

Klimaskov

- *tænke globalt*
 - *handle lokalt*
-





Poppelammetræer med bøg – 11 år



Poppelammetræer med bøg – 19 år



Mosaikskove

Klima- skoven

et effektivt redskab til håndtering
af CO₂-problemet

ESBEN MØLLER MADSEN, ANDERS TÆRØ NIELSEN,
PALLE MADSEN OG PÆR HILBERT



Globalt

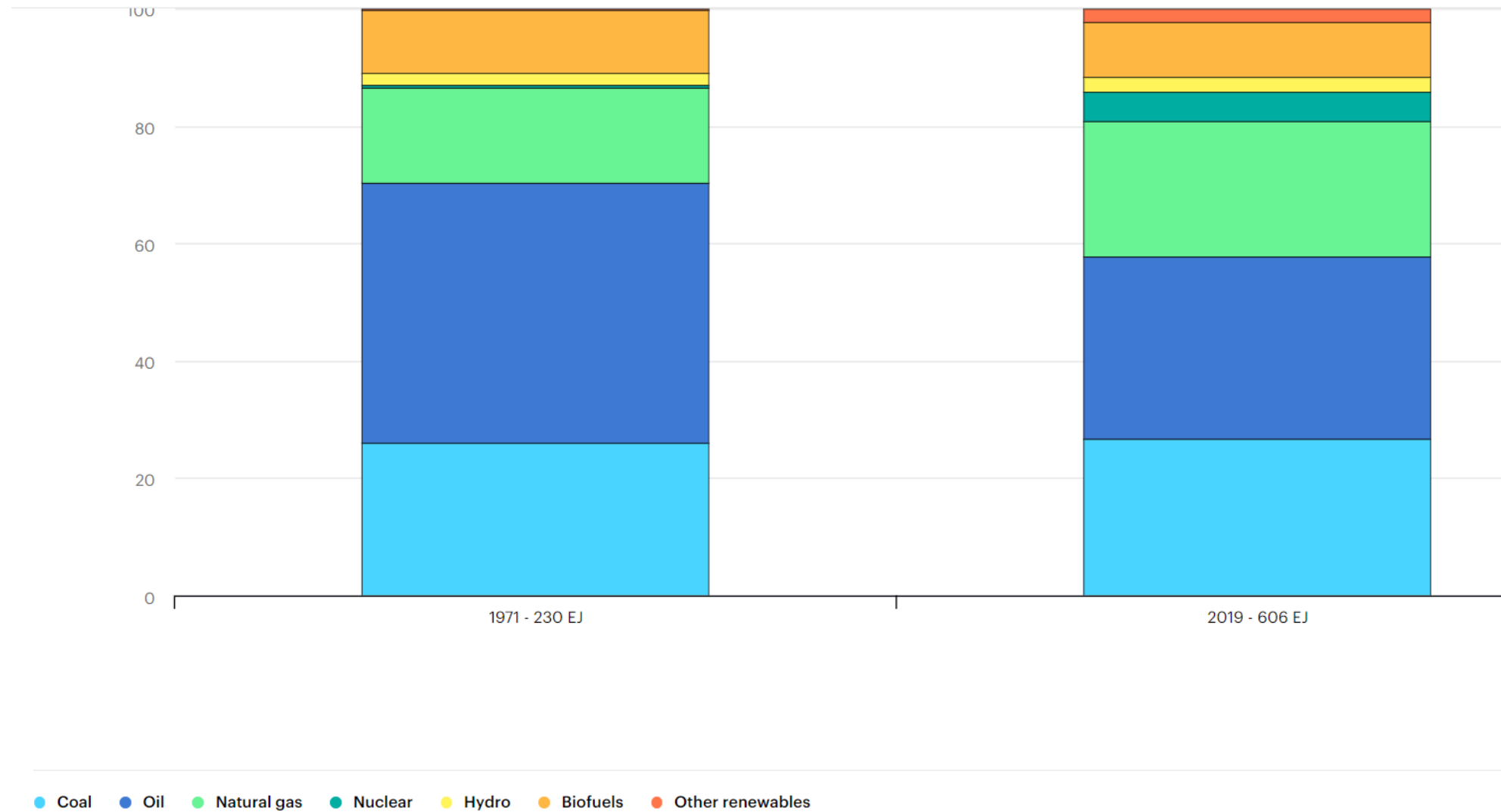
- verdens befolkning stiger
- resourceforbruget stiger endnu mere
- samtidig med at det fossile skal udfases....



