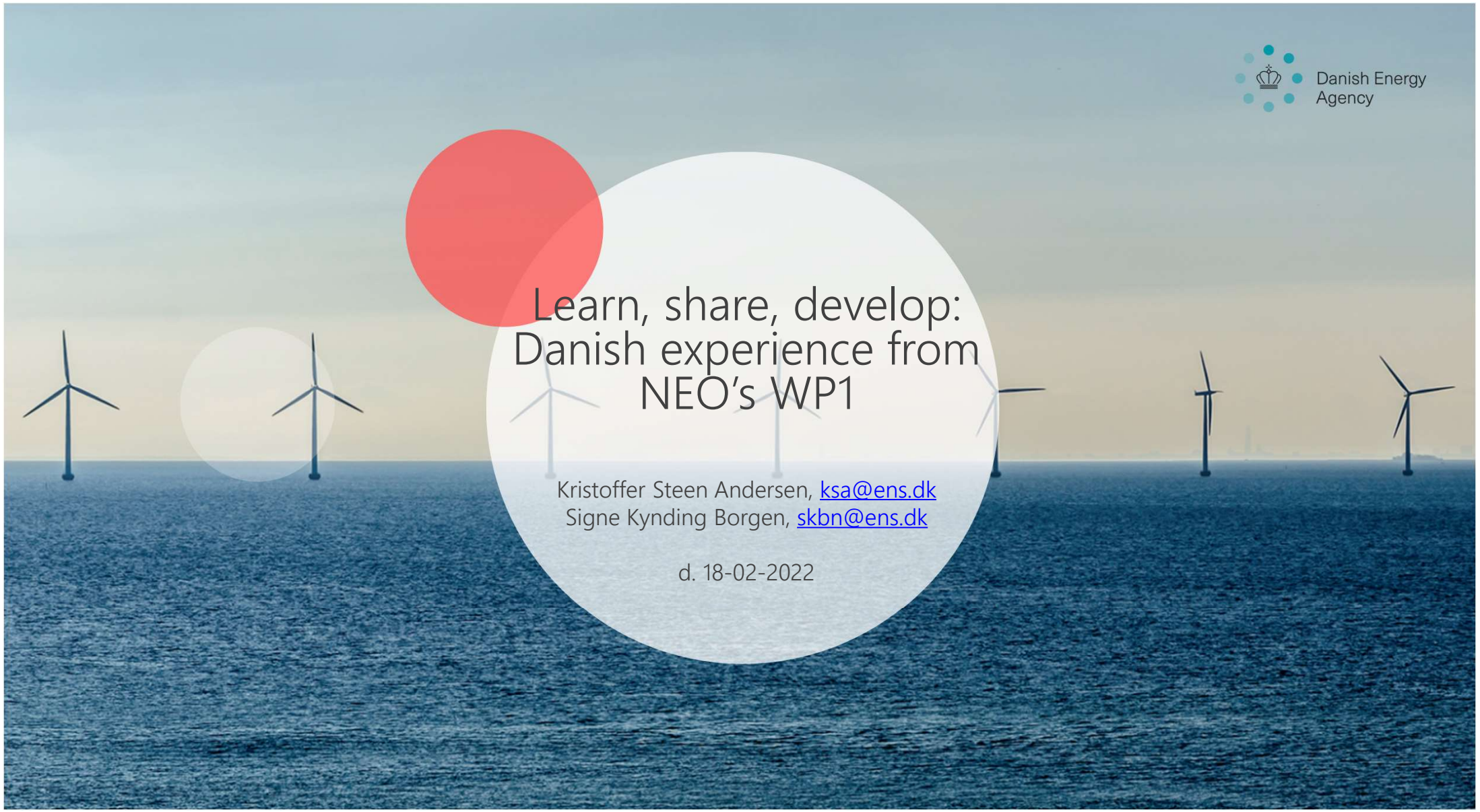

Danish Energy Agency

Learn, share, develop: Danish experience from NEO's WP1

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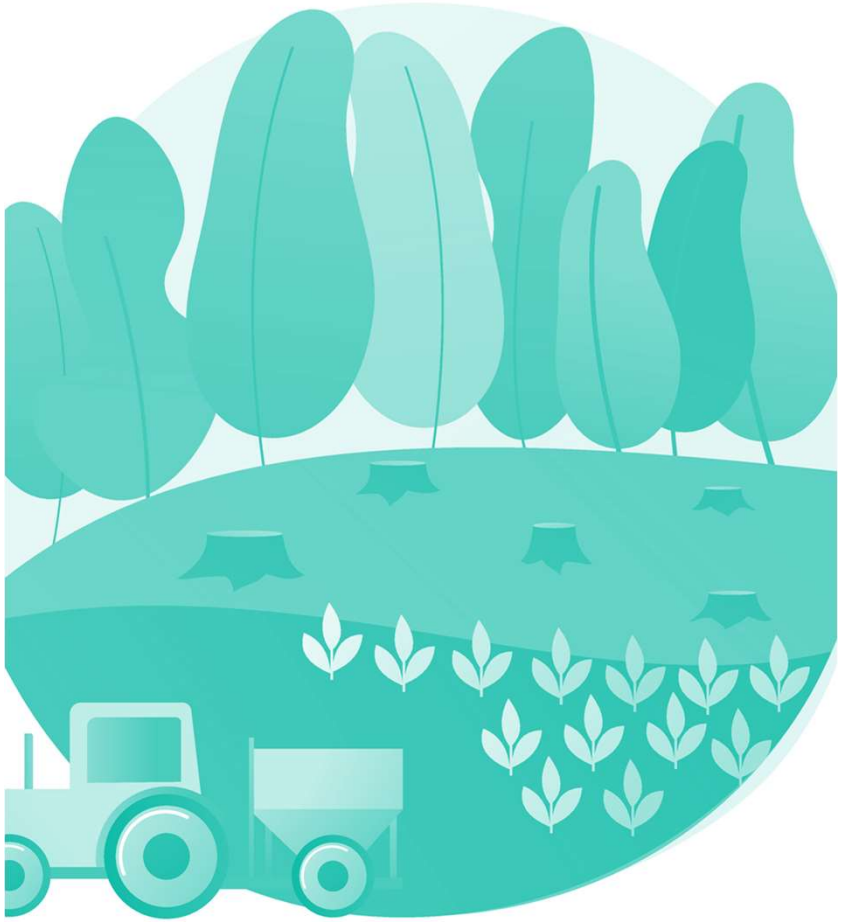
d. 18-02-2022

Outline of presentation

- Danish Energy Agency
- Danish AFOLU sector
  (Agriculture, Forestry, and Land Use)
- Danish experience from NEO's WP1
  - Learning
  - Sharing
  - Develop
- Perspectives on the National Energy and Climate Plans in a Nordic context.
- Conclusions



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Background

- The DEA has an active modelling community contributing to the development of the Danish governmental climate plans within energy, agriculture and LULUCF.

- For several years, energy system modelling has been a part of the DEA energy prognoses and there is extensive knowledge on the applicability and functionality of the different models.

- The DEA is responsible for the annual publication of the national Greenhouse gas status and projection report (*Klimastatus og – fremskrivning*) and collaborates closely with Aarhus University regarding the agricultural and LULUCF sectors.

