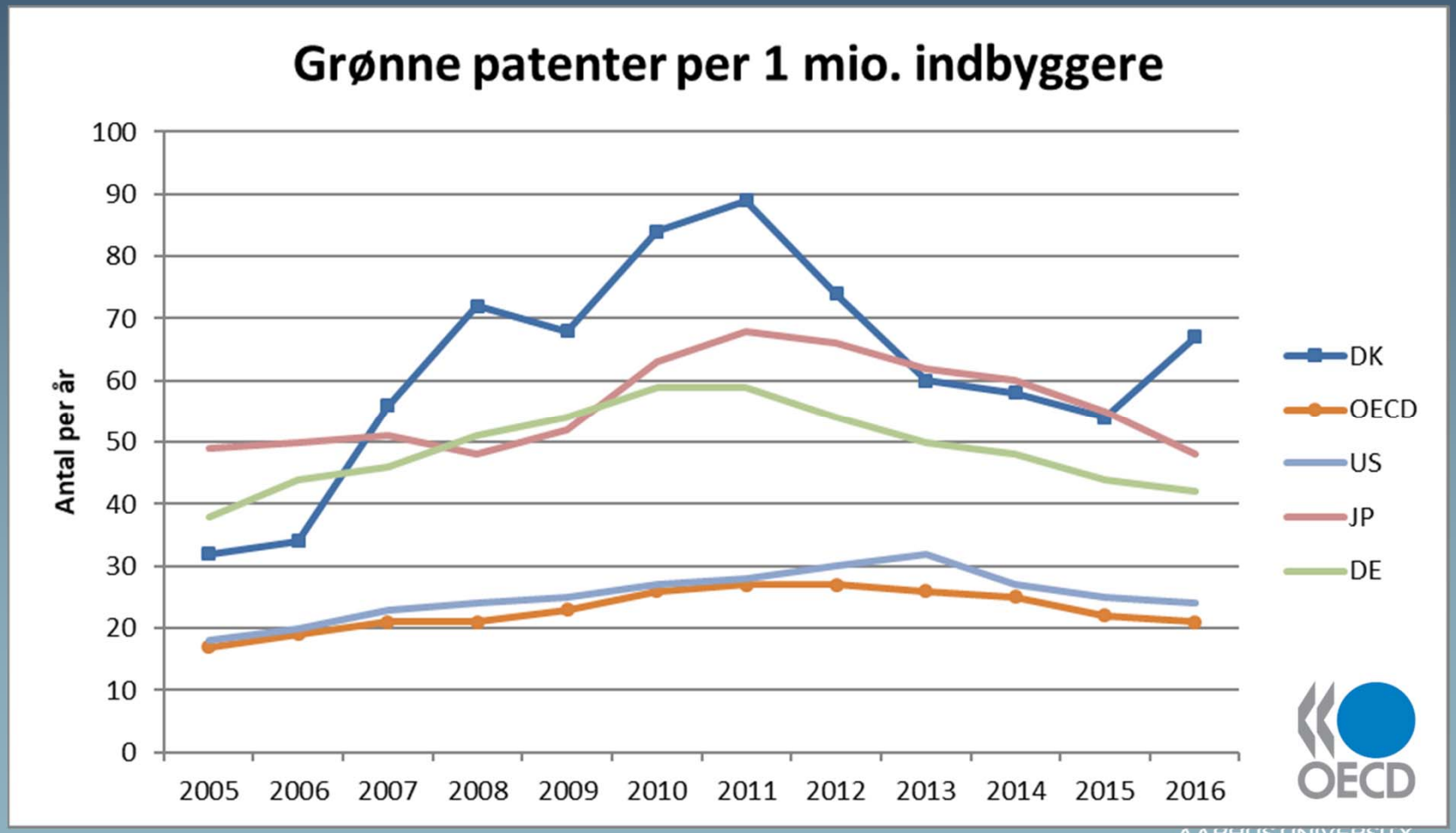


Energistyrelsen, Basisfremskrivning 2019

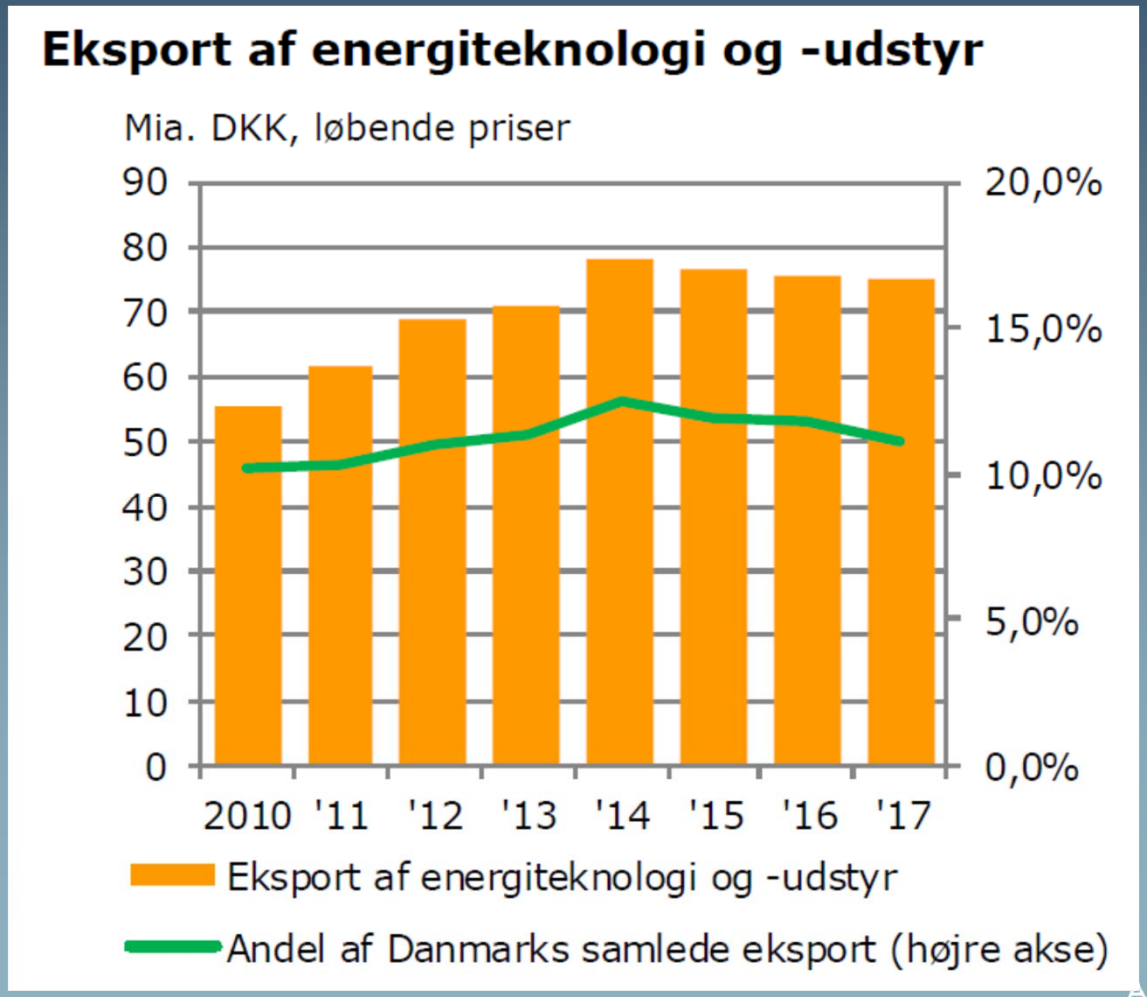
DK: relativt flest grønne patenter i Norden



