



Forests and Climate Change - Science in Dialogue

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Our world is warming rapidly

- Science is clear: human activities have increased atmospheric greenhouse gas concentrations
- CO₂ increased nearly 50% since pre-industrial (~1850).
- Global Mean Surface Temperature has increased by about 0.9 °C, and nearly twice as much over land.

Climate change impacts are already felt around the world.



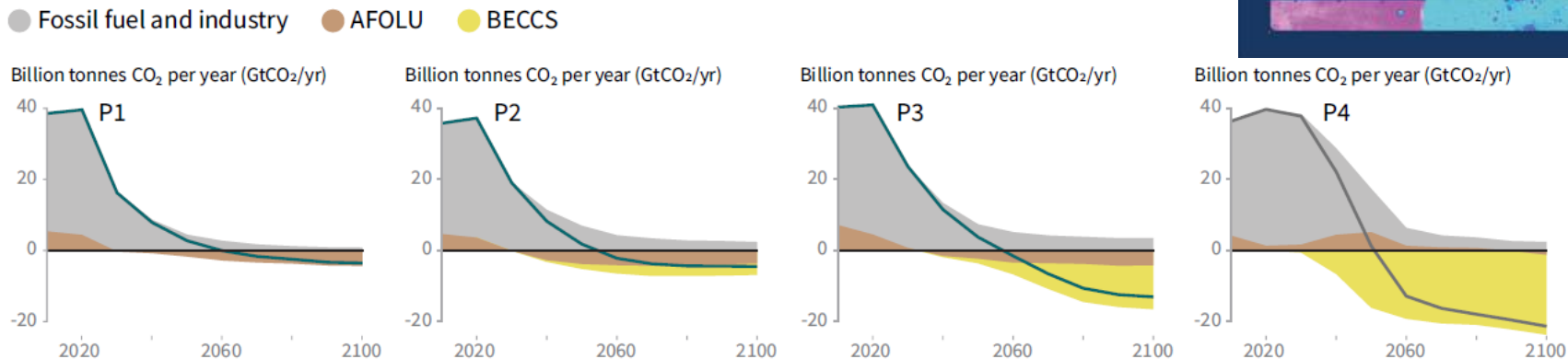
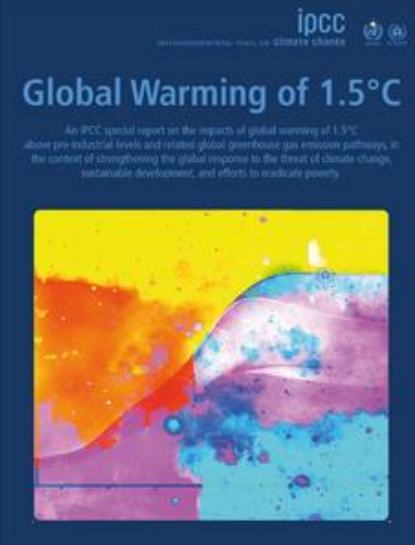
... and many release more GHG or change energy balance (albedo).

We cannot keep warming below 2 °C without land sector contributions

- **Net negative emissions** are required later this century: CO₂ removals from the atmosphere must be greater than emissions.
- Expectations are high that the land sector will contribute these removals.

IPCC SR1.5

Emissions must be reduced and land sinks must be increased.
Delays in emission reduction will increase required future land sinks
This further increases the demand for land ...