Climate and Energy Outlook 2021

Klimastatus og – fremskrivning

Danish Energy Agency

- IntERACT Consumption
- Energy-statistics
- RAMSES Production
- Biogas projection
- Danish Energy and climate model
- INTERMIT Wind and solar
- Transport
- Oil- and gas production

Aarhus University

- Agriculture
- Forests
- Industrial procesemissions

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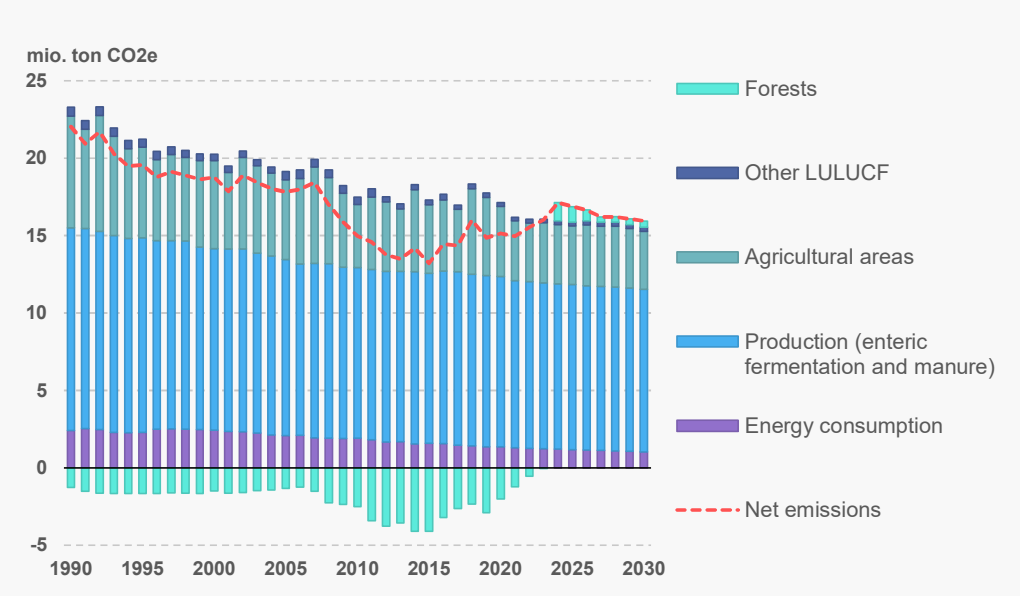
Agriculture, fishery, forests and other land use (AFOLU)*

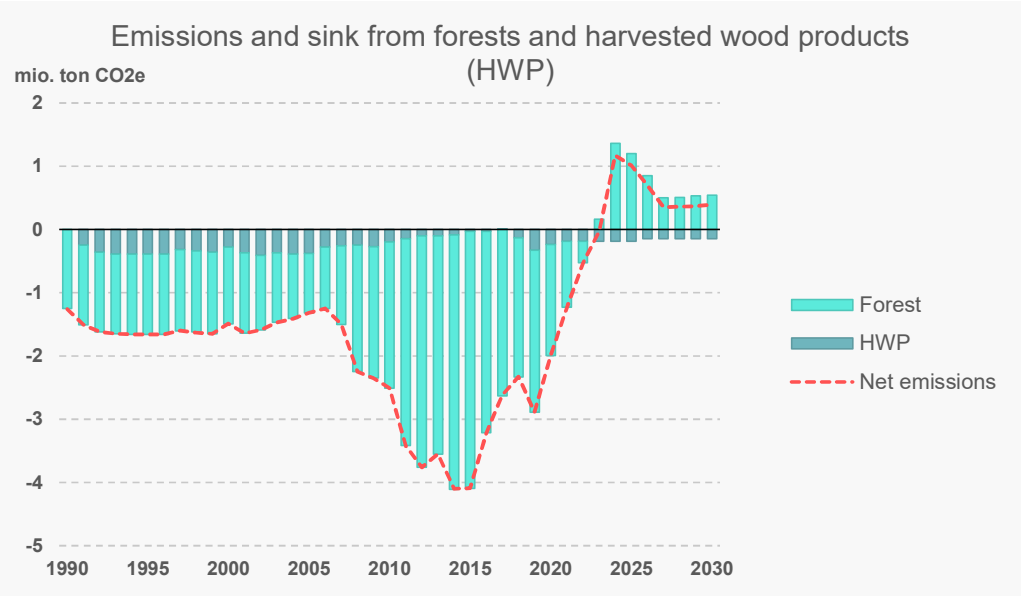
*Based on Danish Climate and Energy Outlook 2021