*It's a fact
that our growing global population*

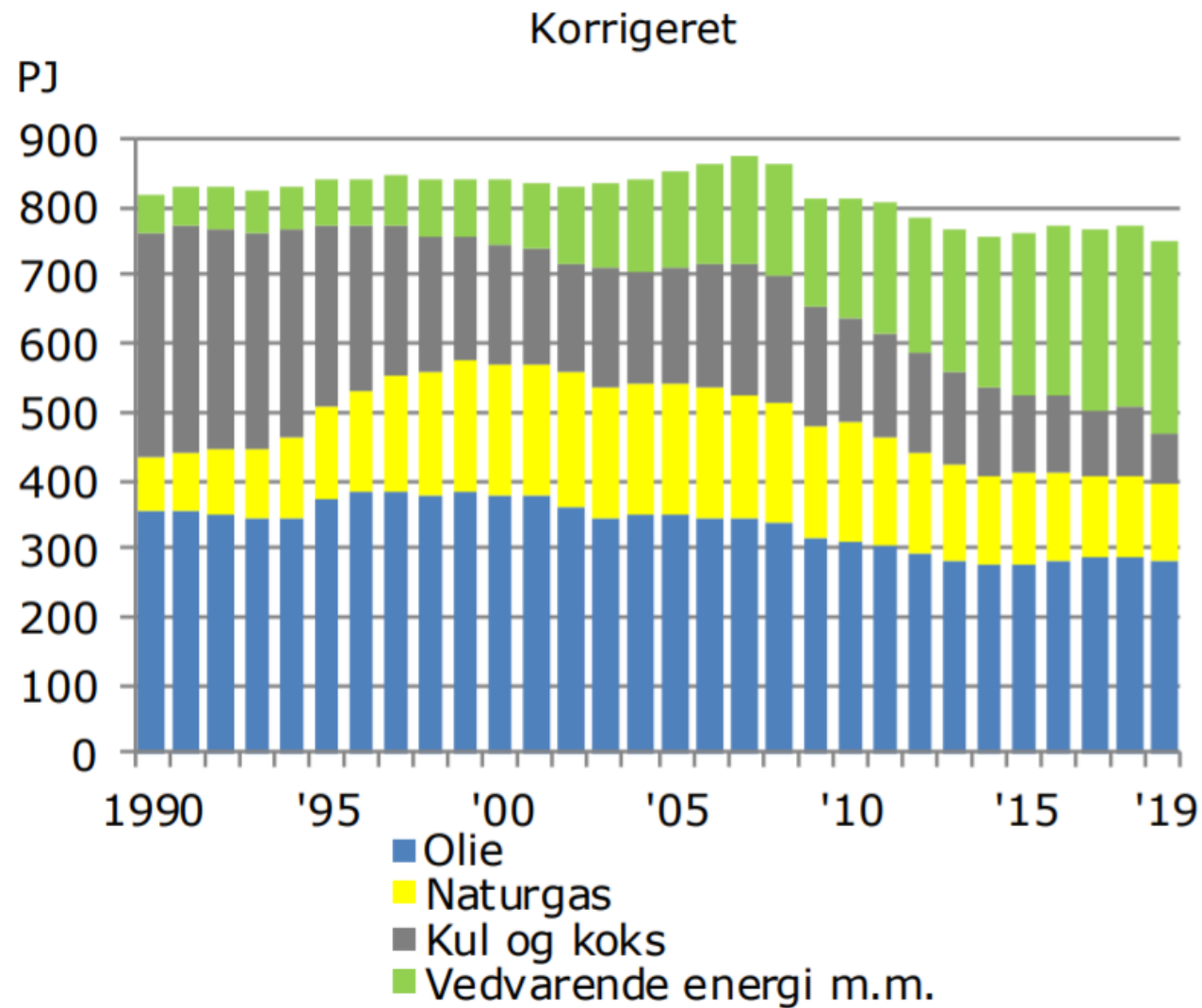
80 % af globalt energiforbrug dækkes fortsat af fossil brændsel

- bemærk totalt energiforbrug 1971 – 230 EJ 2019 – 606 EJ



Energistyrelsens energistatistik 2019

Bruttoenergiforbrug fordelt på brændsler



THE DEMAND FOR WOOD PRODUCTS

The Living Forests Model projects significant growth in wood removals to meet rising demand for wood products.

In 2010, global reported wood removals⁴⁵ amounted to 3.4 billion m³. Total removals were undoubtedly higher due to illegal or unreported wood harvesting, especially fuelwood. Of the reported harvest, 1.5 billion m³ was used as industrial roundwood and the rest for fuelwood⁴⁶.

The Living Forests Model (see figure) projects annual wood removals in 2050 will be three times the volume reported for 2010. The projection includes steadily growing demand for solid wood and paper products between now and 2050 in emerging markets. However, a projected massive escalation in use of wood as a feedstock for bioenergy is the main driver of rising demand. The Living Forests Model projects that by 2050, annual demand for **energy wood** (woody biomass that is not used for household fuelwood or the production of wood-based products) alone will exceed 6 billion m³ under the **Do Nothing scenario** and 8 billion m³ under the **Bioenergy Plus scenario** (the latter projection is more than double the total reported wood removals in 2010)⁴⁷.