**Bioenergy Plantations
Land Demand (Mha)**

22

93

283

724

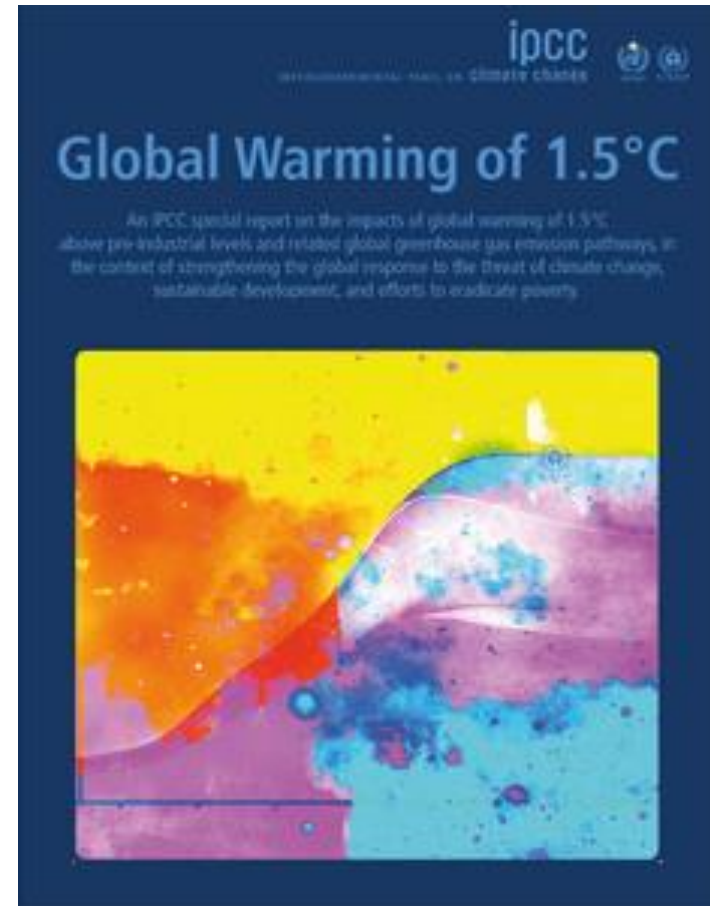
IPCC SR1.5

Every tonne of GHGs matters

Every year matters

Every degree matters

We still have choices ...