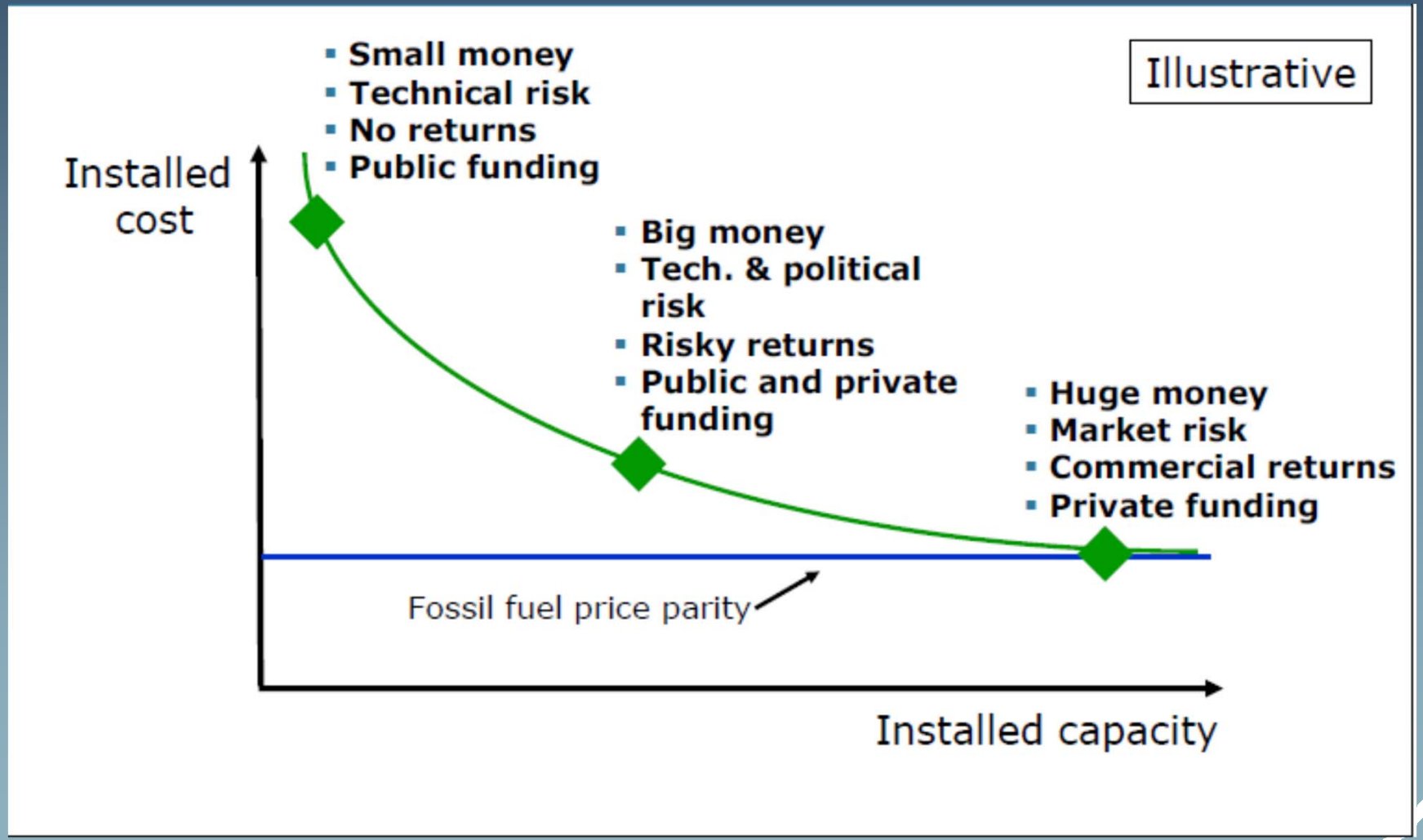
DK: langt over OECD gennemsnittet



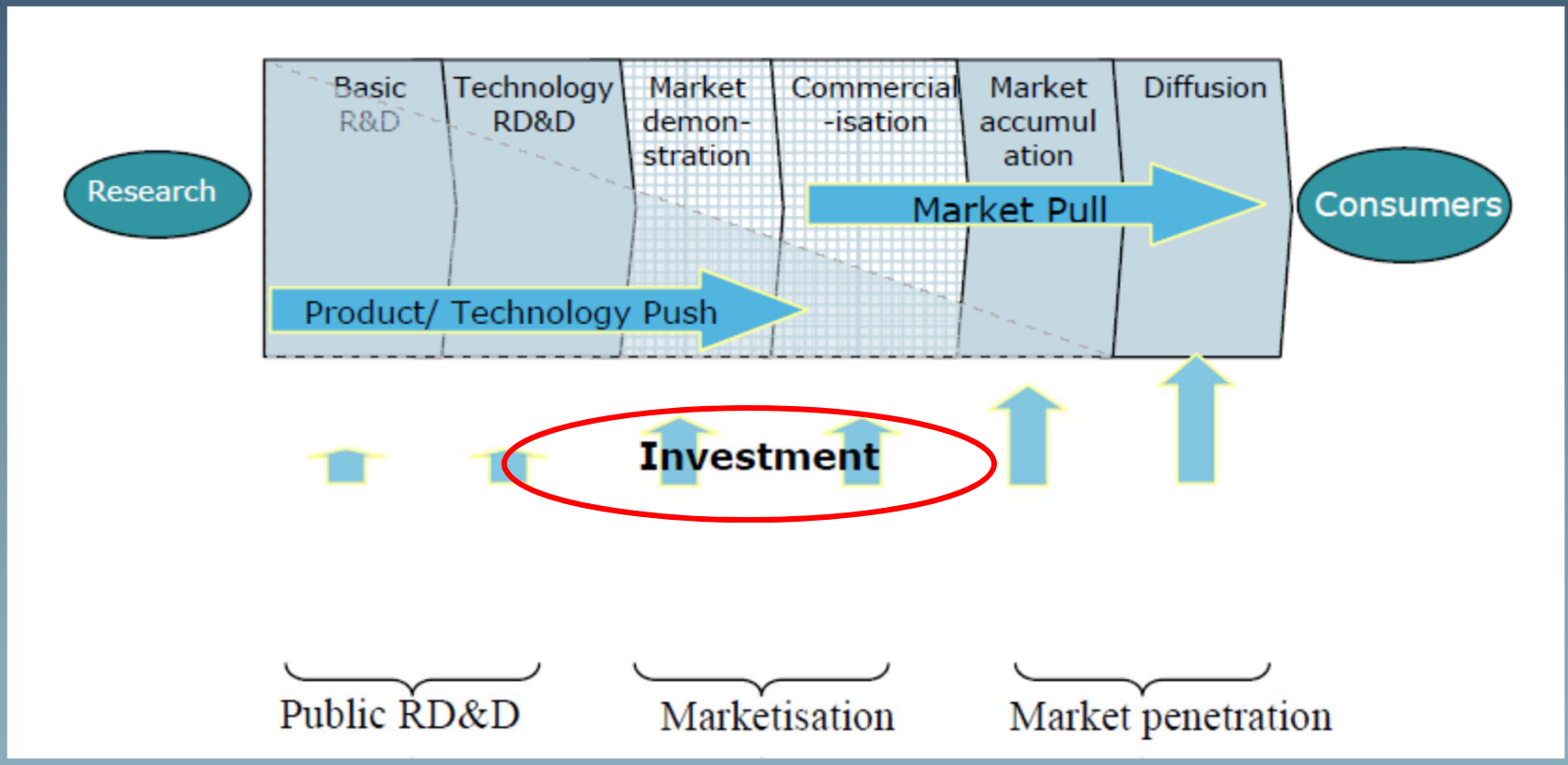
..men eksporten af grøn energi-teknologi viger



Olieprisen påvirker investerings-lysten

