Ympäristöministeriö
Miljöministeriet
Ministry of the Environment

Options for carbon dioxide removal (CDR)

Finnish perspectives on how to realise negative emissions

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National target – carbon neutrality on year 2035 *and carbon negative soon after that*

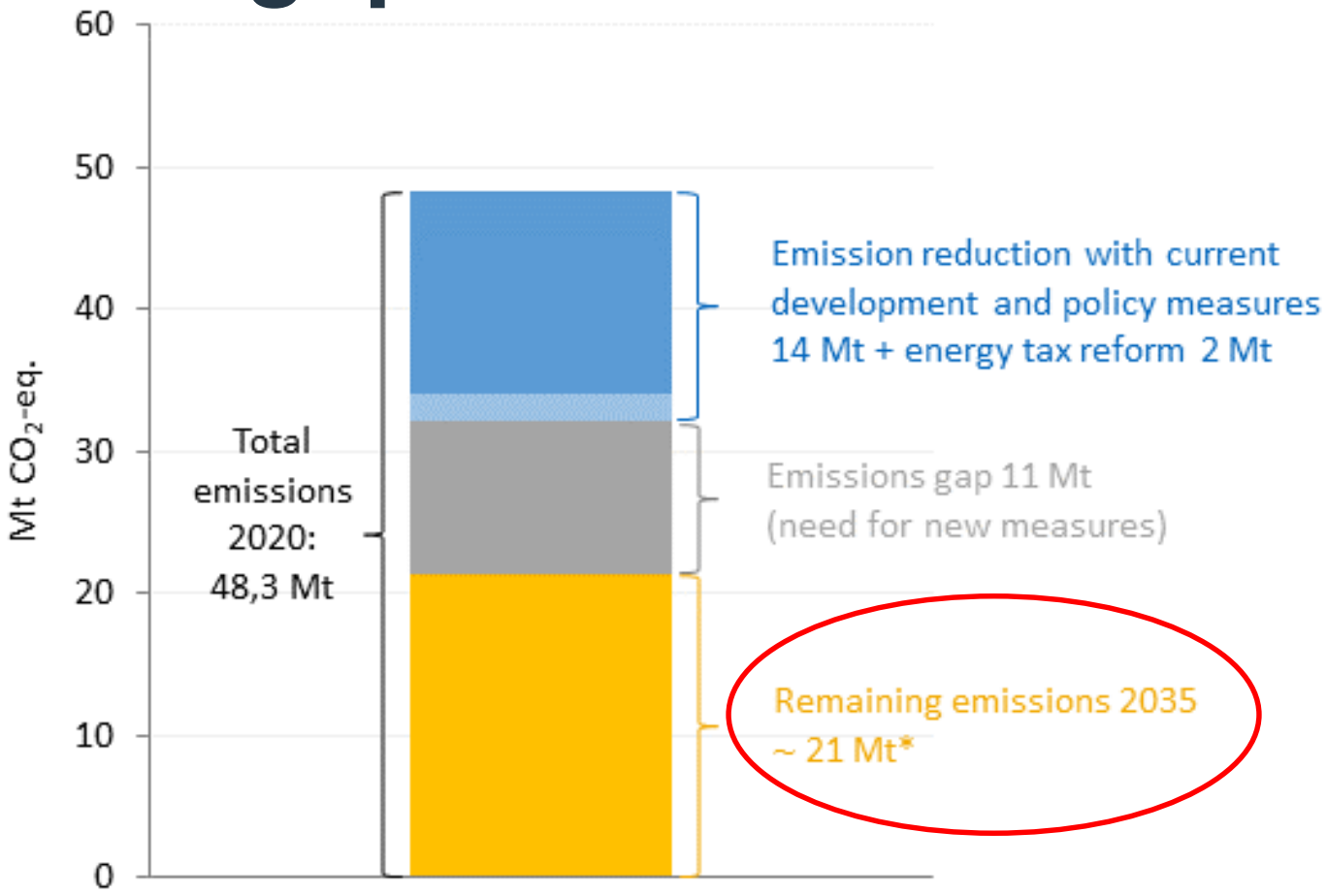
- One of the three strategic themes in the Goverment programme **“Carbon neutral Finland that protects biodiversity”**
- **Government roadmap to carbon neutral Finland 2/2020:**
  - REMOVALS: The aim for the Government is to increase Finland’s net carbon sink. The Government aims for **additional sequestration of at least 3 Mt in the land use sector** compared to the present measures.

