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Bioraffinaderier – vägen mot en grönare ekonomi?

Göran Berndes

Chalmers University of Technology

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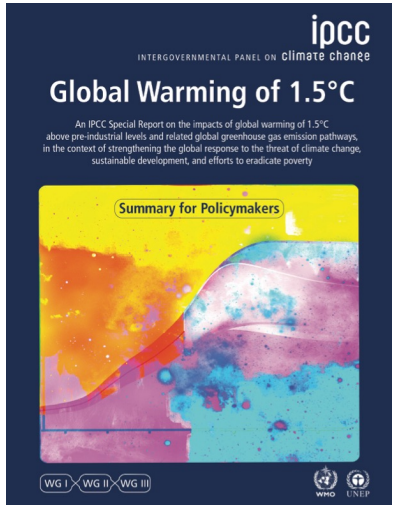
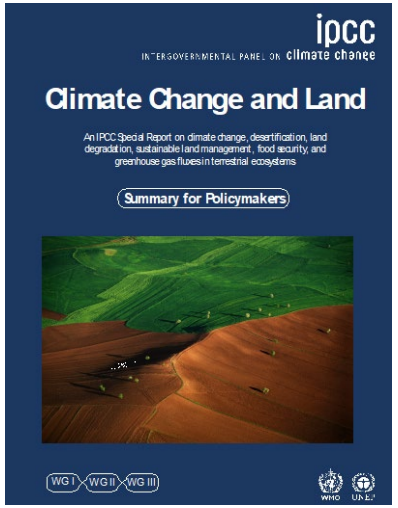
Fokus på bioenergins roll i omställningen mot klimatmål och andra hållbarhetsmål





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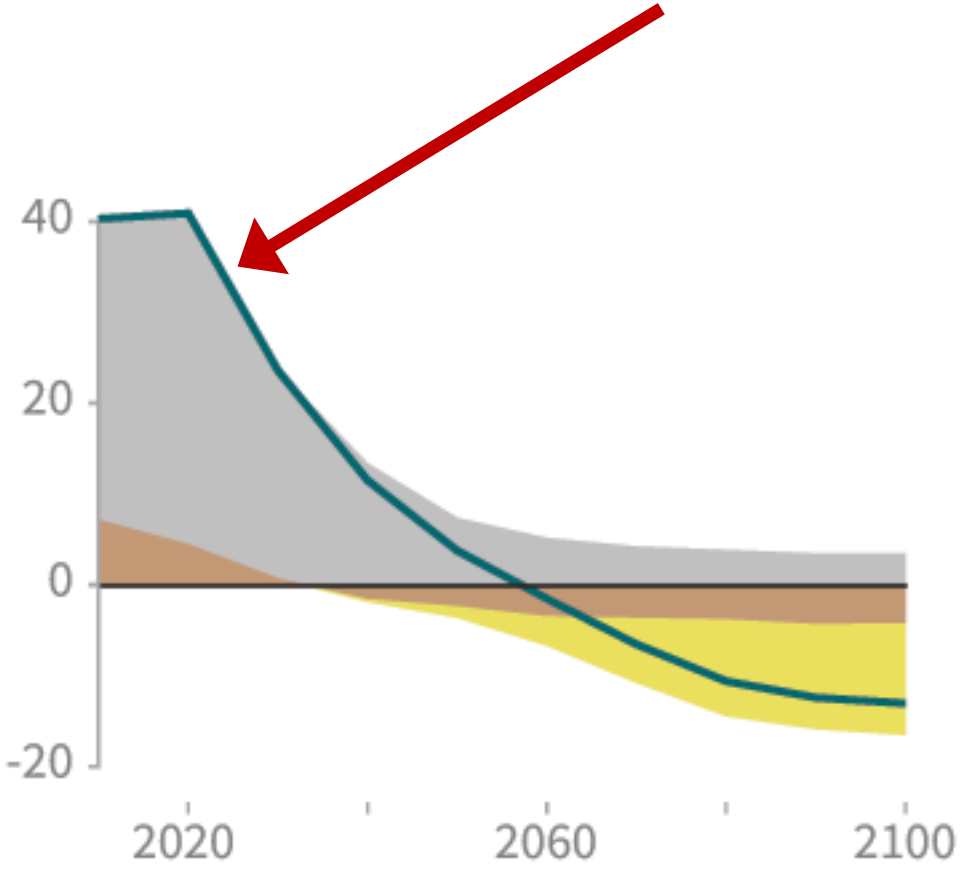
Globala nettoutsläpp av koldioxid till atmosfären