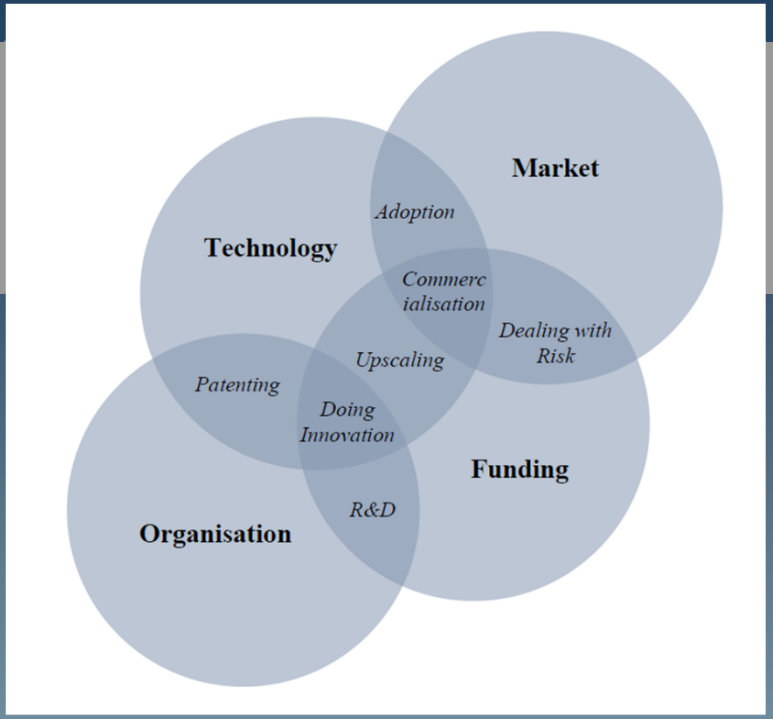


Fra pilot stadie til markedet: Valley-of-death



Nye veje til grøn vækst ?

- Interviews med indehavere af grønne patenter i Norden
- Kortlægning af barrierer
- Resultater primo 2021