Source: IPCC Special Report 1.5 Degrees

IPCC SRCCL

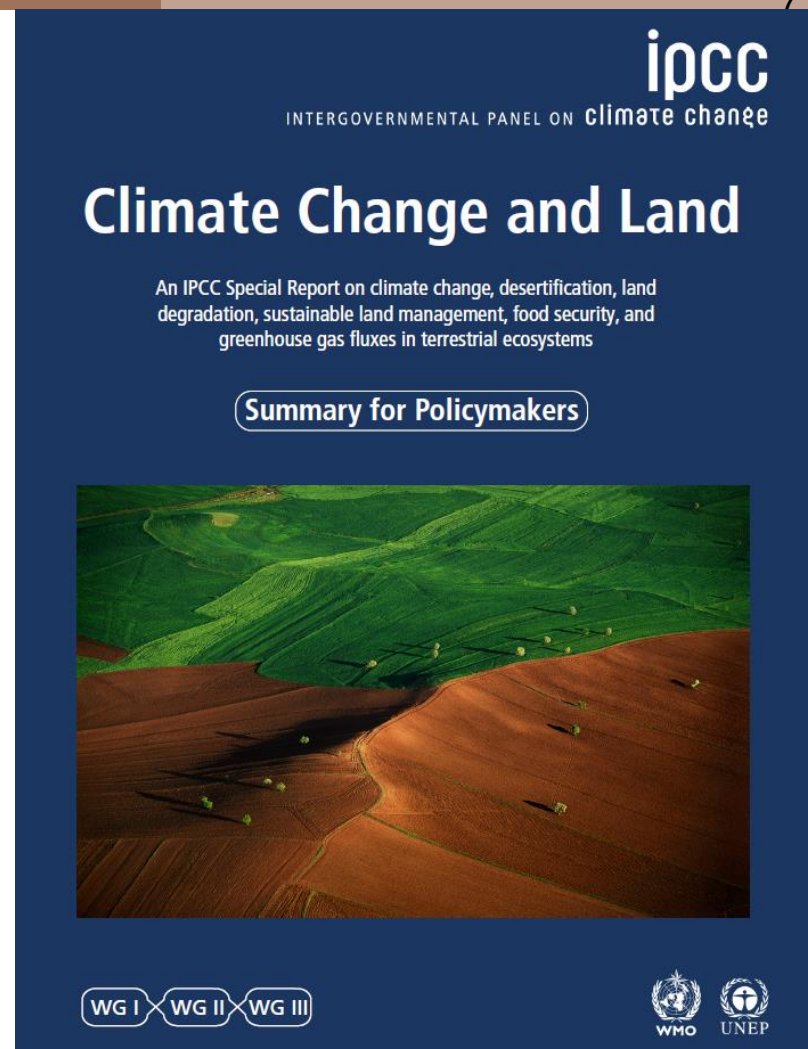
Carbon removal through land and

- Desertification
- Degradation
- Sustainable land management
- Food security

Identifies risks, opportunities and synergies

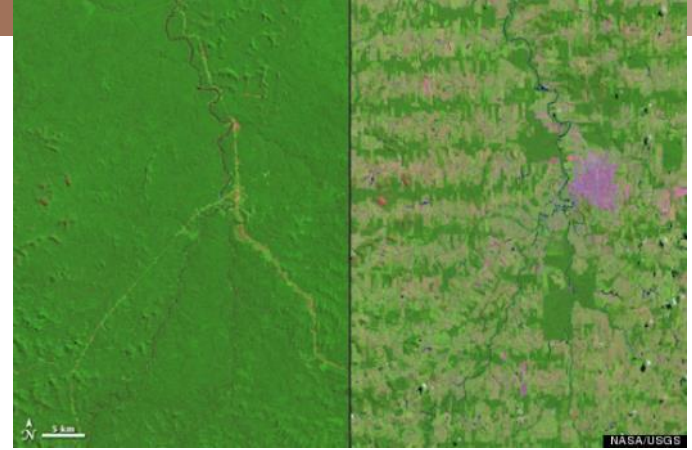
Not all activities require land

<https://www.ipcc.ch/report/srccl/>



Reduce deforestation

- The fastest and largest land sector mitigation opportunity is reducing the conversion of forest to other land uses ...



Source: NASA/USGS



Source: [Oil Palm Concession in Riau, Sumatra](#)
by Hayden \ [CC-BY-2.0](#), via Wikimedia Commons

Reforestation

- Opportunities to align mitigation and land restoration objectives.
- Informed by local knowledge
- Anticipate climate change impacts



Source: Korea Forest Service, IPCC SRCCL

Sustainable Forest Management

- Maintain or increase forest carbon stocks,
- increase forest C sinks, and
- provide sustainable supply of timber, fiber and energy



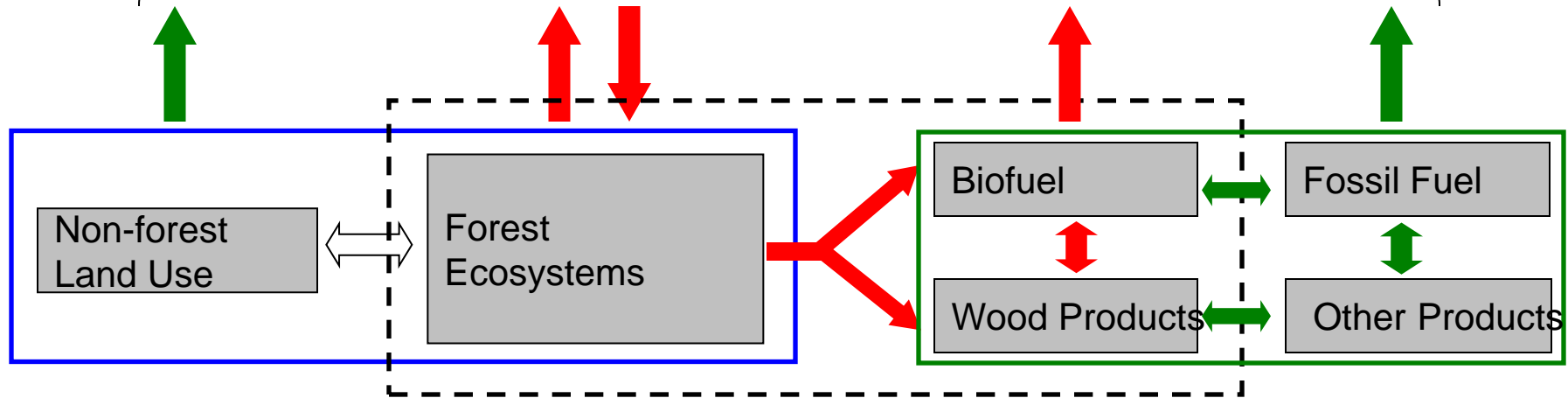
Source: Susulyka, CC BY-SA 4.0,
<https://commons.wikimedia.org/w/index.php?curid=3900688>

