Indirect land use change emissions

UNECE GRPE IWG on Automotive Life Cycle Assessment
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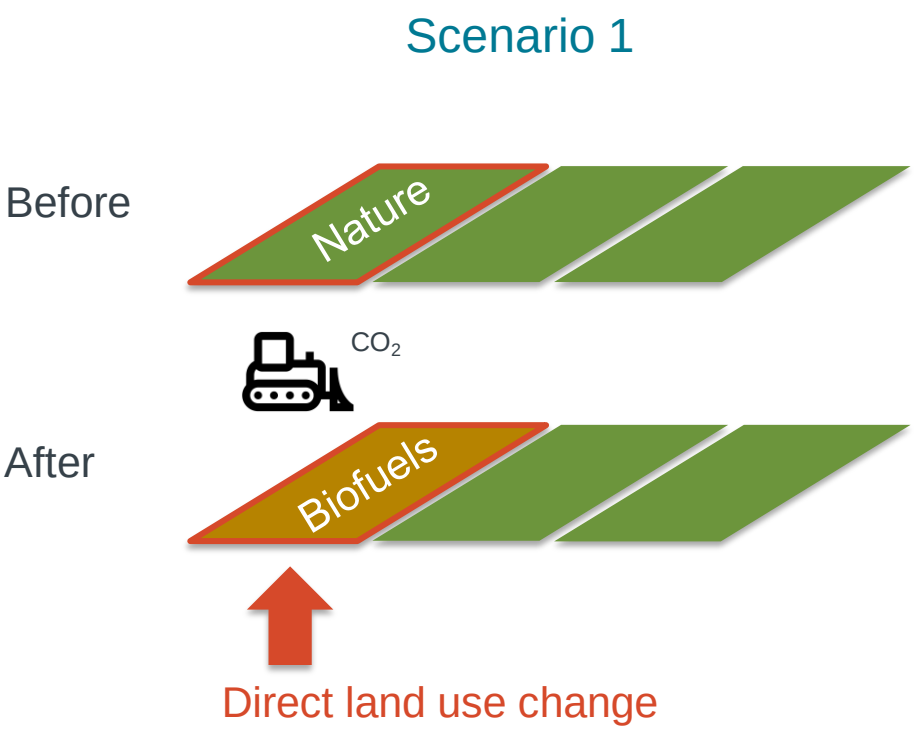
Direct land use change emissions

Biofuels production results in an expansion of the agricultural area.

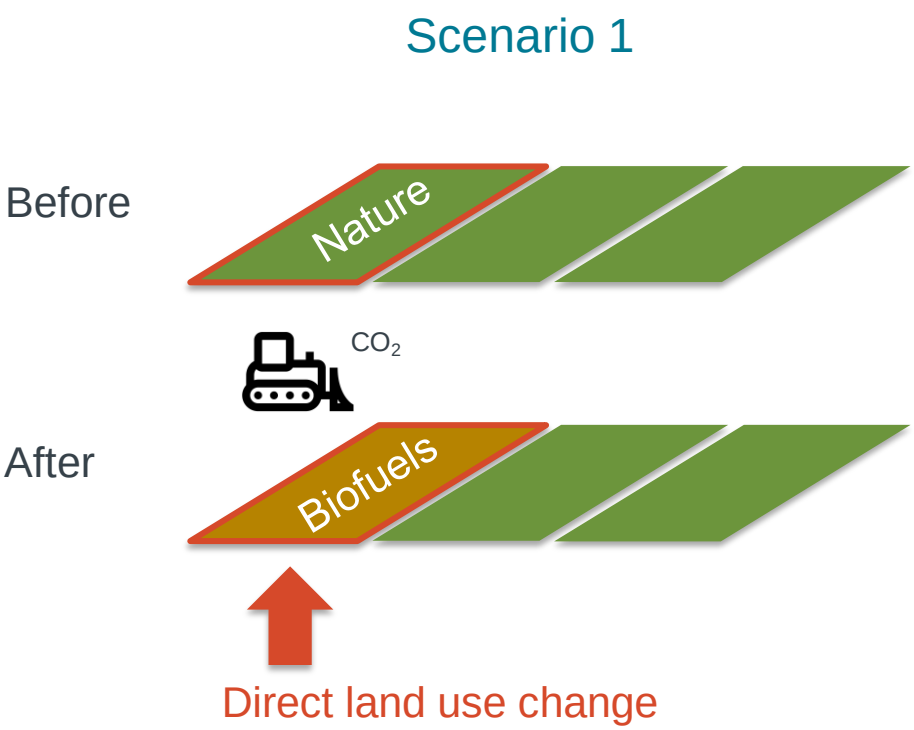
- CO_2 emissions from clearing **above-ground biomass** and **change in soil carbon**.
- Divided by fuel output over a period, e.g., 20 years (IPCC).