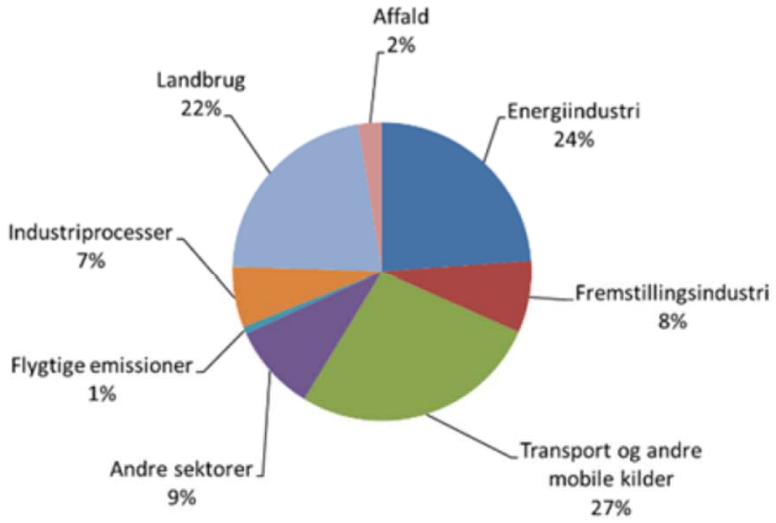


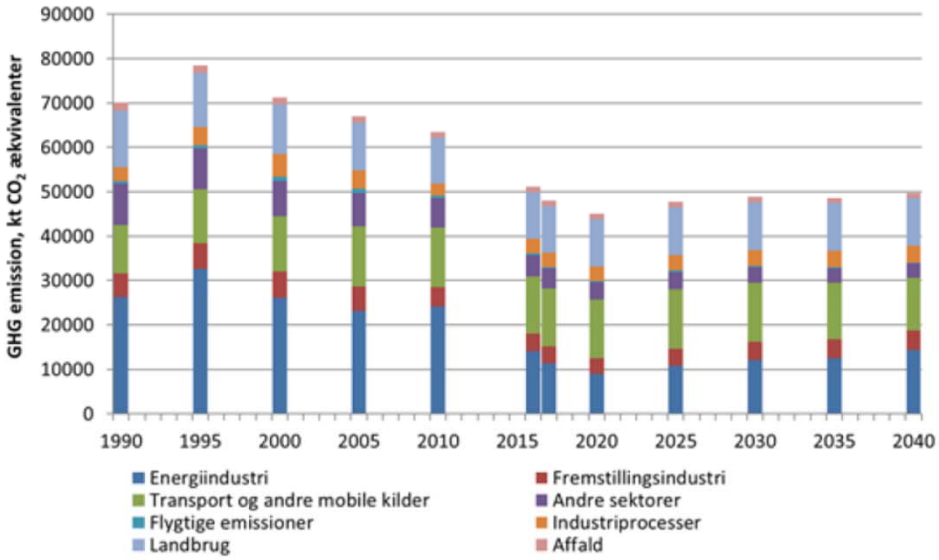
Stage / Factor	R&D	Doing innovation	Patenting	Upscaling	Dealing with risk	Commercialisation	Adoption
Organisation	Organisation where the R&D activities were carried out	Role of organisational and cultural capacity	The reasons for patenting				
Tech		How the technology is environmental and innovative	The readiness level of patent	The technical challenges in upscaling		How the commercial level is reached in technical terms	The receiving infrastructure and industry
Funding	How the R&D was funded	Securing seed funding		The financial challenges in upscaling	How investors perceive the market	The role of commercial partners	
Market					The role of policy and regulation	The role of prices and competitors	The target market segment

Table 1. Matrix of the topics covered in each factor/stage intersection. These are also the criteria for classifying a quote according to a specific topic.

Pizzol & Andersen, in prep.

Grøn omstilling af transport og landbrug





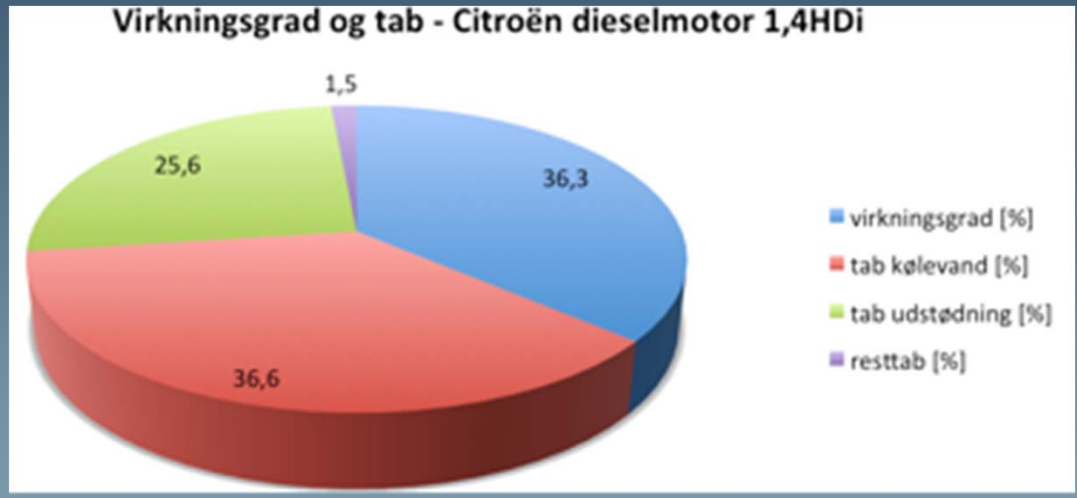
Figur R.2 Totale drivhusgasemissioner i CO_2-ækvivalenter fordelt på hovedsektorer for 2016 og tidsserier fra 1990 til 2040.

- DCE-fremskrivning viser behov for nye tiltag

Stort konverteringstab i fossil biler

Energi-udnyttelse

- Benzin biler: 20 %
- Diesel biler: 35%
- El-biler: 70%



TAB

- - kølevand til motor & udstødning

Derfor: Vejtransporten idag kræver 162 PJ (+12M tCO2)

Men hvis 100% el-biler 2½ gang mindre: ca. 64 PJ

God økonomi i elbiler ifølge FDM

FDM analyse (Motor 6/19)

- 9000 kr/år på brændstof i besparelse (20.000 km)
- Mindre vedligehold
- Værditab

FACIT: Konkurrencedygtige elbiler er på markedet

Analysens udgifter omfatter ifølge FDM alt (el, dæk, værditab, forsikring, serviceaftale, ejer-afgift, renter, vask og parkering)