Danish Energy Agency

Agriculture, fishery, forests, land use and land-use change*

- Agricultural production is slightly decreasing due to increase in part due to biogas production from manure, but emissions are closely link to amount of animals
- Emissions from agricultural areas are projected to decrease primarily due to the decrease in acres of organic soils
- The projection of the LULUCF sector, and especially forestry, is uncertain as emissions/removals occur from natural sources, which can be difficult to measure and model.





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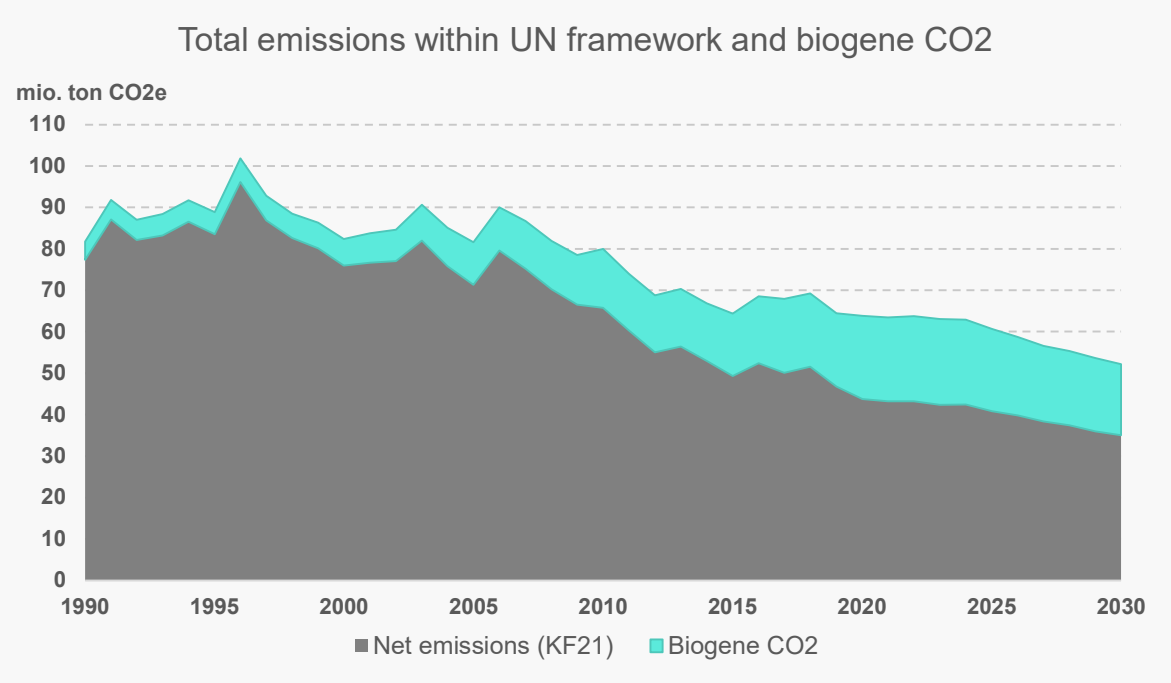
*Based on Danish Climate and Energy Outlook 2021

What about biomass – is it CO2-neutral?

CO2 from biomass etc. is defined as CO2-neutral.

If biomass was included the emissions would be approx. 30% higher.