“Agriculture and forestry are key sectors in combatting climate change. We can further strengthen carbon sequestration in forests and soil.”

- Updating Climate Change Act of Finland on-going, will be finalized in coming months

=> Climate plan/programme for the land use sector, should be finalized at the beginning of year 2022

Where are we now? Emissions gap

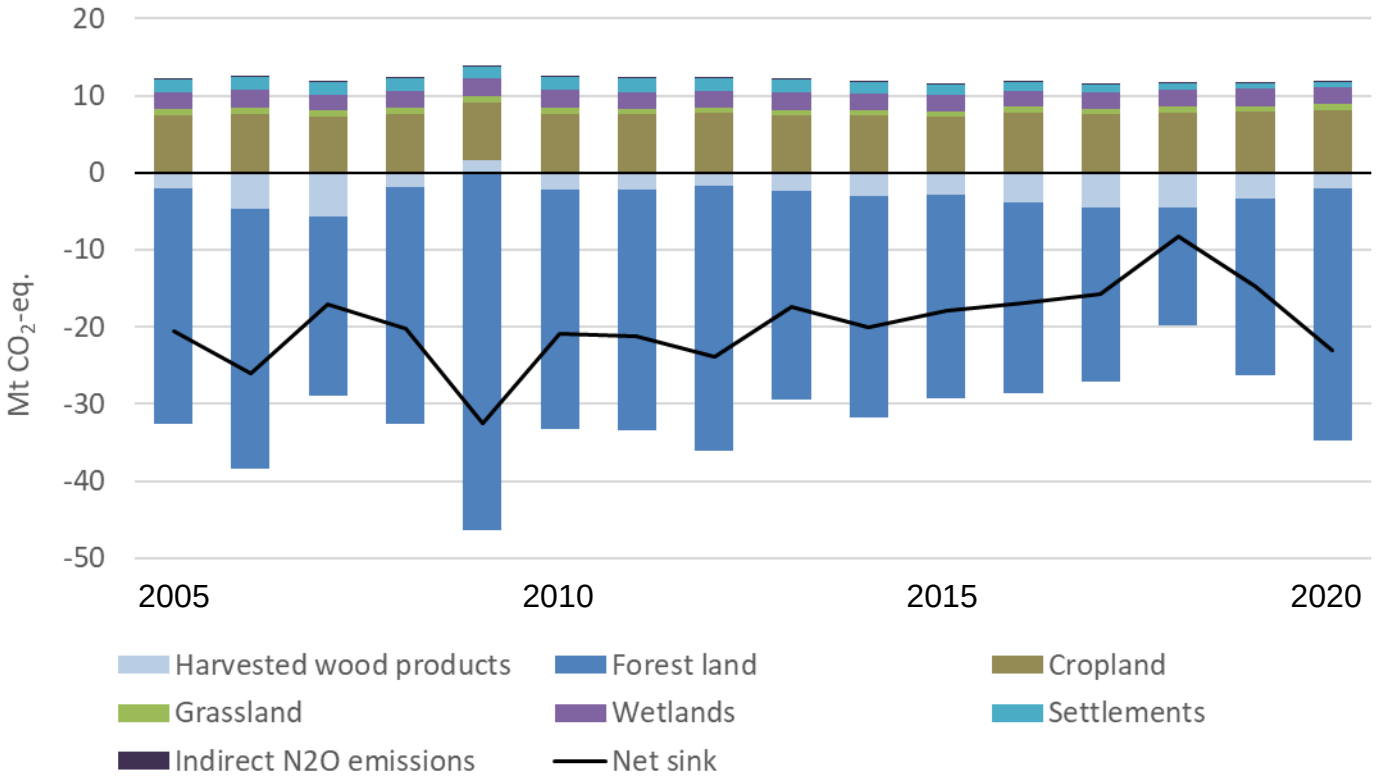


*Needed net sink

Preliminary analysis

Net sink in LULUCF sector during years 2005 - 2020

- LULUCF net sink variation driven mainly by the volume of harvest removals
- On year 2018 record high harvests, 78 mill.m3
- On year 2020 harvested volume was 69 mill.m3



How big role increasing HWP sink could play in mitigation?