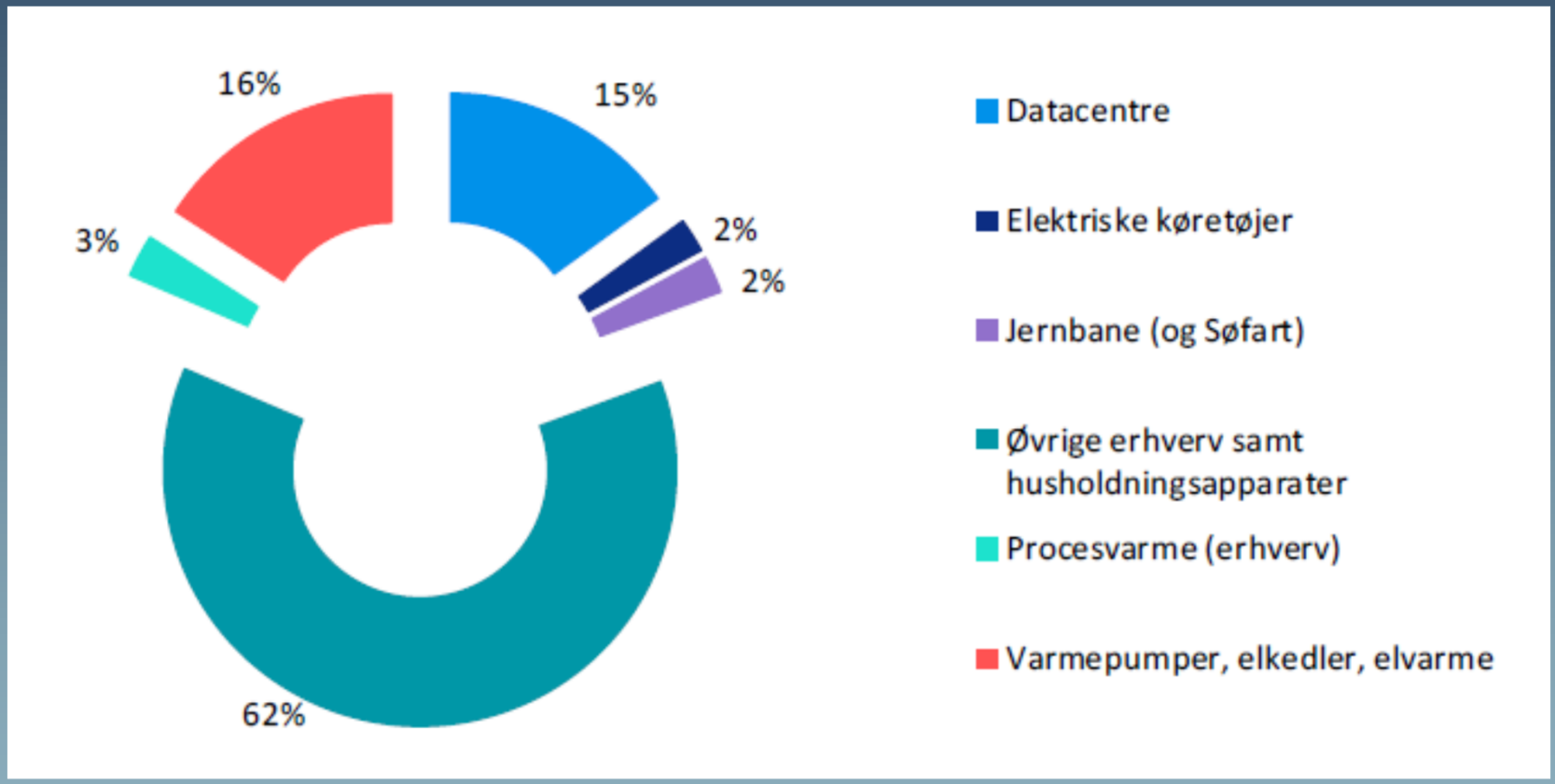
Så meget koster en km i en elbil

Smart Fortwo	2,90 kr./km
Hyundai Ioniq	3,05 kr./km
VW e-Golf	3,40 kr./km
Kia e-Niro 64 kWh	3,50 kr./km
Kia e-Soul 64 kWh	3,50 kr./km
Hyundai Kona 64 kWh	3,55 kr./km
Nissan Leaf e+ 62 kWh	3,70 kr./km
BMW i3 120 Ah	3,95 kr./km
Tesla Model 3 Long Range AWD	4,35 kr./km
Mercedes-Benz EQC	6,10 kr./km
Jaguar I-Pace	6,35 kr./km
Audi e-tron	6,65 kr./km
Tesla Model S Long Range	7,05 kr./km
Tesla Model X Long Range	7,70 kr./km

Brændstofbiler (til sammenligning)

Toyota Yaris Hybrid H3	2,85 kr./km
VW Golf 1.5 TSI Highline	3,50 kr./km
Mazda 3 2.0 Cosmo	3,75 kr./km
Nissan Qashqai DIG-T 160 Tekna+	4,35 kr./km
BMW 320d	4,85 kr./km
Jaguar E-Pace 180hk AWD	5,55 kr./km

Elforbruget i 2030 med 100% el køretøjer ?
- fra en andel på 2% til 20 %



Energistyrelsen, Basisfremskrivning

Behov for mere VE-el; 64 PJ vil fx kræve 5000 MW landvind

Eller flere energibesparelser!

Landbrugets drivhusgasser: metan og lattergas

Table 6.1 Historic and projected emission from the agricultural sector, given in CO_2 equivalents.

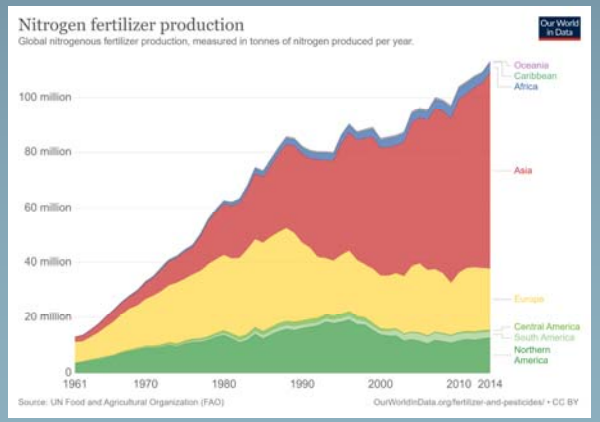
Kt CO_2 equivalents	1990	2000	2005	2010	2015	2016	2017	2020	2025	2030	2035	2040
Enteric fermentation	4 039	3 631	3 483	3 631	3 667	3 712	3 743	3 831	4 006	4 195	4 195	4 195
Manure management	2 523	3 034	3 167	2 800	2 608	2 572	2 485	2 322	2 259	2 173	2 173	2 173
Agricultural soils	5 490	4 324	3 941	3 818	3 936	4 035	4 073	4 155	4 186	4 274	4 219	4 252
Field burning of agricultural residue	3	4	5	3	3	3	4	4	3	3	3	3
Liming	565	261	220	153	166	212	206	201	197	194	194	194
Urea application (CO_2 emission)	15	2	0	1	1	2	1	1	1	1	1	1
Other carbon-containing fertilisers	38	5	2	3	10	3	4	4	4	4	4	4
Total	12673	11262	10818	10408	10392	10539	10515	10517	10655	10844	10788	10821