*Based on Danish Climate and Energy Outlook 2021

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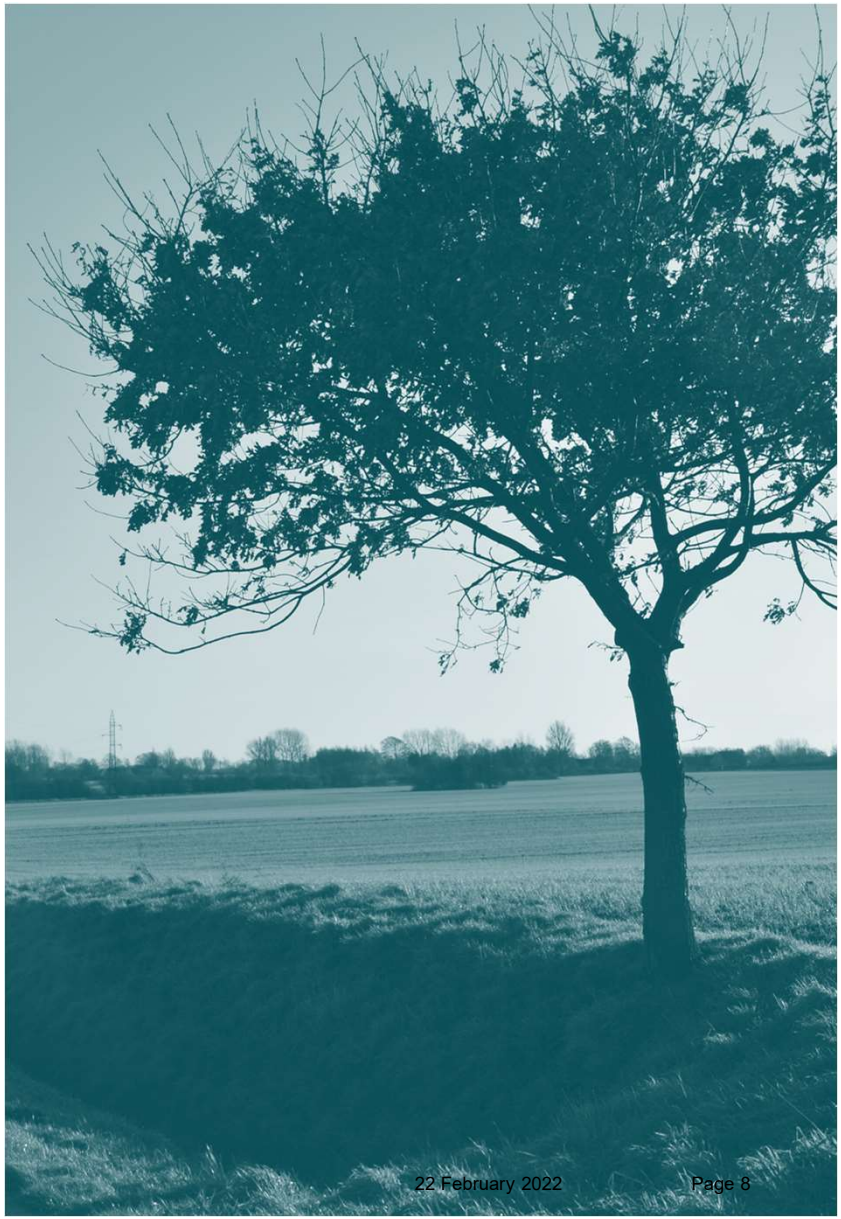
Danish experience from NEO's WP1

- The Danish Energy Agency has contributed to the Nordic Energy Outlook in-kind by sharing data, modelling experience, and providing feedback to the participating Nordic research institutions.



Learning

Danish experience from NEO's WP1

- Insights gained into:
  - uncertainties associated estimating emissions from Agriculture, Forestry, and Land Use.
  - modelling of agriculture, forestry, and land use for future Danish Climate and Energy Outlooks.
  - the use of LCA in accounting for upstream-emission in from Agriculture, Forestry, and Land Use in general energy system models.