The Living Forests Model projections are based on certain assumptions, and should not be read as an attempt to forecast the future, given the many uncertainties that will affect future demand and supply. For example, the model does not attempt to factor in potential, but currently unknown, uses of wood spurred by future technological innovation, nor does it assume dramatic shifts in consumption patterns or recycling rates. However, the model does highlight the likelihood of steady growth in overall volume of virgin wood for products and the potential for dramatic growth in the volume of wood harvested for use as energy “and to reach ambitious carbon mitigation targets under the Bioenergy Plus scenario”⁴⁸.



	FAO 2010	LIVING FORESTS MODEL			
		2030		2050	
		Do Nothing	Bioenergy Plus	Do Nothing	Bioenergy Plus
Saw logs & veneer logs	853	1,444	1,444	1,763	1,773
Pulpwood*	527	754	754	905	893
Other industrial roundwood ⁴⁹	153	153	153	153	153
Energy wood	1,868	2,753	3,138	6,317	8,209
Household fuelwood		2,064	2,064	2,218	2,054
Total wood supply	3,401	7,168	7,553	11,356	13,082

Units: millions of cubic metres (roundwood equivalent)

Projected annual rate of wood removals in 2030 and 2050 under the Living Forests Model's Do Nothing and Bioenergy Plus scenarios compared to FAO statistics on reported wood removals in 2010. Source: FAO (2010 figures²⁰) and IIASA (2030 and 2050 projections)

* Pulpwood does not include offcuts and sawdust from saw logs that are used in significant amounts in pulp production.

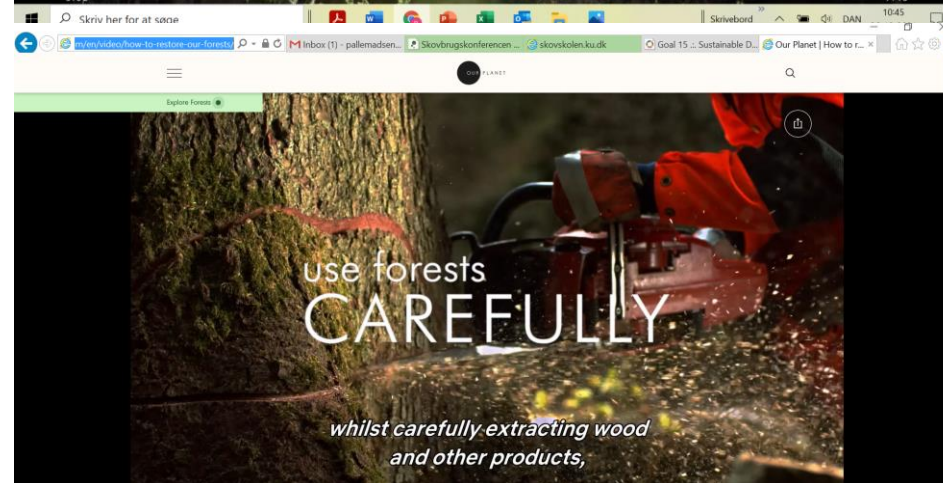
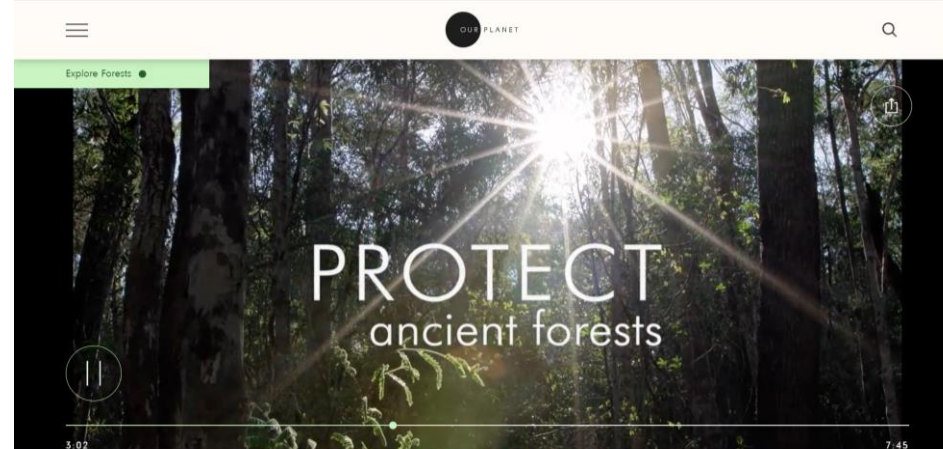
WOOD AND THE SUSTAINABLE DEVELOPMENT GOALS

Wood value chains can contribute to all 17 of the SDGs.



Source: Sustainable Wood for a Sustainable World. FAO/Scion.