- Metan fra drøvtyggere og husdyrgødning
- Lattergas fra tilførsel af kunstgødning til markerne

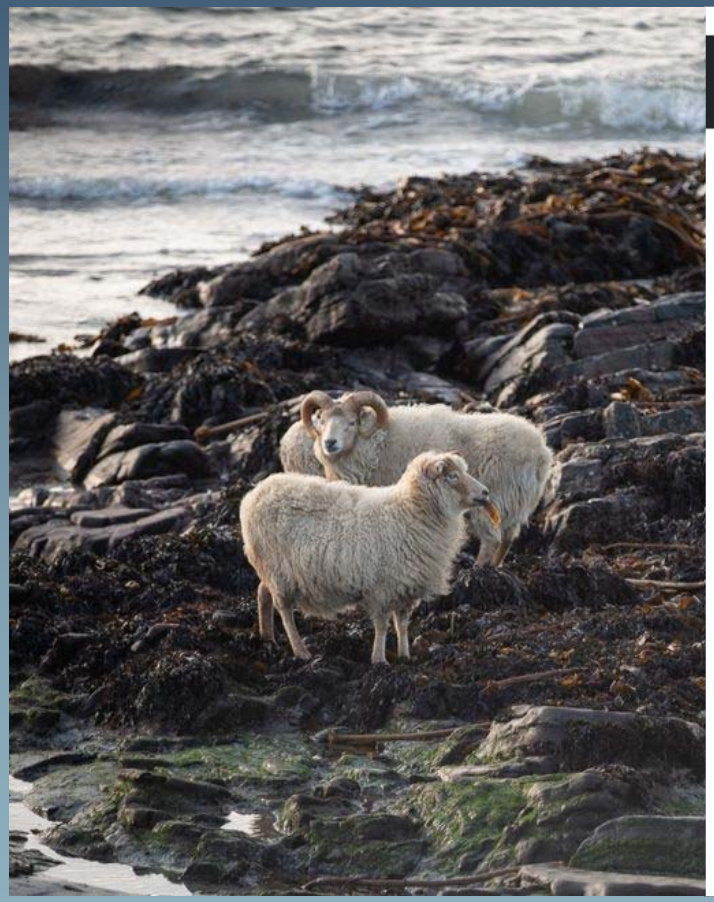
Erstat kunstgødning med husdyrgødning

Fertilizer product		Nutrient content	GHG emissions (GWP 100 yrs: IPCC, 2007) Fertilizer production	Fertilizer use (soil effects)					Fertilizer production + use		Energy consumption* Fertilizer production
fertilizers europe			At plant gate	CO_2 from urea hydrolysis	Direct N_2O from use	Indirect N_2O via NH_3	Indirect N_2O via NO_3^-	CO_2 from liming and CAN	Total	Total	On-site
			kg CO_2-eq/ kg product						kg CO_2-eq/kg product	kg CO_2-eq/kg nutrient	MJ/kg product
Ammonium nitrate	AN	33.5% N	1.18	0.00	1.26	0.01	0.35	0.27	3.06	9.14	14.02
Calcium ammonium nitrate	CAN	27% N	1.00	0.00	0.89	0.01	0.28	0.20	2.40	8.88	11.78
Ammonium nitrosulphate	ANS	26% N, 14% S	0.83	0.00	1.10	0.02	0.27	0.40	2.62	10.09	10.61
Calcium nitrate	CN	15.5% N	0.68	0.00	0.65	0.00	0.16	0.00	1.50	9.67	7.23

- 9-10 kg $CO2_{eq}$ per kg kvælstof (N)
- Globalt ~3% af GHG fra kunstgødning
- Husdyrgødnings effekt kommer gradvis med mineralisering – viden!



Tang i husdyr foderet: >80% metan reduktion



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Home / Earth / Environment

MAY 11, 2019

The race is on to cultivate a seaweed that slashes greenhouse emission from cows, other livestock