Year 2016:
Forestland carbon sink= -24,8 Mt CO_{2ekv}
Harvested Wood Products (HWP) = -3,8 Mt CO_{2ekv}
Emissions from crop & wetlands etc. 11,7 Mt CO_{2ekv}
LULUCF Net sink = -16,9 $MtCO_{2eq}$

Year 2018:
Forestland carbon sink= -15,3 Mt CO_{2ekv}
Harvested Wood Products (HWP) = -4,6 Mt CO_{2ekv}
Emissions from crop & wetlands etc. 11,6 Mt CO_{2ekv}
LULUCF Net sink = -8,2 $MtCO_{2ekv}$

Change in forest ecosystem sink ca.10 Mt CO_{2ekv}

Change in HWP sink 0,8 Mt CO_{2ekv}

Here no substitution accounted for!

Long-term strategy (LTS) of Finland 10/2020

- Strategy describes three scenarios and their impact assesments concerning the carbon neutrality target 2035 and developments in greenhouse gas (GHG) emissions and **removals** by 2050.
- the reference scenario ‘With Existing Measures’ (WEM) depicts the development achievable with current policy measures
  - => carbon neutrality will not be achieved until 2050 – and even then only with land use net sinks at about -30 Mt CO2eq.
- Two low-emission scenarios, named as ‘Continuous Growth’ and “Savings, reach both carbon neutrality by 2035
- the scenarios **do not** include any quantitative analysis of the concrete measures or political decisions that would be required to achieve the carbon neutrality target or the 2050 targets

Low-emission scenarios in LTS

- ‘Continuous Growth’:
  - 87,5% GHG emission reductions by 2050 compared to 1990
  - no carbon capture and storage (CCS)
  - land use sector net sink 15 MtCO2eq larger than in WEM scenario
- ‘Savings’:
  - 90% GHG emission reductions by 2050 compared to 1990
  - BECCS used after 2030 => 14 MtCO2eq in year 2050
  - land use sector net sink 10 MtCO2eq smaller than in WEM scenario

Net sink trends in the LULUCF sector in different scenarios, $MtCO_2eq$

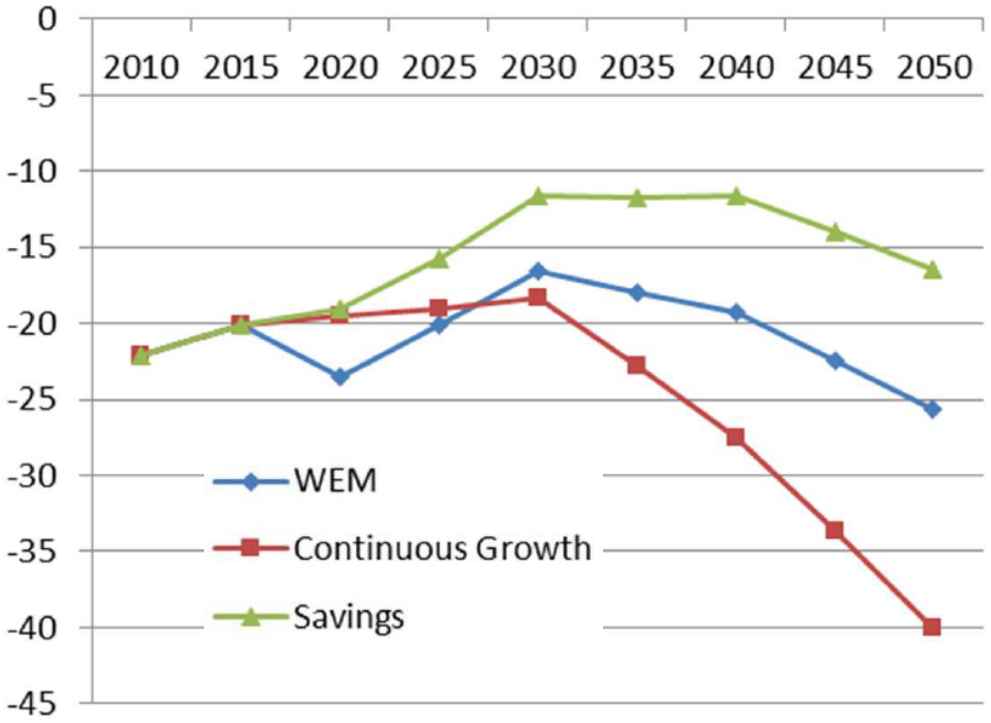
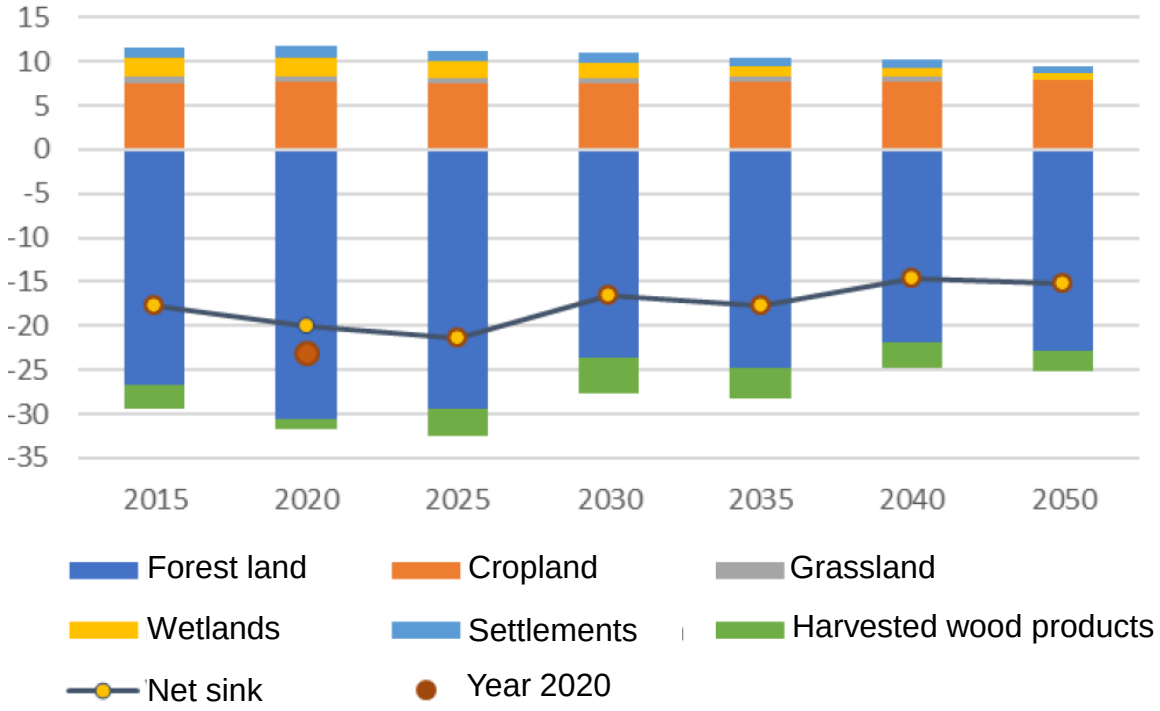