- David Attenborough for WWF-Int.,
New Generation Plantations
- How to restore our forests
- <https://www.ourplanet.com/en/video/how-to-restore-our-forests/>





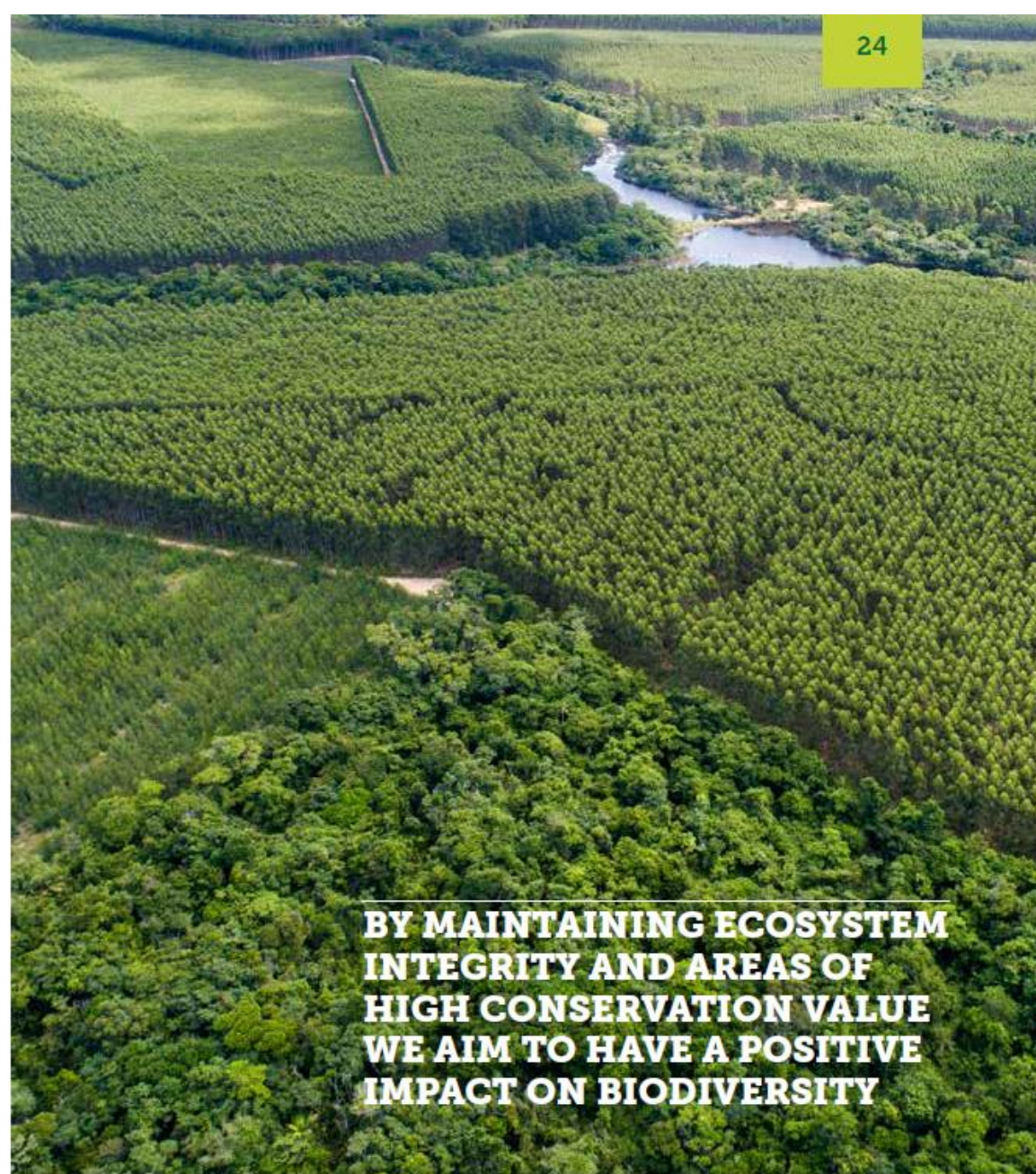
Biodiversity conservation

By following our conservation principles, which are aligned with NGP principles of maintaining ecosystem integrity and protecting and enhancing areas of high conservation value, we aim to have a positive impact on biodiversity. In 2017, conservation areas covered 44.7% of our total owned and leased area, or 538,168 hectares, and included 31 areas of high conservation value. As well as supporting our work to maintain these areas, green bond proceeds enabled us to expand environmental education and research studies at Neblinas Park.



Water management, Energy efficiency and Renewable energy

Green bond proceeds have financed a number of projects to improve the environmental performance of our pulp plants. We have upgraded several wastewater treatment facilities, improved energy efficiency, and generated more renewable electricity from black liquor, a by-product of the pulp-making process. At our Mucuri unit in Bahia, a new treatment plant reduced the organic load in the effluent by 60%, improving the quality of the river water as well.



BY MAINTAINING ECOSYSTEM INTEGRITY AND AREAS OF HIGH CONSERVATION VALUE WE AIM TO HAVE A POSITIVE IMPACT ON BIODIVERSITY

Sustainable Intensification - bæredygtig intensivering



AT AN AREA OF
278
MILLION
HECTARES
IN 2015, PLANTED
FORESTS REPRESENT
AN INCREASING
PROPORTION OF
THE GLOBAL
FOREST AREA



PLANTED FORESTS
HAVE THE POTENTIAL
TO PRODUCE UP TO
TWO-THIRDS OF
GLOBAL INDUSTRIAL
ROUNDWOOD
DEMAND, RISING
TO AS MUCH AS 80%
IN 2030.