by Joshua Emerson Smith, The San Diego Union-Tribune

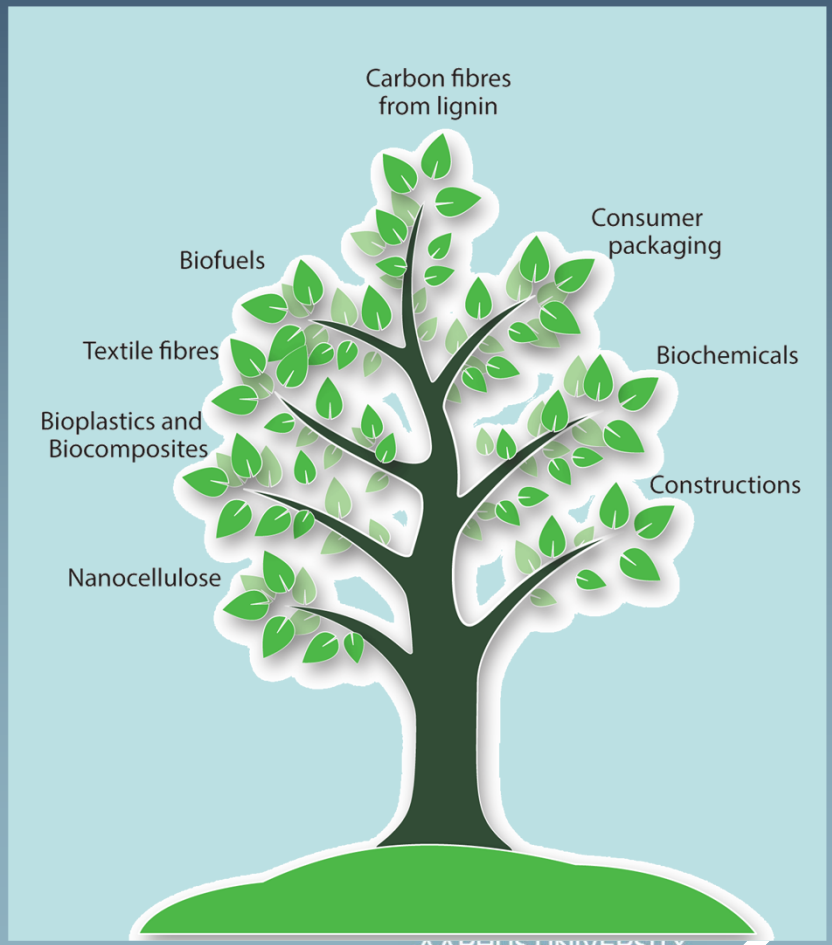
Those concerned with climate change may soon feel less compunction about biting into a cheeseburger.

Researchers have recently discovered that feeding cattle and other livestock a specific type of seaweed—known as Asparagopsis taxiformis—can dramatically reduce the massive amount of planet-warming methane such farm animals burp and fart into the atmosphere.

Scientists from San Diego to Vietnam to Australia are now working overtime to figure out how to best cultivate the underwater plant—which a growing number of private aquaculture companies are seeing as a potential cash cow.

Finland: Bioøkonomi

- Bio-diesel til transporten, incl. fly og skibe
- Bio-raffinering: kaskader af ressource anvendelser
- Lignin fra træmasse til biobaserede emballager



Norge: effektiv bilbeskatning

- CO2 element i registreringsafgiften siden 2007

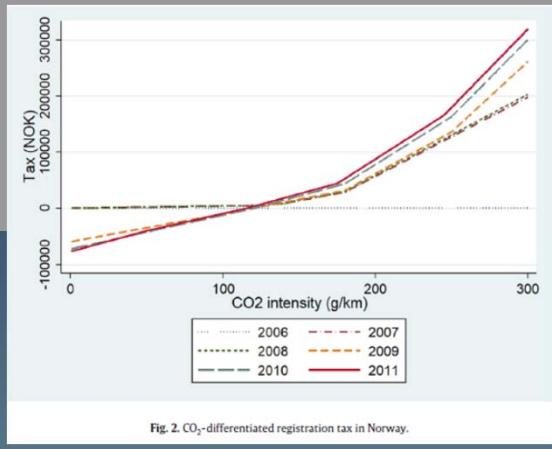


Fig. 2. CO_2-differentiated registration tax in Norway.

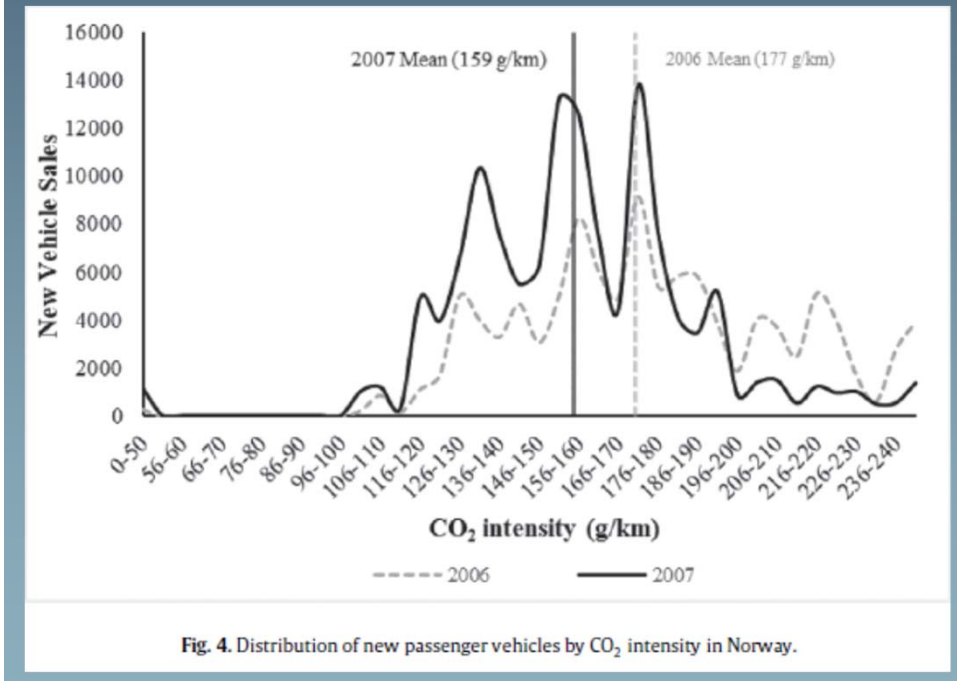


Fig. 4. Distribution of new passenger vehicles by CO_2 intensity in Norway.