Direct land use change emissions

Direct land use change emissions:

- Scope limited to change in area used for biofuels production.
- Indirect effects on land use elsewhere is not covered.



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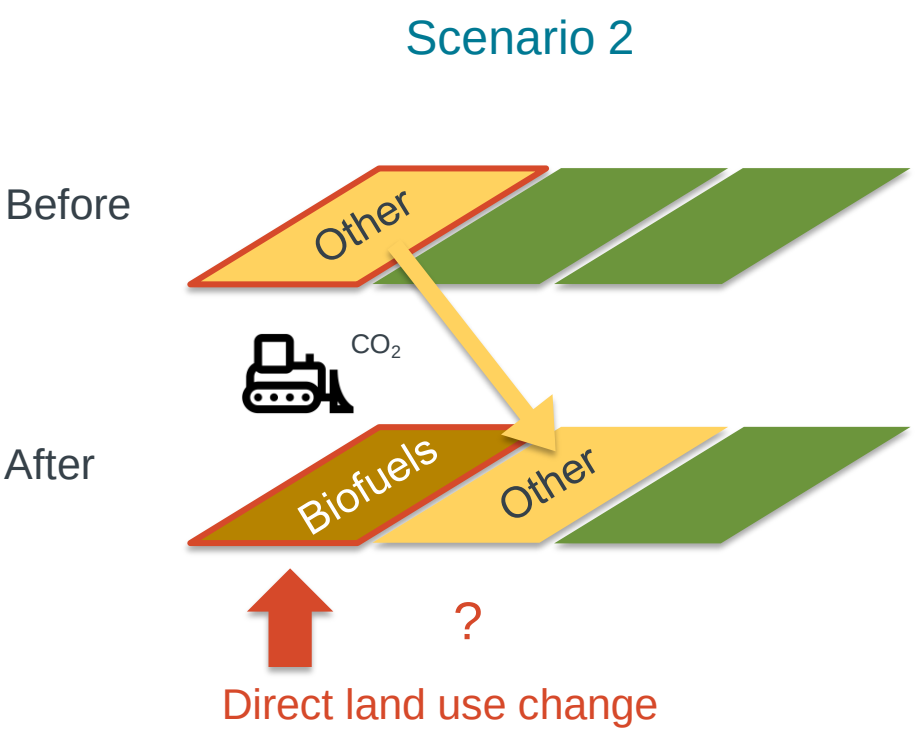
Direct land use change emissions do not show the full climate impact.



Why *indirect* land use change emissions?