Sharing

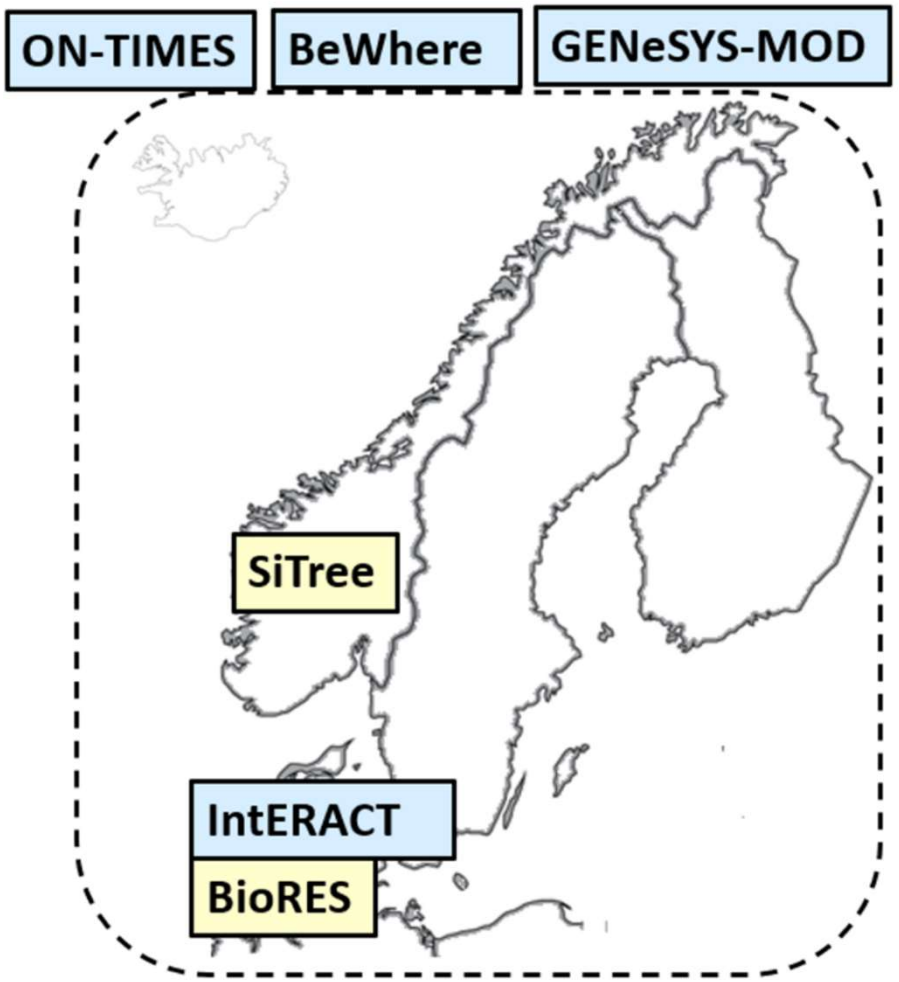
Danish experience from NEO's WP1

- Share data related to Danish biogas production for utilization in the BeWhere model.
- Share knowledge and experience related to national greenhouse gas inventory estimation models.
- Share Danish modelling experience with explorative scenarios using IntERACT and BioRES models.

IntERACT and BioRES two different national approaches to agriculture and LULUCF

- IntERACT: National energy system model
  - Recently used to create explorative scenarios dealing with how meeting Danish long-term climate policy goals may look when considering different pathways.
  - Emissions from AFOLU follows exogenous projections. This ensures that IntERACT represents all relevant GHG emissions, although only emissions related to the energy system are endogenous within the model.

- BioRES: Simple national biomass flow model
  - Transparent excel-based model dealing with national biomass flows and potentials across energy, AFOLU and end-uses.
  - The design of the BioRES model makes it ideal for making explorative bioenergy scenarios. Scenarios which can then be used to facilitate dialog between different stakeholders or serve as input to dedicated energy system models, such as IntERACT, ON-TIMES, and GENeSYS-MOD.



Develop

Danish experience from NEO's WP1

- Improve modelling and input data associated with of agriculture, forestry, and land use for GHG projections in the Danish Climate and Energy Outlook, e.g.:
  - Forest modelling could adapt a more detailed approach, such as SiTree, including forest soils (which is currently assumed in equilibrium in DK).