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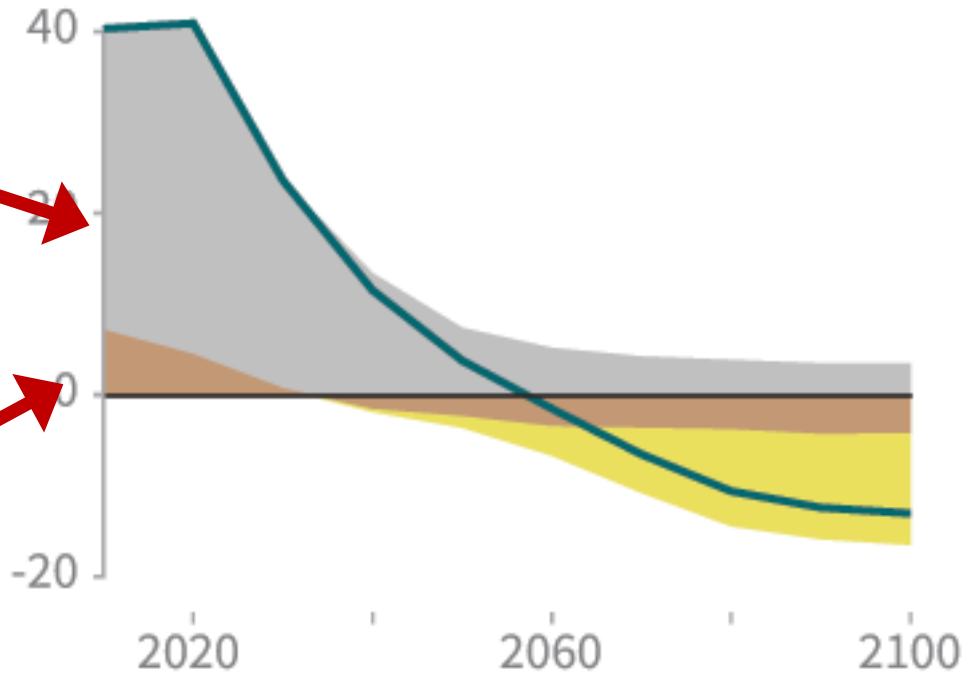
Utsläpp: fossilbränslen
och industriella processer



Utsläpp: markanvändning
t ex avskogning

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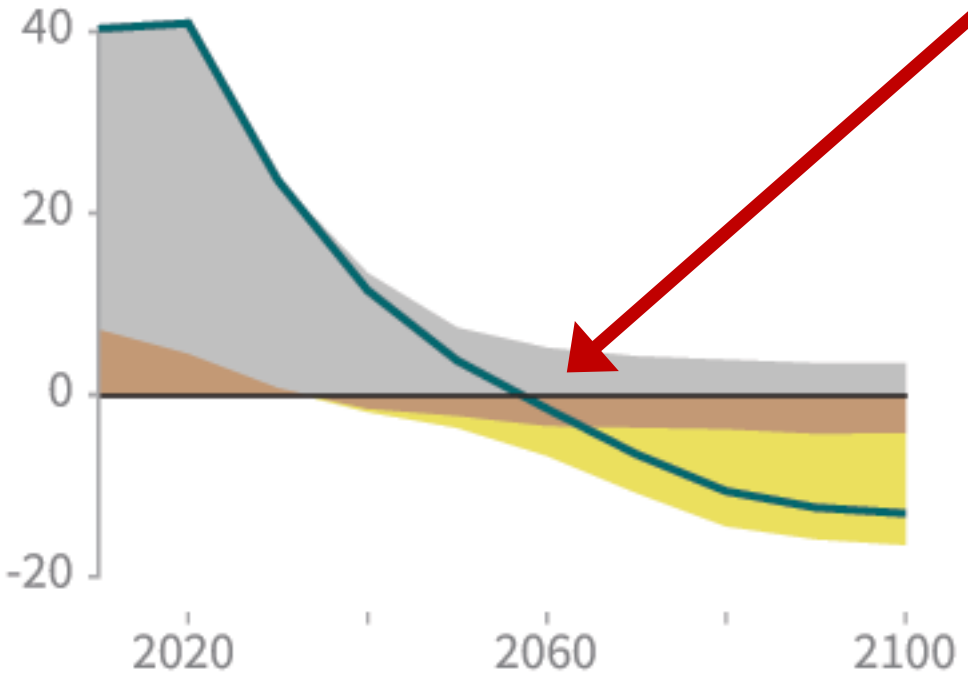
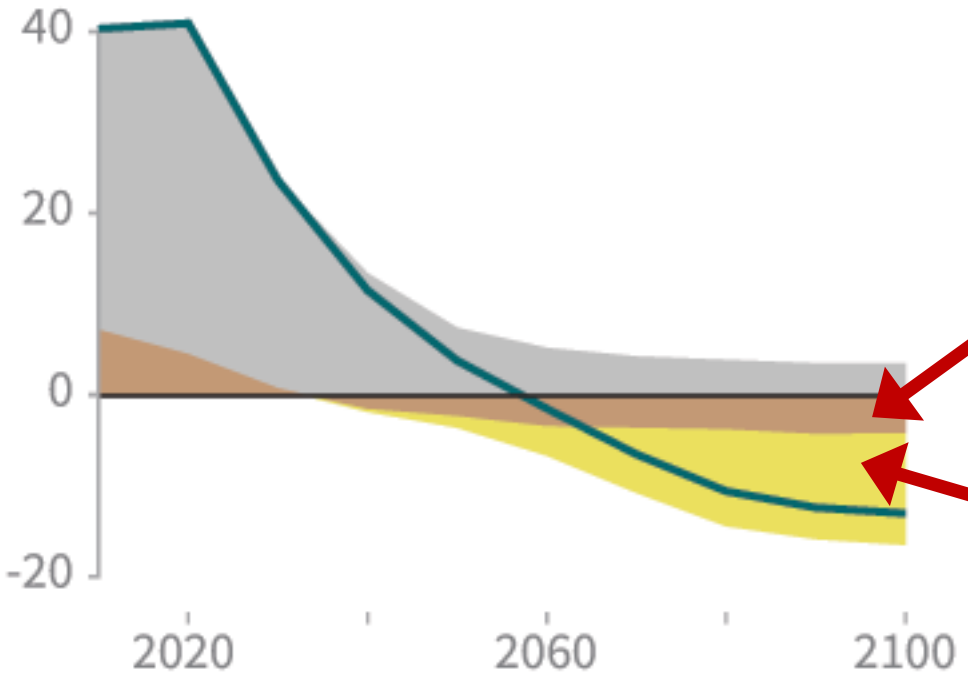