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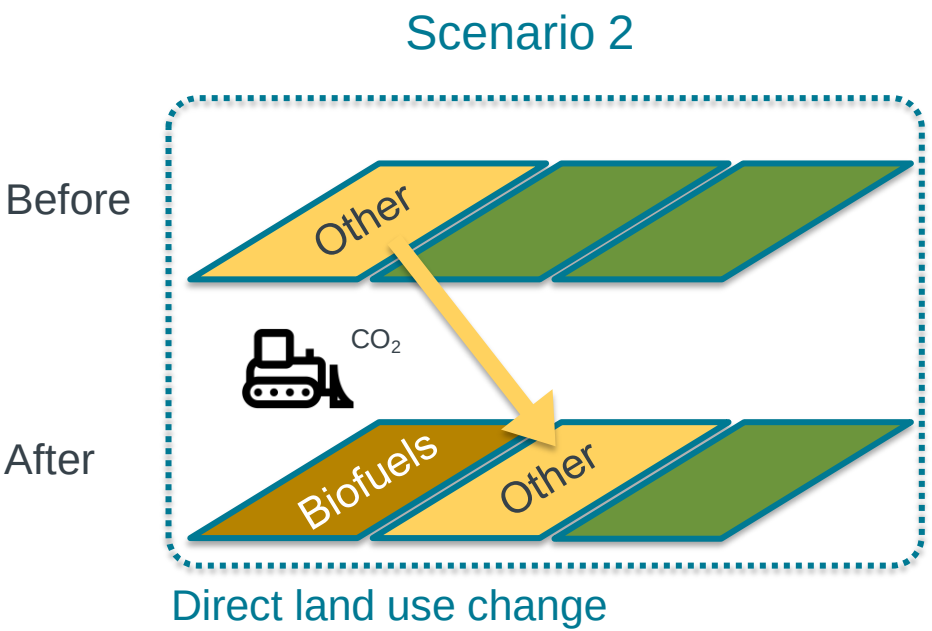
Indirect land use change emissions:

- Global scope: global expansion of agricultural area resulting from increase in demand.
- Market-based, economic models.



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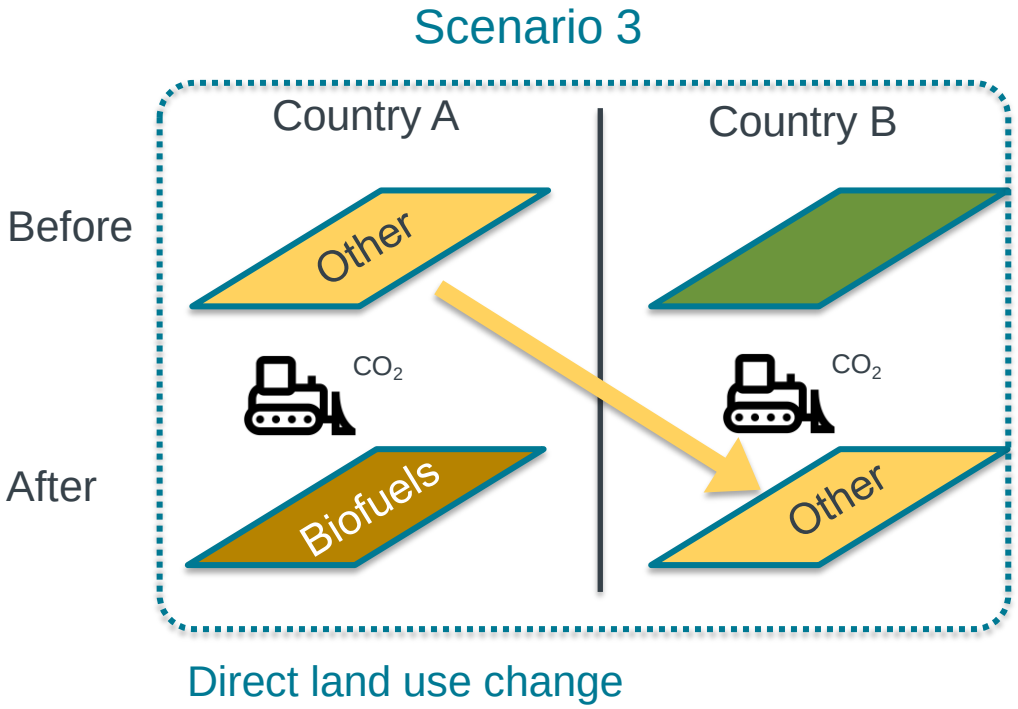


Why *indirect* land use change emissions?