Mitigation Strategies: Need for Systems Perspective

Minimise net impacts on the climate system

Minimise net Emissions to the Atmosphere

Maximise Carbon Stocks



Land-use Sector

Forest Sector

Services used by Society

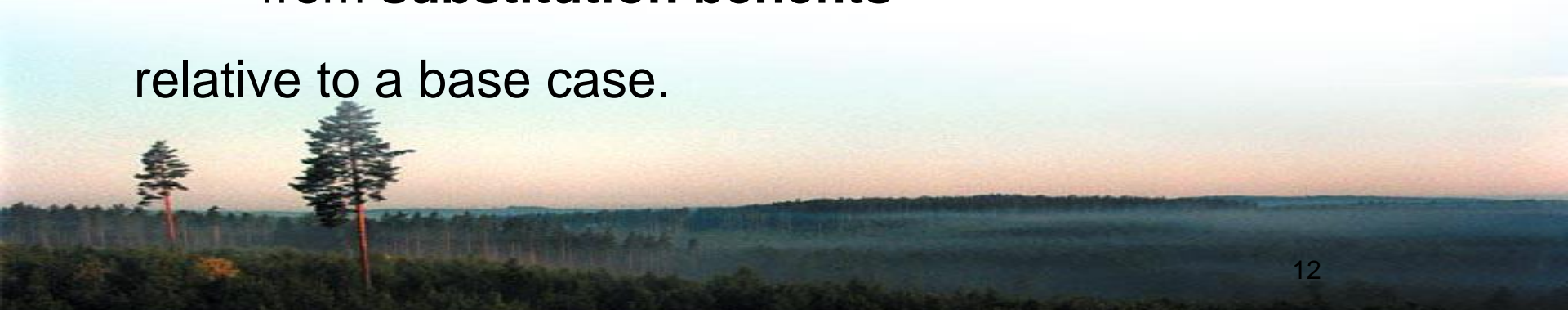
Source: IPCC 2007, AR4 WG III, Forestry

Focus on GHG balance, not stocks

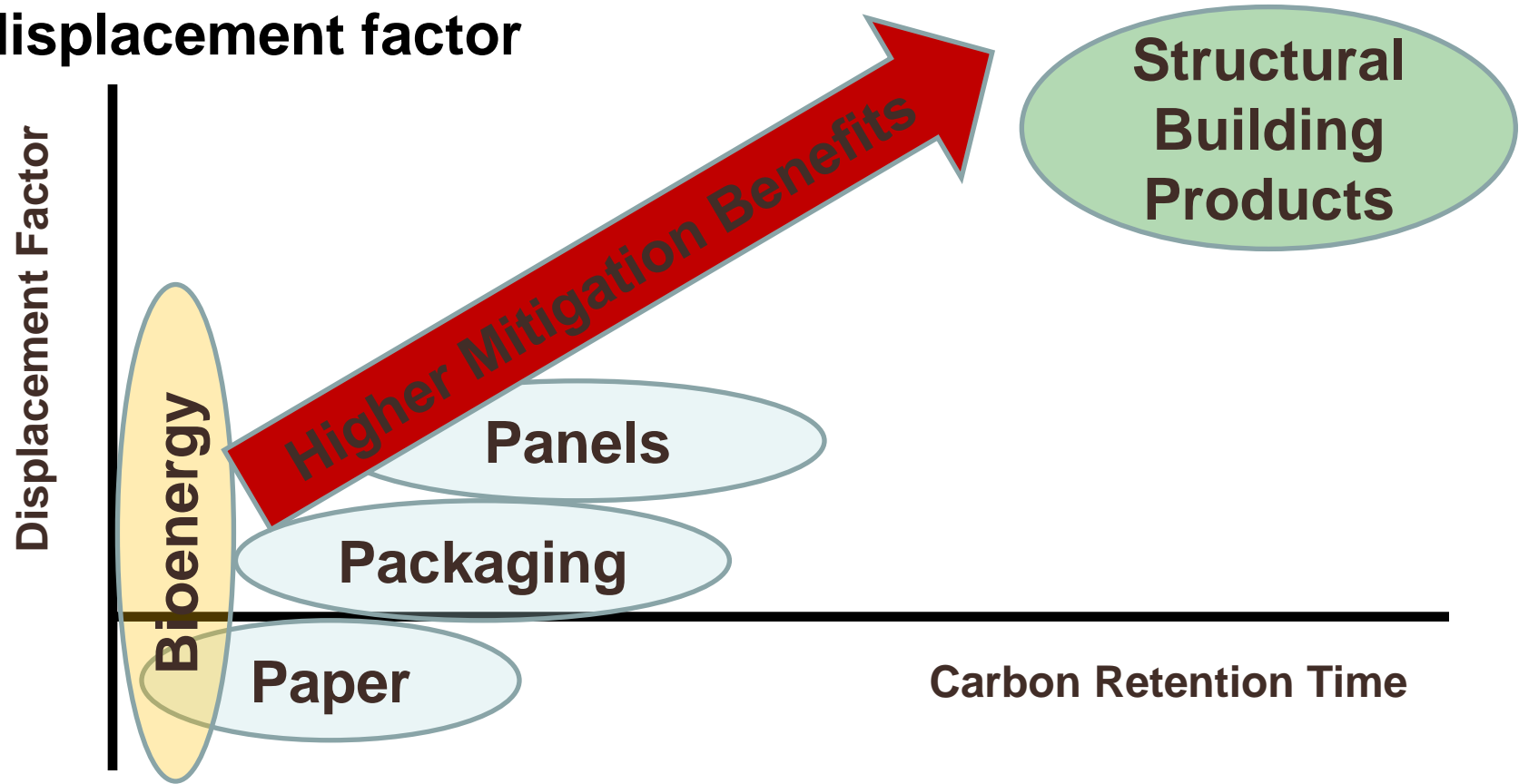
Design of climate change mitigation portfolios in the forest sector should account for net GHG balance in

- **forest ecosystems,**
- in **harvested wood products,** and
- from **substitution benefits**

relative to a base case.



Mitigation benefit increases with carbon retention and displacement factor



Mitigation benefits by displacing emissions from concrete and steel through the use of wood products

18-story wood building completed



35-story wood building planned



Art Gallery of Ontario
Toronto, Ontario

Source: Perkins and Will

Innovation



Wood products to increase C retention and substitute emission intensive alternatives

Photos: <https://www.nordic.ca/>

Climate change impacts

- Climate change impacts will be regionally-differentiated
 - Enhanced or reduced growth and mortality rates (CO₂, N, T)
 - Increased decomposition rates
 - Thawing permafrost
 - Shifting vegetation zones
 - Increased disturbances

Net effects are difficult to predict

– but there is an asymmetry of risk.

In British Columbia, 2017 and 2018 annual direct wildfire emissions estimated at ~3 times the emissions from all other sectors



Science Contributions

- Quantify **opportunities** to mitigate climate change through enhancement of forest sinks, conservation and wood use
- Communicate **limitations** compared to fossil emissions.
- Assess and mitigate **risks** from climate change impacts
- Support **implementation** of mitigation and adaptation strategies informed by local knowledge, and
- **Monitor** and report outcomes.

Conclusions

- Keeping temperature increase to below 2 °C requires **net negative emissions** before 2100.
- This is within the **lifetime** of children born today!
- Requires **drastic reductions of emissions** in all sectors.
- Not achievable without also greatly increasing **forest sinks**.
- **We still have options** – but the longer we delay action, the more severe the consequences will be.



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Publications at:

<http://cfs.nrcan.gc.ca/publications/search?query=Kurz>



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