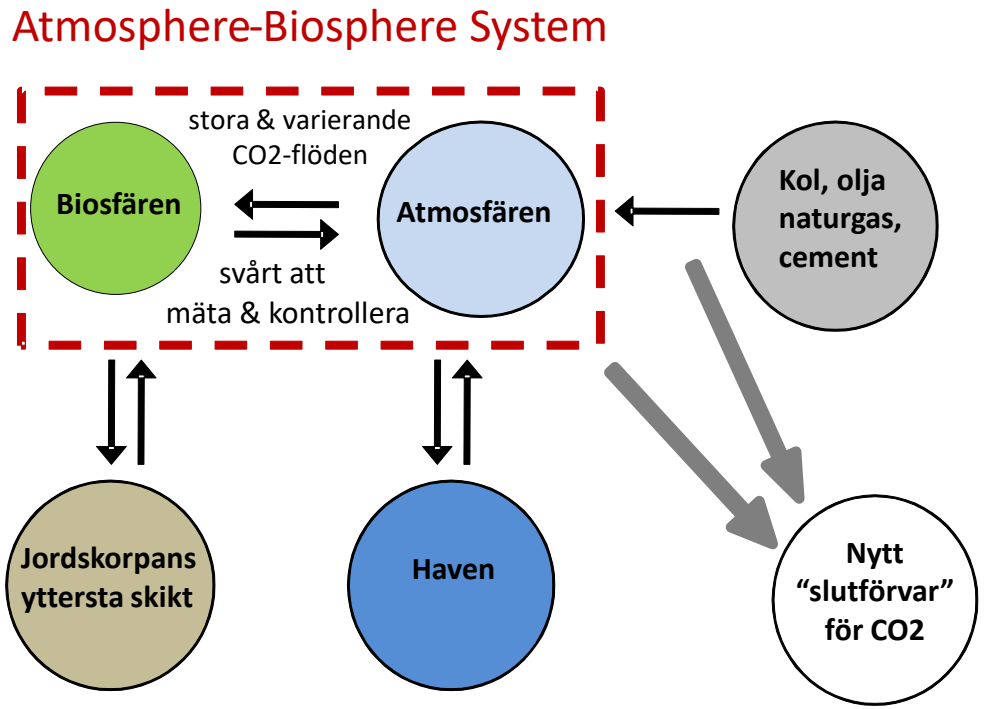
Utfasning av fossila CO2-utsläpp:
Sol, vind, bioenergi, trähus, bioplast, etc.



CO2-inbindning:
markanvändning
t ex beskogning

Bioenergi med CO2-
infångning (finns också
andra sätt)

Svårt att nå våra svenska mål utan lösningar som tar bort CO2 ur atmosfären (“negativa utsläpp”)



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Lantbruket kan utveckla lösningar för produktion av biobaserade produkter i “klimatpositiva landskap”

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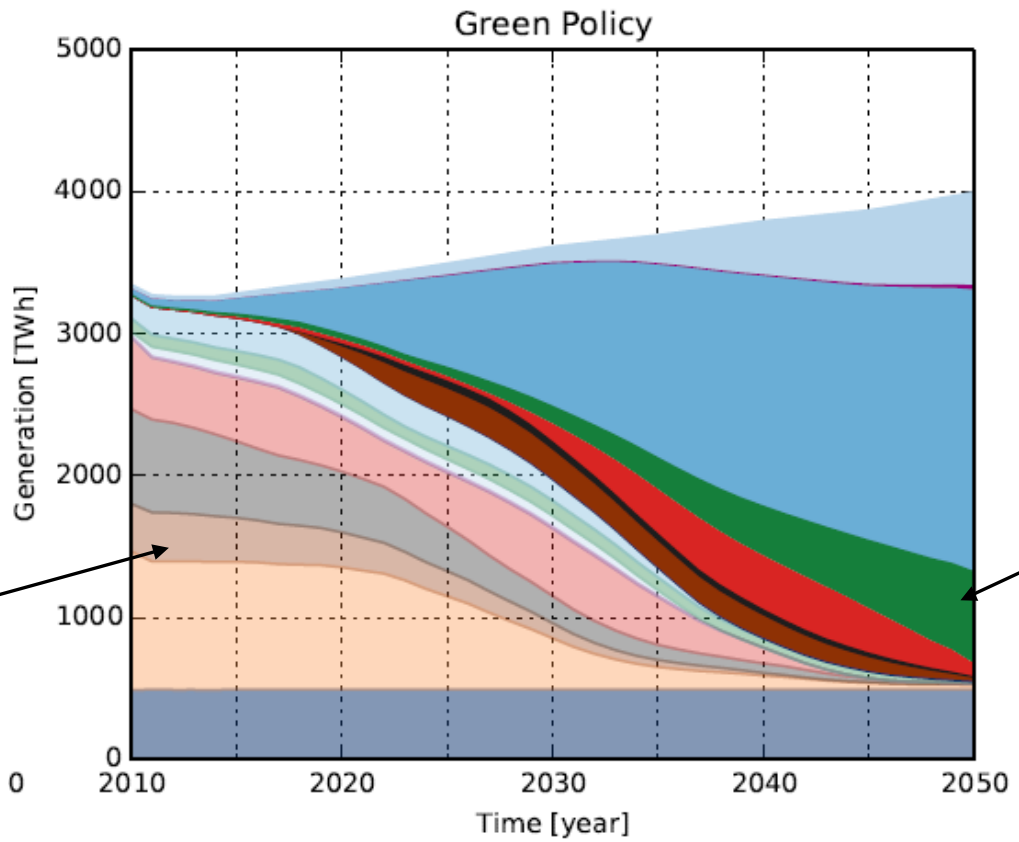
Bioenergins roller varierar geografiskt och förändras över tid