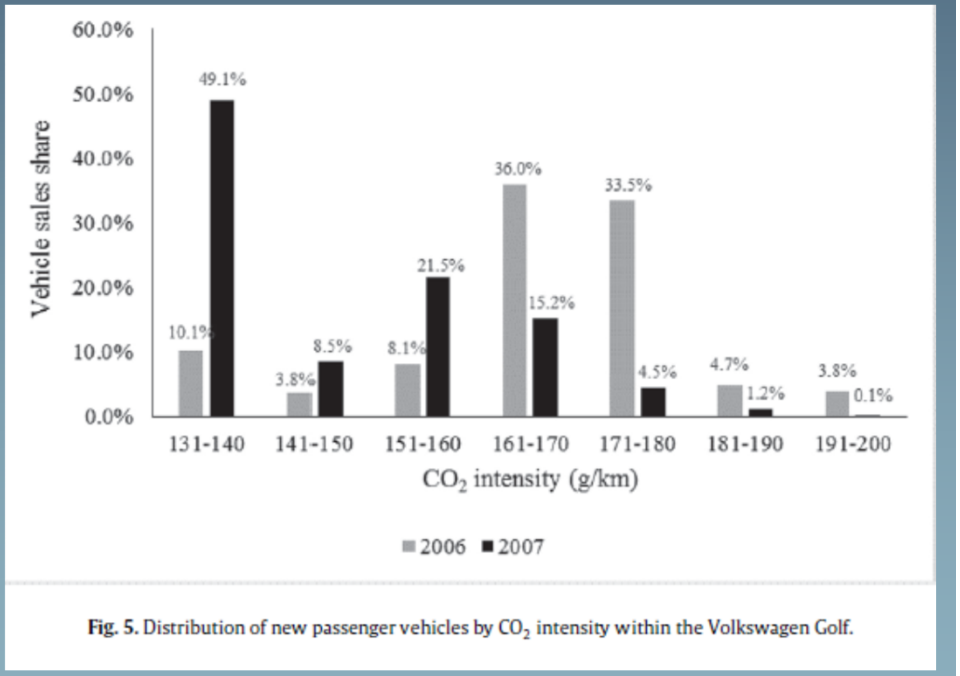
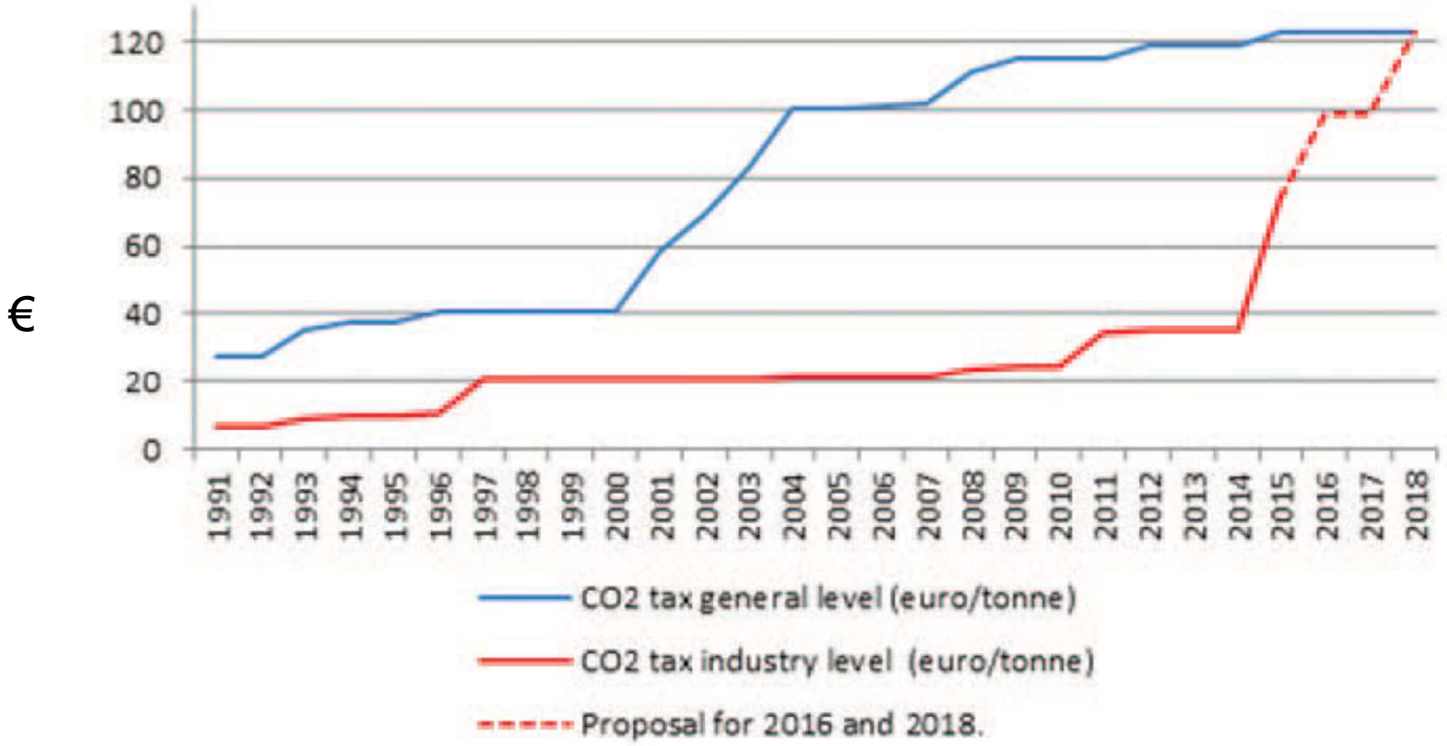


Fig. 5. Distribution of new passenger vehicles by CO_2 intensity within the Volkswagen Golf.

S. Yan and G.S. Eskeland / Journal of Environmental Economics and Management 91 (2018) 247–262

Sverige: Højere CO2-afgift, lavere energiafgift

FIGURE 2: Development of Swedish carbon tax rate over time



Source: Swedish Ministry of Finance (NOTE: from 2008 industry outside EU Emissions Trading Scheme (EU ETS)).

Mere retvisende afgifter i Danmark

- Gradvist højere CO2-afgift
- Elsektoren: Undtagelse for brændselsafgift (kul/olie mv) ophæves – beskat konverteringstabet
- Afgift på luftforurening der modsvarer omkostningen
- Nedsæt energi-afgiften på el til 37 øre/kwh – samme belastning som brændsler
- Erhvervslivet: energi-afgift på el som før – også bidrage til grøn omstilling
- Indfase afgifter på kunstgødning og metan i landbruget

Offentlig støtte og nye finansielle instrumenter

- MUDP og EUDP
- Den grønne investeringsfond

- Grønne obligationer (svanemærket)
- Lavt forrentede lån gennem Kommunekredit til at udrulle grøn teknologi

Figur 3: Renten på 10-årige statsobligationer

Kilde: Bloomberg

Tak for opmærksomheden

Nordic Green Growth

NordForsk

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