Figure 13 in Finland's long-term low greenhouse gas emission development strategy



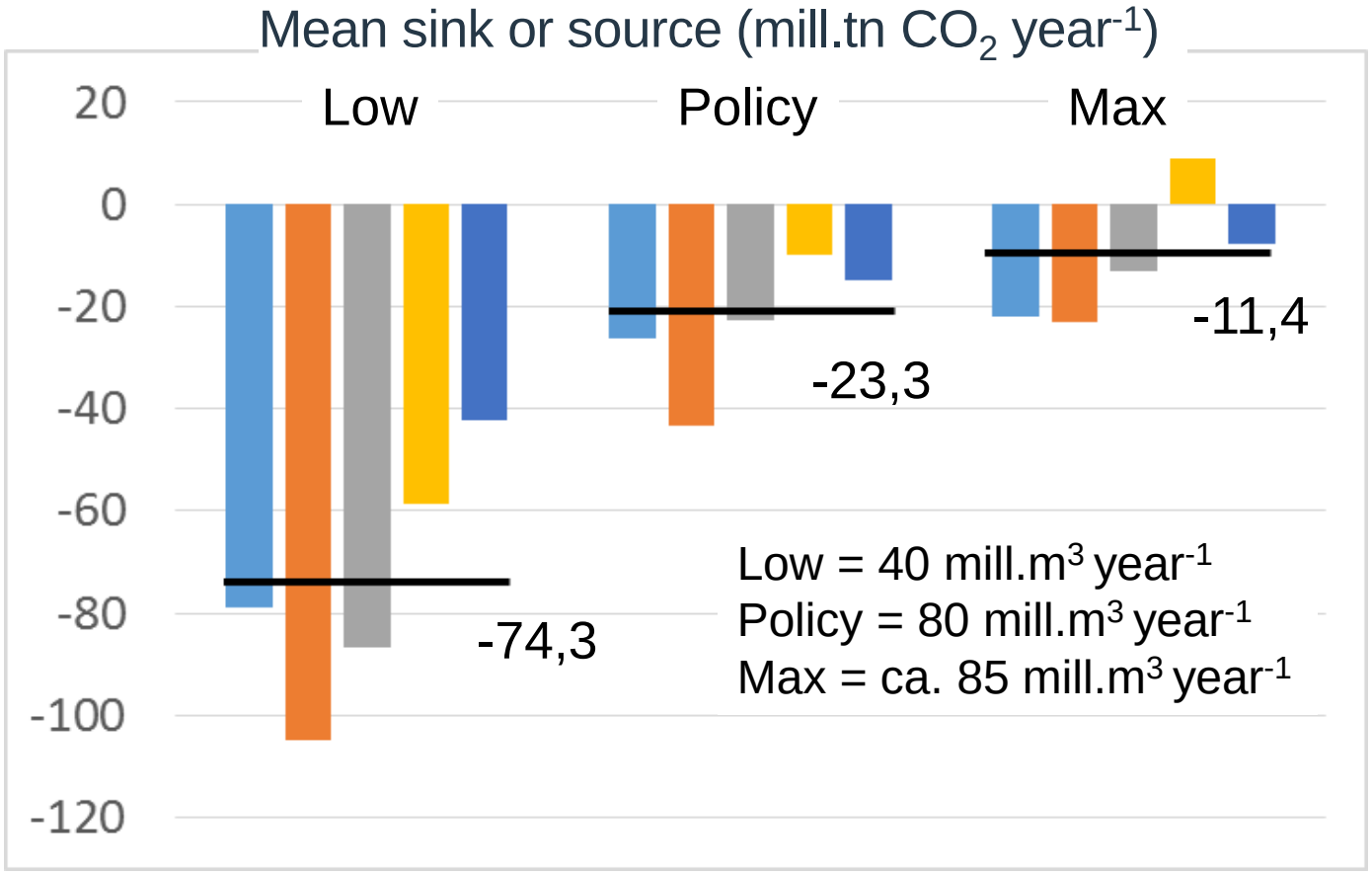
Updated WEM, preliminary analysis

Low-emission scenarios in LTS

- Increasing the amount of harvested timber will decrease the sinks (Savings) and, vice versa, reducing the amount of harvested timber (biomass) will increase the sinks (Continuous Growth).
- Harvested wood products will not fully compensate for decreasing sinks, even if production focused on durable products (Savings).

Scenario	Forest increment, Mm3/yr	Harvest removals, Mm3/yr
WEM	116	72 => 81
Continuous Growth	117	76 => 78
Savings	113	76 => 92

Model ensemble: Projected mean forest carbon stock change in different scenarios, period 2015-2065



Five different simulation models

- EFISCEN
- FORMIT
- MELA
- MONSU
- PREBAS

Forest carbon sink reduction 1,2 – 2,2 tnC per harvested tonne of wood.

Kalliokoski ym. 2019

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Changes in agriculture supporting increased CDR

- the Continuous Growth and Savings scenarios assume a considerable reduction in national consumption of livestock products (-30% to -50% by 2050).
- As a result, the arable area under active cultivation will shrink due to declining demand for forage area
- Agricultural emissions on year 2050
  - WEM 6,45 MtCO2eq ~ same as current level
  - Savings 4.36 MtCO2eq
  - Continuous Growth 3.84 MtCO2eq
- Agricultural changes will especially have an impact on peatland emissions classified under the LULUCF sector's 'cropland' emissions, which would decline by 4–5 Mt CO2eq over a period from 2015 to 2050.

Climate measures in the land use sector

- As part of planning for the climate and energy policy system, the Government will create a comprehensive climate programme for the land use sector.
  - Safeguarding the management, growth capacity and health of forests
  - Advancing afforestation
  - Reducing deforestation
  - Means to reduce the emissions of swamps and peatlands
  - Climate-sustainable management of swamp forests
  - Reducing the emissions and strengthening the carbon sequestration properties of agricultural land

=> Work to define necessary policy measures on-going and impact assesment should be ready during first quarter of year 2022

On the role of CCS in the long-term strategy

- Under the Savings scenario, which assumes that CCS will be available, CCS plays very significant role at 2050
  - it can be applied in cement manufacturing,
  - fuel refining processes
  - and, to a limited extent, in pulp production.

  ⇒ If ETS price increases as projected

  ⇒ Transport to where? Or CCU “power-to-X”?

Thank you!

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