- Bioenergin kan växa inom nuvarande tekniska infrastruktur
- Ofta integrerade system som producerar el, värme, bränslen och material

Bioenergins roller varierar geografiskt och förändras över tid

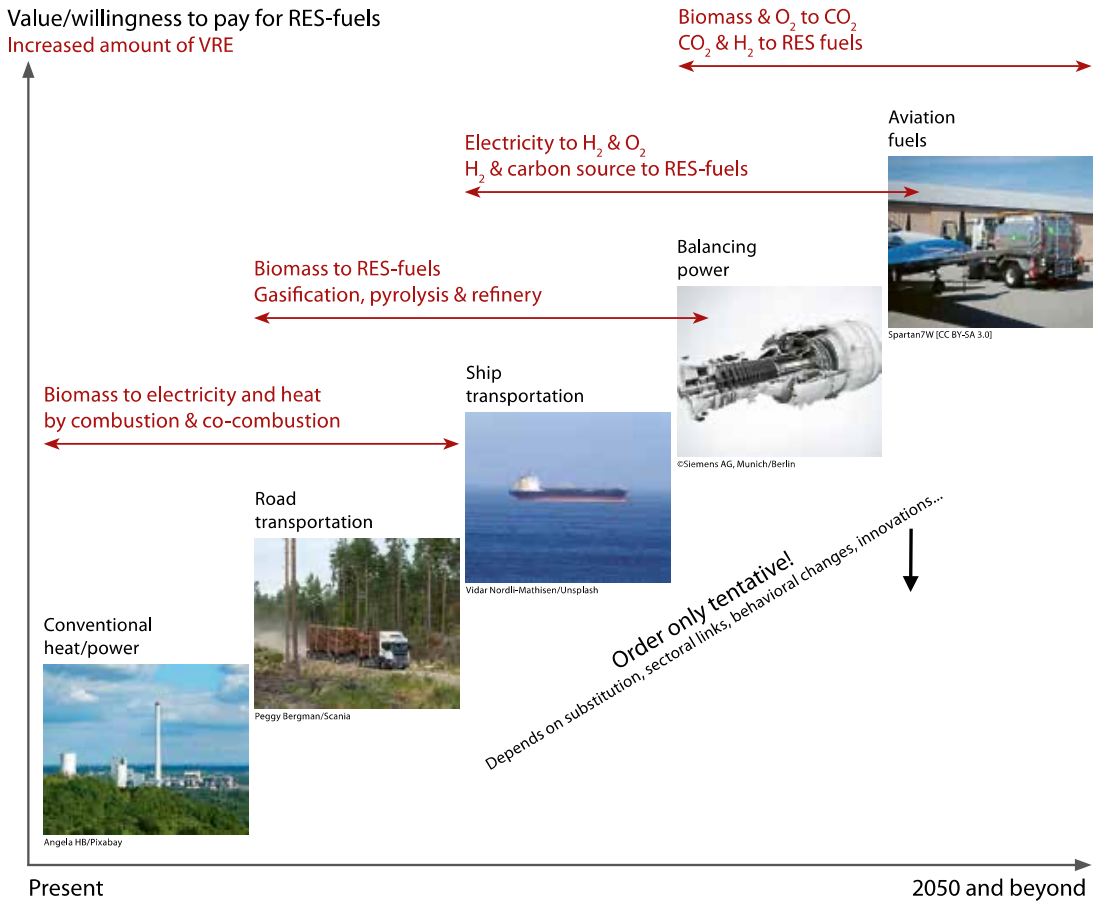


Thermal generation is load following

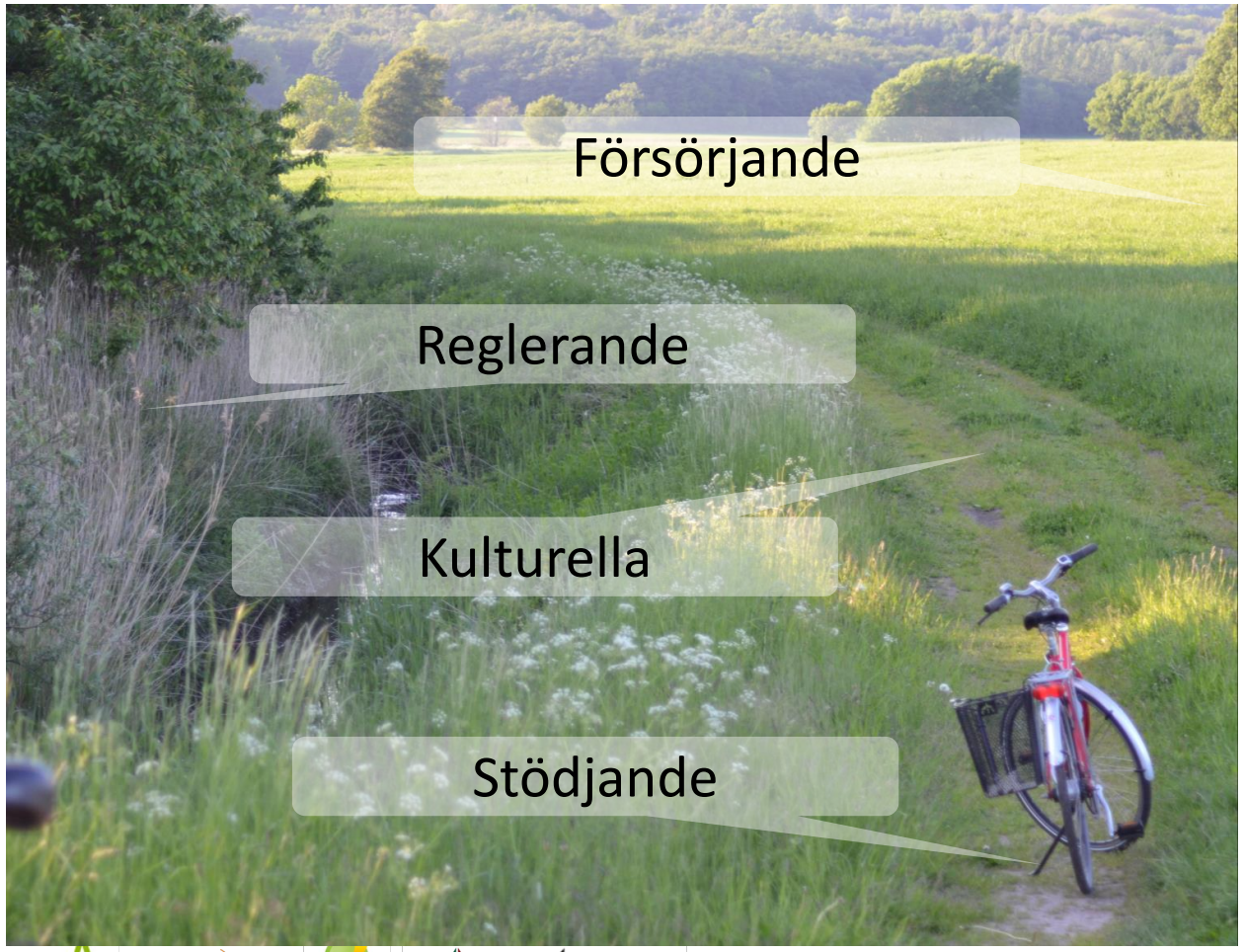
Thermal generation is base load

Diagram: Filip Johnsson, Chalmers

Bioenergins roller varierar geografiskt och förändras över tid