Kilde: NGP review - <http://newgenerationplantations.org/en/>

Skovens og skovdyrkningens klimaeffekt:

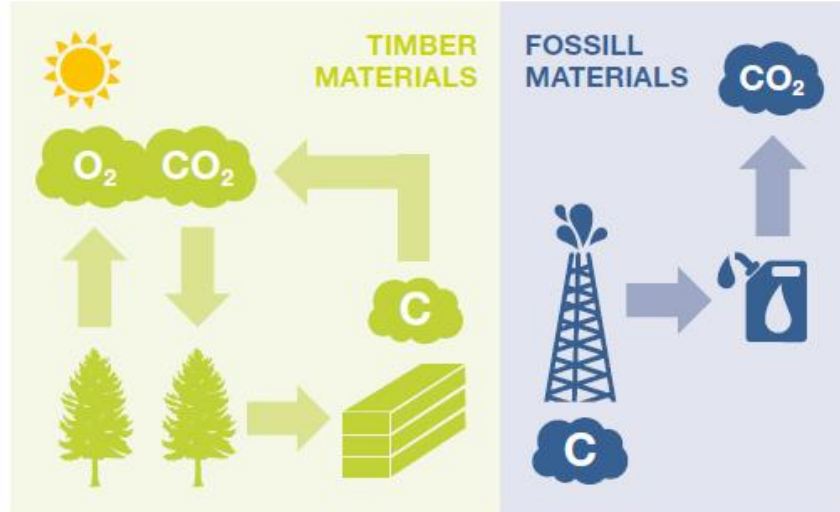
- træernes vækst
- fortrængning af beton, stål, aluminium og andre energitunge materialer
- CO₂ lageret i skoven og i træprodukter

in raising the profile of wood, forging partnerships and, of course, growing the trees needed to build a resilient, sustainable world.

resident, Head of Sustainability for Wood Products at Stora Enso.

Thanks also to Roy Antink (Stora Enso) and Elspeth MacRae (Scion).

CARBON IN WOOD HAS A CIRCULAR LIFE



Use of carbon-neutral wood material and biomass instead of non-renewable and fossil materials reduces CO₂ emissions and mitigates global warming.

New Generation Plantations Review 2018



Kilde: NGP review - <http://newgenerationplantations.org/en/>

Fig. 5.

Når træ erstatter andre produkter spares der CO₂

Produkt	Middelværdi	Lav	Høj
Kul	1,4	0,9	1,9
Naturgas	0,9	0,6	1,2
Benzin	0,4	0,4	0,4
Stål	4,0	0,9	10,0
Beton	4,0	1,0	9,8
Plastik	2,0	2,0	2,0

Eksempel:

Poppelforkultur – kommunal skovrejsning, Elmelund Skov, Odense Sponseret af Fjernvarme Fyn

30 ha poppelforkultur i Elmelund Skov – status efter 7 år – maj 2020

- Akkumuleret: 106 t CO₂/ha
- Nuværende årlig CO₂-binding: 25 t CO₂/ha år

Naboareal: Alm. løvtræ (eg) skovrejsning (6 år):