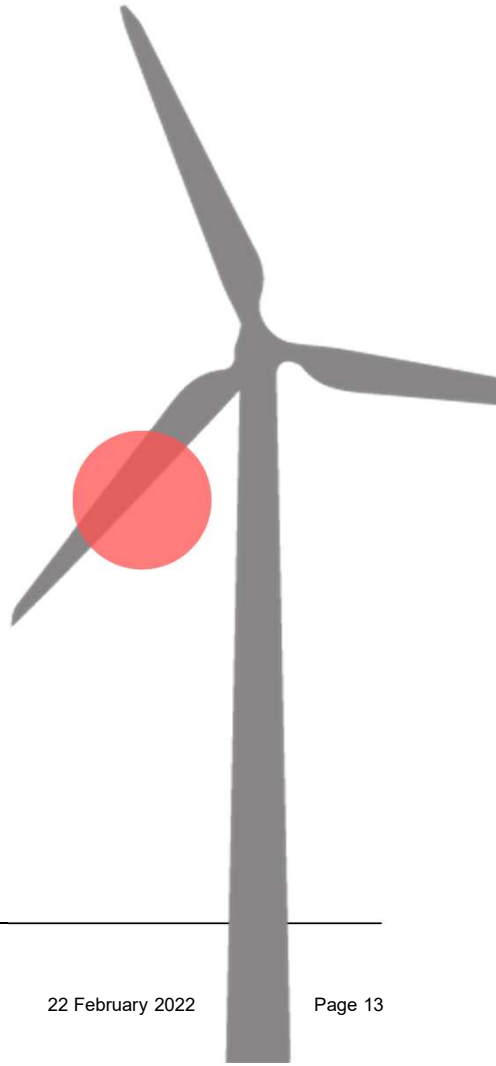
- Inspired by the link between GENeSYS-MOD and SiTree future work could be:
  - Explore linking bioenergy scenarios from IntERACT or BioRES to sector-specific LULUCF models used in the Danish national GHG inventory (IPCC methodology), e.g.:
  - Effects of removing agricultural residues from the field simulated by the soil-plant ecosystem model C-TOOL.
  - Interactions between biogas production and emissions from animal manure in the stables and the field.

- Improve representation of land-use change (afforestation and wetland restoration) and management of agricultural residues within explorative scenarios.
  - Objective: How to meet the Danish long-term climate policy goals considering different pathways.

National Energy and Climate Plans

- The NECPs are an important tool requiring EU member states to take a holistic approach to climate and energy policy
  - Not only focus on GHG emission reduction but also on renewable energy, energy efficiency, security of supply, markets, infrastructure, and research and competitiveness.
  - NECP **encourages** a regional perspective on these subjects issues.

- From a regional Nordic perspective, the large difference in biomass potential (e.g., forested areas) and the use of biomass for energy purposes across Nordic countries is worth noting.
  - Future Nordic collaboration could better understand these differences
  - Explore the potential for better integration of Nordic bioenergy markets.
  - E.g. in NECP context, investigate the role biomass for the security of energy supply in a Nordic context.