Bidraget till omställningen är inte begränsat till energiförsörjning



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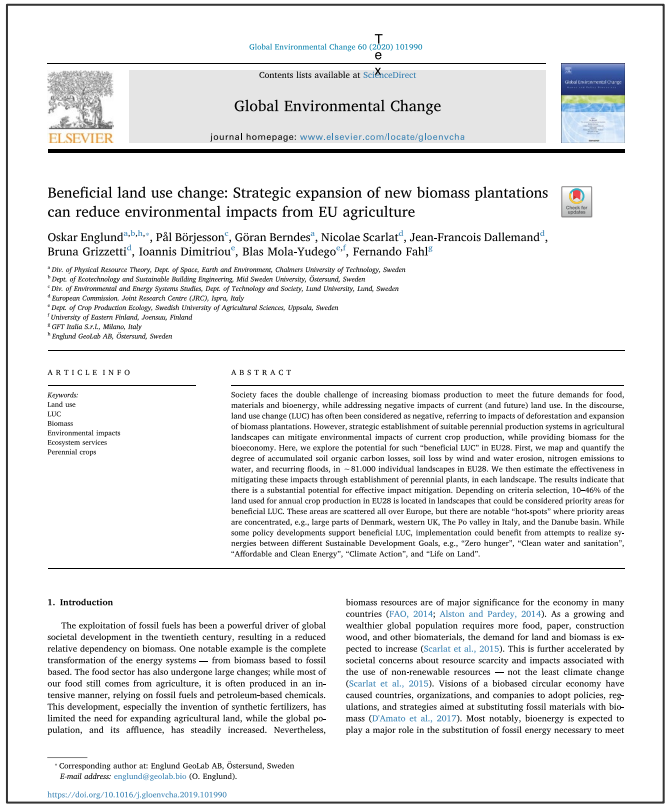
Bidraget till omställningen är inte begränsat till energiförsörjning



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Beneficial land use change: Strategic expansion of new biomass plantations can reduce environmental impacts from EU agriculture