Economic models: Global expansion of agricultural area from increase in demand of a given feedstock.

- GLOBIOM (Global Biosphere Management Model)
- GTAP (Global Trade Analysis Project)
- ADAGE (Applied Dynamic Analysis of the Global Economy)
- GCAM (Global Change Assessment Model)
- …

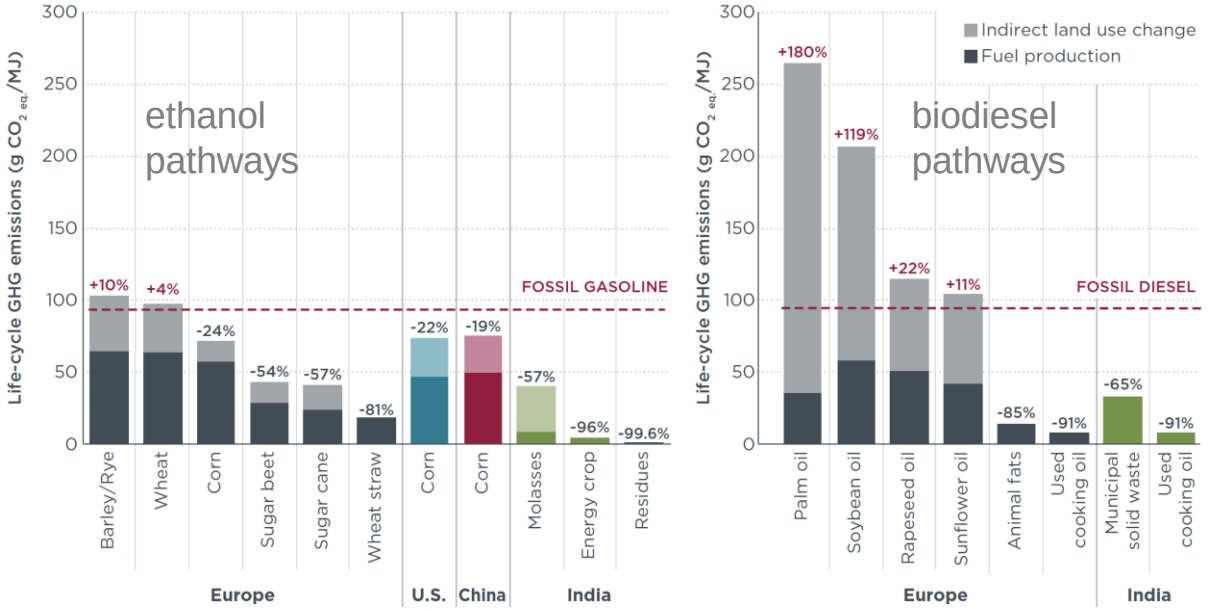
ILUC: a fundamental part of biofuels climate impact

Indirect land use change (ILUC) emission of biofuels:

- **Food-based biofuels:** high ILUC emissions
- **Residue- and waste-based biofuels:** low ILUC emissions

Most biofuels are food-based!

Biofuel production and indirect land use change emissions



Bieker (2021). A global comparison of the life-cycle GHG emissions of combustion engine and electric passenger cars.

ILUC emissions in fuels policies

Key consideration in **fuels policies & analysis**:

- European Union Renewable Energy Directive (RED)
- United States Renewable Fuels Standard (RFS)
- California Low Carbon Fuels Standard (LCFS)
- International Civil Aviation Organization (ICAO):
  Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)
- …

Conclusion

Direct land use change emissions:

- **Attributional**
- Unable to cover full climate impact
- Well precedent to evaluate

Indirect land use change emissions:

- **Consequential**
- Show full climate impact
- Data available, e.g., from CORSIA

The goal of the LCA is to assess the climate impact of vehicles and allow **comparison (of models) across power train types:**

- The comparison is **incomplete** without acknowledgement of ILUC, land use change emissions make most sense be **consequential**.
- Most parts make most sense to be attributional.

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Thank you!

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