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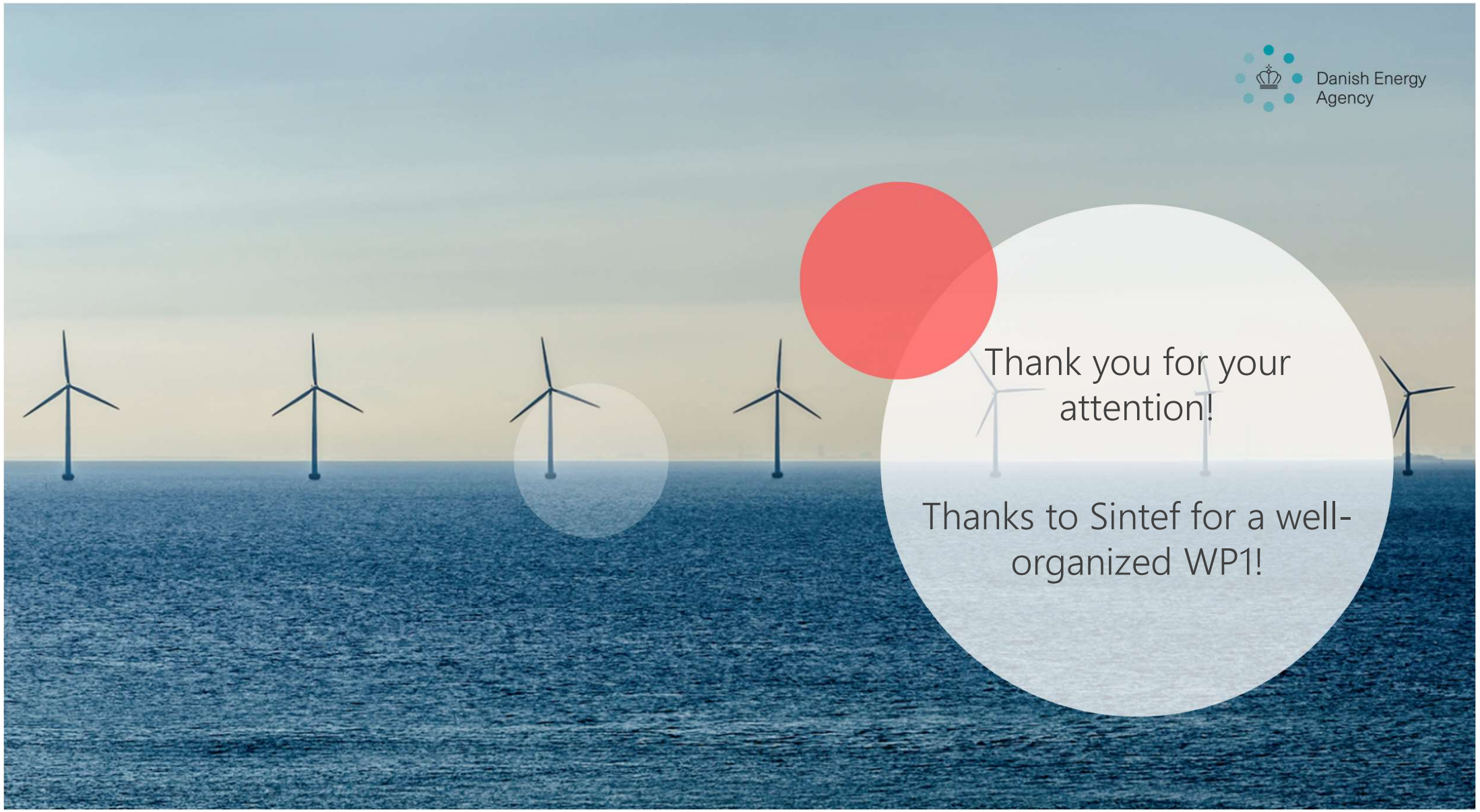
WP1 in conclusion

- Key lesson:
  - All models are a simplification of a complex reality. If we are to provide robust climate policy insight, we need to collaborate on using and comparing models to better understand the validity and limitation of each model.

- Key take-aways:
  - The WP1 has proven to be a fruitful and much-needed forum for discussing and sharing Nordic modelling experience within AFOLU.
  - LCA provides essential insight in terms of assessing important upstream emissions. However, future research should focus on avoiding double counting and confusion when combining LCA with general energy system models.
  - Developing common databases and model frameworks are essential ingredients in the further collaboration between different research institutions in a Nordic context (openENTRANCE and ON-TIMES are just a few good examples worth pursuing further).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Thank you for your attention!
Thanks to Sintef for a well-organized WP1!