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Environmental impacts
Ecosystem services
Perennial crops

ABSTRACT

Society faces the double challenge of increasing biomass production to meet the future demands for food, materials and bioenergy, while addressing negative impacts of current (and future) land use. In the discourse, land use change (LUC) has often been considered as negative, referring to impacts of deforestation and expansion of biomass plantations. However, strategic establishment of suitable perennial production systems in agricultural landscapes can mitigate environmental impacts of current crop production, while providing biomass for the bioeconomy. Here, we explore the potential for such "beneficial LUC" in EU28. First, we map and quantify the degree of accumulated soil organic carbon losses, soil loss by wind and water erosion, nitrogen emissions to water, and recurring floods, in ~81.000 individual landscapes in EU28. We then estimate the effectiveness in mitigating these impacts through establishment of perennial plants, in each landscape. The results indicate that there is a substantial potential for effective impact mitigation. Depending on criteria selection, 10–46% of the land used for annual crop production in EU28 is located in landscapes that could be considered priority areas for beneficial LUC. These areas are scattered all over Europe, but there are notable "hot-spots" where priority areas are concentrated, e.g., large parts of Denmark, western UK, The Po valley in Italy, and the Danube basin. While some policy developments support beneficial LUC, implementation could benefit from attempts to realize synergies between different Sustainable Development Goals, e.g., "Zero hunger", "Clean water and sanitation", "Affordable and Clean Energy", "Climate Action", and "Life on Land".

1. Introduction

The exploitation of fossil fuels has been a powerful driver of global societal development in the twentieth century, resulting in a reduced relative dependency on biomass. One notable example is the complete transformation of the energy systems — from biomass based to fossil based. The food sector has also undergone large changes; while most of our food still comes from agriculture, it is often produced in an intensive manner, relying on fossil fuels and petroleum-based chemicals. This development, especially the invention of synthetic fertilizers, has limited the need for expanding agricultural land, while the global population, and its affluence, has steadily increased. Nevertheless, biomass resources are of major significance for the economy in many countries (FAO, 2014; Alston and Pardey, 2014). As a growing and wealthier global population requires more food, paper, construction wood, and other biomaterials, the demand for land and biomass is expected to increase (Scarlat et al., 2015). This is further accelerated by societal concerns about resource scarcity and impacts associated with the use of non-renewable resources — not the least climate change (Scarlat et al., 2015). Visions of a biobased circular economy have caused countries, organizations, and companies to adopt policies, regulations, and strategies aimed at substituting fossil materials with biomass (D'Amato et al., 2017). Most notably, bioenergy is expected to play a major role in the substitution of fossil energy necessary to meet

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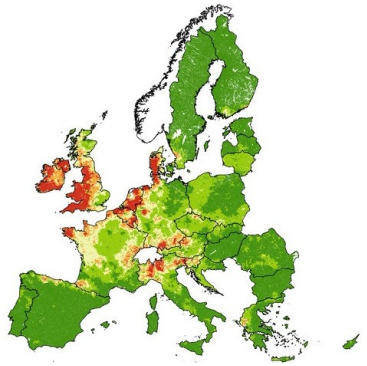
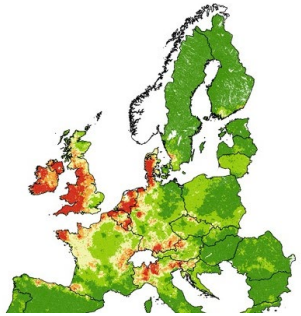


Kväveutsläpp till vattendrag

Mitigation effectiveness by
strategic perennialization

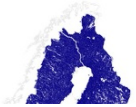
”Nytta” med perenna odlingar

N emissions to water



Dominans årliga grödor

Mitigation effectiveness b
strategic perennialization



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Framtidens bioenergi och biomaterial?

Mines are failing to curb death rates

19 September 2017 - 06:55 Tamar Kahn

Picture: BLOOMBERG/SIMON DAWSON

There has been no improvement in mine fatality rates from 2014 to 2016, according to the mine health and safety inspectorate's 2016-17 annual report tabled in Parliament on Monday.

"Batteries experience a huge scale-up in the B2D2, with EV battery markets leading other sectors in size"

(IEA Energy Technology Perspectives 2017)

Framtidens bioenergi och biomaterial?