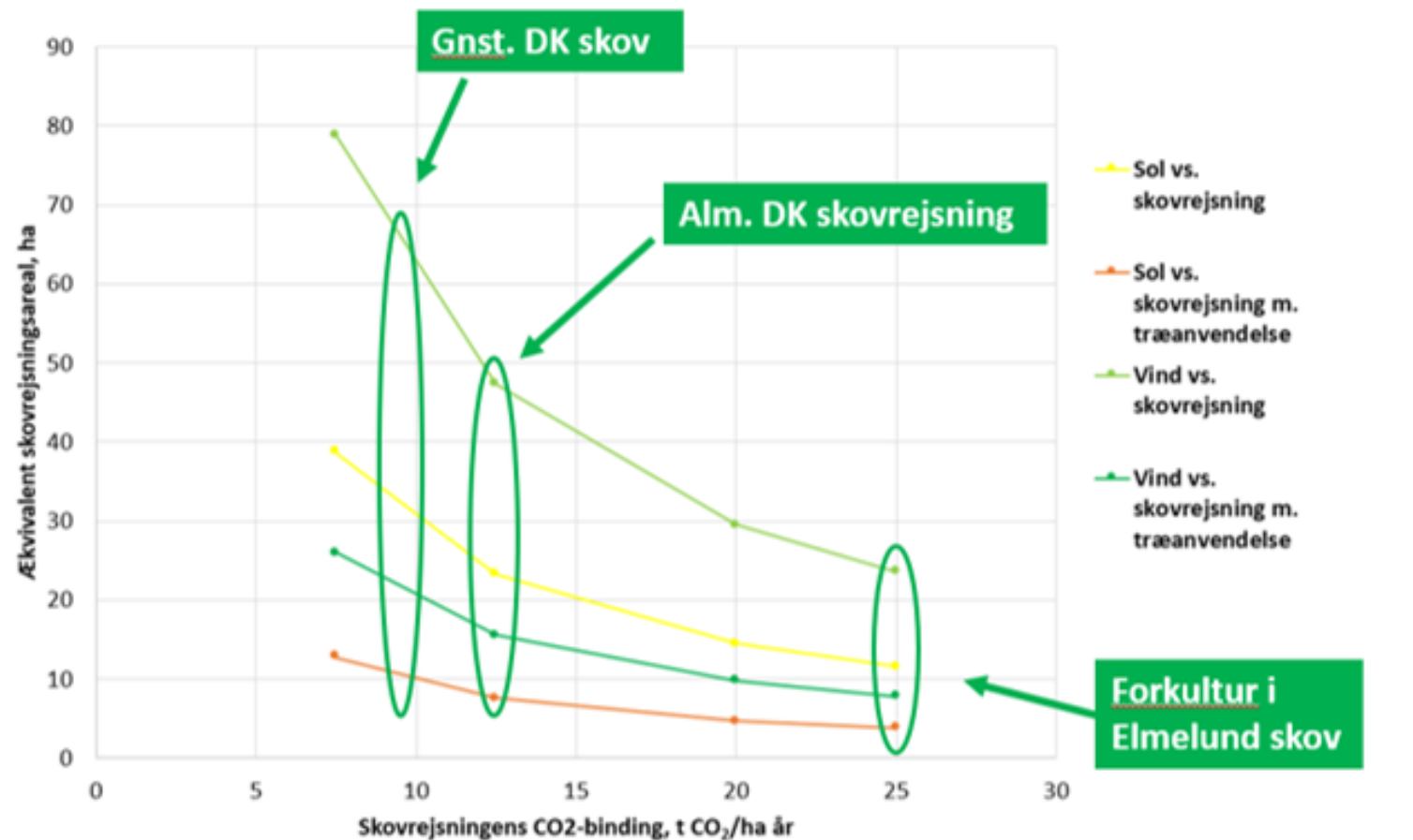
Akkumuleret: 1 t CO₂/ha

Gnst. danske skov 9-10 t CO₂/ha år

BeCCS teknologi – åbner for CO₂-negativt samfund

Øget skovrejsning og træproduktion kan vise sig at blive rettidig omhu og forberedelse til BeCCS





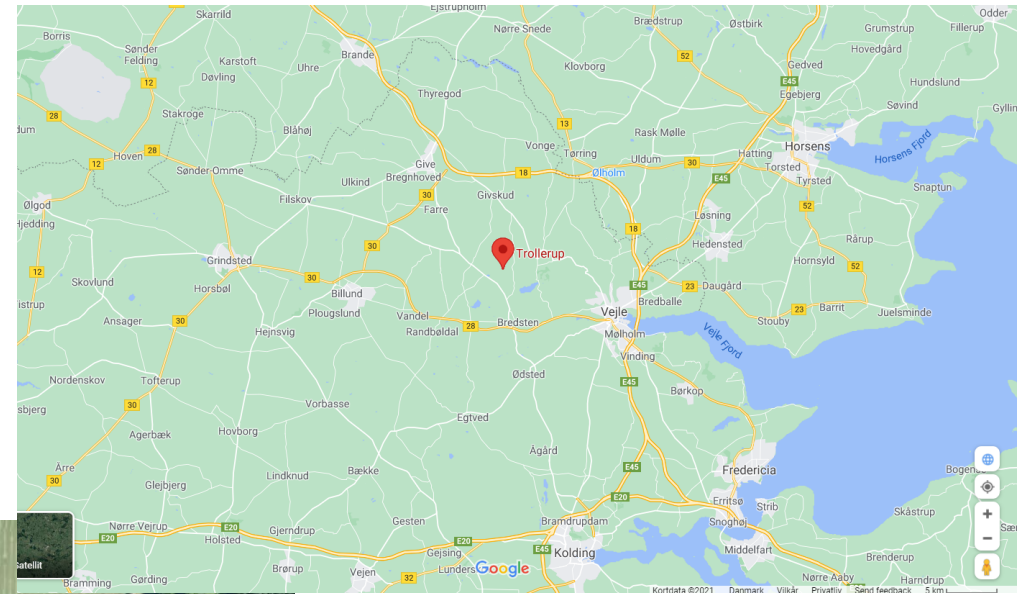
Figur 1: Hvor mange hektar (ha.) skovrejsning, der skal der til for at give samme CO₂-effekt som sol- og vindenergi pr. ha med og uden træanvendelsens substitutionseffekt. Forudsætninger: (1) Solenergi – 763 MWh/ha år – svarende til 290 t CO₂-effekt/ha år. (2) Landbaseret vindmølle – 5,6 MW – 19.000 MWh/år svarende til 1.555 MWh/ha år og 591 t CO₂/ha år ved 350 m indbyrdes afstand ml. møllerne (12.25 ha/mølle). Se nedenfor vedr. forudsætninger og referencer.