R. Arvidsson, B.A. Sandén / Journal of Cleaner Production 156 (2017) 253–261 257

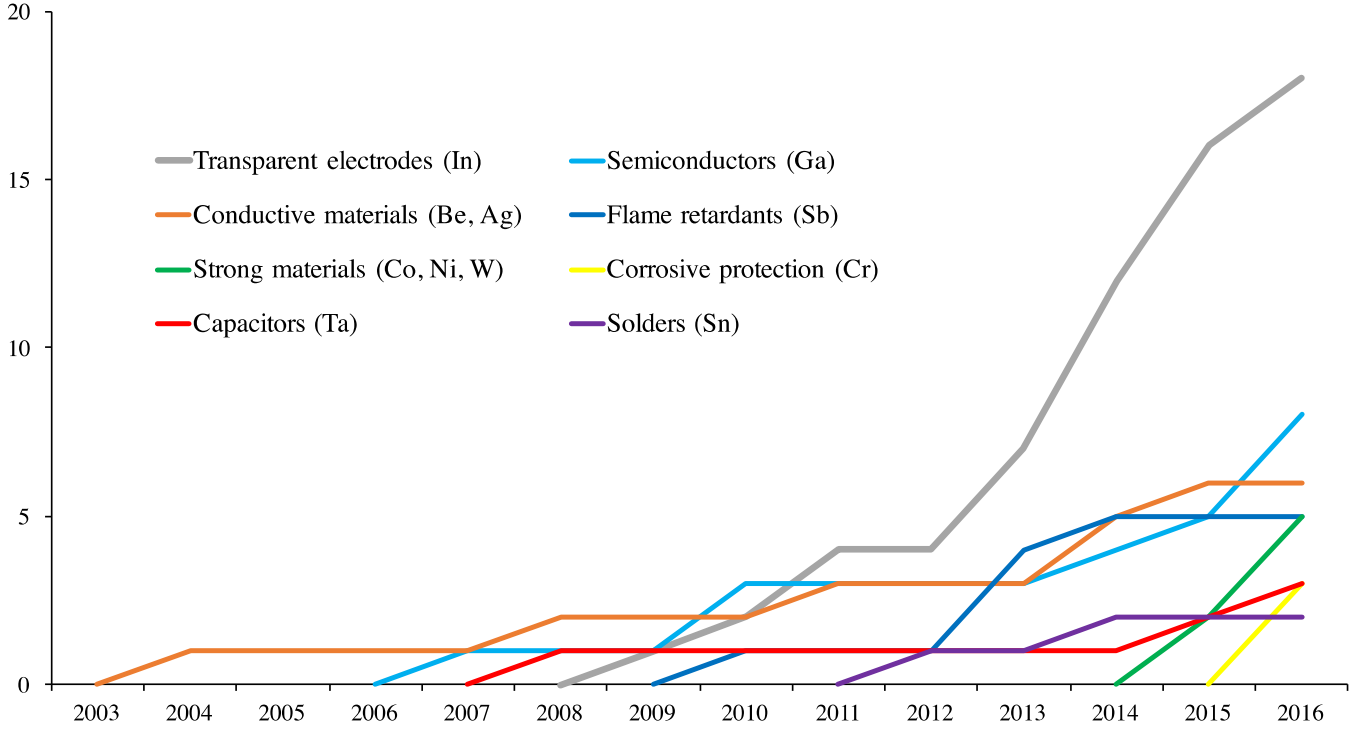
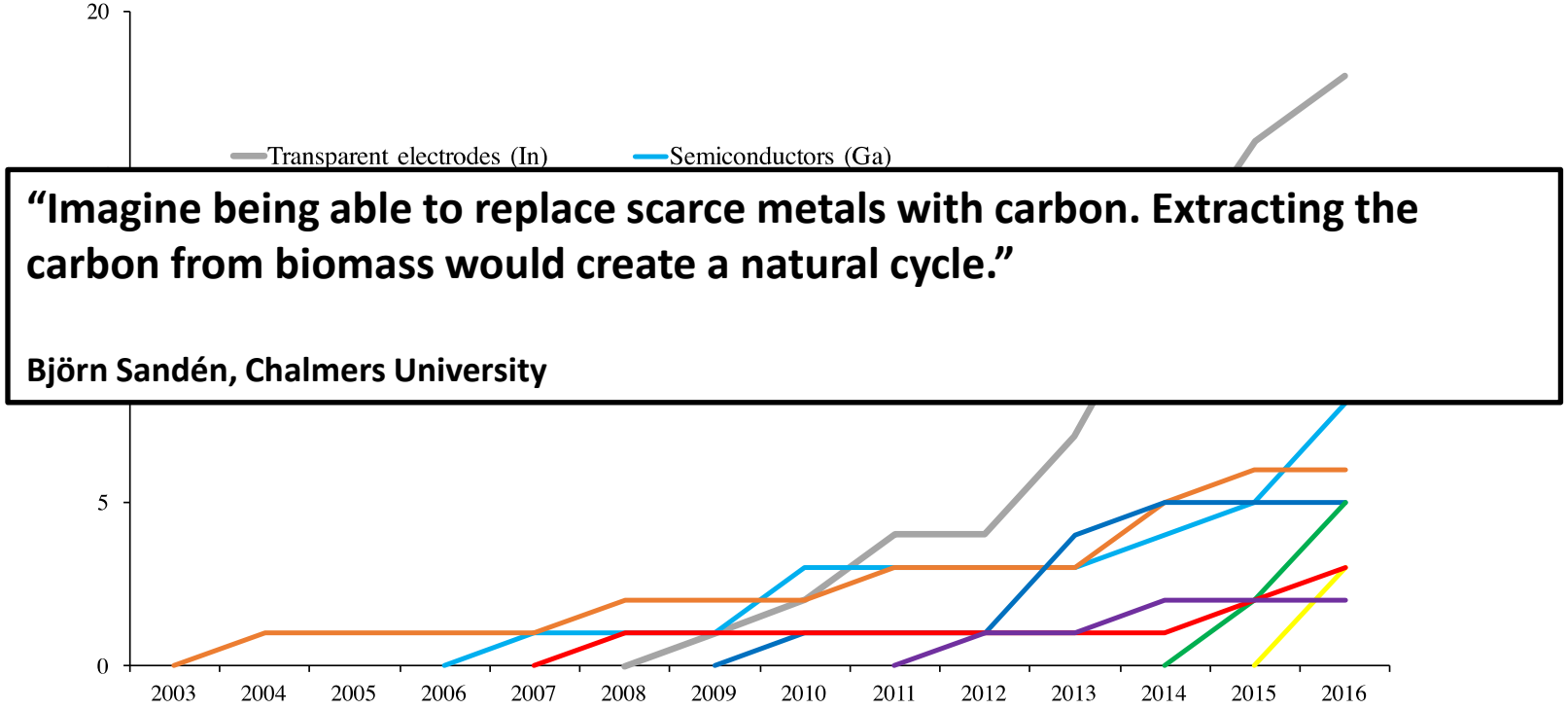


Fig. 1. Graph showing the cumulative number of patents for the carbon nanomaterial applications over time. The scarce metals in parenthesis are those currently used for the application.

Framtidens bioenergi och biomaterial?



“Imagine being able to replace scarce metals with carbon. Extracting the carbon from biomass would create a natural cycle.”

Björn Sandén, Chalmers University

Fig. 1. Graph showing the cumulative number of patents for the carbon nanomaterial applications over time. The scarce metals in parenthesis are those currently used for the application.

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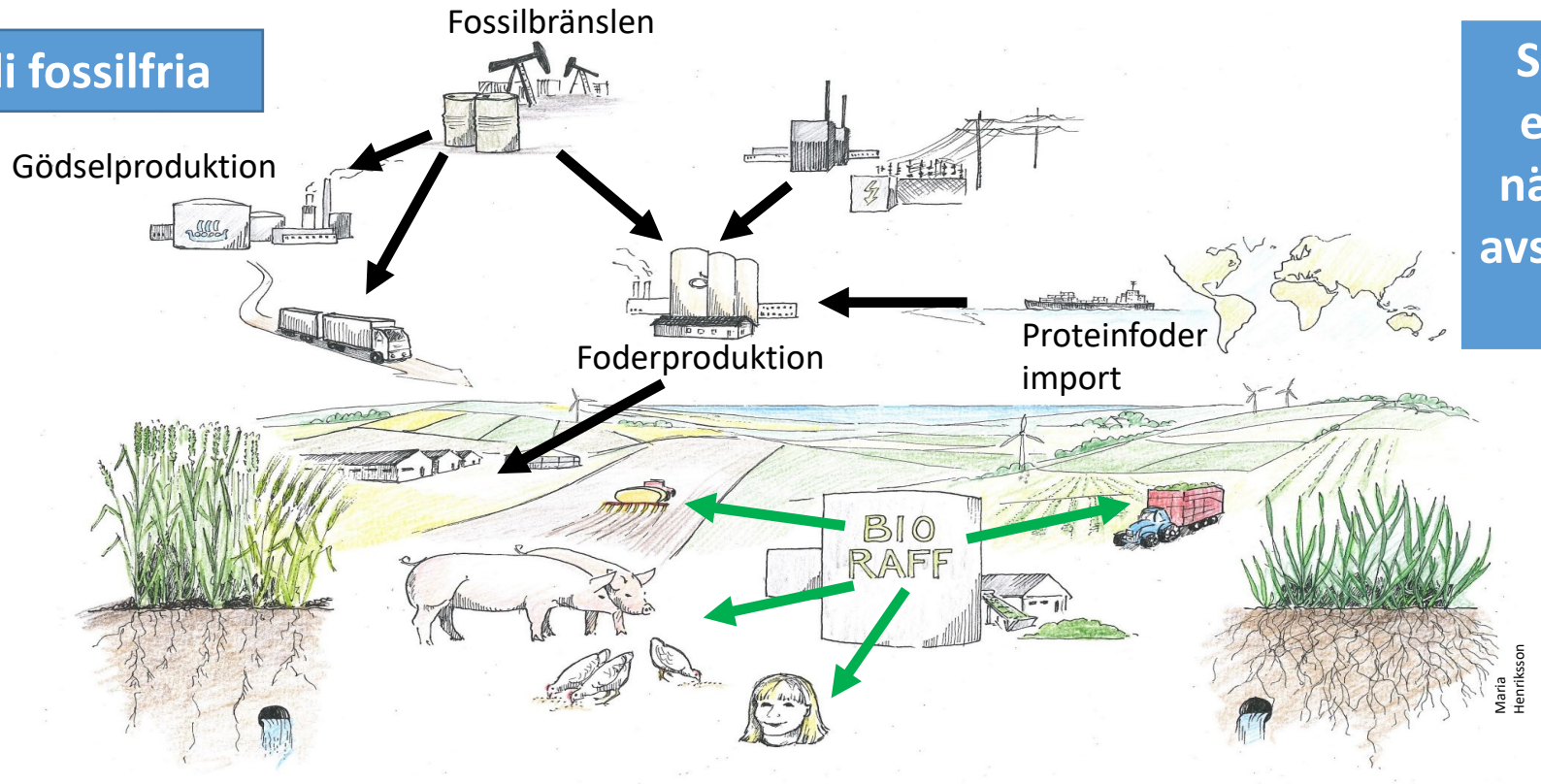
Vi ska bli fossilfria



Sojaimport = enkelriktade näringsflöden, avskogning, mkt pesticider

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