30%
CO₂-reduktion

Når skovarealet øges til 25 %

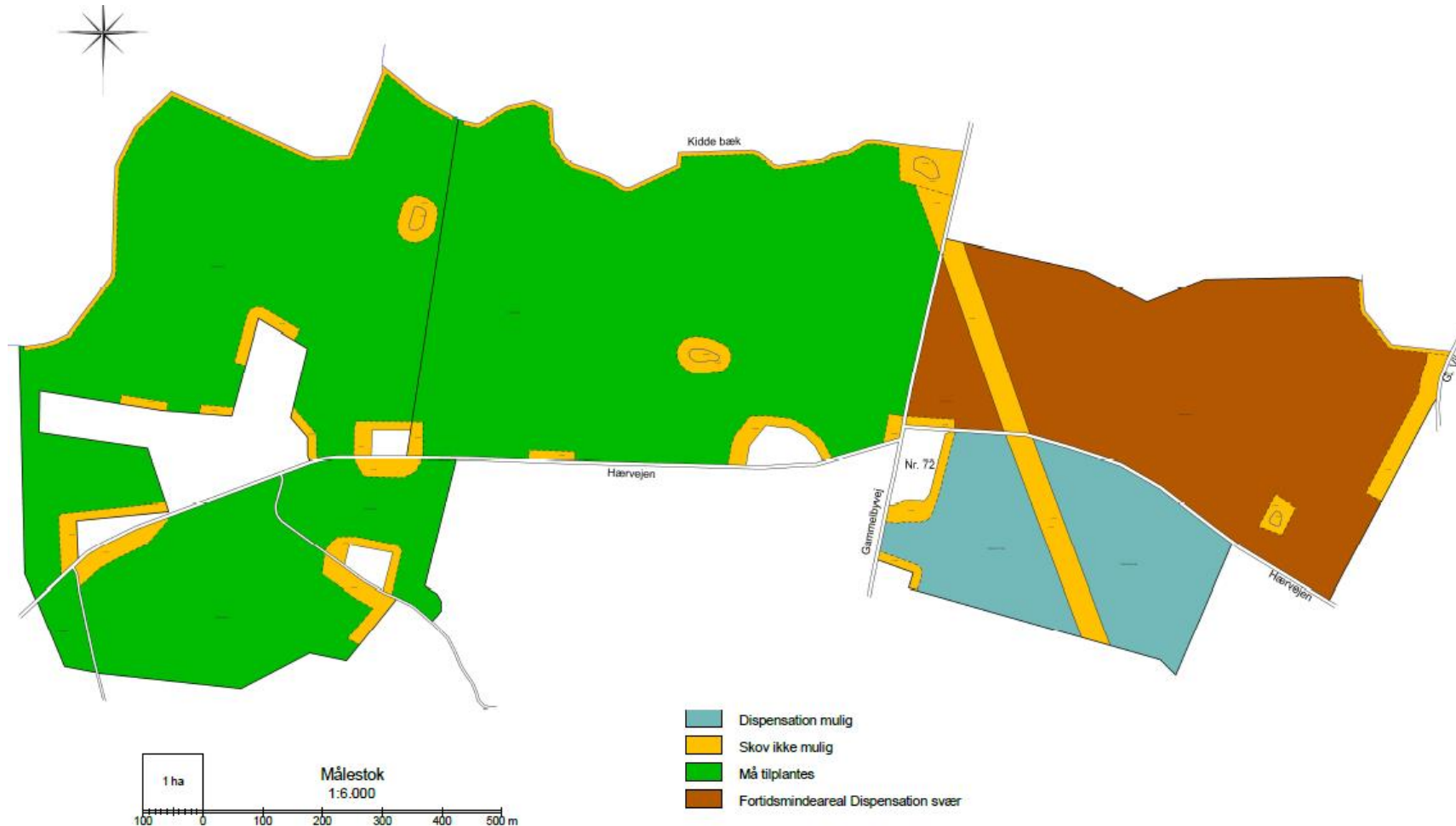


Trollerup Forsøgsskov



Trollerup Forsøgsskov

- Stilles til rådighed af Julianelyst
- Fokus – CO₂-effekt - klimaskov
- Hvordan kombinere forkultur og hovedtræarter?
- 150 ha – købt marts 2021, plantning påbegyndes forår 2022





Fremtidens mosaikskov

- *Bornholmsk lokalitet i globalt netværk af demonstrationsforsøg (RFFL – Resilient Future Forests Lab)*
- *Skovselskabet Poulsker ApS*
- *Støttet af Godfred Birkedal Hartmanns Familiefond (www.GBHF.dk)*

Træartsblandinger

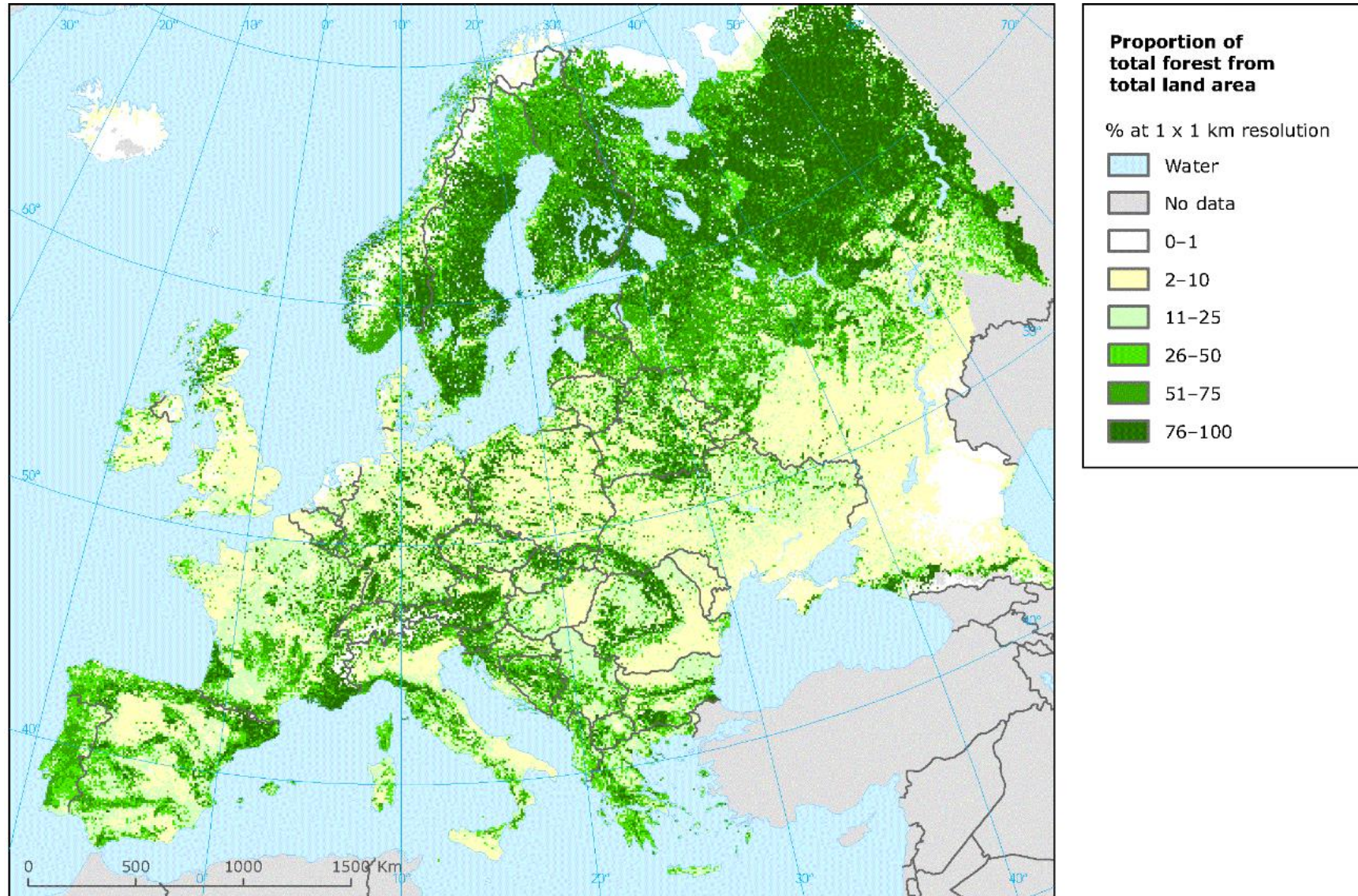
Højproduktive nåletræblandinger

Produktive løvtræblandinger

Biodiversitetsskov

Forest map of Europe

European Environment Agency



Danmarks skov- og landskabshistorie er en forløber for den nuværende globale skovrejsning

- vi var nede på 2-4% skovdække omkring 1800
- det er dyrt CO₂-mæssigt, hvis vi vender tilbage til overdrevet på produktive arealer
- der er effektiv og velkendt klimahandling ved hånden med skovrejsning



Foto 1. Hedetilplantning på Isenbjergheden (Gludsted plantage) i 1896. Jagt- og Skovbrugsmuseet.

En mulighed nu?

Fra 14% til 25% skov (500.000 ha – 20% af landbrugsarealet) med produktiv skov:

- Årlig CO₂-effekt på 10 mio t CO₂ - ca. 20-30%
- Dertil mere med CO₂ fangst i kraftvarme værkerne?

Lad os nu bare tænke os
rigtigt godt om!

